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The Influence of Gaze Cuing on Affective Judgments of Faces

(Der Einfluss von Blickrichtung als Hinweisreiz auf affektive Beurteilungen von Gesichtern)

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CONTENT

ABSTRACT

Eye gaze is the most important indication of what or whom somebody is attending to. Recent studies revealed, that observing a shift of an eye gaze results in an obligatory shift of attention towards the direction the observed person is attending to. Since gaze cannot only serve as an indicator of the attentional state but also reflect preference formation, seeing that an object is looked at by a person can lead to the assumption that the person likes that object. Recent studies showed that an observing a face gazing towards an object results in an enhanced evaluation of that object. The present study investigated whether this enhancement can be found when another face rather than an object was the target of gaze. Photographs of naturalistic scenes with two people standing side by side were used as stimuli in the present study. Gazed at faces were found to be rated as more attractive and more trustworthy than faces that have not been gazed at (Experiment 2). The study's findings also showed a difference in data depending on the active gazing behaviour of the faces; with the faces exhibiting a direct gaze being rated as more attractive and more trustworthy than the faces exhibiting an averted gaze. Additionally, a laterality bias was observed. Faces presented on the left side of the scene received higher ratings on both scales (attractiveness and trustworthiness) than faces presented on the right side.

ABSTRACT IN DEUTSCH

Die Blickrichtung gilt als wichtigster Indikator dafür, wem oder was jemand gerade seine Aufmerksamkeit schenkt. Jüngste Studien zeigten, dass die Beobachtung eines Blickrichtungswechsels zu einer automatischen Verschiebung der eigenen Aufmerksamkeit in die Richtung, in welche die beobachtete Person blickt, führt. Blickrichtung kann jedoch nicht nur ein Indikator für Aufmerksamkeit, sondern auch für Präferenzbildung sein. Die Beobachtung, dass ein Objekt von einer Person angesehen wird, kann zu der Annahme führen, dass die Person das Objekt positiv bewertet. In weiteren Studien wurde gezeigt, dass die Beobachtung der Blickrichtung eines anderen Gesichtes hin zu einem Objekt zu einer erhöhten Wertschätzung des Beobachters für dieses Objekts führen kann. In der vorliegenden Studie wurde untersucht, ob diese Erhöhung der Wertschätzung auch zutrifft, wenn Gesichter anstatt von Objekten das Ziel von Blickrichtungen sind. Im Untersuchungsdesign wurden Fotografien von natürlichen Szenen mit zwei nebeneinander stehenden Menschen als Stimuli verwendet. Es wurde herausgefunden, dass Gesichter, die von anderen Gesichtern angesehen werden, als attraktiver und vertrauenswürdiger beurteilt werden, als Gesichter, die nicht von anderen Gesichtern angesehen werden (Experiment 2). Die Ergebnisse der Studie zeigten auch eine vom aktiven Blickverhalten der Gesichter (direkter bzw. abgewandter Blick) abhängige Differenz in den Daten. Gesichter, welche einen direkten Blick zeigen, werden als attraktiver und vertrauenswürdiger bewertet als Gesichter, die einen abgewandten Blick zeigen. Zusätzlich wurde ein Einfluss von Lateralität beobachtet. Gesichter, die auf der linken Seite des Bildes präsentiert werden, erhalten höhere Bewertungen auf beiden Skalen (Attraktivität und Vertrauenswürdigkeit) als auf der rechten Seite des Bildes präsentierte Gesichter.

All action is of the mind and the mirror of the mind is the face, its index the eyes.
Cicero *(106 BC - 43 BC)*

INTRODUCTION

The present paper will examine the influence of Gaze Cuing on affective judgments of perceived faces. At the beginning the importance of eye gaze in a social environment, especially as a tool in communication and as an indicator of attention and interest, will be outlined. Eye gaze as an indicator of attention will be compared to other attentional cues as well as will be shown to be chosen in naturalistic scenes. Following, the sensitivity for eye gaze will be highlighted by providing studies that found different processing and evaluation of direct versus averted gaze.

As a next step, the effects that perceived eye gaze can elicit in an observer will be discussed. Beginning with examining the robust findings on the effect Gaze Cuing has on attentional processes, which report an obligatory shift of attention based on gaze following behaviour , the present paper will continue with investigating effects of Gaze Cuing on preference formation. Different explanations for changes in preference formation due to gaze following behaviour will be presented. Furthermore the effect on evaluation caused by gaze perception will not only be discussed in terms of aesthetic judgments (such as likeability and attractiveness ratings), but also for social judgments (such as trustworthiness ratings). Finally the conducted study will be presented and discussed. The study investigated the influence of Gaze Cuing on attractiveness ratings and trustworthiness ratings in two experiments. Naturalistic scenes with two peripherally presented full lengths bodies were chosen as stimuli. Due to the peripheral presentation, effects of laterality needed to be taken into account as well and will be examined prior to presenting the study.

The Importance of Eye Gaze

Information perceived from eyes has always been considered to be of great importance in literature, in science and in everyday life. Besides the direction a person is turning his eyes to, the duration and frequency of the eye fixation provide information of a person's gaze. While eye gaze can have the meaning of a steady and intend look in everyday language, or be defined as the direction of one's gaze at another's eyes (Harper, Wiens, & Matarazzo, 1978) or as the direction of one's gaze towards another's face and eyes (Kleinke, 1986), the present study is using the term eye gaze as a synonym for the act of looking in general, regardless of intensity, duration and target.

While the early stages of eye gaze research mainly focused on the role of eye gaze and eye contact in interaction and communication, the attentional and evaluative factors of eye gaze gained in importance in later studies. The present paper will briefly summarize these early findings and theoretical understandings to provide a basis for underlining the significance and validity of research on eye gaze and will continue with discussing attentional and evaluative aspects in specific.

Eye Gaze in Communication

Besides interpersonal distance, touch, body orientation etc. eye gaze has been shown to be one of the most important factors of nonverbal communication (Patterson 1982). Based on Patterson´s (1982) sequential functional model of nonverbal exchange, Kleinke (1986) categorized the findings of previous studies on the role of gaze as a nonverbal communication tool. In his main categorization he distinguished between five functions:

- providing information
- regulating interaction
- expressing intimacy
- social control
- service task

Interpreting someone's gazing behaviour can provide information for evaluation of liking, attentiveness, competence, social skills, credibility and dominance of a person. In social interactions, a moderate amount of gazing is in general preferred to constant gazing or sparse gazing (Argyle, Lefebvre, & Cook, 1974). Furthermore when interacting, eye gaze is used for synchronization and regulation of communication (Kendon, 1967). It correlates with verbal behaviour and is used as a turn-taking cue in conversations. Regarding the expression of intimacy and social control, Kleinke (1986) summarizes that eye contact and eye gaze serve many diverse functions in social interactions. While the intensity of eye contact can be an indicator of the feelings of warmth and liking two people share with each other, eye gaze also can be used as a tool to persuade and deceive others. A prolonged eye gaze can be shown when seeking for friends, but also communicate threat and dominance. For the receiver of an inappropriate long eye gaze it can lead in escape and avoidance but also in compliance with the gazing person's requests. However, the way gaze can be interpreted depends on the context and the perception of the gazing person's intentions. Besides these affective components in communication, the proper appliance of eye gaze can also serves to accomplish tasks and achieve goals. Eye gaze can be used to facilitate communication as well as for information seeking. Thus, eye gaze is crucial for teaching-learning processes as well as in other social situations, e.g. when bargaining.

Gaze as an Indicator of Attention and Interest

As outlined above, one of the main functions of eye gaze in communication is to provide information of a person's attention. This function is not only pivotal in communication but in all kinds of interpersonal interaction. But is this ability unique to eyes or could other body parts adopt it as well? This question has been examined in neuronal studies and in studies applying behavioural measures.

Neuronal single cell research revealed inhibitory connections between the individual cells in the superior temporal sulcus (STS) that are sensitive to eye, head and body position (Perrett, Hietanen, Oram, & Benson, 1992). Based on that findings Perret et al. (1992) suggested the existence of a direction-of-attention detector (DAD), which combines the information about eye, head and body position. The DAD is most sensitive to the direction information of the eyes followed by the head and the body position. Further, according to Perret et al. (1992), if direction information of the eyes is available, it will override head and body direction information and therefore is the most important indicator of where a person is orienting his attention.

Baron-Cohen (1995) as well support the importance of eye gaze as an indicator of interest by outlining its evolutionary aspects. In his model of mind reading system, which will be discussed in more detail at a later point, he includes an Eye-Direction Detector (EDD), which he supposes to have the most primitive function of detecting whether a person is looking at you or not. He assumes that this detector is independent of any other body part information and acts as an "early warning system" that indicates whether another organism may be about to attack or be interested in the observer.

However, although more recent studies on Gaze Cuing (as discussed at a later point) also underlined the crucial role of eyes as a direction indicator (e.g. Bayliss, di Pellegrino, & Tipper, 2004) there have been studies, that proposed a more equal relation between eye and head information as hypothesized by the Perret et al.' s (1992) DAD model (see Langton, Watt, & Bruce, 2000 for a review). For instance, Langton (2000) showed by adopting a Stroop-type interference paradigm that reaction times when asked for the gaze direction were affected by an incongruity of the head direction in a similar amount as an incongruity of the eye direction affected the reaction time when asked for the head direction. Thus, he showed that head position can bias information retrieved from the eyes in the same way as perceived eye gaze direction can bias the information retrieved from the head position. In sum, the role

of eye gaze as a unique indicator of a person's attention is not as clear as proposed in early studies. However, it can still be assumed that eye gaze, if available, is a fundamental indicator of attention.

In science the pivotal role of eye gaze was additionally reinforced by the invention of eye tracking equipment, such as the eye tracker. The eye tracker is a device to measure where a participant is looking at and how long he is looking at specific features of a stimulus. Eye tracking is applied to reveal what a person is interested in, whether this interest is due to visual or semantic informativeness. Especially findings on the influence of semantic informativeness on gazing behaviour (Henderson, Weeks, & Hollingworth, 1999) provide evidence that eye gaze can reflect cognitive interest. Solso (1996) explains that the interest of cognitive science in eye gaze is due to the assumption that humans can control their eye movements and therefore it "can be used to obtain valid measurements of person's interests and cognitive processes" (p. 132). He subsequently concludes, "it is likely that visual attention in human adult is driven by intention, interest, previous knowledge, movement, unconscious motivation, and context" (p.136).

Eye tracking underlines the importance of eye gaze not only by actively showing that participants eyes can be used to analyze attention and interest, but also by providing data that showed that the eye region of faces were selected more often than other details of a stimulus. This was shown when presenting faces in isolation (Yarbus, 1967) as well as with complex scenes (Birmingham, Bischof, & Kingstone, 2008). The eye tracking studies by Birmingham et al. (2008) revealed that the preference to select the eye region more often than any other details of scenes was furthermore influenced by the social content and the level of activity of the scene with the highest amount of eye region fixations in active scenes with a high social content (e.g. three people playing card games with each other). Thus, Birmingham et al. (2008) stressed the assumption that information gained by eye gaze is of especial importance for understanding social interactions.

The intuitive gaze selection in naturalistic scenes can be explained from an evolutionary point of view by the adaptive advantage you have by knowing where a person is attending to. Langton et al. (2000) conclude from the hypothesis that gaze is directed towards things that are of current interest that it is important to know if an individual is looking at you, because "you might be the recipient of another's gaze, for instance, because you are a potential meal, a mate, or simply because you are someone with whom they would like to interact" (p. 52).

Direct Versus Averted Gaze Processing

Reviewing literature on the evolutionary perspectives of the impact of gaze in social situations (Baron-Cohen, 1995; Langton et al. 2000), it can be assumed that direct gaze (gaze that is directed towards the observer) is of particular importance in social interactions. Carrying on this idea, the question whether direct and averted gaze is processed in different ways arises. Neuronal studies as well as studies applying behavioural measures investigated the difference between processing direct and averted gaze. Although there have been studies that measured the influence of direct versus averted gaze on process time and performance in categorizing the faces, most of the behavioural studies focus on the affective evaluation of the faces.

Regarding the difference in perceiving direct versus averted gaze, neuronal studies revealed a distinctive brain area activation of direct gaze by showing increased fusiform and amygdala activation when seeing faces with a direct gaze compared to averted gaze (George, Driver, & Dolan, 2001). Since it is known that fusiform regions are activated when perceptually analyzing faces and that the amygdala is involved in emotional processes as well as in social evaluation of faces, George and Conty (2008) concluded that, unlike the averted gaze, "direct gaze is associated with preferential detection mechanisms and triggers processes related to the analysis of faces" (p. 201). This association of direct gaze with preference

formation could be also shown when presenting attractive faces. Regarding the difference in valence of direct versus averted gaze, imaging studies revealed that observing attractive faces with a direct gaze elicits a stronger activation in brain systems, that are involved in evaluation of reward value, than attractive faces with an averted face (Kampe, Frith, Dolan, & Frith, 2001). However, neuronal studies also showed distinctive activation for faces exhibiting an averted gaze. Hoffman and Haxby (2000) showed in their studies on cerebral substrates that viewing faces with an averted gaze elicits a significantly stronger activation of the intraparietal sulcus (IPS) and the left superior temporal sulcus (STS) than viewing faces with a direct gaze. Based on these findings, Haxby, Hoffman, and Gobbini (2000) suggested in their model of the distributed human neural system for face perception that the IPS as an indicator of spatially directed attention, and the STS, which is activated when processing changeable aspects of faces, are the main brain areas associated with processing averted gaze. Haxby et al.´s (2000) model was recently supported by Lee et al. (2010), who extended its applicability by reporting similar observations for rigid face motions.

A difference of processing direct versus averted gaze was also shown by means of behavioural measures. For instance, studies measuring reaction times revealed that the gender of faces were categorized faster and priming effects were stronger for faces with a direct gaze compared to faces with averted gaze (Macrae, Hood, Milne, Rowe, & Mason, 2002). Thus, Macrae et al. (2002) conclude that direct gaze can facilitate basic aspects of the person-perception process.

Perceived Attractiveness of Faces with Direct Versus Averted Gaze

However, most of behavioural studies on the processing of direct versus averted gaze focused on the alteration of perceived attractiveness. There has been research that showed elevated attractiveness ratings for faces that exhibited a gaze shift towards the observer (Mason, Tatkow, & Macrae, 2005) as well as research on static faces that examined the

strength of preference for faces with a direct gaze in attractiveness comparison tasks (Conway, Jones, DeBruine, & Little, 2008). Although there was evidence that static faces with a direct gaze were chosen over faces with an averted gaze when exhibiting a happy or disgusted face (Conway et al., 2008) and that the strength of attractiveness preference was influenced by the gaze direction of a static smiling face (Jones, DeBruine, Little, Conway, & Feinberg, 2006), none of the studies were able to confirm that neutral static faces with a direct face were preferred over neutral static faces with an averted gaze (Mason et al., 2005; Jones et al. 2006).

Ewing, Rhodes, and Pellicano (2010) attributed these missing findings to the applied design used. While Mason et al. (2005) used gaze direction as a between subjects variable, which is assumed to elicit an adaptation to averted gaze, Jones et al. (2006) manipulated the attractiveness of the compared faces to measure the strength of preference for the more attractive face, which is only a indirect measure of the influence of gaze direction. Ewing et al. (2010) were able to show the expected preference for static faces exhibiting a direct gaze compared to the same faces with an averted gaze in a direct comparison task. Since this effect was remarkably reduced when inverting the faces, the assumption, that the effect is based on face-specific, social factors rather than just elicited by a preference for symmetry, was emphasized. Ewing et al. (2010) did not only apply comparison tasks, they also measured the influence of gaze direction on preference formation via attractiveness ratings. As in the comparison task, they found a significant impact of gaze direction on attractiveness ratings. Interestingly, the difference in attractiveness ratings was shown between faces with direct gaze and faces looking to the left side, but not when comparing faces with direct gaze to faces looking to the right side. This asymmetry will be resumed at a later point when discussing the effects of laterality.

The more positive evaluation of faces with direct gaze was not only explained by the afore mentioned facilitative impact of direct gaze (Macrae et al., 2002) - in combination with

facial expression it was also described as a function that "allows the most attractive individuals, who are likely to reciprocate one's own social effort to be identified" (Jones et al., 2006, p.591). However, due to the aforementioned pivotal role of eye contact in social interactions and communication, the preference of direct gaze should not be restricted to the context of mate choice (Ewing et al., 2010).

The Influence of Gaze Cuing on Attentional Processes

As discussed above, brain areas that are especially activated when seeing averted gaze are associated with processes that are linked to the orientation of spatial attention (Hoffman & Haxby, 2000). This together with the assumption that people look at places they are interested in, make it easy to understand that people tend to look in the direction other people are looking at. This phenomenon is called gaze following or joint attention and will be explained in detail by providing results from different kinds of studies. However, since most of these studies are based on the Posner cueing paradigm, it seems to be reasonable to explain the influence of cuing on attention in general first.

The Influence of Cuing in General on Attention Processes

Since attention is a limited resource, we cannot pay attention to everything in our environment that meets our senses. According to Findlay (2003), who reviewed the work of James (1890), " the object that we are paying attention to appears to receive more processing and is more richly represented in perception" (p. 35). Thus, it can be deduced that the choice of what we are attending to is an important decision in everyday life. In common, cues are signals that point to sensory input from the environment the perceiver might be interested in. Therefore they usually help people to direct their attention. Since this paper is dealing with visual input only, the term Cuing will be used for a process that elicits attentional orienting by visual cues only. One of the main findings in visual attention research was the distinction between *endogenous* and *exogenous* attentional processes (Posner, 1980). In his original

paradigm Posner (1980) measured reaction times of an onset of light that was previously cued by central cues (arrows pointing to the left or right, see Figure 1) or peripheral cues (short illumination of the left or right box, see Figure 2). Since he found that the peripheral cues, but not the central cues affected participants performance when being invalid (counter predictive information), he described the resulting *exogenous* attention as stimulus driven and reflexive, no matter if the cues are predictive or not. On the contrary, he defined *endogenous* attention to be evoked by central cues and to be goal-driven and voluntary.

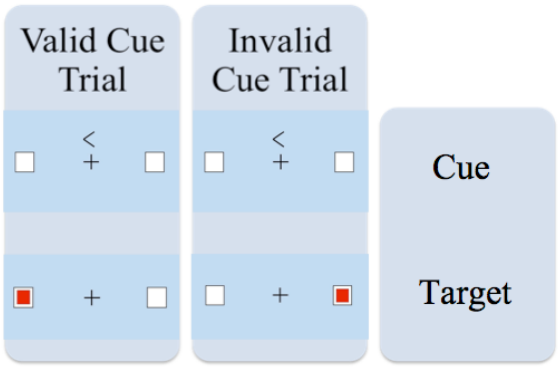


Figure 1. Measurement of endogenous attention by applying central cues.

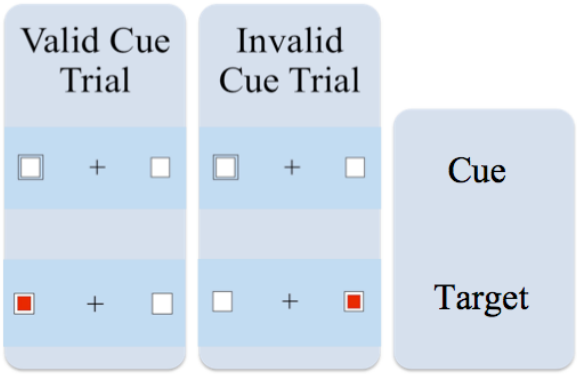


Figure 2. Measurement of exogenous attention by applying peripheral cues.

In following studies this exact distinction could not be sustained. It was shown that also centrally presented invalid arrow cues influenced participants' performance in reaction tasks (Tipples, 2002; Ristic, Friesen, & Kingstone, 2002). Thus, the assumption that central

cues always elicit *endogenous* voluntary attention shifts was challenged. Furthermore, as will be outlined in the next section, central presented social cues (gaze, head, fingers etc.) were found to generate an automatic shift of attention regardless of their predictability and therefore contradict the hypothesis of Posner´s (1980) distinction as well.

Gaze Following and Joint Attention

As discussed above, observing the gaze of another person in a social interaction can have an adaptive advantage (Langton et al., 2000). From a very young age, humans tend to retrieve information from other peoples' eyes and follow the directions they are looking at. This gaze following behaviour could be found in infants as young as 3 months old (Hood, Willen, & Driver, 1998). Especially for children, orienting towards an object a person is looking at is crucial for learning processes, in particular language acquisition (Baldwin, 1995). Besides the external information (direction of gaze, object somebody is looking at etc.), gaze direction can also be used as a social cue for internal states of a person (emotional and intentional).

Based on these findings, Emery (2000) describes the four states that can result from observing another's gaze direction:

- Mutual gaze
- Gaze following
- Joint Attention
- Shared Attention
- Mental state attribution or theory of mind

The term "mutual gaze" can be used similar to eye contact and explains the state when two people are looking at each other. The difference in processing direct versus averted gaze and the rewarding nature of this state in comparison to perceiving an averted face has been

discussed earlier in this paper. In contrast to mutual gaze, gaze following and joint attention describes states where one person encounters the averted gaze of another person. In both states this observation results in a shift of attention in the same direction. The difference between gaze following and joint attention is that gaze following only describes the following of the line of sight of another person, while joint attention is the shift of attention towards the same focus of attention (e.g. object). Shared attention is described as a combination of mutual gaze and joint attention, where both individuals follow the gaze of each other towards the same object. However, in literature the terms "shared attention" and "joint attention" are mostly used as synonyms and therefore will be used interchangeably in this paper as well. The attribution of mental state describes the higher-order cognitive strategy, where one person infers from the gaze of another person, that the person is attending to a stimulus, because he plans to do something with that object or just thinks about the object (Emery, 2000). This phenomenon is described as theory of mind and will be explained in detail later. However, this section concentrates on the attentional aspects of Gaze Cuing. Therefore the focus of this section will be on gaze following and joint attention.

