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Exploring the influence of emotional expression and the three-step sequence on gaze cueing and object desirability

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April 2015

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ABSTRACT

It is suggested that a sequence of gaze shifts, called the three-step sequence, can influence affective evaluation of objects. Angry target faces have been found to enhance shifts of attention and happy have been found to increase likeability of objects, it was expected emotion would interact with sequence accordingly. A computer-based object-recognition task was completed by twenty-seven undergraduate students. A 22ms difference in RT was found between the two gaze conditions, with three-step being significantly faster. No significant interaction was found between emotion and gaze sequence, however an interesting interaction has been found between the gender of the model presenting the gaze shifts and whether or not the sequence shows any effect. In conclusion, findings suggest that the three-step sequence's influence on object desirability is a result of efficient gaze-cueing however further research is warranted due to this effect only being present when observing a male target face.

KEY WORDS	GAZE-CUEING	EMOTION	GENDER	LIKEABILITY	OBJECT-DESIRABILITY

Introduction

A fundamental part of a human's social development is structured around observing the people around them. In particular eye gaze has a prominent role in human communication (Becchio, Bertone, & Castiello, 2008). From observing others, an individual can infer a lot about a situation and in turn self-regulate based on these inferences. For example, Repacholi, Meltzoff, Rowe and Toub (2014) investigated infants capability to self-regulate from observing social interactions between two adults. When the adult directly looked at the infant, having previously been angry, the infant was less likely to repeat the behaviour they observed to cause the emotion in the adult. In this research it is apparent that the infant assessed the information available from the adult's gaze to determine the correct behaviour for the situation present. Observing the gaze of others provides interesting information, for example research suggests it is essential in deciphering others emotional states (Baron-Cohen, 1995). All individuals share an automatic skill of 'joint attention' in which gaze is instantly shifted to the same location as someone else (Friesen & Kingstone,1998), this is one way in which humans are programmed to respond to environmental cues. By automatically shifting our gaze it allows us to have a higher awareness on what is happening around us therefore enabling a person to make decisions according to what they perceive.

The perception of other's gaze has also been found to influence a person's affective evaluation of a surrounding object (Ulloa, Marchetti, Taffou, & George, 2015). This has produced an interesting line of research which investigates the mechanism of gaze and its influence on the processing of information. Specifically, research suggests that gaze direction can influence affective judgements of objects. Bayliss, Paul, Cannon and Tipper, (2006) found that people tend to like objects more if they are looked at by someone else compared to if they are not. Participants evaluated cued objects more positively than uncued objects. This research suggested that the positive evaluation of cued objects was given as a result of facial cues which signalled the valence of the object to the observer. From this research it is apparent that gaze can influence the affective judgements that we make. Ulloa et al.'s study also found evidence of this socially induced liking effect, however they argue this may be only be specific to gaze cues. When comparing gaze cues to pointing hand gestures, results showed that pointing gestures produced no significant liking effect. Another constraint which has been found to influence whether or not gaze leads to affective object evaluation is whether or not the participant can see the object. Research by Manera, Elena, Bayliss and Becchio (2014) tested this theory in three experiments. They hypothesised that this liking effect depends of the processing of intentional relation between other's eye gaze and the object in question. Each participant observed a face looking left or right and at objects behind an opaque screen. Findings suggested that looked at objects were responded to faster than those that were not. However interestingly observed gaze only led to affective evaluation if the participant believed the target face could see the object behind the screen.

It is also evident from the literature that although this effect seems to be specific to eye gaze, features associated with the individual initiating the gaze can also influence the effect. For example Bayliss, Frischen, Fenske and Tipper (2007), found that a target object looked at with a happy expression was liked more than objects looked at with a disgusted expression. No differences were recorded when the gaze was averted away from the target object. Results suggested no difference in response times (RT)

between happy and disgust expressions and presented a standard joint attention effect, with RT's for 'cued' objects 20ms faster than 'uncued' objects. This therefore suggests that the effect of increased likeability with happy expressions is not due to attentional shift.