As will be shown, numerous studies have demonstrated that the direction of another's gaze can be used as a cue and leads to a shift of attention. Most of these studies applied the Posner cueing paradigm to prove this assumption. They were measuring reaction times and accuracy in target detection, localization or discrimination tasks, with faces presented centrally and targets being positioned in different locations around the face. According to Posner´s (1980) idea of attention orienting, in this kind of setting, gaze cue should elicit *endogenous* attention. However, as will be demonstrated in this section, research has demonstrated that gaze cues elicit reflexive shifts of attention, and therefore can be associated with *exogenous* attention rather than with an voluntary *endogenous* attention orienting.

The first study that applied the Posner pardigm to examine the influence of gaze on spatial attention was conducted by Friesen and Kingstone (1998). They showed that

participants performed better in detecting, locating and categorizing letters when targets were previously cued by a centrally presented unpredictive schematic face. Further, studies with computerized faces (Driver et al., 1999; Langton & Bruce, 1999) and photographs of faces (Sato, Okada, & Toichi, 2007; Downing, Dodds, & Bray, 2004; Frischen & Tipper, 2004) showed a similar pattern of results. Langton and Bruce (1999) applied a target detection task and tested participants´ performance with a 50% (Experiment 1) and a 25% (Experiment 2) validity of the observed social cue. In both experiments, although cues with a 25% validity were entirely unpredictive, participants were significantly faster in detecting targets that were presented in the cued than in the uncued location. Langton and Bruce (1999) attributed these findings to reflexive and stimulus-driven processing. They further supported this assumption by showing no influence of participants´ expectancy on performance (Experiment 3). In a next step they showed that this effect is restricted to social cues as it was disrupted when inverting the used faces (Experiment 4). Driver et. al (1999) further reinforced the idea of gaze cues eliciting a reflexive, automatic and mandatory attention shift. They showed a robust Gaze Cuing effect on attentional processes even though people were instructed to ignore the presented face in a letter discrimination task (Experiment 1 and 2) as well as when participants knew that letters were four times as likely to occur on the uncued side (Experiment 3).

While Langton and Bruce (1999) used the face and the eyes in combination as a social cue, Driver et al. (1999) only varied the direction of the eyes with the face staying frontal. Langton and Bruce (1999) found expected results for cues with matching gaze and head direction. However, other studies showed different results by only revealing a Gaze Cuing effect on attentional processes when gaze and head direction were incongruent (Hietanen, 1999), even when that meant that the eyes were, in fact, gazing straight ahead, while the face was turned to the incongruent side. Thus, it was assumed that the perceived direction of attention of a face seems to rely on the interaction of both cues (head and gaze).

However, more recent studies by Sato et al. (2007) again supported Langton and Bruce's (1999) findings for matching head and eye direction cues. In their studies, where stimuli were presented subliminally, Sato et al. (2007) revealed an equal power to influence attentional processes for altered gaze cues and altered congruent head-gaze cues of schematic as well as for realistic faces. To sum up, again the unique role of gaze as a social cue could not be entirely confirmed. However, gaze direction was found to elicit an attentional shift in all mentioned behavioural studies and thereby altering solely the gaze to change the attentional state of a face seems to elicit a very robust Gaze Cuing effect.

The shift of attention in the observer caused by perceived gaze direction was not only examined by means of reaction tasks but also by using eye tracking. Studies applying the Posner paradigm showed that latencies towards a target were remarkably facilitated when previously cued by an eye gaze (Mansfield, Farroni, & Johnson, 2003). Further it was demonstrated that perceived eye gaze is able to distract goal-driven eye movements (Riccciardelli, Bricolo, Aglioti, & Chelazzi, 2002; Bonifacci, Ricciardelli, Lugli, & Pellicano, 2008). However, most of the eye tracking studies examining gaze following behaviour used naturalistic scenes as stimuli and will be discussed at a later point.

Reviewing the conducted studies, the question whether the observed automaticity of attentional shifts due to Gaze Cuing is an innately specified mechanism or is a result of learning processes arises. The problem with answering this question is that previous learning processes cannot be controlled for. Driver et al. (1999) commented on that topic that participants "presumably came into our experiments with around 20 years of experience that seen gaze can often be predictive of events in the corresponding direction" (pp. 532).

Gaze in Comparison to Other Cues

As discussed above, results of whether gaze is a unique indicator of attention and interest varied. In Gaze Cuing research the question of whether gaze is the only social cue,

which elicits an automatic change in the direction a person is attending to or can be replaced or be influenced arose as well. Recent studies by Ivanoff and Saoud (2009) found that, using stick figures, nonpredictive cues by pointing fingers can influence decision processes in the same way as nonpredictive gaze cues do — both fastened the responses to targets and increased the number of false alarm errors. In their studies similar results were found for nonpredictive arrow cues as well, but not for nonpredictive peripheral cues. They concluded that gaze and hand cues can be subsumed as social cues with pointing gestures being similar to symbolic, nonsocial cues such as arrows. Similar results were shown using eye tracking. Centrally presented arrow cues elicited the same distracting impact on participants´ voluntary saccades as gaze cues did, although both were counterpredictive (Kuhn & Kingstone, 2009). Downing et al. (2004) compared the influence gaze cues to the influence of laterally extended tongues as direction cues on discrimination task performance. They found similar results for both social cues, eyes and tongues when both cues were completely nonpredictive (the possibility for the target to appear in the cued location was the same as the possibility for the target to appear in the uncued location). However, only the gaze cues were able to still have an impact when being counterpredictive (the possibility for the target to appear in the uncued location was higher than the possibility for the target to appear in the cued location) with the target being four times as likely to occur on the opposite side. Ristic et al. (2002) as well reconsidered their suggestion that the reflexive orienting effect due to central unpredictive cues is limited to biological stimuli (Friesen & Kingstone, 1998) and showed an equal effect of arrows and eyes on participants´ performance. However, based on their findings from experiments with split-brain patients (Kingstone, Friesen, & Gazzaniga, 2000; Ristic et al., 2002) they suggested, “although nonpredictive eyes and arrows may produce similar behavioral effects, they are not subserved by the same brain systems.” (Ristic et al., 2002, p. 705)

In sum, it can be concluded that the orienting effect elicited by gaze cues might not be as special as expected at the beginning of Gaze Cuing research. However, special characteristics of data obtained when using gaze as a cuing stimuli were identified. Furthermore Gaze Cuing is an appropriate method in attention research, since studies using social cues, such as eye gaze, obtain data with a higher ecological validity than traditional research (Frischen, Bayliss, & Tipper, 2007).

Gaze Cuing in Naturalistic Scenes

As outlined before, the traditional distinction of *endogenous* and *exogenous* attention (Posner, 1980) had to be reviewed after finding reflexive orienting behaviour caused by centrally presented gaze cues. Additionally, the findings of nonpredictive, nonsocial cues eliciting the same reflexive effect, made it pointless to sustain the traditional differentiation of orienting behaviour. Kingstone, Smilek, Ristic, Friesen, and Eastwood (2003) used these findings as an occasion to advocate a modulation in attentional research. They postulated that it is necessary to investigate „how attention operates when people are embedded in real-world situations“ and to consider „the characteristics of observers´ natural everyday environment“ (pp.179).

Regarding ecological validity, Gaze Cuing per se was a great advance in attention research. One way to further enhance ecological validity of attention research was to conduct Gaze Cuing studies that embedded the gaze cue as well as the target in a naturalistic scene. Most of the studies on Gaze Cuing in naturalistic scenes were employing eye tracking (Fletcher-Watson, Findlay, Leekam, & Benson, 2008; Dukewich, Klein, & Christie, 2008), however recently there were also Gaze Cuing studies using detection tasks in naturalistic scenes (Freeth, Ropar, Chapman, & Mitchell, 2010).

Fletcher-Watson et al. (2008) recorded participants viewing patterns when seeing person absent scenes next to scenes containing one person, who fixates an object. Their

findings did not only support previous studies by showing a strong bias towards looking at persons in scenes, especially at their faces. It also backed up Gaze Cuing research, since they showed that participants tended to look at the gazed at objects right after attending the faces. This gaze following behaviour was found in a free-viewing condition, but not when asked for gender discrimination. Thus, they concluded that the gaze following process seems to be under a specific amount of control and not completely automatic as assumed by most of traditional Gaze Cuing research. Further information that can be retrieved from Fletcher-Watson et al.´s (2008) study is that people did not increase attending the viewing cone (the direction the scene character looked at), but solely focused on the object that was in the view of the scene character. Thus, based on Emery´s (2000) categorization, it can be assumed that, at least for this kind of stimuli (naturalistic scenes), Gaze Cuing leads to joint attention rather than simple gaze following.

Freeth et al. (2010), who presented naturalistic scenes that contained one person with an unpredictive gaze and three different distinctive objects to their participants, recently supported this finding. Their results showed that when asking participants to identify changes (appearing or disappearing) of the objects, they had a better performance for objects, which were in the exact location of the gazing person, than for objects located on the same or opposite side of the direction of the gaze. Thus, they also showed that Gaze Cuing in naturalistic scenes leads to joint attention rather than simple gaze following.

Another eye tracking study exploring the effect of Gaze Cuing on attentional processes when seeing naturalistic scenes was conducted by Dukewich et al. (2008). Using paintings as stimuli, they also found a bias of participants' eye movements towards the direction of an observed gaze, but only when asked for social content. They concluded that the pivotal reflexive influence of Gaze Cuing found in previous studies might be a result of presenting gaze in a demanding way, but that this influence might be mediated by social circumstances. Reviewing the results of studies that examined the influence of Gaze Cuing on

attentional processes when naturalistic scenes were used as stimuli, it can be concluded that it seems that Gaze Cuing in naturalistic scenes is not as reflexive as when employing the traditional Posner Cuing paradigm. However, perceived gaze again was found to have a crucial impact on peoples orienting processes.

The Influence of Gaze Cuing on Preference Formation

Knowing that observing a gaze towards an object leads to a shift of attention towards that object in the observer, the question, whether there are other responses than attention shifting to the perceived gaze direction, arises. Since literature showed that enhanced attention to a certain stimuli results in a more positive evaluation of stimuli, it can be assumed that a more positive evaluation of stimuli could also derive from Gaze Cuing. This effect is called Liking Effect and will be examined at the end of this section. At the beginning of this section concepts, that could explain a potential evaluative alteration caused by Gaze Cuing, will be outlined, including perceptual fluency and the gaze cascade effect in combination with the theory of mind mechanism.

Perceptual Fluency Versus Attentional Inhibition

The idea of perceptual fluency was derived from the concept of the mere-exposure effect. The mere-exposure effect indicates that different types of stimuli (e.g. ideographs, faces words, paintings) are preferred the more familiar they become. This could be shown with material that has been presented on a conscious level (Zajonc, 1968) as well as for stimuli that has been presented subliminally (Kunst-Wilson & Zajonc, 1980). Bornstein (1990) suggested that the repeated exposure leads to a facilitation of perceptual processing—a perceptual fluency. Subsequently, Reber, Winkielman, and Schwarz (1998) showed that this perceptual fluency was not only elicited by repeated exposure but also by increasing presentation duration, figure-ground contrast and matching visual priming. They furthermore demonstrated that similar to the mere-exposure effect perceptual fluency also leads to

increased liking and prettiness ratings of stimuli. Based on these findings it can be assumed that the more attention an object or person receives the easier elaboration and the more positive evaluation might be.

As a consequence, the reverse (a negative effect of not attending a stimuli on evaluation of that stimuli) can be assumed as well. Recent studies showed a negative effect of attentional inhibition on likeability and social-emotional judgments about stimuli without affective characteristics (Raymond, Fenske, & Tavassoli, 2003) as well as for social meaningful stimuli such as faces (Fenske, Raymond, Kessler, Westoby, & Tipper, 2005; Raymond, Fenske, & Westoby, 2005). It was demonstrated that unfamiliar faces were devalued when they had previously been distractors in a visual search task (Raymond et al., 2005) as well as chosen as "less trustworthy" when participants were previously asked to withhold a response for those faces (Fenske et al., 2005).

In summary, for the effect of Gaze Cuing, these findings would indicate that an alteration of evaluation of stimuli that have been gazed at by presented faces would be a consequence of facilitation of processing these stimuli solely. However, as will be outlined later, this hypothesis is controversial (Bayliss, Paul, Cannon, & Tipper, 2006).

The Gaze Cascade Hypothesis

The idea of mere-exposure has been put a step further by suggesting that this effect cannot only be elicited by means of presentation but also by the own attention orienting behaviour. In their model of a gaze cascade effect, Shimojo, Simion, Shimojo, and Scheier (2003) suggested that "the adult process of preference formation is not independent of more implicit, reflexive orienting mechanisms, but rather emerges from them" (p. 1317). Based on their findings, they proposed that gaze behaviour towards objects is influenced by preference for those objects and that this attention orienting behaviour on the reverse influences evaluation of that objects. In detail, they proposed a loop of preferential looking and mere

exposure. However, this gaze cascade effect was not found for novel graphic patterns (Nittono & Wada, 2009) and might be specific to preference formation of faces. Regarding Gaze Cuing, the gaze cascade hypothesis can account for the sensitivity for other people's gaze as well. It assumes that ones own tendency to look at things that are preferred might be noticed at least subconsciously and might lead to the inference that others have the same tendency to look at the things they like and like the things they look at. Based on these assumptions, other people's gaze behaviour is a fundamental information source for understanding other people's preferences.

Theory of Mind Mechanism

As discussed above, gaze can be used as an indicator of interest and preference. The ability of humans to interfere other people's intentions and beliefs from their observable behaviour was firstly described in Baron-Cohen's (1995) mind reading system. In his model he describes four modules:

- the intentionality detector (ID)
- the eye-direction detector (EDD)
- the shared-attention mechanism (SAM) and
- the theory-of-mind mechanism (ToMM)

While the IDD is described as a perceptual device that infers the basic mental states, such as approach and avoidance, from motions, the EDD has three different tasks: detecting eyes, computing the direction of the eyes and interpreting what the observed person is seeing from that information. The model is structured in a way that ID and EDD are processing in parallel and SAM is combining the retrieved information from ID and EDD (see Figure 3). SAM is in charge of building triadic representations, which means that two people are sharing the same mental state. ToMM builds on the three other modules and has two main functions:

the complete inference of mental states from observable behaviour and the prediction of behaviour by building up theories. Thus, ToMM is used to understand people's feelings, perception and thoughts.

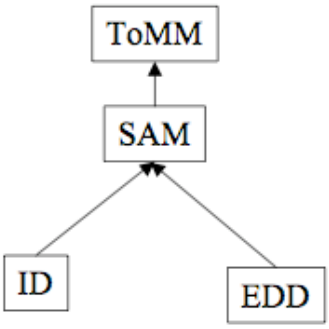


Figure 3. Baron-Cohen's (1995) structure of the four modules of the mind reading system.

In his theory Baron-Cohen (1995) especially stresses the role of the EDD in reading mental states. He assumes that EDD's special function of reading gaze in terms of mental states is based on its association with IDD and ToMM (via SAM). He emphasizes the importance of EDD by describing the eyes as being the "windows to the mind in further sense that by observing the direction of someone's eyes we can identify the target of that person's desire or goal, since these correlate with the target of the gaze" (p. 106). As outlined before, this assumption was supported in later studies (Shimojo et al, 2003).

The ability to use ToMM by observing gaze was found to develop early in humans. For instance, Baron- Cohen, Campbell, Karmiloff-Smith, Grant, and Walker (1995) showed that children of an age from 3 to 4 years could attribute mental states such as desire, when seeing schematic faces gazing towards an object. Thus, even young infants seem to be able to draw conclusions from other people's behaviour on their mental states. However, this ability of mental attribution seems to be unique for humans. As in contrast to gaze following and joint attention, it was not found in monkeys or great apes (see Emery, 2000, for a review).

Regarding the explanation of a possible effect of Gaze Cuing on preference formation, the theory of mind mechanism would explain the results as a result of the inference that the face looks at the stimuli because it likes the stimuli (gaze cascade hypothesis). Thus, in contrast to an explanation based on perceptual fluency, further mental processes than attentional ones, would be needed to elicit an effect of Gaze Cuing on preference formation.

The Liking Effect

The Liking effect was firstly described by Bayliss et al. (2006). In their studies Bayliss et al. (2006) examined whether an attention shift due to observing a persons gaze direction towards an object comes along with an alteration of the affective appraisal of this object. Besides the expected cuing effect on attentional processes in a categorization task, their main finding was, that objects, which were previously looked at by faces, were liked more by the observers than those, which were not looked at. Since this Liking Effect was shown when human gaze was used as a cue (Experiment 1) but not when nonhuman shapes such as arrows were presented (Experiment 2), they deduced that the change in the affective appraisal is not solely due to an attention shift. This assumption was further confirmed as there was no correlation between the cuing effect on reaction time and the Liking Effect. Thus, the liking ratings of a cued object were independent of the strength of the attention shifts towards that objects.

In a later study Bayliss, Frischen, Fenske and Tipper (2007) showed that the Liking Effect found in Bayliss et al. (2006) can be modulated by the emotional expression of the gazing faces. Besides the expected cuing effect on attentional processes for all faces, regardless of facial expression (as already shown by Hietanen & Leppänen, 2003), they demonstrated that the affective evaluation of an object was positively influenced when the object has been looked by a face with a happy expression and was negatively influenced when the face had a disgusted facial expression. However, there was no influence of the facial

expression of the faces on object ratings when the faces were looking straight ahead. Interestingly, in both studies (Bayliss et al., 2006; Bayliss et al. 2007) when asking participants which indicators they based their ratings on, none of the participants mentioned the seen faces, but always properties of the objects. Thus, the influence of Gaze Cuing on affective judgments seems to be rather subconscious. Knowing that arrows did not elicit the same Liking Effect (Bayliss et al., 2006) and that facial expression can influence that effect (Bayliss et al., 2007), it can be deduced that in the process of influencing evaluative judgments gaze operates as a social cue rather than an attentional cue. Therefore an explanation based on the gaze cascade hypothesis and the theory of mind mechanism seems to be more valid than an explanation solely based on perceptual fluency.

Another way to show the preference for objects that have been looked at by a face was demonstrated by Freeth et al. (2009). With their study on the influence of perceived gaze direction in naturalistic scenes on perception, memory and attention, they did not only underline the assumption of Gaze Cuing causing orienting to a specific object rather than general areas (Experiment 2), but also showed that people's preference for pictures is biased by the direction an observed person is looking at (Experiment 1). Their way to examine preference formation in Experiment 1 was to ask participants to move photos of certain naturalistic scene configuration (one person looking at one object) behind a static window to make it appear best. Analyzing the final positions, participants chose, a general tendency to centre the person in the scene was found. Moreover, the final position was systematically biased by the gaze direction of the depicted person. Thus, with their findings they did not only emphasize the importance of gaze in naturalistic scenes in general, but also revealed its power to enhance the significance of an object when being the target of a gaze.

The impact of Gaze Cuing on preference formation was also revealed when showing movie clips instead of static pictures (Hayes, Paul, Beuger, & Tipper, 2007). Hayes et al. (2007) did not only show the expected enhancement in rating objects when seeing someone

looking at that object, but also revealed that gaze processing is an essential mediator of the influence of observed action fluency on liking ratings. As will be outlined at the end of this section, these findings were later used to underline the impact of intentionality on the Liking Effect.

However, there were also studies with contrasting result patterns to Bayliss et al. (2006). For instance, Strick, Holland, and van Knippenberg (2008) showed, by using implicit evaluative measures, that mean reaction times to positive primes to targets were significantly shorter when targets were presented next to attractive faces with direct gaze in comparison to targets that have been looked at by an attractive faces (averted gaze) or targets presented next to an unattractive faces, independent of gaze direction. Similar results were found with explicit measures. When asking for the likeability of used targets, participants liked stimuli presented next to an attractive face with a direct gaze more than stimuli that have been looked at by an attractive face. Also a reverse trend with stimuli, that have been associated with an unattractive face with averted gaze, being liked more than stimuli, that have been associated with unattractive faces with direct gaze, was described. As discussed above, the influence of direct gaze direction on the reward value of attractive faces has already been shown in neuroscientific studies (Kampe et al., 2001) as well be demonstrated in behavioural measures (Jones et al., 2006; Erwin et al., 2010). Strick et al.´s (2008) studies further extended the validity of these studies by showing that, conducting an conditioning experiment, the rewarding value of attractive faces with direct gaze can further result in a more positive evaluation of an associated object.

However, comparing the contrast findings of Bayliss et al. (2006) and Strick et al. (2008), it has to be considered, that Strick et. al. (2008) findings are limited to attractive faces and that they did not use a paradigm that requested the participants to pay attention to the orientation of attention of the faces. Therefore, attentional orientation might not have been processed sufficiently to elicit the same effects as found in Bayliss et.al. (2006). Recent

studies, which also used implicit measures, but with a gaze direction related exposure phase, again, could support the Liking Effect (Corneille, Mauduit, Holland, Strick, & 2009). As Corneille et al. (2009) applied affective priming tasks to examine a Liking Effect, their findings indicate that the perception of a gaze direction towards an object can influence preference formation in a rather implicit fashion.

However, due to findings such as the crucial role of observed gaze when inferring other people's actions and motor intentions (Castiello, 2003; Hayes et al., 2007) and the conclusions that can be retrieved from Baron-Cohen´s (1995) mind reading system, it seems to be fruitful to focus on the intentionality aspect of gaze processing as well. Regarding the intentionality in context of the Liking Effect Becchio, Bertone, and Castiello (2008) imply in their concept of intentional imposition that "the existence of a mechanism that allows transferring to an object the intentionality of the person, who is looking at it" (p.256). Based on that assumption they indicate for the Liking Effect, "the enriching effect does not appear to be based on gaze processing, *per se*, but seems to result from the intentionality of perceived gaze" (p.256). However, although it has been advocated that the Liking Effect is influenced by intentionality processing factors, it is important to consider that it does not need conscious awareness to be elicited (Bayliss et al., 2006; Bayliss et al., 2007).

The Influence of Gaze Cuing on Social Judgments

Besides likeability and attractiveness judgments, the present paper also takes the influence of Gaze Cuing on social judgments into account. So far, there has not been any studies examining the impact of an observed gaze towards another person on the social judgments about the gazed at person. However, there has been research on the influence of gazing behaviour on social judgments of the gazing face. In most of the studies trustworthiness has been used as a social dimension variable, since trustworthiness has been shown to be a very sensitive social factor (Krumhuber et al., 2007). The main idea behind

research investigating the influence of Gaze Cuing on trustworthiness ratings, is the assumption that gaze behaviour cannot only be applied for good, e.g. in learning processes, but also to deceive others (see Emery, 2000, for a review), thus eye gaze in combination with actual behaviour can be an indicator of someone's trustworthiness. Bayliss and Tipper (2006) examined this hypothesis by employing a Gaze Cuing procedure. Their participants saw faces that either always indicated the location of a target with their gaze direction (cooperative), or never did so (deceptive), or were entirely non predictive. Although the cuing effect on attentional processes in a localization task was the same for all faces, participants chose the cooperative faces the more trustworthy faces when compared to the deceptive faces. They furthermore showed a general preference for cooperative faces over deceptive faces. As in other studies on the effect of Gaze Cuing on preference formation (Bayliss et al., 2006; Bayliss et al., 2007), Bayliss and Tipper (2006) asked their participants what factors they based their choice on. Since the majority of the participants did not mention the gazing behaviour of the faces eye gaze, the assumption of Gaze Cuing affecting social judgments in a rather subconscious fashion, was validated.

In a more recent study, Bayliss, Griffiths, and Tipper (2009) showed that the previous found effect of gaze behaviour on social judgments could be influenced by the facial expression of the faces. From their findings that only smiling faces, but not faces with a neutral or angry facial expression, were rated to be more trustworthy when being cooperative than when being deceptive, they concluded "implicit processing of reward contingencies associated with gaze cues relies on a positive emotional expression to maintain expectations of favourable outcome of joint attention episodes" (p.1072). Again, participants showed a cuing effect on attentional processes for both, cooperative and deceptive faces (regardless of their facial expression) and could not correctly distinguish between cooperative and deceptive faces after being debriefed. Based on their research, Bayliss et al. (2009) indicated for a social environment that "although we might not be able to prevent orienting in the direction in

which a known deceiver is looking, the deception is at least encoded, and this information aid the guidance of other, more complex interaction with such individuals" (p.1083). In sum, it can be concluded that perceived gazing behaviour seems to have an impact on trustworthiness judgments. However, again this impact seems to occur in a rather subconscious fashion.

Laterality

As mentioned at the very beginning of this paper, in the present study the evaluated faces are presented peripherally on either the right or the left side of the scene. Thus, effects of laterality on preference formation need to be considered as well. Key research on the influence of laterality on aesthetic judgments relied on studies examining the preference for geometric images with altered compositional dimensions of interest, weight and balance (Christman & Pinger, 1997) and studies analyzing postures in portraits (McManus & Humphrey, 1973). Using geometric images a preference for stimuli with a left-to-right directionality was found and was later explained by the habitual scanning direction of the participants, who were left-to-right Roman script readers (Heath, Mahmasanni, Rouhana, & Nassif, 2005). By analyzing photographic and painted portraits a clear bias to show the left cheek was demonstrated (McManus & Humphrey, 1973). It was shown that this bias is not due to a mechanical preference of the artist, but rather reflects the depicted persons´ intention to exhibit the left side of their faces (Nicholls, Clode, Wood, & Wood, 1999). Since the left side of the face is controlled by the emotive, right cerebral hemisphere it can be deduced, that the left cheek bias is a result of peoples intuitive motivation to express emotion.

Later, the impact of laterality on aesthetic judgments was also shown when asking for attractiveness of faces. In studies examining the difference in attractiveness ratings of faces with direct gaze versus faces with averted gaze, the mean ratings for faces with direct gaze significantly varied from those with a left-averted gaze (Ewing et al., 2010). However, faces with a right-averted gaze were evaluated as equally attractive as faces exhibiting a direct gaze.

Ewing et al. (2010) explained their findings with recent studies that revealed a greater difficulty to notice little variations in right-averted gaze, compared to left-averted gaze (Calder, Jenkins, Cassel, & Clifford, 2008).

An influence of laterality was also shown on the effect of observed gaze direction on preference for naturalistic scenes (Freeth et al., 2009). In a group of high functioning adolescents with autism spectrum disorder (ASD) the bias of gaze direction on preference for positioning pictures was obviously lower in the condition where the observed person looked to the right side (was located on the left side) than in the condition where the observed person looked to the left side (was located on the right side). The lack of influence of the right averted gaze on positioning tasks again could be explained by the greater difficulty to detect little variations in right-averted gaze (Calder et al., 2008). However as the bias was only shown in an ASD group, but not for a typically developing group, other causes such as an abnormal face processing in the right hemisphere of people with ASD, could explain these results as well (Freeth et al., 2009). Reviewing research on laterality biases, a tendency of deeper processing stimuli associated with a leftwards direction can be observed. However, robust findings on laterality biases, especially in naturalistic scenes, are missing.

Rationale of the current study

The main aim of the present study was to examine whether the Liking Effect for objects found in Bayliss et al. (2006) could be demonstrated for human faces as well. Thus, the present studies presented two faces either with one of the faces looking at the other face or both faces looking straight ahead. Similar to Bayliss et al. (2006), the present study also applied a familiarity phase to ensure an appropriate processing of the faces gaze directions. However, in contrast to Bayliss et al. (2006) the present study only showed faces either looking at the other face or looking straight ahead, but never faces that looked away from the other face. Thus, the present study only focuses on the expected positive effect a perceived

gaze toward a face can have rather than an effect that could occur by perceiving a gaze that is directed in the opposite direction of the face. Similar to Bayliss et al. (2006), the present study aims to determine if the perception of a gaze towards a stimulus can alter the affective judgment of that stimulus and examine whether simple effects such as perceptual fluency or higher-order cognitive systems such as the theory of mind mechanism are appropriate to explain this possible Liking Effect.

Until now there was only one study that has used two faces to examine the influence of perceived gaze direction of one face on affective judgments of the gazed at face (Jones, DeBruine, Little, Burriss, & Feinberg, 2007). Jones et al.'s (2007) key finding was, that women rate male faces as more attractive when previously cued with a smiling female face, than when cued with a female face exhibiting a neutral expression. The reverse effect was found in male participants. However, Jones et al. (2007) focused on the intersexual relations and the interaction with facial expression in their studies. Therefore, their findings are not suitable to explain whether the Liking Effect that was found for objects is relevant for faces as well. The present study differs from Jones et al. (2007) in several points. Firstly, Jones et al. (2007) used profile pictures as a cue and varied the cuing faces in facial expression — the present study only altered the eyes of the faces and all faces exhibited a neutral expression. Secondly, Jones et al. (2007) showed female faces together with male ones— the present study presented only same sex faces together to prevent any intersexual mediator effects. Finally, in contrast to Jones et al. (2007), who applied a comparison task, the present study collected separate ratings for each face.

As the present study endeavours to have a high ecological validity, presented faces were embedded in naturalistic scenes. As it was important to keep the scenes as realistic as possible, it was decided not to artificially put the face cue in the centre of the stimuli, but present the faces peripherally with both of the faces being equally salient in the scene. Due to this peripheral presentation laterality effects need to be considered as well and thus will be

included in analyses. Based on previous findings it can be assumed that the side of presentation could have an impact on evaluative processes.

In general, the present study differs from previous Gaze Cuing research as it does not apply the traditional Posner cueing paradigm, but focus on the role of gaze in naturalistic scenes. It will neither have a centrally presented cue nor a movement of the gaze cue, but will present static gaze cues in naturalistic scenes. Therefore the present study will provide information on evaluative effects caused by Gaze Cuing when stimuli are not embedded in a typical experimental setting, but in a more realistic setting of a naturalistic scene. As only the eyes were manipulated, it is possible to attribute possible effects on changes of gaze direction rather than other indicators (e.g. head position). Therefore, a possible effect would underline the pivotal role of gaze in indicating attention and interest.

The current study employed faces not only as cues, but also as targets and asked participants to rate the faces in both functions (cues and targets), thus participants also rated faces with an averted gaze. Based on Erwing et al.'s (2010) findings on attractiveness ratings for static faces with neutral expression, it is hypothesized that faces with averted gaze receive lower attractiveness ratings than faces exhibiting direct gaze. As faces were presented next to each other, the influence of the attractiveness of one face on the attractiveness rating of the other face needed to be considered as well. Thus, the applied faces were chosen to be of average attractiveness to prevent an influence of evaluative conditioning (see De Houwer, Thomas, & Baeyens, 2001, for a review).

Moreover the present study also included a social dimension in one of the experiments (Experiment 2). In this experiment participants were not only ask to rate each face for attractiveness, but also for trustworthiness. This of course was only possible, because the present study used social stimuli (faces) instead of objects as targets. It was hypothesized that, such as with the attractiveness ratings, trustworthiness ratings of faces would be enhanced when faces were looked at by another face. Thus, it was supposed that the change of

evaluation found in the Liking Effect could be extended to social judgments as well. Regarding research on the influence of gaze direction on trustworthiness ratings (Bayliss et al., 2009; Bayliss & Tipper, 2006), the present study will extend the approach of previous studies from solely investigating the effects of Gaze Cuing on trustworthiness ratings of the gazers themselves to focusing on both gazers and the gazed at persons. Contrasting with previous research on the impact of Gaze Cuing on social judgments, the present study only presented faces that either looked straight ahead or towards the other face, therefore there were no faces that exhibited deceptive behaviour. Thus, the study focused on whether the perceived gaze towards the rated face had an impact on evaluation. Expected findings would also be emphasizing for the research on the influence of attentional inhibition on trustworthiness ratings (Fenske et al., 2005), as they would show the reverse effect of attentional enhancement eliciting higher trustworthiness ratings.

Hypotheses

Based on the outlined assumptions the following hypotheses were proposed:

For the effect of Gaze Cuing on attentional processes:

H0 (1): Reaction times for categorizing faces gaze direction are the same for faces that have been looked at by another face than for faces that have been presented next to a straight looking face.

H1(1): Reaction times for categorizing faces gaze direction are shorter for faces that have been looked at by another face than for faces that have been presented next to a straight looking face.

For the effect of Gaze Cuing on attractiveness ratings:

H0 (2): Attractiveness ratings are the same for faces that have been looked at by another face than for faces that have been presented next to a straight looking face.

H1 (2): Attractiveness ratings are higher for faces that have been looked at by another face than for faces that have been presented next to a straight looking face.

H0 (3): Attractiveness ratings of faces exhibiting a direct gaze are the same as attractiveness ratings for faces with averted gaze.

H1 (3): Attractiveness ratings of faces exhibiting a direct gaze are higher than attractiveness ratings for faces with averted gaze.

For the effect of Gaze Cuing on trustworthiness ratings:

H0 (4): Trustworthiness ratings are the same for faces that have been looked at by another face than for faces that have been presented next to a straight looking face.

H1 (4): Trustworthiness ratings are higher for faces that have been looked at by another face than for faces that have been presented next to a straight looking face.

The main focus of the study is on the hypothesis of attractiveness and trustworthiness judgments. Results on reaction times will only be used to further explain the evaluative findings. If no effect of Gaze Cuing on reaction times was found, results would indicate that the previous found automatic orienting processes due to perceived gaze direction cannot be shown in reaction tasks when using static naturalistic scenes with peripherally presented cues and targets. It could be stated that the reflexive attentional shift due to Gaze Cuing found in previous studies is only valid in a setting that either presents the cue (the gazing face) some time (SOAs) before the target occurred or, if presented simultaneously, in a setting that presents the cue (the gazing face) in the centre of the stimulus. Both of these settings elicit an

order of processing in which the cue is processed prior to target. The present study differed in chronological order and position; therefore, the order of processing is not that clear.

If no difference in evaluation (attractiveness and trustworthiness ratings) of faces that have been looked at and faces that were presented next to a straight looking face was found, it could be indicated that evaluation of faces is less manipulatable than liking ratings for objects (Bayliss et al., 2006). Further a missing finding of differences in the evaluative judgments (attractiveness and trustworthiness ratings) could also be associated with the appliance of naturalistic scenes as stimuli. If a possible Liking Effect was very sensitive to distractors, the features of a naturalistic scene could inhibit an enhancement of evaluation due to perceived gaze directions.

METHODS AND RESULTS

Experiment 1

Method

Participants

Thirty-two participants (16 males, 16 females) took part in the first experiment. The general mean age was 22.3 years (*SD* = 2.3 years) with the male participants having a mean age of 22.5 years (*SD* = 2.2 years) and the females having a mean age of 22.2 years (*SD* = 2.5 years). Twenty-seven of the participants were right-handed; the other six were left-handed (Handedness was examined by using a German language version of the Edinburgh Handedness Inventory). All of the participants had a normal or corrected-to-normal visual acuity and a normal colour vision. Three participants were recruited from the University of Vienna and received course credit for their participation; the others were recruited from the experimenter's environment and served as unpaid volunteers. All of the participants were

naive as to the purpose of the experiment and had no special knowledge about the influence of Gaze Cuing.

Stimuli

Sixteen greyscale scene photographs, eight of them with two female bodies the other with two male bodies were provided from the Database of the Department of Psychological Basic Research. Photographs were taken in and outside of the Vienna University campus by students of a General Psychology proseminar (Research practical II). The models were students from the same proseminar and wore black full-length clothing. They stood next to each other on the same plane with their hands behind their back or close to their bodies. In one scene both models sat on chairs. The distance between the bodies was specified to be 0.5 m and the camera was located at a 4 m distance.

As it was important to keep the influence of one face on the other face as low as possible, it was decided to replace the faces of the models by faces of average attractiveness. Hence, thirty-two faces were chosen out of a larger sample of forty faces from the greyscale FERET- database (National Institute of Standards and Technology, 2008). All of the faces were previously rated as average in attractiveness by fifteen additional students of the General Psychology proseminar mentioned before. The faces were arranged as pairs with each pair matching for gender and approximate age. All faces had a neutral facial expression and were staring straight ahead. Faces were cut out and attached to the scene photographs, where they replaced the existing faces, using Adobe Photoshop CS4. In some cases the necks of the existing bodies were retained, in the others the faces attached included their own neck part.

Furthermore, to create scenes where either one of the faces looked at the other, the eyes of the faces were manipulated again using Adobe Photoshop CS4. For a detailed

explanation of this manipulation see Appendix A1. Due to this eye manipulation of the faces each scene was generated in three different *looking conditions* (see Figure 4):

- Both faces looking straight ahead. (Condition 1)
- The left face looking at the right face. (Condition 2)
- The right face looking at the left face. (Condition 3)

a.  b.  c. 

Figure 4. Example for the stimuli used in Experiment 1. The same scene presented in Condition 1, both faces looking straight (a), Condition 2, left face looking at the right face (b) and Condition 3, the right face looking at the left face (c).

Since it was important that attractiveness judgments were based on the face evaluations and were not based on distractors such as clothing or details of the environment, specific rating versions of each scene were created. The two different rating versions were generated by blurring every other detail but the faces. Blurring was conducted by using a Gaussian blur with $\sigma = 8$. The two rating versions differed in the faces they showed while rating. In one rating version everything but the two faces in 150× 168 - pixel ellipses was blurred. In the other rating version only the to-be-rated face remained clear. One participant saw all rating stimuli in only one of these rating versions. Thereby participants were divided in Rating Group 1, who always saw both faces clearly visible while rating, and Rating Group 2, who only saw the to be rated face clearly visible while rating. Thus, *rating group* was a

between-subjects variable. Figure 5 shows an example of the rating stimuli presented in the two different *rating groups.*

a.  b. 

Figure 5. Examples for the rating stimuli used in the two *rating groups* in Experiment 1. The same scene presented in Rating Group 1, both faces clearly visible (a), and Rating Group 2, only to-be-rated face clearly visible (b).

For the experiment all of the pictures were transformed to a greyscale and cropped so that they fit into an 800×800-pixel frame. Cut outs were chosen so that about 10% of the models body lengths remained above and under the models. All of the pictures were presented centred on the screen on an opaque background. All writing was presented in white text. The whole set of stimuli used in Experiment 1 (familiarity and rating phase) can be found in Appendix A.

Presentation of stimuli and recording of participants´ responses and reaction times was conducted on PCs using E-Prime Version 2 (Schneider, Eschman, & Zuccolotto, 2002; see also www.pstnet.com/eprime). Participants sat at an approximate distance of 50 cm to the computer screen. The screen resolution of the experiment was 1280×1024 pixels with a 32 bit color depth.

Design

A familiarity phase was used to ensure that people observe the direction of each gaze appropriately. In the familiarity phase participants were asked to categorize faces gaze direction. The question of direction was chosen over other tasks such as gender identification or age estimation since it was important to ensure that participants pay most of their attention to the eye region and do not focus on other details of the body that could tell gender or age of the model.

As outlined above, the present study presented scenes in three different looking *conditions* (Condition 1, both faces looking straight; Condition 2, left face looking at the right face and Condition 3, the right face looking at the left face). Thus, faces always looked straight or toward the other face, but never looked to the opposite side. However, the main aim of the study was to investigate the effect of a perceived gaze towards a face on the evaluation of that gazed at face. Therefore the information whether the rated face was looked at or not was of greater importance than the gazing behaviour (exhibiting direct versus averted gaze) of the rated faces itself. Thus these two information sources (looked at/ not looked at; direct/averted gaze) were combined in the design and following three different *gaze states* of a face were distinguished (for a further explanation see Figure 6):

- **Straight** (both faces of Condition 1 are looking straight ahead)
- **Looking** (in Condition 2 the left face is the looking face; in Condition 3 the right face is the looking face)
- **Looked at** (in Condition 2 the right face is the looked at face, in Condition 3 the left face is the looked at face)

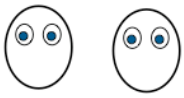
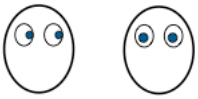
Looking condition	*position*	
	left	**right**
Condition 1 	straight 	straight 
Condition 2 	looking 	looked at 
Condition 3 	looked at 	looking 

Figure 6. Resulting *gaze state* for both *positions* in all 3 *looking conditions* of Experiment 1.

Participants saw each picture in only one of the three looking conditions and therefore each face in only one of the three gaze states. The looking condition, in which a participant saw a particular scene in, was randomly allocated. As all of the participants saw all of the three looking conditions and therefore rated faces in all of the three different gaze states, *gaze state* was a within-subjects factor. A second within-subjects factor was the *position* (left/right) of the rated face. Since there might be an influence of *participants gender* on the effect of Gaze Cuing the gender ratio was kept equal in general, as well as among the rating groups. Furthermore, the gender of the rated face (*rated gender)* could also have an impact on the attractiveness ratings and therefore was the third within-subjects variable.

Regarding the rating phase, participants were divided into two groups. Thus, *rating group* was a between-subjects factor. Each group consisted of eight female and eight male participants. Rating Group 1 was presented with rating stimuli that showed both faces clearly

visible. Rating Group 2 saw rating stimuli, which only presented the to-be-rated face clearly visible (see Figure 5). The two different rating groups were generated to see how long-lasting a possible effect of Gaze Cuing on attractiveness judgments would be. If an effect was found in Rating Group 1, but not in Rating Group 2, this would mean that perceived gaze direction towards faces does influence attractiveness ratings for those faces, but only when seen while judging. On the other hand, if Rating Group 2 showed the same effect as Rating Group 1, this would indicate that the effect of a perceived gaze direction is able to maintain even though the gaze cue is not directly present any more.

Procedure

All participants were tested individually in a quiet room at the faculty of Psychology of the University of Vienna. Prior to each computer testing participants´ visual acuity, colour vision (Ishahara Colour Visual Test) and handedness (Edinburgh Handedness Inventory) were tested and a consent form was signed. When participants were seated in front of the computer, they saw an introduction screen that welcomed them. All instructions were presented on the computer screen. No oral instructions were needed to conduct the experiment.

Familiarity phase. The familiarity phase started with an introduction screen to the familiarity task. In one block of the familiarity phase the participants saw each of the 16 scenes individually for 500 ms each. Subsequent to each presentation, participants were asked in which way either the left or the right person in the scene was looking. Directions and perspectives were explained previously in the introduction by providing an example. The question " In welche Richung blickt die linke/rechte Person?" (*In which direction is the left/right person looking*) was placed centred under the picture with the position information "linke"/"rechte" (*left/right*) highlighted and stayed until a response was given. Answers were given by pressing the spacebar for straight ahead, the "d" key for left and the "k" key for right

on a standard keyboard. The complete instruction text of Experiment 1 can be found in Appendix B. Immediately after an answer was given the presentation time of the following scene started. Within one familiarity block the pictures were presented in a random order. Questions that asked for the left faces' gaze direction and those that asked for the right faces' gaze direction were assigned randomly to the presented stimuli. The familiarity block was run five times with short breaks in between the blocks. Participants could individually end the break whenever they felt ready to continue. Altogether the familiarity phase of the first experiment consisted of 80 trials and took approximately 10 minutes.

Rating phase. After the last familiarity block, the rating phase started with an introduction screen. Participants were asked to rate the attractiveness of either the left or the right person on a Likert scale from 1 (*very unattractive*) to 7 (*very attractive*). The instruction told the participants to answer speedily and spontaneously by clicking one of the seven numbers presented on the computer screen with the computer mouse. The complete introduction text of the rating phase of Experiment 1 can be found in Appendix B. The number scale was presented centred under the rating picture with the words "sehr unattraktiv" (*very unattractive*) on the left and "sehr attraktiv" (*very attractive*) on the right of it. The question to rate the attractiveness of the left or the right person on the following scale was presented centred above the picture with the position information "linke"/"rechte" (*left/right*) highlighted. Since the participants were asked to rate the attractiveness of both, the right and the left person, the set of rating stimuli was presented twice in Rating group 1 (both faces clearly visible). Rating group 2 had two different versions for rating the left (only left face clearly visible) and the right (only right face clearly visible) person, thus each version was presented once only. Each rating screen remained until an answer was given. The rating phase of the first experiment consisted of 32 trials and took approximately 3 minutes.

Results

In all analysis (except for task error calculation) the used data was aggregated per participant and relevant within-subjects variables. Depending on the question that was analyzed, relevant within-subjects variables were *gaze state* (straight, looking, looked at), *position* (left, right) and/or *rated gender* (male/female face). *Rating group* (Rating Group 1, Rating Group 2) and *participants gender* were the applied between-subjects variables. Descriptive statistics for all gaze states and positions per subject can be found in Appendix C.

Familiarity phase. In the familiarity phase participants were asked to categorize the direction of the faces. Direction task errors were made on 2.5% of all trials. Error trials were excluded from reaction time analysis. The mean reaction time (RT) of the remaining trials was 2667 ms (*SD* = 2009 ms). A one way within-subjects ANOVA showed a significant effect of *gaze state* on the time participants needed to categorize gaze direction, F (2,30) = 27.34, $p < .001$, with the straight looking faces categorized fastest (mean RT = 2248 ms, *SD* = 820 ms), followed by the looked at faces (mean RT = 2678 ms, *SD* = 929 ms) and the looking faces (mean RT = 3109 ms, *SD* = 1122 ms).

Attractiveness rating phase. Conducting a two-way within-subjects ANOVA with the factors *gaze state* and *position,* neither a significant interaction, F (2,30) = 0.19, p = .83 nor a difference in attractiveness ratings between straight, looking and looked at faces (*gaze state)*, F (2,30) = 0.25, p = .781 was found (see Table 1). However, regarding *position*, faces were rated significantly higher when presented on the left side (M = 3.05, *SD* = 0.91) of the scene, F (2,31) = 6.5, p = .016 compared to the right side (M = 2.9, *SD* = 0.75). To determine whether the type of presentation when rating the faces had an influence on the effect of Gaze Cuing on attractiveness ratings, an additional mixed-factor ANOVA with *rating group* as between-subjects factor and *gaze state* as within-subjects factor was run. Although there was

no interaction between *gaze state* and *rating group*, F (2,29) = 0.03, p = .823 and no significant difference between the rating groups, t (30) = -1.16, p = .257, a trend of Rating Group 2 having higher overall ratings than Rating Group 1 was observed. Table 1 shows the mean attractiveness ratings per rating group for all gaze states and both positions. Finally a mixed ANOVA with the within-subjects variable *rated gender* and the between-subjects variable *participants gender*, neither revealed an interaction of the variables, F (1,30) = 0, p = .99, nor a significant difference between rating male faces (M = 2.9, SD = 0.72) and female faces (M = 3.05, SD = 0.8), F (1,30) = 1,27 p = .268. Comparing the overall ratings of female participants (M = 2.94, SD = 0.69) to those of male participants (M = 3.01, SD = 0.68), no difference was found, t (30) = -.28, p = .781. The results of Experiment 1 will be discussed in detail in the next section, after Methods and Results of Experiment 2 have been presented.

Table 1

Mean Attractiveness Ratings (Standard Deviation in Parentheses) of Experiment 1 for all gaze states and positions for Rating Group 1 (both faces clearly visible) and Rating Group 2 (only to be rated face clearly visible).

	Rating Group 1		Rating Group 2		
	position		*position*		
gaze state	left	right	left	right	total
straight	2.78 (0.87)	2.75 (0.67)	3.21 (0.81)	2.98 (0.82)	2.93 (0.80)
looking	2.84 (0.86)	2.92 (0.58)	3.31 (1.10)	2.99 (0.81)	3.02 (0.86)
looked at	2.85 (0.83)	2.82 (0.96)	3.33 (0.89)	2.91 (0.69)	2.98 (0.86)
total	2.82 (0.84)	2.83 (0.74)	3.29 (0.93)	2.96 (0.76)	2.98 (0.83)
	2.83 (0.79)		3.12 (0.86)		

Experiment 2

As in Experiment 1, in Experiment 2 the influence of an observed gaze towards a face on evaluation of that face was examined. Since no effects of Gaze Cuing on attractiveness ratings were found in Experiment 1, it was considered, that attractiveness evaluation might have been a judgment too stable to be influenced by Gaze Cuing in naturalistic scenes. Thus, an additional social judgment dimension was included in Experiment 2. Trustworthiness as a social dimension was found to be a very sensitive social dimension (Krumhuber et.al, 2007) and therefore is expected to be easier to manipulate than attractiveness.

Regarding methodology, modifications were made in the familiarity phase of Experiment 2. Since participants of Experiment 1 indicated that they perceived the familiarity phase as very long and reported difficulties to maintain attention, the familiarity phase of Experiment 2 was cut down to 1 block of 32 trials (Experiment 1 had 5 blocks of 16 trials each). To ensure that faces gaze directions were still processed appropriately, even though they were shown less often in Experiment 2, a larger cut out of the stimuli was chosen to make the eyes of the faces more salient. (compare Figure 4 to Figure 7)

Method

Participants

Forty participants (9 males, 31 females) took part in Experiment 2. Since no effects of gender on Gaze Cuing were found in Experiment 1, there was no particular need to have an equal number of male and female participants in the Experiment 2. The general mean age of participants was 21.6 years (*SD* = 2.7 years) with the male participants having a mean age of 22.2 years (*SD* = 1.3 years) and the female participants having a mean age of 21.4 years (*SD* = 3.0 years). Thirty-six of the participants were right-handed; the other four were left-handed (Handedness was examined by using a German language version of the Edinburgh Handedness Inventory). All of the participants had a normal or corrected-to-normal visual

acuity and normal colour vision. Thirty-four of the participants were recruited from the University of Vienna and received course credit for their participation; the other six were recruited from the experimenter's environment and served as unpaid volunteers. All of the participants were naive as to the purpose of the experiment and had no special knowledge about the influence of Gaze Cuing. Participants, who took part in Experiment 1, were not allowed to participate in Experiment 2.

Stimuli

Experiment 2 used the same photographs as Experiment 1 but this time all manipulated photographs were further cropped so that they fit into a 600×800 pixel- frame. The cut out was chosen so that the lower parts of the faces approximately ended on the horizontal centreline of the rectangle. The width of the rectangle was chosen so that the arms of the models were fully included. This resulted in the faces being larger on screen and therefore the eye directions easier to distinguish (compare Figure 4 to Figure 7). Additionally the scenes in Condition 1 (both faces looking straight ahead) were excluded to get a larger number of ratings for the more interesting "looking" and the "looked at" faces shown in Condition 2 (left face looking at the right face) and Condition 3 (right face looking at the left face). Figure 7 shows an example for the two looking conditions used in Experiment 2.

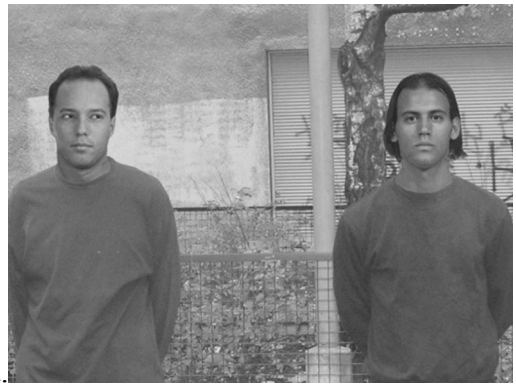
a.  b. 

Figure 7. Example for the stimuli used in Experiment 2. The same scene presented in Condition 2, left face looking at the right face (a) and Condition 3, the right face looking at the left face (b).

The stimuli used in the rating phase were cropped in the same way as the stimuli of the familiarity phase. As a consequence the clearly visible area of the scene increased with the ellipse around the face having an approximate diameter of a 225×260 pixel- frame (see Figure 8). The whole set of stimuli used in Experiment 2 can be found in Appendix D.

a.  b. 

Figure 8. Examples for the rating stimuli used in the two *rating groups* in Experiment 2. The same scene presented in Rating Group 1, both faces clearly visible (a), and Rating Group 2, only to be rated face clearly visible (b).

In Experiment 2, facilities (room, computer and software applications) and requirement tests (vision and handedness) were the same as in Experiment 1.

Design

The experiment's design was basically the same as in Experiment 1, but with the additional dependent variable *trustworthiness rating*. In addition, due to the exclusion of Condition 1 (both faces looking straight), the within-subjects variable *gaze state* was reduced to two levels (looking, looked at; see Figure 9). Furthermore, it was decided to divide each rating group into two order groups (Order Group 1, Order Group 2) which differed in the order they completed the two rating blocks (attractiveness rating and trustworthiness rating). While participants of Order Group 1 started with the attractiveness-rating block and continued with the trustworthiness-rating block, the order of participants of Order Group 2 was reversed.

The splitting of the groups was done to avoid differences in attractiveness and trustworthiness ratings due to the order they were presented.

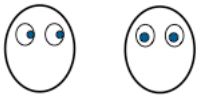
Looking condition	*position*	
	left	**right**
Condition 2 	looking 	looked at 
Condition 3 	looked at 	looking 

Figure 9. Resulting *gaze state* for both *positions* in the 2 *looking conditions* of Experiment 2.

Procedure

As a consequence of the weak overall attractiveness ratings (see Table 1) and participants´ feedback after completing the experiment, it was suggested, that the familiarity phase of Experiment 1 was to long. Thus, in Experiment 2 the familiarity phase was reduced to one block and all breaks were excluded. For each scene, participants were asked for direction of the left persons or the right persons gaze. In one trial, presentation time of each familiarity stimulus without the question was the same as in Experiment 1 (500ms). The resulting 32 trials (16 scenes with 2 different questions [left/right]) were presented in a random order and finished with the introduction to the first rating block (attractiveness rating in Order Group 1, trustworthiness rating in Order Group 2). After finishing the first rating block, the second rating block (trustworthiness rating in Order Group 1, attractiveness rating in Order Group 2) started with an introduction and ended with the same debrief used in

Experiment 1. The introduction to the attractiveness-rating block was the same as in Experiment 1. The introduction to the trustworthiness-rating block was the same as the introduction to the attractiveness-rating block, but with the word "Vertrauenswürdigkeit" (*trustworthiness)* instead of "Attraktivität" *(attractiveness)*. Additionally, the words "sehr unattraktiv" (*very unattractive*) on the left side and "sehr attraktiv" (*very attractive*) on the right side of the number scale were replaced by "nicht vertrauenswürdig" (*not trustworthy*) and "sehr vertrauenswürdig" (*very trustworthy*) in the trustworthiness-rating introduction and for trustworthiness rating. Positions of the pictures, number scales and writings kept the same as in Experiment 1. All texts used in the introductions can be found in Appendix E.

Results

Again, in all analyses (except for task error calculation) data was aggregated per participant and relevant within-subjects variables. Depending on the question that was analyzed, relevant within-subjects variables were *gaze state* (looking, looked at), *position* (left, right) and/or *rated gender* (male/female face). *Rating group* (Rating Group 1, Rating Group 2) and *participants gender* were the applied between-subjects variables. Descriptive statistics for all gaze states and positions per subject can be found in Appendix F.

Familiarity phase. Participants made direction categorization errors were made in 4,3 % of the familiarity trials. Error trials were excluded from further reaction time analysis. The mean reaction time of the remaining trials was 2823ms (SD = 956 ms). A dependent t-test with reaction time as dependent variable was conducted to examine whether there was a time difference in responses for faces in the different gaze states (looking, looked at). Participants were significantly faster in categorizing gaze direction of looked at faces (M = 2617 ms, SD = 722 ms) than categorizing gaze direction of looking faces (M = 3028 ms, SD = 1114 ms), t (39) = 4.10, p > .001.

Attractiveness rating phase. As in Experiment 1, a two- way within-subjects ANOVA with the factors *gaze state* and *position* was conducted. In contrast to Experiment 1, the difference between the faces presented on the right side (M = 3.56, SD = 0.61) and those presented on the left side (M = 3.71, SD = 0.57) was not significant, F (1,39) = 3.62, p = .064. However, the same trend as in Experiment 1, with the left faces being rated as more attractive than the right faces was observed (see Table 2). Regarding the face's gaze, there was a significant effect of the factor *gaze state* on attractiveness ratings, F (1,39) = 4.36, p = .043, with the looked at faces rated as more attractive than the looking faces (see Table 2). There was no significant interaction between *gaze state* and *position* of the faces, F (1,39) = 0.18, p = .676. Running a mixed ANOVA, no significant interaction of *rated gender* and *participants gender* on attractiveness ratings was found, F (1,38) = 0.20, p = .656. Comparing the attractiveness rating means of male (M = 3.53, SD = 0.57) and female (M = 3.66, SD = 0.4) participants no significant difference in *participants gender* was found, t (38) = -.59, p = .562. However, the mixed ANOVA revealed a significant impact of the models´ gender (*rated gender)* on attractiveness ratings, F (1,38) = 5.13, p = .029, with female faces (M = 3.79, SD = 0.61) receiving higher scores on the attractiveness scale than male faces (M = 3.47, SD = 0.47).

Finally to investigate how long- lasting the previous found effect of the faces´ gaze on attractiveness ratings might be, results from Rating Group 1 (both faces clearly visible while rating) were compared to those from Rating Group 2 (only to be rated face clearly visible while rating). Hence, a mixed ANOVA with the between-subjects variable *rating group* and the within-subjects variable *gaze state* was conducted. No influence of *rating group* on the effect of *gaze state* on attractiveness rating was observed, F (1,38) = 0.07, p = .788. Furthermore, comparing the overall ratings of Rating Group 1 and Rating Group 2, no impact

of the presentation type was revealed, t (38) = -.96, p = .344. Table 2 shows the mean attractiveness ratings per rating group for all gaze states and both positions.

Table 2

Mean Attractiveness Ratings (Standard Deviation in Parentheses) of Experiment 2 for all gaze states and positions for Rating Group 1 (both faces clearly visible) and Rating Group 2 (only to be rated face clearly visible).

	Rating Group 1		Rating Group 2		
	position		*position*		
gaze state	left	right	left	right	total
looking	3.58 (0.49)	3.41 (0.55)	3.65 (0.65)	3.57 (0.54)	3.55 (0.55)
looked at	3.78 (0.53)	3.56 (0.66)	3.81 (0.62)	3.68 (0.68)	3.71 (0.62)
total	3.68 (0.51)	3.48 (0.66)	3.73 (0.63)	3.63 (0.61)	3.63 (0.59)
	3.58 (0.57)		3.68 (0.62)		

Trustworthiness rating phase. For the trustworthiness ratings the same two-way repeated measures ANOVA as for the attractiveness ratings was conducted. Both factors, *gaze state* and *position* were significant, F (1,39) = 24.66, p < .001 (*gaze state*) and F (1,39) = 15.83, p < .001 (*position*) in the trustworthiness rating. The direction of the differences was the same as for the attractiveness ratings: higher ratings were given for faces presented on the left side (M = 4.19, SD = 0.65) compared to faces presented on the right side (M = 3.93, SD = 0.74) and faces that have been looked at received higher ratings than looking faces (see Table 3). Similar to the attractiveness ratings, there was no significant interaction between the two factors (*gaze state* and *position*), F (1,39) = 0.84, p = .365. Regarding the gender of the raters (*participants gender*) and the rated models (*rated gender*), there was no difference in the raters gender (male ratings: M = 4.01, SD = 0.62, female ratings: M = 4.08, SD = 0.49), t (38)

= -.32, p = .756, and no interaction, F (1,38) = 0.21, p = .652, between raters´ and models´ gender. However, overall, participants rated women (M = 4.39, SD = 0.65) as more trustworthy than men (M = 3.73, SD = 0.54), F (1,38) = 29.07, p < .001. To investigate whether the models´ gender (*rated gender*) had an impact on the influence of the perceived gaze directions (*gaze state*) on trustworthiness ratings a two-way repeated measures ANOVA with the factors *rated gender* and *gaze state* was conducted. There was no interaction between the two factors, F (1,39) = 0.65, p = .426.

Finally, as with attractiveness ratings, a mixed ANOVA with the factors *rating group* and *gaze state* was conducted for the trustworthiness ratings. Although there was a trend of Rating Group 2 giving higher values than Rating Group 1, neither the difference between the rating groups, t (78) = -1.26, p = .211, nor the interaction with the factor *gaze state*, F (1,38) = 0.13, p = .717 was significant. Table 3 shows the mean trustworthiness ratings for all gaze states and both positions per rating group

Table 3

Mean Trustworthiness Ratings (Standard Deviation in Parentheses) of Experiment 2 for all gaze states and positions for Rating Group 1 (both faces clearly visible) and Rating Group 2 (only to be rated face clearly visible).

	Rating Group 1		Rating Group 2		
	position		*position*		
gaze state	left	right	left	right	total
looking	3.92 (0.65)	3.60 (0.65)	4.06 (0.64)	3.74 (0.81)	3.83 (0.70)
looked at	4.24 (0.67)	4.13 (0.89)	4.54 (0.69)	4.26 (0.61)	4.29 (0.61)
total	4.08 (0.58)	3.87 (0.81)	4.30 (0.70)	4.00 (0.63)	4.06 (0.71)

DISCUSSION

The results of Experiment 1 did not support the stated research hypothesis proposed for the effect of Gaze Cuing and gaze direction on attractiveness ratings. Faces that have been looked at by another face were not rated as more attractive than faces that were presented next to a straight looking face (see Table 1). Furthermore, faces exhibiting an averted gaze were not rated as less attractive than faces with direct gaze. Contrary to expectations, there was a trend for faces exhibiting an averted gaze receiving higher attractiveness ratings than faces with a direct gaze. These results could either be explained by weak overall attractiveness ratings (see Table 1) or the setting of the familiarity phase. As outlined above, previous findings revealed higher attractiveness ratings for faces exhibiting a direct gaze compared to faces with an averted gaze. However, the used faces in these studies were either of high or average attractiveness. Even though the present study used faces, which were previously rated as average attractive, participants of Experiment 1 overall gave attractiveness ratings below average. Thus, it could be possible that faces did not receive higher attractiveness ratings when exhibiting direct gaze, because they were in general perceived as rather unattractive.

Another explanation for faces with averted gaze receiving higher attractiveness ratings than straight looking faces could be that in the familiarity phase responses for averted gaze were not as often required as responses for direct gaze. In fact, participants had to press the spacebar for all faces exhibiting direct gaze (looked at and straight) but different keys (“d”, ”k”) for faces exhibiting an averted gaze. Hence, pressing the spacebar was required four times as often as pressing the “d” or the “k” key. Thus, it could be possible that categorizing face direction for faces exhibiting an averted gaze was perceived as more challenging and more exciting than categorizing faces with a direct gaze. This enhanced activation associated with faces exhibiting an averted gaze could explain an elevated evaluation of these faces.

In Experiment 2 this difference in challenge when asking for faces with direct gaze and asking for faces with an averted gaze was reduced by excluding the neutral looking condition (Condition 1- both faces looking straight ahead). In contrast to Experiment 1, results of Experiment 2 supported the hypothesized effects of Gaze Cuing and gaze direction on attractiveness ratings. Faces that have been looked at by another face were rated as more attractive than faces that were presented next to a straight looking face (see Table 2). As there was no neutral condition, all faces that have been presented next to a straight looking face were faces that were looking themselves. Thus, it can be deduced that faces exhibiting a direct gaze were rated as more attractive than faces exhibiting an averted gaze. The same effect was found for trustworthiness ratings (see Table 3). Faces that have been looked at (exhibited direct gaze) were rated as more trustworthy than faces that were presented next to a straight looking face (exhibited averted gaze). Findings of Experiment 2 could therefore extend the validity of the previously found Liking Effect (Bayliss et al., 2006) to settings that include naturalistic scenes with faces instead of objects as targets. Furthermore Experiment 2 showed that this enhancement of evaluation cannot only be found when asking for attractiveness judgments but also for trustworthiness judgments of the cued face. Regarding the gaze direction of rated faces, the results of Experiment 2 support Erwing et al.'s (2010) findings that static faces with direct gaze receive higher attractiveness ratings than faces with averted gaze and further make them valid for settings of naturalistic scenes. The present study further provides confirmation for the enhanced evaluation of faces with direct gaze by revealing that faces with direct gaze were rated as more trustworthy than faces with an averted gaze. Thus, Erwing et al.'s (2010) hypothesis was not only found to be valid for preference formation, but also when asking for social dimensions such as trustworthiness.

Considering the effect of Gaze Cuing on attentional processes, Experiment 1 does not support the hypothesis of looked at faces being categorized faster than faces that were presented next to straight looking faces. However, as outlined above, missing findings on

reaction times could be attributed to the experiment's material (peripherally presented static cues). Experiment 2 did show results that confirmed the proposed hypothesis. Faces gaze direction were categorized faster when being looked at by another face than when being presented next to a straight looking face. As discussed above, faces that were presented next to a straight looking face in Experiment 2 were always faces that were looking themselves (exhibited averted gaze) and responses for averted gaze (either looking to the left or to the right) in the familiarity phase were less often than for straight gaze. Thus, categorizing faces with a straight gaze might have been perceived as an easier task than categorizing faces with an averted gaze. Hence, the difference of reaction times might be a result from a task setting. All in all, results on reaction times do not explicitly provide evidence that the present findings on the effect of Gaze Cuing on evaluative judgments are a result of a more fluent processing of the looked at face. Thus, as in Bayliss et al. (2006) it is assumed that the found effects of Gaze Cuing on affective judgments are elicited by a higher-order cognitive strategy. The missing finding of a difference between the rating groups further supports this assumption. As participants, who only saw the to be rated face while rating (Rating Group 2), showed the same pattern of results as participants, who saw both faces in the rating trials (Rating Group 1) in both experiments (see Table 1, 2 and 3), it can be concluded that the influence of a perceived gaze towards a face is remembered (at least for some minutes). The power of Gaze Cuing to influence evaluative judgments of faces even though not directly present anymore, indicates that Gaze Cuing influences evaluative judgments rather consciously than reflexivly. Overall, it can be assumed that the applied design was less demanding for attentional processes to be influenced by Gaze Cuing compared to previous studies and therefore, explanations solely based on attentional shifting do not seem to be appropriate to explain current findings.

Regarding laterality, Experiment 1 as well as Experiment 2 showed an effect of side of presentation. In both experiments, faces presented on the left side were found to be rated as

more attractive than faces presented on the right side (see Table 1 and Table 2). However, this difference was only significant in Experiment 1. The same pattern of results was found for trustworthiness ratings (see Table 3). Participants gave significantly higher trustworthiness ratings for faces presented on the left side compared to faces presented on the right side. None of the differences in results due to laterality were found to be influenced by the gaze direction a face exhibited. Thus, the side of space a face was presented on was found to have the power to independently influence preference formation as well as social judgments.

FINAL CONSIDERATIONS

The present study did find effects of gazing behaviour on attractiveness and trustworthiness judgments. However, the present study only revealed these effects in an experiment (Experiment 2), which does not allow to make interferences of whether the found effects are due to passive gazing behaviour (being looked at versus not being looked at) or active gazing behaviour (exhibiting direct versus averted gaze). Thus, the current findings of course need to be replicated and tested again including a neutral condition to get a baseline. As the present study did support the idea of striving for ecological validity and used naturalistic scenes as material, it is suggested to maintain the setting of a naturalistic scene in further studies as well, since findings on effects in naturalistic scenes with social stimuli supports significance and validity of research on eye gaze in general and provide data appropriate for real-life application. Following studies might also vary attractiveness of faces and expression of faces to obtain more detailed results that could be compared to previous studies that varied these variables, but did not use a naturalistic setting (Bayliss et al., 2007; Jones et al., 2006; Strick et al., 2008). Furthermore studies employing eye tracking could make a significant contribution to research on the influence of a perceived gaze towards a face on the affective judgments about that face in naturalistic scenes. Data obtained by an eye

tracking study could better describe attentional processes of Gaze Cuing in general as well as their involvement in evaluation processes.

However, although it cannot explicitly derived from present data, literature on Gaze Cuing and the applied familiarity phase lead to the assumption that the state of whether a person was looked at or not did have an influence on evaluation of the faces. Thus, the study's findings further underline the importance of eye gaze and show that the functions of eye gaze (for instance in communication) are not only due to its ability to serve as an indicator of attention, but also because of its function to provide information on evaluative processes.

The finding that people that were looked at are perceived as more attractive and more trustworthy could be used in several areas. As previous studies, which found that a perceived gaze towards an object is able to enhance the liking for that object (Bayliss et al., 2006), suggested that Gaze Cuing and the arranging of joint attention might be a appropriate tool for advertising. The findings of the present study can be employed when the aim of advertising is to promote people rather than objects. Especially in terms of social judgments, the present study might give directions to improve for instance political promotion. On most advertising posters politicians show their portrait alone on a coloured background. Considering the evaluative effects of Gaze Cuing by adding other people that look at the politician would lead to an enhanced evaluation of the politician in terms of attractiveness and in terms of trustworthiness. Of course, findings are only reasonable to be implicated when the target faces (politician) as well as the cue faces (looking face) are of average attractiveness, since there has been contradicting results on the evaluative influence of Gaze Cuing when attractive rather than average faces where used as cue faces (Strick et al., 2008).

Implications can also be made for interpersonal actions. The discovery that people like an object or another individual better, because they perceive someone else looking at it and infers that the one looks at it because he likes it, could be associated with emotions of jealousy and envy. The present findings could explain aspects of interpersonal and intergroup

conflicts and therefore help to build up understanding for each other's motives. Corneille et al. (2009) explain this phenomenon with René Girard´s (1987) mimetic desire theory, which argues that people have no other choice but desiring things that are desired by others. This mimetic desire is described as an imitation process, which can be compared with learning processes and needs to be regulated in a social environment. Taking into account this idea together with the findings of this study and previous studies that Gaze Cuing can influence affective judgments, even when cues were not predictive, the crucial influence of people's behavior on other's inner processes such as attention and evaluation was confirmed.

However, it need to be considered that the findings of the present study is not only, as mentioned above, limited due to its ambiguous results regarding the passive versus active role of gaze on affective judgments, but also due to the experiment's tested population and material. Participants of the conducted studies were quite young, since most of them were students at university. Hence, the validity of found results are rather limited to young adults. Furthermore, regarding the applied material, current findings are limited to a setting where two people of same sex are placed next to each other. Influences of gender on the effects caused by Gaze Cuing have been observed earlier (Jones et al., 2007). The present study tried not to have their results biased by effects caused by presentation of inter-gender compositions. However, further studies may take the gender intercorrelation into account and combine Jones et al.'s (2007) idea of the influence of Gaze Cuing on mate preferences with the present study's settings of naturalistic scenes. The obtained results of such a study could be compared to the present study's findings to derive information on the effect of gender intercorrelation on the evaluative modifications caused by Gaze Cuing in naturalistic scenes.

Furthermore, it needs to be considered that there could have been mediator variables that caused the differences in the affective judgments of the faces. Status could have been one of them. As it was observed that people tend to gaze more often and longer at other people of a high status compared to people of a lower status (see Kleinke, 1986 for a review), it could

be concluded that participants rated faces that were looked at as more attractive and more trustworthy, because they perceived them as people of a higher status. Another possible mediator variable for current findings could have been learning processes. As mentioned before, the participants, like all of us, of course had experiences with gazing behavior in their lives. Following the gaze cascade hypothesis (Shimojo et al., 2003), people tend do look at what they like and like what they look at. It might be a simple learning process that other people also look at what they like. Thus, it could be concluded that participants just learned that other people look more intense and often at attractive faces and in reverse automatically rated faces that have been looked at as more attractive without really inferring any intentions of the looking face. This automatic change of evaluation caused by learning processes could neither be explained by perceptual processes such as perceptual fluency nor by higher order cognitive strategies such as the theory of mind mechanism. However, as mentioned above, it is not possible to control for these previous learning processes.

Although it was not the main focus of investigation, the most robust finding of the present study was the influence of laterality on affective judgments. The side a face was presented on significantly biased attractiveness as well as trustworthiness judgments of the faces. In both experiments faces presented on the left side were rated higher on attractiveness (Experiment 1 & Experiment 2) and on trustworthiness (Experiment 2) compared to faces presented on the right side of the scene. Similar to the findings on Gaze Cuing, this information can also be used in advertisement when it comes to promote people (instead of objects). For instance, according to the study's findings presenting politicians on the left side of a scene would lead to enhancement of their evaluation. This effect might not only be interesting for advertisement, but also in every other situation in everyday life when two people are presented next to each other. However, to further confirm the found effect of laterality it is proposed to examine the laterality effect in a design that does focus on position only and does not alter gaze directions of the faces. In sum, the influence of laterality on

affective judgments definitely requires further examination as it is such as the influence of Gaze Cuing a research topic that can provide meaningful and applicable information for real-life situations.

In sum, the current study revealed an influence of Gaze Cuing as well as active gazing behaviour (exhibiting direct versus averted gaze) on affective judgements. In Experiment 2, faces that have been looked at by another face and exhibited direct gaze were found to be perceived as more attractive and more trustworthy than faces that were not looked at and exhibited averted gaze. The effect of Gaze Cuing was shown to be long-lasting as affective judgements were biased in a same amount when the gaze cue (the gazing face) was not present in the rating phase (Rating Group 2). The present study do not only support previous research on the effect of Gaze Cuing on affective judgements, but also makes their findings valid in a setting where faces were used instead of objects and static naturalistic scenes replaced traditional cuing paradigms. Moreover the present findings showed an influence of laterality on affective judgments. Faces presented on the left side of a scene were found to be rated as more attractive and more trustworthy compared to faces presented on the right side of the scene. The present study's findings on the influence of Gaze Cuing, active gazing behaviour and laterality on affective judgements cannot only provide useful information for real-life application (e.g. advertisement, conflict management), but also underline the importance of perceived behaviour and interaction on our own impressions and inner processes.

REFERENCES

Argyle, M., Lefebvre, L. M., & Cook, M. (1974). The meaning of five patterns of gaze. *European Journal of Social Psychology 3*(4), 125-136.

Baldwin, D. A. (1995). Understanding the link between joint attention and language. In C. Moore, & P. J. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 131-158). Hillsdale, NJ: Erlbaum.

Baron-Cohen, S. (1995). *Mindblindness: An essay on autism and theory of mind.* Cambridge, MA: MIT Press.

Baron-Cohen, S., Campbell, R., Karmiloff-Smith, R., Grant, J., & Walker, J. (1995). Are children with autism blind to the mentalistic significance of the eyes? *British Journal of Developmental Psychology, 13,* 379-398.

Bayliss, A. P., di Pellegrino, G., & Tipper, S. P. (2004). Orienting of attention via observed eye gaze is head-centred. *Cognition, 94*, B1–B10.

Bayliss, A. P., Frischen, A., Fenske, M. J., & Tipper, S. P. (2007). Affective evaluations of Objects are influenced by observed gaze direction and emotional expression. *Cognition, 104*, 644–653.

Bayliss, A. P., Griffiths, D., & Tipper, S. P. (2009). Predictive gaze cues affect face evaluations: The effect of facial emotion. *European Journal of Cognitive Psychology, 21*(7), 1072-1084

Bayliss, A. P., Paul, M. A., Cannon, P. R., & Tipper, S. P., (2006). Gaze cueing and affective judgments of objects: I like what you look at. *Psychonomic Bulletin & Review, 13*(6), 1061-1066.

Bayliss, A. P., & Tipper, S. P. (2006). Predictive gaze cues and personality judgements: Should eye trust you? *Psychological Science, 17*(6), 514-520.

Becchio, C., Bertone, C., & Castiello, U. (2008). How the gaze of others influences object processing. *Trends in Cognitive Sciences, 12*(7), 254-258.

Birmingham, E., Bischof, W. F., & Kingstone, A. (2008). Gaze selection in complex social scenes. *Visual Cognition, 16*, 341-355

Bonifacci, P., Ricciardelli, P., Lugli, L., & Pellicano, A. (2008). Emotional attention: effects of emotion and gaze direction on overt orienting of visual attention. *Cognitive Processing 9*(2), 127-135.

Bornstein, R. F., Kale, A. R., Cornell, K. R. (1990). Boredom as a Limiting Condition on the Mere Exposure Effect. *Journal of Personality and Social Psychology 58(5)*, 791-800.

Calder, A. J., Jenkins, R., Cassel, A., & Clifford, C. W. G. (2008). Visual representation of eye gaze is coded by a nonopponent multichannel system. *Journal of Experimental Psychology: General, 137,* 244-261.

Castiello, U. (2003). Understanding other people's actions: Intention and attention. *Journal of Experimental Psychology: Human Perception and Performance, 29,* 416-430.

Christman, S., & Pinger, K. (1997). Lateral Biases in Aesthetic Preferences: Pictorial Dimensions and Neural Mechanisms. *Laterality, 2*, 155-175.

Conway, C. A., Jones, B. C., DeBruine, L. M., & Little, A. C. (2008). Evidence for adaptive design in human gaze preference. *Proceedings of the Royal Society of London, Series B: Biological Sciences, 275*, 63-69.

Corneille, O., Mauduit, S., Holland R. W., & Strick, M. (2009). Liking products by the head of a dog: Perceived orientation of attention induces valence acquisition. *Journal of Experimental Social Psychology, 45* (1), 234-237.

De Houwer, J., Thomas, S., & Baeyens, F. (2001). Associative learning of likes and dislikes: A review of 25 years of research on human evaluative conditioning. *Psychological Bulletin, 127*, 853-869.

Downing, P., Dodds, C. M., & Bray, D. (2004). Why does the gaze of others direct visual attention? *Visual Cognition, 11,* 71-79.

Driver, J., Davis, G., Ricciardelli, P., Kidd, P., Maxwell, E., & Baron-Cohen, S. (1999). Gaze perception triggers reflexive visuospatial orienting. *Visual Cognition, 6*, 509-540.

Dukewich, K. R., Klein, R. M., & Christie, J. (2008). The effect of gaze on gaze direction while looking at art. *Psychonomic Bulletin & Review, 15,* 1141–1147.

Emery, N. J. (2000). The eyes have it: The neuroethology, function and evolution of social gaze. *Neuroscience & Biobehavioral Reviews, 24*, 581-604.

Ewing, L., Rhodes, G., & Pellicano, E. (2010). Have you got the look? Gaze direction affects judgements of facial attractiveness. *Visual Cognition*, *18*(3), 321-330.

Fenske, M., Raymond, J., Kessler, K., Westoby, N., & Tipper, S. P. (2005). Attentional inhibition has social-emotional consequences for unfamiliar faces. *Psychological Science, 16,* 753-758.

Findlay, J.M. (2003). Visual selection, covert attention and eye movements. In J.M. Findlay & I.D. Gilchrist (Eds.), *Active vision* (pp. 35-55). Oxford: Oxford University Press.

Fletcher-Watson, S., Findlay, J. M., Leekam S. R., & Benson, V. (2008). Rapid detection of person information in a naturalistic scene. *Perception, 37* (4), 571-83.

Freeth, M., Ropar, D., Chapman, P., & Mitchell, P. (2010). The eye gaze direction of an observed person can bias perception, memory, and attention in adolescents with and without autism spectrum disorder. *Journal of Experimental Child Psychology, 105*(1-2), 20-37.

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*(4), 694-724.

Frischen, A., & Tipper, S. P. (2004). Orienting attention via observed gaze shift evokes longer term inhibitory effects: Implications for social interactions, attention, and memory. *Journal of Experimental Psychology:General, 133,* 516-533.

George, N., & Conty, L. (2008). Facing the gaze of others. *Clinical Neurophysiology, 38*(3), 197-207.

George, N., Driver, J., & Dolan, R. J. (2001). Seen gaze-direction modulates fusiform activity and its coupling with other brain areas during face processing. *Neuroimage, 13,* 1102-1112.

Girard, R. (1987). *Things hidden since then foundation of the world.* Stanford: Stanford University Press.

Harper, R. G., Wiens, A. N., & Matarazzo, J. D. (1978). *Nonverbal communication: The state of the art*. New York: Wiley.

Haxby, J., Hoffman, E.A., Gobbini, M.I., (2000). The distributed human neural system for face perception. *Trends in Cognitive Sciences, 4*(6), 223-233.

Hayes, A.E., Paul, M.A., Beuger, B., & Tipper S.P. (2007). Self produced and observed actions influence emotion: the roles of action fluency and eye gaze. *Psychological research, 72*, 461-72.

Heath, R., Mahmasanni, O., Rouhana, A., & Nassif, N. (2005). Comparison of aesthetic preferences among Roman and Arabic script readers. *Laterality: Asymmetries of Body, Brain, and Cognition, 10,* 399-411.

Henderson, J.M., Weeks, P.A. Jr., & Hollingworth, A. (1999). The effects of semantic consistency on eye movements during complex scene viewing. *Journal of Experimental Psychology: Human Perception and Performance, 25,* 210-228.

Hietanen, J. K. (1999). Does your gaze direction and head orientation shift my visual attention? *NeuroReport, 10,* 3443-3447.

Hietanen, J. K., & Leppänen, J. M. (2003). Does facial expression affect attention orienting by gaze direction cues? *Journal of Experimental Psychology: Human Perception and Performance, 29,* 1228-1243.

Hoffman, E. A., & Haxby, J. V. (2000). Distinct representations of eye gaze and identity in the distributed human neural system for face perception. *Nature Neuroscience, 3*(1), 80-84.

Hood, B. M., Willen, J. D., & Driver, J. (1998). Adult's eyes trigger shifts of visual attention in human infants. *Psychological Science, 9*, 131–134.

Ivanoff, J., & Saoud, W., (2009). Nonattentional effects of nonpredictive central cues. *Attention, Perception, & Psychophysics, 71*, 872-880.

James. W. (1890). *Principles of Psychology*. New York: H. Holt & Co

Jones, B. C., DeBruine, L. M., Little, A. C., Burriss, R. P., & Feinberg, D. R. (2007). Social transmission of face preferences among humans. *Proceedings of the Royal Society of London, Series B, 274,* 899-903.

Jones, B. C., DeBruine, L. M., Little, A. C., Conway, C. A., & Feinberg, D. R. (2006). Integrating gaze direction and expression in preferences for attractive faces. *Psychological Science, 17*, 588-591

Kampe, K. K. W., Frith, C. D., Dolan, R. J., & Frith, U. (2001). Reward value of attractiveness and gaze. *Nature, 413*, 589.

Kendon, A. (1967). Some functions of gaze-direction in social interaction. *Acta Psychologica, 26.* 22-63.

Kleinke, C.L. (1986). Gaze and eye contact: a research review. *Psychological Bulletin, 100* (1), 78-100.

Kingstone, A., Friesen, C. K., Gazzaniga, M. S. (2000). Reflexive joint attention depends on lateralized cortical connections. *Psychological Science, 11*(2), 159-166.

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.

Krumhuber, E., Manstead, A. S. R., Kappas, A., Cosker, D., Marshall, D., & Rosin, P. L. (2007). Facial dynamics as indicators of trustworthiness and cooperative behavior. *Emotion, 7,* 730-735.

Kuhn, G., & Kingstone, A. (2009). Look away! Eyes and arrows engage oculomotor responses automatically. *Attention, Perception & Psychophysics, 71*(2), 314-327.

Kunst-Wilson, W. R., & Zajonc, R. B. (1980). Affective discrimination of stimuli that cannot be recognized. *Science, 207*, 557-558.

Langton, S. R. H. (2000). The mutual influence of gaze and head orientation in the analysis of social attention direction. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology, 53,* 825-845.

Langton, S. R. H., & Bruce, V. (1999). Reflexive visual orienting in response to the social attention of others. *Visual Cognition, 6*, 541-567.

Langton, S. R. H., Watt, R. J., & Bruce, V. (2000). Do the eyes have it? Cues to the direction of social attention. *Trends in Cognitive Sciences, 4*, 50-59.

Lee, L. C., Andrews, T. J., Johnson, S. J., Woods, W., Gouws, A., Green, G. G. R., & Young, A. W. (2010). Neural responses to rigidly moving faces displaying shifts in social attention investigated with fMRI and MEG. *Neuropsychologia, 48* (2), 477-490.

Macrae, C. N., Hood, B. M., Milne, A. B., Rowe, A. C., & Mason, M. F. (2002). Are you looking at me? Eye gaze and person perception. *Psychological Science, 13*, 460-464.

Mansfield, E. M., Farroni, T., & Johnson, M. H. (2003). Does gaze perception facilitate overt orienting? *Visual Cognition, 10,* 7-14.

Mason, M. F., Tatkow, E. P., & Macrae, C. N. (2005). The look of love: Gaze shifts and person perception. *Psychological Science, 16,* 236-239.

McManus, I. C., & Humphrey, N. K. (1973). Turning the left cheek. *Nature, 243*, 271-272.

National Institute of Standards and Technology. (2008). The Color FERET Database (Version 2). Retrieved from http://face.nist.gov/colorferet/

Nicholls, M. E., Clode D., Wood, S. J., & Wood, A. G. (1999) Laterality of expression in portraiture: putting your best cheek forward. *Proceedings of Biological Sciences, 266,*1517-1522.

Nittono, H., & Wada, Y. (2009). Gaze shifts do not affect preference judgments of graphic patterns. *Perceptual and Motor Skills, 109*(1), 79-94.

Patterson, M. L. (1982). A sequential functional model of nonverbal exchange. *Psychological Review, 89,* 231-249.

Perrett, D. I., Hietanen, J. K., Oram, M. W., & Benson, P. J. (1992). Organisation and functions of cells responsive to faces in the temporal cortex. *Philosophical Transactions of the Royal Society of London, Series B, 335,* 23-30.

Posner, M. I. (1980). Orienting of attention. *Quarterly Journal of Experimental Psychology, 32,* 3-25.

Raymond, J. E., Fenske, M. J., & Tavassoli, N. T. (2003). Selective attention determines emotional responses to novel visual stimuli. *Psychological Science, 14*, 537-542.

Raymond, J. E., Fenske, M. J., & Westoby, N. (2005). Emotional devaluation of distracting patterns and faces: A consequence of attentional inhibition during visual search? *Journal of Experimental Psychology: Human Perception and Performance, 31*, 1404-1415.

Reber, R., Winkielman, P., & Schwarz, N. (1998). Effects of perceptual fluency on affective judgments. *Psychological Science, 9*, 45-48.

Ricciardelli, P., Bricolo, E., Aglioti, S. M., & Chelazzi, L. (2002). My eyes want to look where your eyes are looking: Exploring the tendency to imitate another individual's gaze. *Neuroreport, 13,* 2259-2264.

Ristic, J., Friesen, C. K., & Kingstone, A. (2002). Are eyes special? It depends on how you look at it. *Psychonomic Bulletin & Review, 9*, 507-513.

Sato, W., Okada, T., and Toichi, M. (2007). Attentional shift by gaze is triggered without awareness. *Experimental Brain Research, 183*, 87-94

Schneider, W., Eschman, A., & Zuccolotto, A. (2002). *E-Prime reference guide.* Psychology Software Tools, Inc.

Shimojo, S., Simion, C., Shimojo, E., & Scheier, C. (2003). Gaze bias both reflects and influences preference. *Nature Neuroscience, 6*, 1317-1322.

Solso, R.L. (1996) *Cognition and the visual arts.* Cambridge, MA: MIT Press

Strick, M., Holland, R. W., & van Knippenberg, A. (2008). Seductive eyes: Attractiveness and direct gaze increase desire for associated objects. *Cognition, 106*, 1487-1496.

Tipples, J. (2002). Eye gaze is not unique: Automatic orienting in response to uninformative arrows. *Psychonomic Bulletin & Review, 9*, 314-318.

Yarbus, A. L. (1967). *Eye Movements and Vision.* New York: Plenum

Zajonc, R. B. (1968). Attitudinal Effects of Mere Exposure. *Journal of Personality and Social Psychology, 9,* 1-27.

APPENDICES

APPENDIX A1 (Explanation of eye manipulation)

APPENDIX A (Stimuli used in Experiment 1):

- Stimuli used in the Familiarity Phase of Experiment 1
  - In Condition 1
  - In Condition 2
  - In Condition 3

- Stimuli used in the Rating Phase of Rating Group 1 of Experiment 1
  - In Condition 1
  - In Condition 2
  - In Condition 3

- Stimuli used in the Rating Phase of Rating Group 2 of Experiment 1
  - In Condition 1
  - In Condition 2
  - In Condition 3

APPENDIX B (Text used for familiarity and rating instruction in Experiment 1)

APPENDIX C (Experiment 1: Attractiveness ratings per subject)

APPENDIX D (Stimuli used in Experiment 2):

- Stimuli used in the Familiarity Phase of Experiment 2
  - In Condition 2
  - In Condition 3

- Stimuli used in the Rating Phase of Rating Group 1 of Experiment 2
  - In Condition 2
  - In Condition 3

- Stimuli used in the Rating Phase of Rating Group 2 of Experiment 2
  - In Condition 2
  - In Condition 3

APPENDIX E (Text used for familiarity and rating instruction in Experiment 2)

APPENDIX C (Experiment 2: Attractiveness ratings per subject; Trustworthiness ratings per subject)

APPENDIX A1
(Explanation of eye manipulation)

Manipulation was conducted by creating several layers and put them together again in changed positions (see Figure A1). First of all, the pupil and the iris in the original photograph were whitened. Following an *eye layer* and an *eyeless layer* were put on the retouched original layer. To create the *eyeless layer* everything within the eyelids was cut out. The *eye layer* consisted of the cut out pupil and iris only. The change of gaze direction was attained by moving the *eye layer* a little bit to the right (for the face positioned on the left side looking to the right side) or to the left (for the face positioned on the right side looking to the left side) side. The *eyeless layer* was applied to make the gazing face look more natural, by letting small parts of the iris disappear behind the eyelids (see Figure A1). However, pupils were completely visible in all conditions.

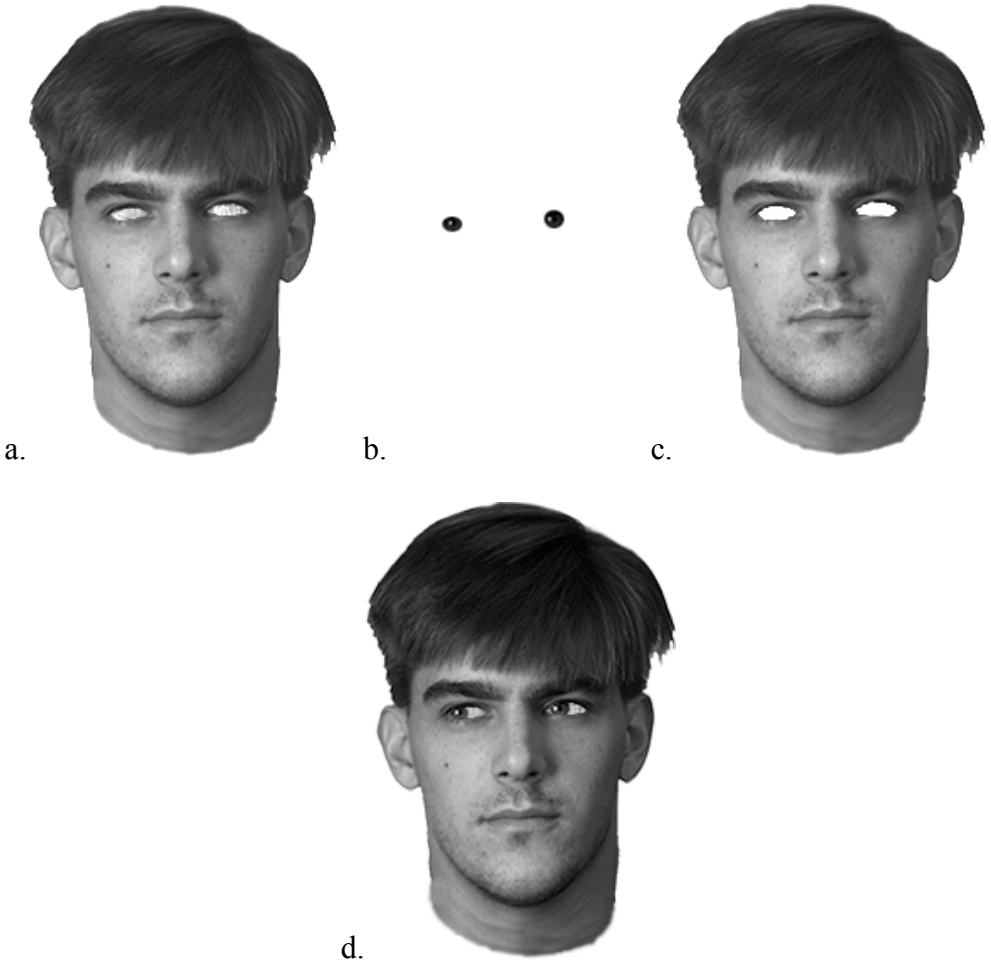


Figure A1. Creation of a gazing face. The original face with whitened eyes (a) was connected with the *eye layer*, pupils and iris, (b) and the *eyeless layer* (c) to generate a gazing face (d).

APPENDIX A
(Stimuli used in Experiment 1)

- Stimuli used in the Familiarity Phase of Experiment 1

    - In Condition 1
    - In Condition 2
    - In Condition 3

- Stimuli used in the Rating Phase of Rating Group 1 of Experiment 1

    - In Condition 1
    - In Condition 2
    - In Condition 3

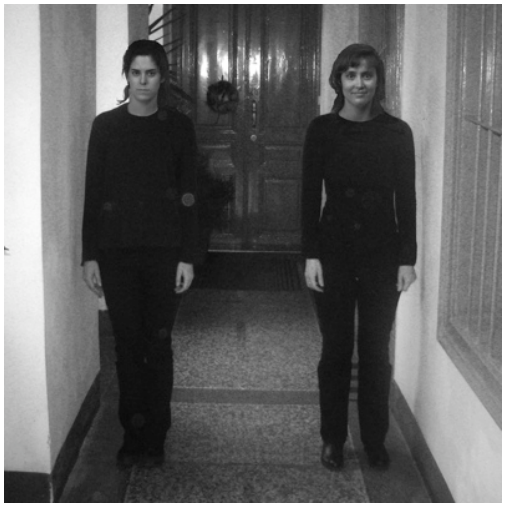
- Stimuli used in the Rating Phase of Rating Group 2 of Experiment 1

    - In Condition 1
    - In Condition 2
    - In Condition 3

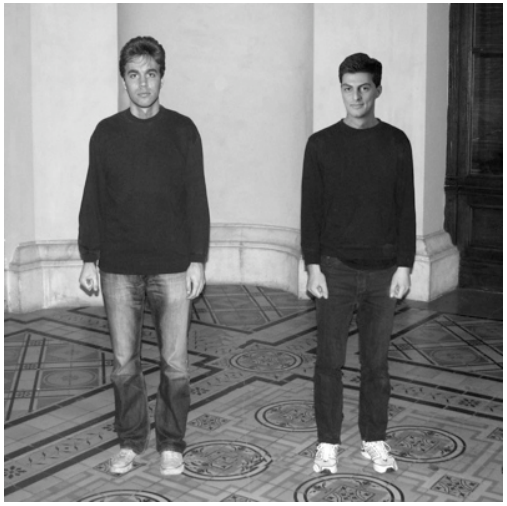
APPENDIX A

Stimuli used in the Familiarity Phase of Experiment 1

Condition 1



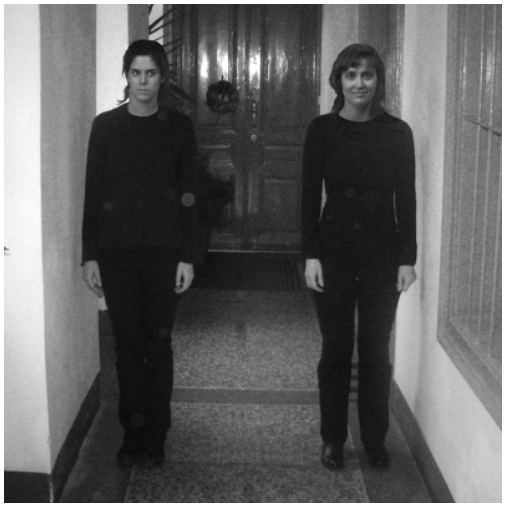

Blumen
Kränze
Gestecke
Hals
Brautschmuck
linke



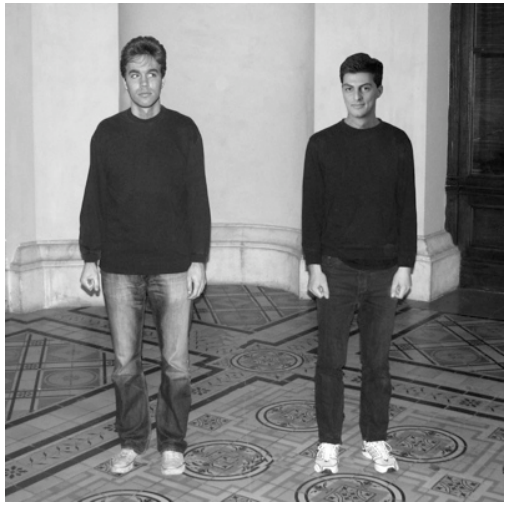
APPENDIX A

Stimuli used in the Familiarity Phase of Experiment 1

Condition 2




Blumen
Kränze
Gestecke
Hals
Brautstrauß
linke

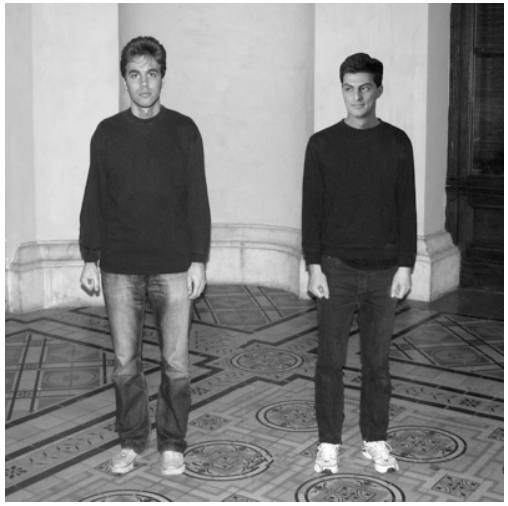


APPENDIX A

Stimuli used in the Familiarity Phase of Experiment 1

Condition 3


Blumen
linke



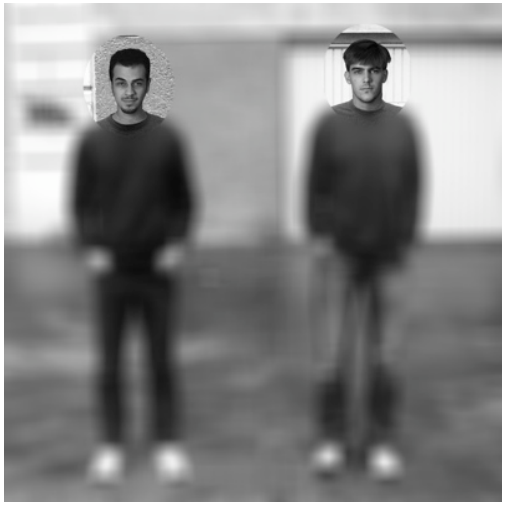
APPENDIX A

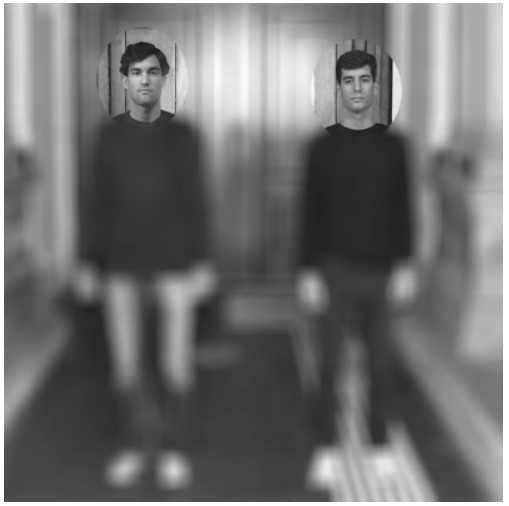
Stimuli used in the Rating Phase of Rating Group 1 of Experiment 1

Condition 1







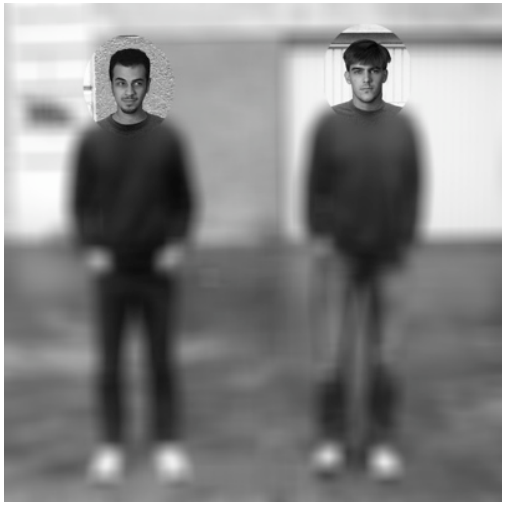
APPENDIX A

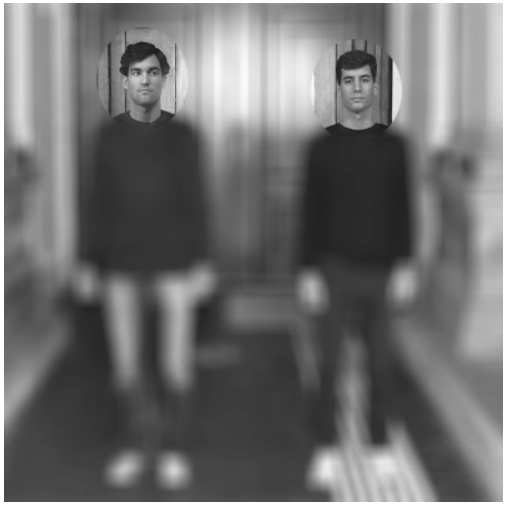
Stimuli used in the Rating Phase of Rating Group 1 of Experiment 1

Condition 2







APPENDIX A

Stimuli used in the Rating Phase of Rating Group 1 of Experiment 1

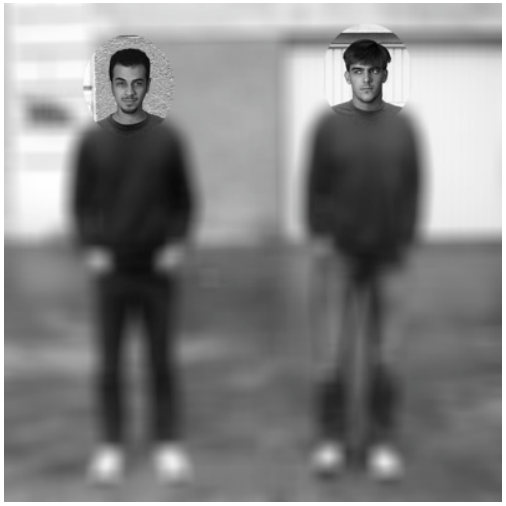
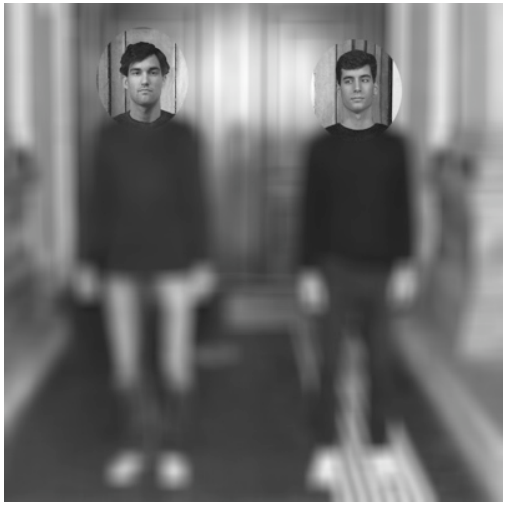
Condition 3









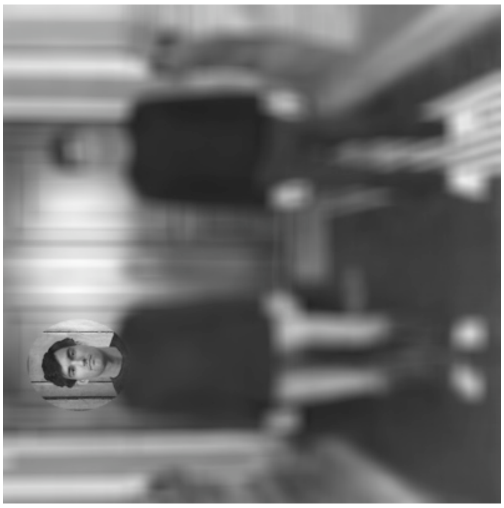
APPENDIX A

Stimuli used in the Rating Phase of Rating Group 2 of Experiment 1

Condition 1










APPENDIX A

Stimuli used in the Rating Phase of Rating Group 2 of Experiment 1

Condition 2
















APPENDIX A

Stimuli used in the Rating Phase of Rating Group 2 of Experiment 1

Condition 3













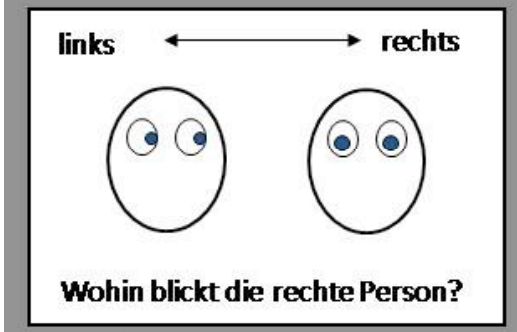



APPENDIX B

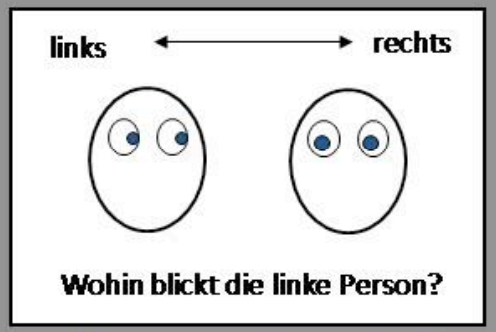
Experiment 1 - Familiarity Phase Instruction

In der ersten Phase der Testung werden Sie Szenen mit zwei Menschen für jeweils 5 Sekunden sehen und gefragt werden, in welche Richtung die *linke* oder die *rechte* Person blickt.
Bitte beantworten Sie die Frage durch drücken der Tasten „d" für links, „k" für rechts und der *Leerzeichentaste* für geradeaus.
Bitte beachten Sie, dass Sie aus Sichtweise des Betrachters, also aus Ihrer Sichtweise beantworten.

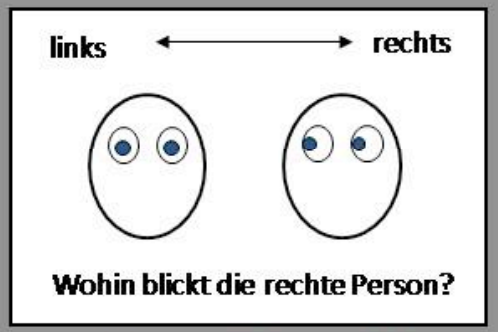
z.B.



richtige Antwort => geradeaus => drücken der Leerzeichentaste



richtige Antwort => rechts => drücken der Taste „k"

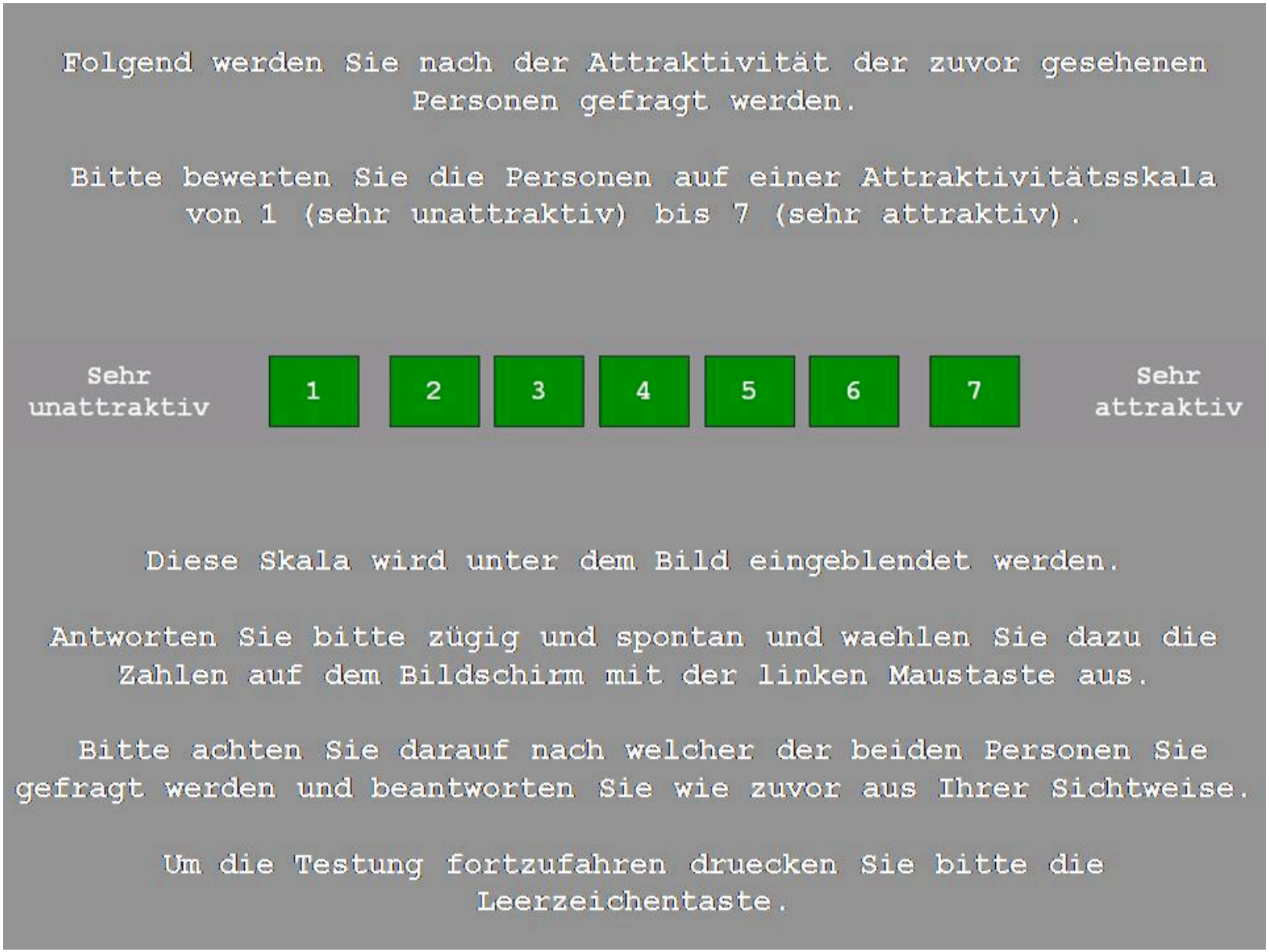


richtige Antwort => links => drücken der Taste „d"

Bei Fragen wenden Sie sich bitte an die Testleiterin/ den Testleiter.
Bitte beginnen Sie die Testung durch drücken der Leerzeichentaste.

APPENDIX B

Experiment 1 - Rating Phase Instruction



APPENDIX C

Experiment 1 -Attractiveness ratings per subject for all gaze states (straight, looking, looked at) and positions (left, right)

Subject	Straight/left	Looking/left	Looked at/left	Straight/right	Looking/right	Looked at/right
1	**3,67**	2,4	2,2	3,5	2,8	2
2	2	2,33	**2,8**	2	2,6	2,17
3	2,4	3,4	2,33	2,6	3	**3,8**
4	2,17	1,6	1,2	**2,67**	1,6	1,4
5	2,2	**4,5**	3,6	2,2	4	3,33
6	3,4	3,2	**4,33**	2,8	3,17	3,4
7	**3,83**	2,4	3,4	3,17	3	2,8
8	**3,4**	2,83	2,8	2,4	**3,4**	3,33
9	2,2	**3,4**	2,83	2,8	2,33	2,8
10	3,5	2,6	2,4	**3,83**	3	3,4
11	2,2	2,67	3	**3,4**	3	2,83
12	3,6	3,8	3,83	3,2	3,17	**4**
13	**3,83**	2,8	3	3,17	3,4	2,2
14	1,6	2,67	2,4	1,6	**3**	2,17
15	3,4	3,8	3,83	3,2	3,33	**4,6**
16	1,17	1	1,6	1,5	**2**	1
17	3,2	2,67	**4,8**	2,2	3,8	3
18	2,4	3	**3,17**	2,4	2,67	3,4
19	4,5	**4,6**	4	4	4	3,6
20	3,6	**4**	3,6	3,6	2,8	2,67
21	3,4	**5,6**	3,33	2	3,67	3,8
22	4,33	4,6	**4,8**	4,5	4,2	4,4
23	2,6	2,67	**3,4**	2,4	3	2,17
24	**3,6**	3,2	2,67	2,4	2,83	2,8
25	2,17	1,6	1,6	**2,67**	1,8	1,6
26	4	2,67	**4,2**	3,8	3,6	2,5
27	2,2	2,2	2	1,8	1,5	**2,6**
28	3,17	**4**	3	3,33	3	3
29	**4,4**	4	4	4	3,8	3,33
30	2,6	**3,8**	3,17	3,4	2,83	3
31	**3**	2,6	2,6	2,67	2	2,2
32	2,2	1,83	**3**	2,6	2,4	2,5

APPENDIX D
(Stimuli used in Experiment 2)

- Stimuli used in the Familiarity Phase of Experiment 2

    - In Condition 2
    - In Condition 3

- Stimuli used in the Rating Phase of Rating Group 1 of Experiment 2

    - In Condition 2
    - In Condition 3

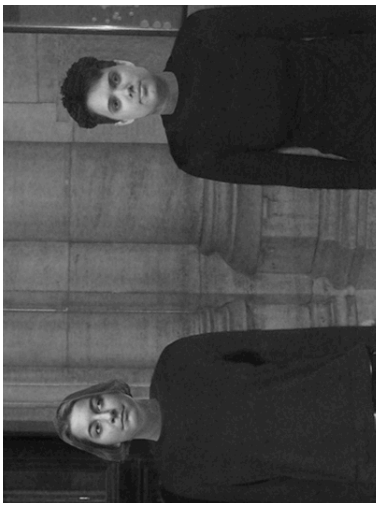
- Stimuli used in the Rating Phase of Rating Group 2 of Experiment 2

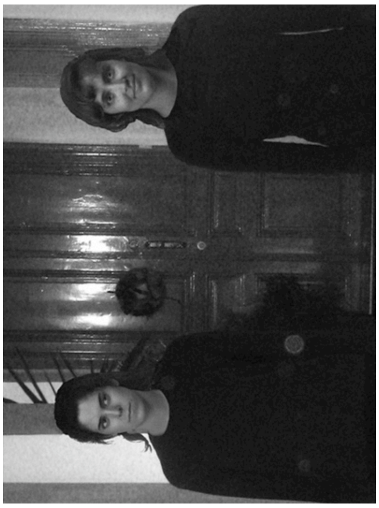
    - In Condition 2
    - In Condition 3

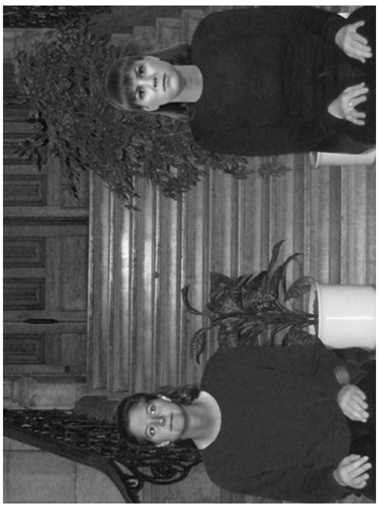
APPENDIX D

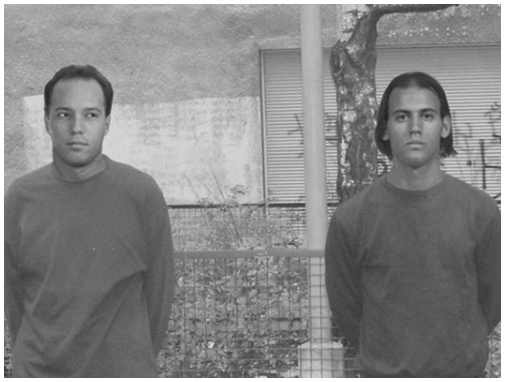
Stimuli used in the Familiarity Phase of Experiment 2

Condition 2

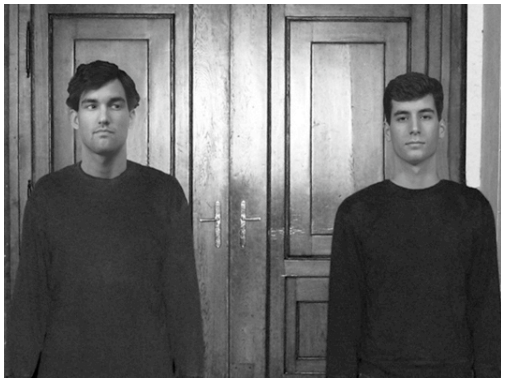


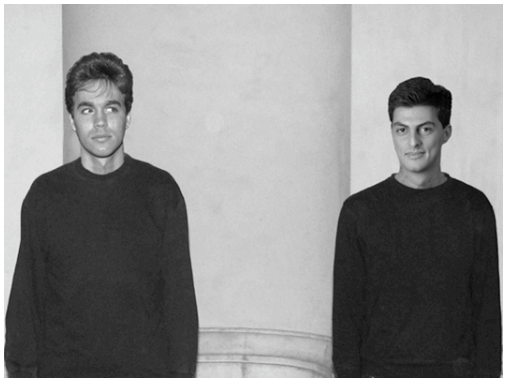


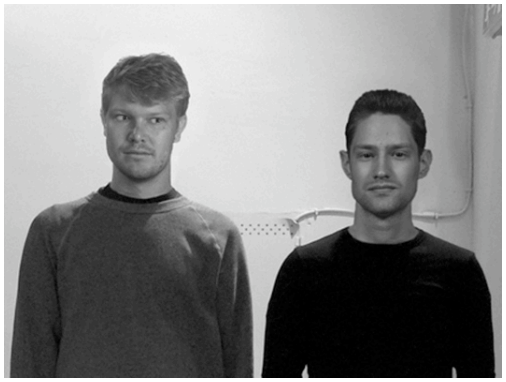


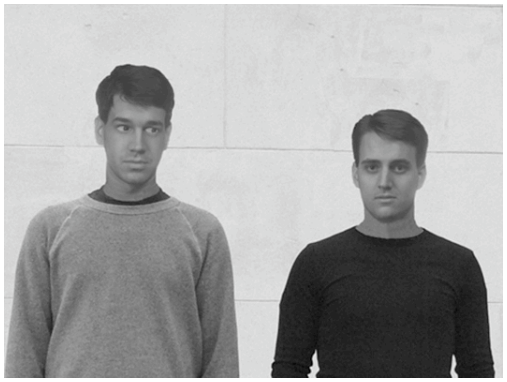




Blumen
Kränze
Gestecke
Auto
Brautschmuck
linke
WÄHLE





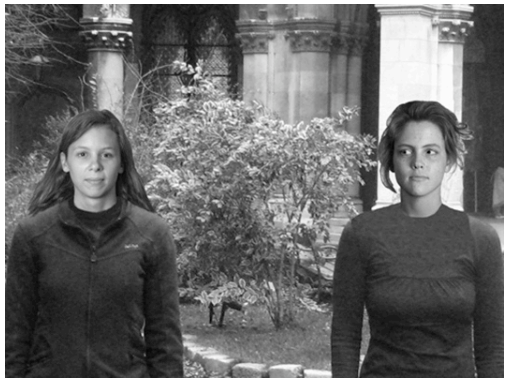


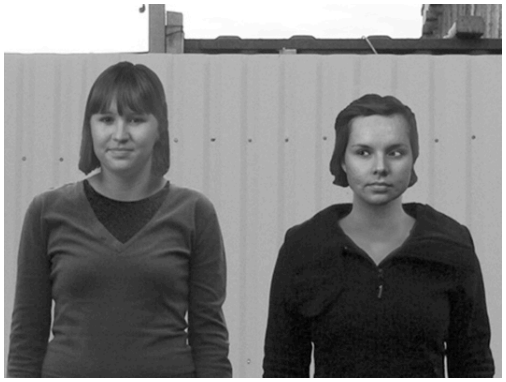


APPENDIX D

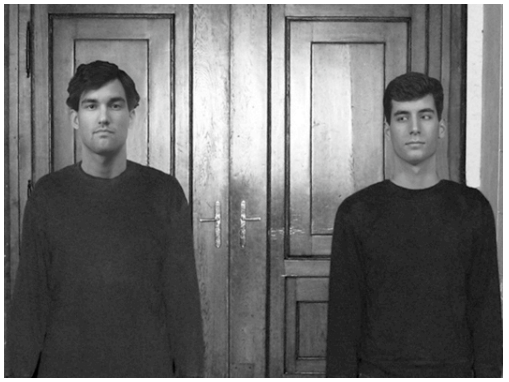
Stimuli used in the Familiarity Phase of Experiment 2

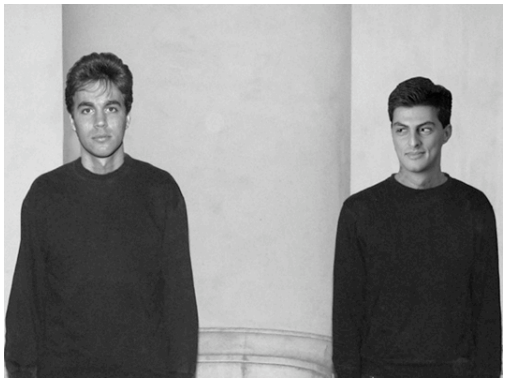
Condition 3

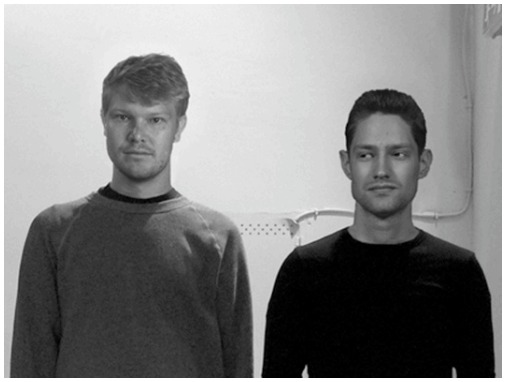


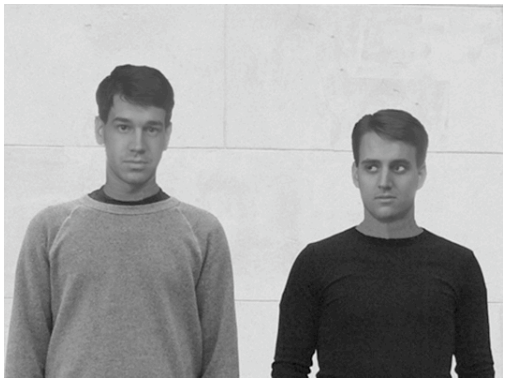



Blumen
Kränze
Gestecke
Braut
linke
WÄHLE





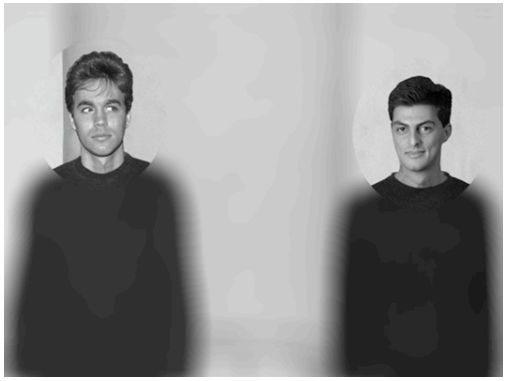


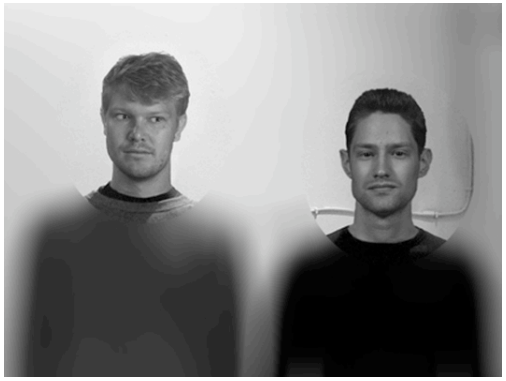


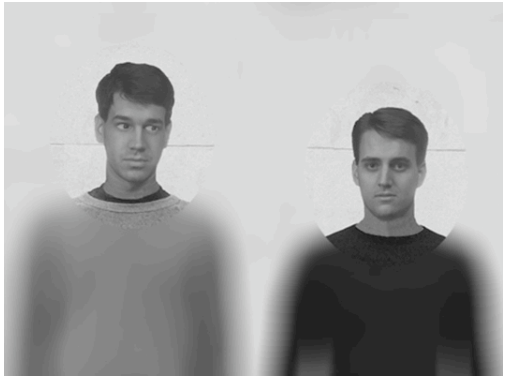
APPENDIX D

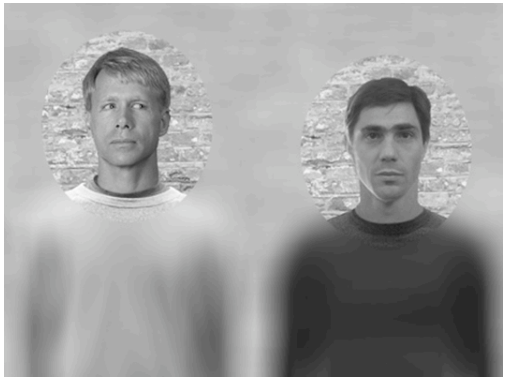
Stimuli used in the Rating Phase of Rating Group 1 of Experiment 2

Condition 2





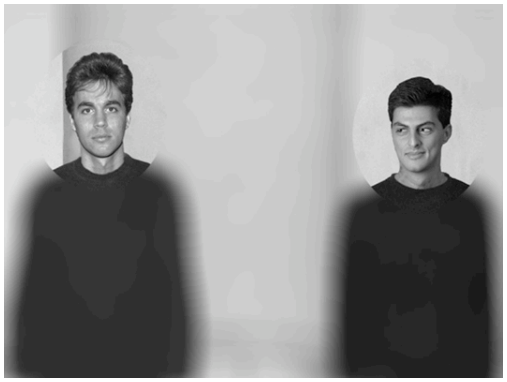


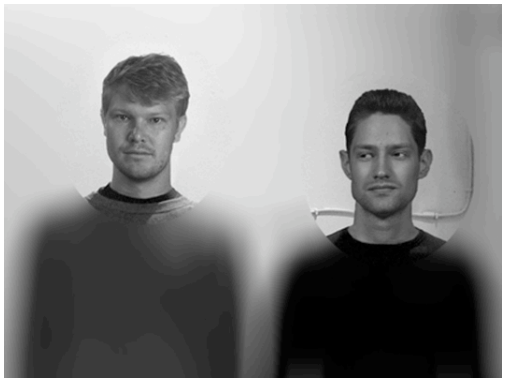


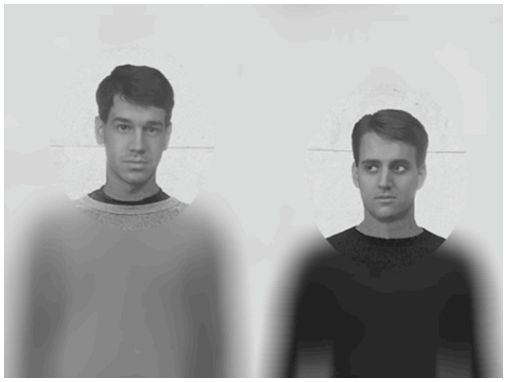
APPENDIX D

Stimuli used in the Rating Phase of Rating Group 1 of Experiment 2

Condition 3





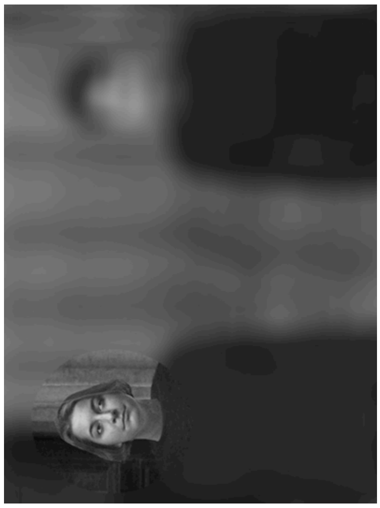


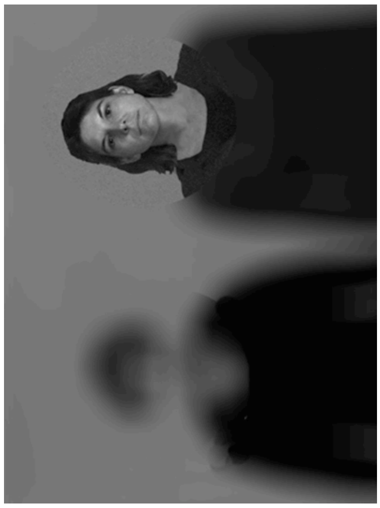
APPENDIX D

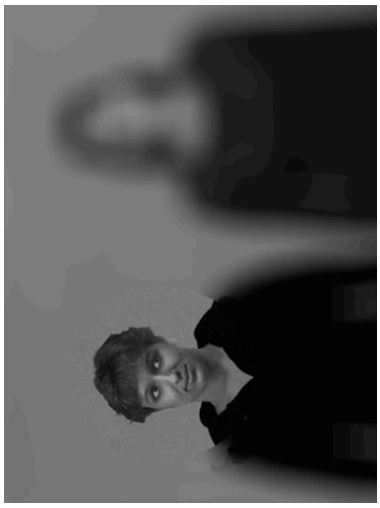
Stimuli used in the Rating Phase of Rating Group 2 of Experiment 2

Condition 2



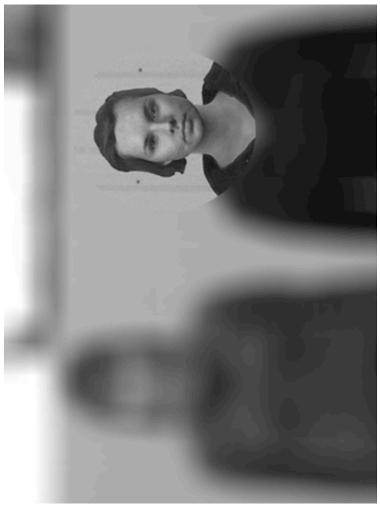



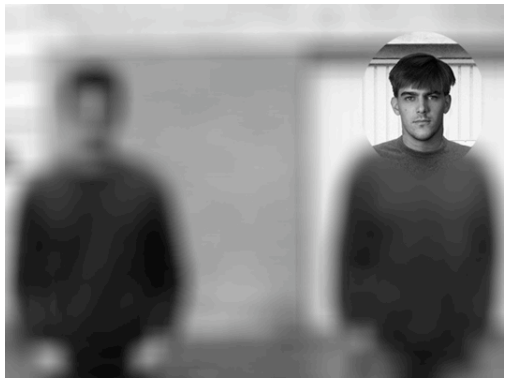



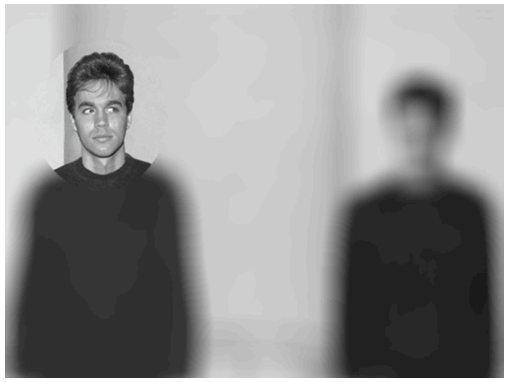


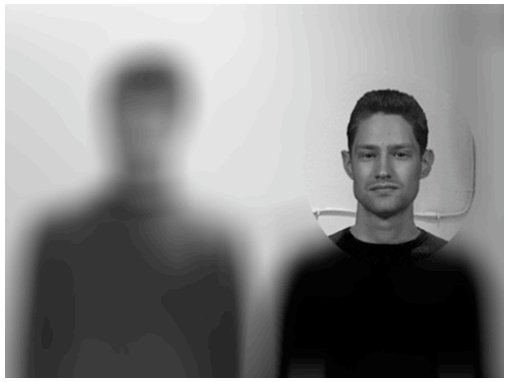


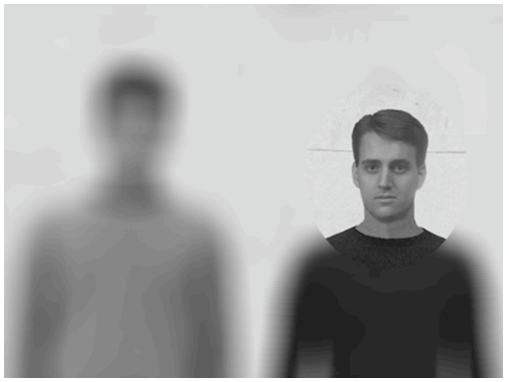








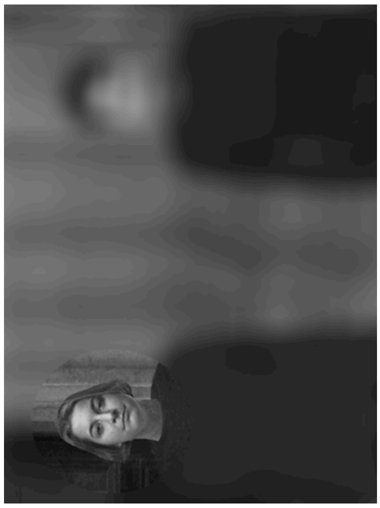


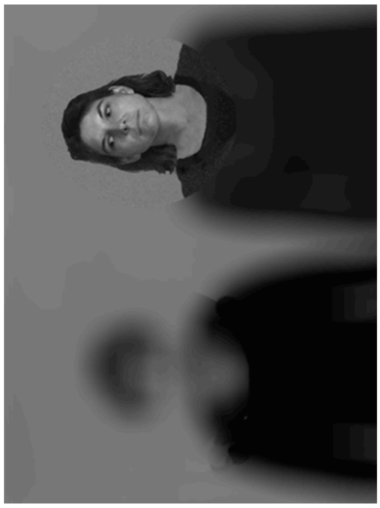
APPENDIX D

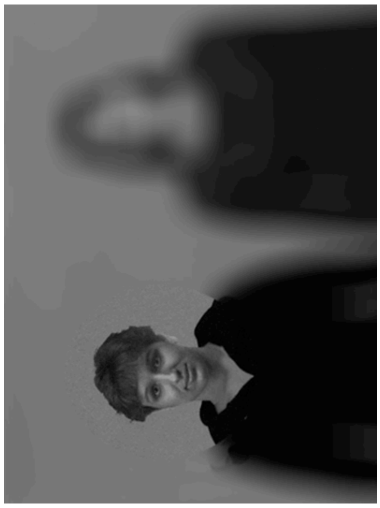
Stimuli used in the Rating Phase of Rating Group 2 of Experiment 2

Condition 3



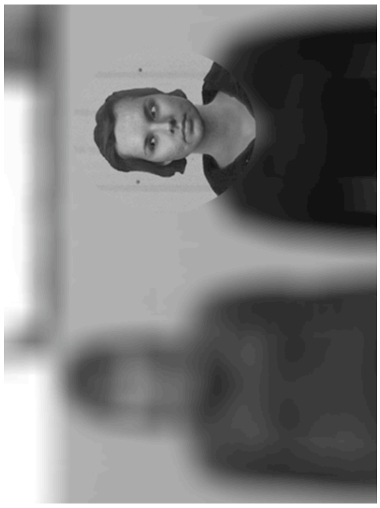



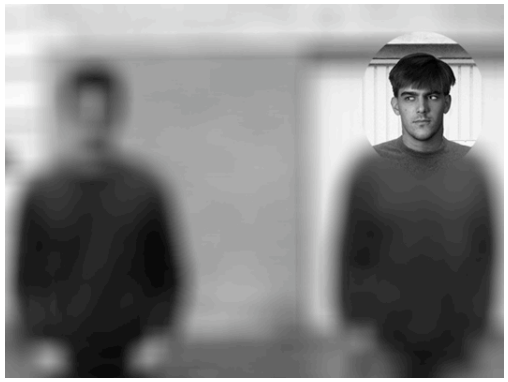



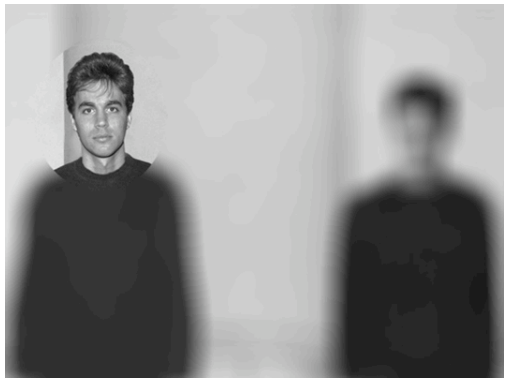


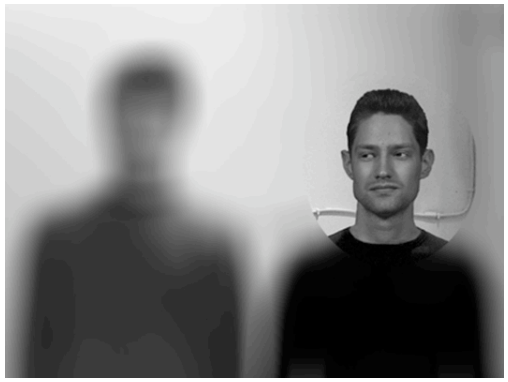


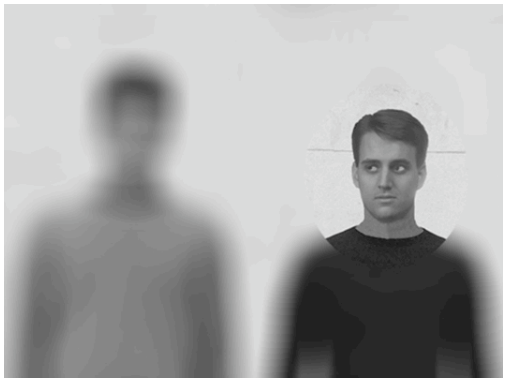








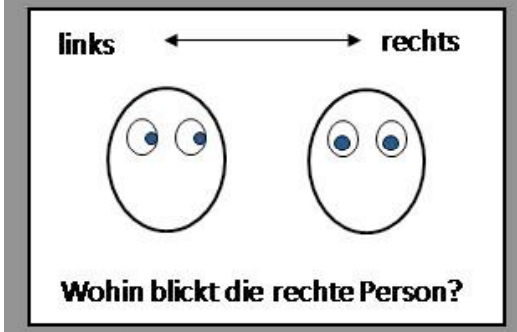


APPENDIX E

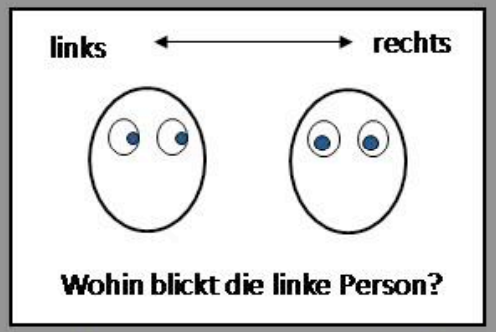
Experiment 2 - Familiarity Phase Instruction

In der ersten Phase der Testung werden Sie Szenen mit zwei Menschen für jeweils 5 Sekunden sehen und gefragt werden, in welche Richtung die *linke* oder die *rechte* Person blickt.
Bitte beantworten Sie die Frage durch drücken der Tasten „d" für links, „k" für rechts und der *Leerzeichentaste* für geradeaus.
Bitte beachten Sie, dass Sie aus Sichtweise des Betrachters, also aus Ihrer Sichtweise beantworten.

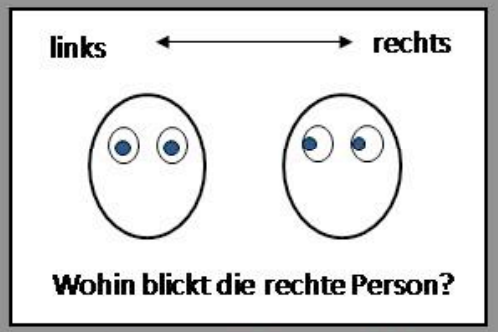
z.B.



richtige Antwort => geradeaus => drücken der Leerzeichentaste



richtige Antwort => rechts => drücken der Taste „k"

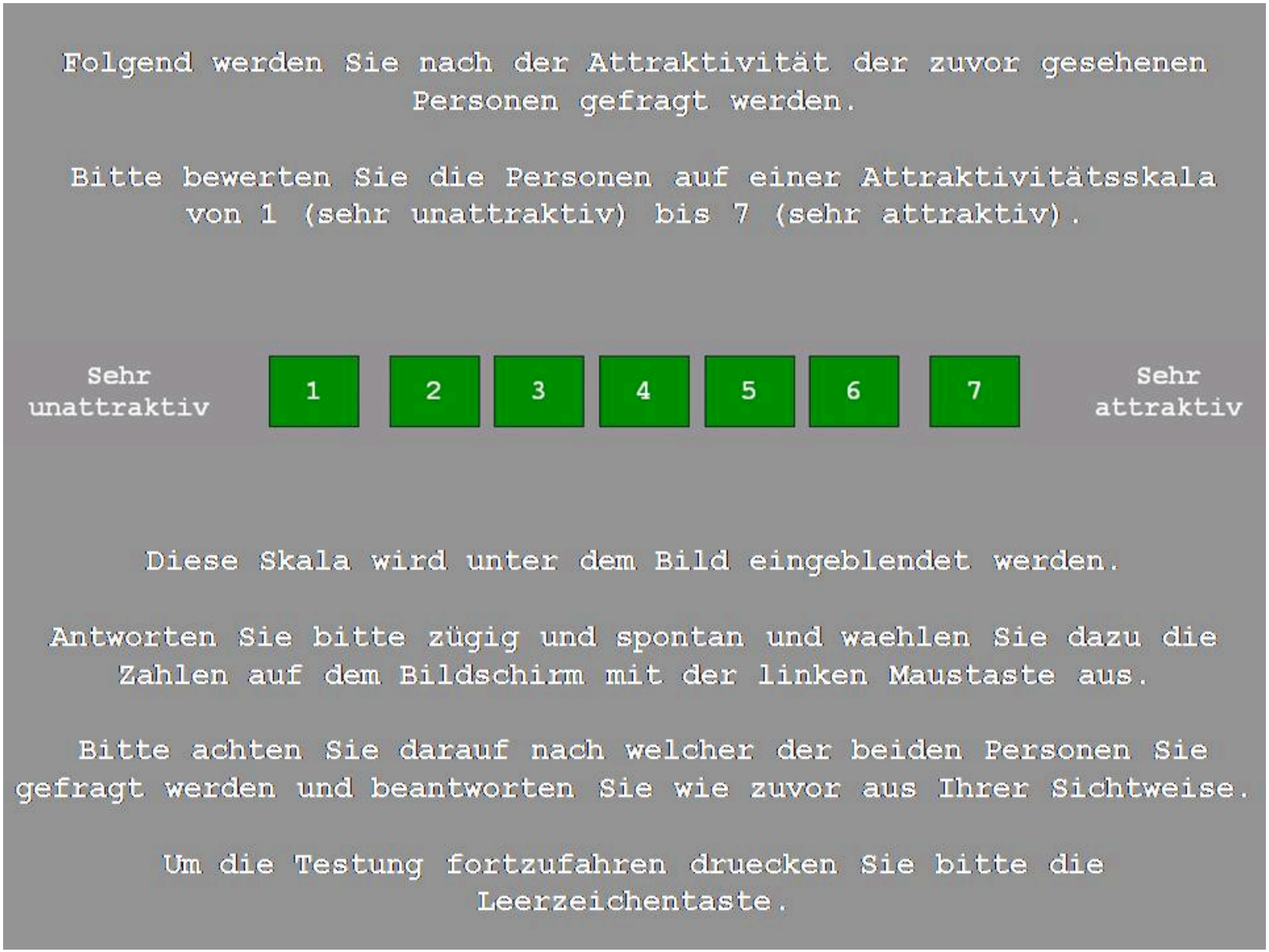


richtige Antwort => links => drücken der Taste „d"

Bei Fragen wenden Sie sich bitte an die Testleiterin/ den Testleiter.
Bitte beginnen Sie die Testung durch drücken der Leerzeichentaste.

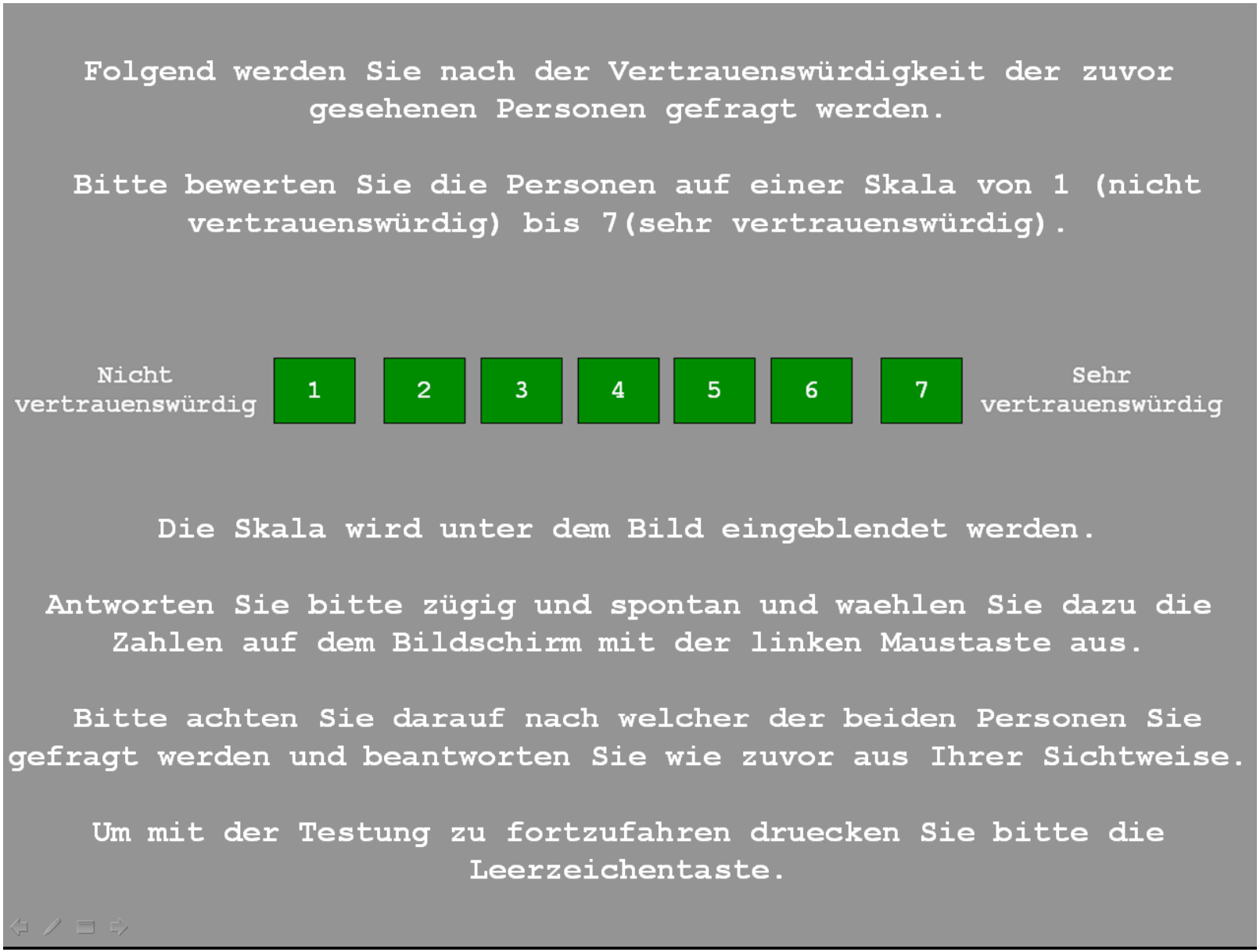
APPENDIX E

Experiment 2 - Attractiveness Rating Phase Instruction



APPENDIX E

Experiment 2 - Trustworthiness Rating Phase Instruction



APPENDIX F

Experiment 2 -Attractiveness ratings per subject for all gaze states (looking, looked at) and positions (left, right)

Subject	Looking/ right	Looking/left	Looked at/right	Looked at/left
1	**4,38**	4,25	3,75	4,25
2	3,63	4	**4,5**	4,25
3	2,88	**3,38**	3,13	3,25
4	2,75	3,38	3,63	**4**
5	**3,13**	2,75	3	3
6	3,13	3,5	**4,25**	3,5
7	**3,88**	3,75	3,25	3,5
8	3,5	3,75	**4,13**	3,75
9	3,5	4	2,25	**4,38**
10	3,5	2,75	**3,75**	3,25
11	**4,38**	4,25	3,5	3,75
12	2,5	**2,63**	2,38	2,5
13	3,25	3	2,88	**3,75**
14	2,75	3,5	**4,25**	**4,25**
15	4,38	3,75	4,13	**4,63**
16	3	3,88	3,88	**4,5**
17	3,88	4	3,63	**4,88**
18	2,88	2,75	**3,38**	3,13
19	4	**4,38**	3,88	4,13
20	2,63	3,13	2,88	**3,63**
21	**3,5**	**3,5**	3,13	3,38
22	4,13	3	**4,75**	3,63
23	2,75	2,63	**3**	**3**
24	3,88	**4,25**	3,75	2,88
25	**3,25**	2,5	2,63	**3,25**
26	3,63	3,63	4,25	**4,38**
27	3,63	4,13	**4,5**	4,25
28	3,25	**4,38**	3	3,88
29	**4,5**	4,13	3,63	3,88
30	3,5	3,13	**4,38**	3,63
31	4,25	4,25	3,88	**4,5**
32	4,25	3,75	**4,63**	3,5
33	**3,88**	3,5	3,5	**3,88**
34	3,25	4,13	**4,38**	3,75
35	3,38	3,75	2,75	**4**
36	3,25	3,75	**4**	3,50
37	**4,13**	3,63	2,75	4
38	3,13	3,88	**4,38**	**4,38**
39	**3,38**	3,25	3	3
40	3,00	4,75	4,25	**5**

APPENDIX F

Experiment 2 - Trustworthiness ratings per subject for all gaze states (looking, looked at) and positions (left, right)

Subject	Looking/ right	Looking/left	Looked at/right	Looked at/left
1	5,13	4,25	4,63	**5,38**
2	3,88	3,88	**5,63**	5
3	2,75	**3,38**	2,5	3
4	3,38	**3,75**	3,38	3,38
5	2,88	3,13	**3,25**	**3,25**
6	3,63	4,5	**5,75**	4,63
7	3	3,25	3,5	**4,13**
8	4,75	4,25	**5,38**	5
9	4,13	4,88	3,5	**5,13**
10	2,88	3,88	4,13	**4,75**
11	2,88	3,88	**4,5**	4,38
12	3,88	4	4	**4,5**
13	3,63	3,25	3,63	**3,88**
14	3,13	3,88	**4,38**	4,13
15	3,13	4,13	**4,75**	3,88
16	3,88	4,25	**4,38**	4,25
17	3,88	4	4,88	**5,5**
18	3,5	3,38	**3,88**	3,75
19	3,63	3,5	4,25	**4,88**
20	3,63	**4,25**	3,75	**4,25**
21	3,88	3,63	4	**4,38**
22	4,13	4,13	4,25	**5,13**
23	2,75	2,38	**3,25**	3
24	3,88	**4,63**	4,5	4,38
25	3,25	3,88	3,38	**4,25**
26	3,75	4,88	**5,38**	**5,38**
27	**4,63**	4	4,5	**4,63**
28	3,25	4,5	4,25	**4,75**
29	4,5	4,88	4,38	**5,5**
30	2,88	3,25	**4,38**	4
31	4,13	4,13	**4,38**	**4,38**
32	5	4,38	**4,63**	4,25
33	3,5	3,75	3,75	**4,63**
34	4,13	3,75	**4,38**	3,5
35	3,38	2,88	**3,63**	**3,63**
36	4,13	**5**	4,13	4,5
37	**4,13**	2,88	4	3,88
38	2,63	5,5	3,88	**5,63**
39	4	4,38	**4,63**	3,88
40	3,5	4,38	5	**5,13**

APRIL 10

CURRICULUM VITAE

FLORA KURAS

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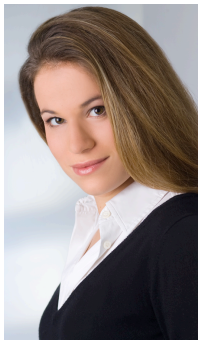

DATE OF BIRTH:	February 10th 1986
NATIONALITY:	Austrian
MARITAL STATUS:	single

EDUCATION

1992- 1995	Elementary school De La Salle, MARIANUM, Vienna
1995- 2004	ALBERTUS-MAGNUS-SCHULE, Vienna
2004	Matura at ALBERTUS-MAGNUS-SCHULE
Since October 2004	Student at the HAUPTUNIVERSITÄT WIEN: Psychology
January 2007	1st Diploma examination
2008	Exchange semester (joint study) at the UNIVERSITY OF WESTERN AUSTRALIA, Perth

WORK EXPERIENCE

Since 2004	Private Tutoring in Mathematics and English
Summer 2004	Internship at "GOLDFISH- young communication", advertising agency
Summer 2005 and Summer 2006	Internship at „SCHOLDAN&COMPANY", Investor Relations Financial Communications, Corporate Communications
May/June 2009	Internship at "YouGov PSYCHONOMICS", market research institute