The literature also suggests that the characteristics of the face itself, presented to the individual, can effect whether or not a positive response is made. For example Strick, Holland and Knippenberg (2008), developed an affective priming task to assess the variable of attractiveness. They found that attractive faces with direct gaze produced faster response times to positive words than unattractive faces. They argue that faster RT's were due to implicit priming caused by direct gaze, not joint attention as presented by Bayliss et al, (2007). It has also been suggested by King, Rowe, and Leonards (2011) that trustworthiness can influence judgements of objects. It was found that a trustworthy face produces greater liking for a cued object, however no effect of trustworthiness was found when the eyes were averted away from the object.

It is also possible to infer an individual's judgement of an object by measuring the time they spend looking at that object. It has been suggested that the more time a person spends looking at an object the more they must like it. This is known in the literature as the 'gaze cascade effect'. Shimojo, Simion, Shimojo and Scheier (2003) suggested that gaze bias both reflects and influences preference. They showed participants a pair of human faces and asked them to decide which face was more attractive. Initially their gaze was evenly distributed between the two, however a shift in gaze eventually occurred towards their chosen face. The research concluded that gaze is actively involved in preference formation.

Bry, Treinen, Cornielle and Yzerbyt's (2011) study assessed the role in which object-gaze association plays in favourable evaluations of objects in response to gaze cueing. They aimed to see whether or not the likeability effect stemmed from participants awareness of object-gaze association. Participants were told that they would be exposed to videos and asked to carefully pay attention to the screen. Six paintings, found to be neutral in preference in a pilot study, were presented to the participant. In each trial one of four neutral female faces appeared on their left or right of the screen. A target painting appeared on the opposing side. The female then averted her gaze either toward or away from the painting or closed her eyes. She then gazed toward or away from the painting or kept her eyes closed for a further 2 seconds. In this time the target painting disappeared. The target then returned its gaze to the neutral position. This sequence of timing suggested the female's attention was shifted due to the appearance of the painting. After this, participants evaluated the paintings in a painting preference task. The paintings were presented in pairs and the participant was instructed to indicate which one they preferred. Finally, participants then completed a contingency awareness test. For each of the six paintings the participants reported whether the face had; (1) systematically gazed at it, (2) systematically gazed away from it, (3) systematically closed her eyes when presented with it, (4) had no systematic gazing behaviour related to it, or (5) if they did not remember what happened. The researchers considered contingency- awareness if the participant correctly identified the object gaze-association. The results showed that participants preferred objects that were gazed at, however only when aware of the object-gaze association. This research uses clear patterns of gaze shifts which in turn increases awareness of object-gaze association through efficient cueing of attention. This

research has been argued by Ulloa et al.,(2015) to use stimuli which may have intrinsic affective value depending on cultural background of the particpant.Therefore results may be affected by social influences.

It is clear from the research that in order for gaze to influence object desirability the pattern in which the gaze is presented may be important. Weiden, Veling and Aarts (2010) suggest that a variable which is essential for increased object desirability is the sequence in which the gaze is presented. They argue that observing gaze shifts of another person, involving the observer and an object, enhances object desirability, if the gaze shifts are specific. Weiden et al., present the concept of a three-step sequence of gaze cueing, consisting of direct gaze at the viewer, then averted gaze to the object followed by a return of gaze back to the viewer. They argue that that object desirability is enhanced specifically through observing this sequence of gaze shifts. These findings provide new evidence that a sequence of gaze behaviour involving the observer and an object plays an important role in influencing affective evaluation of objects. Consistent with previous research, such as that of Bayliss et al.,(2006) who suggested object evaluation is effected by gaze cues toward and away from an object and Mason, Tatkow and Macrae (2005) who suggest an equally important part of the cueing process is dependent on the pattern or history of gaze shifts between the objects in the environment, this research suggests a combination of both is essential. Weiden et al's study had three experiments and used a within-groups design. The final experiment had three-conditions these were no gaze-control, three-step sequence gazing away from the object and finally the experimental three step toward the object. The stimulus face was a female with neutral expression. Each participant saw the face presented on the right hand side of the screen alongside the stimulus object which was presented on the left hand side of the screen.The stimulus object was a branded bottle of water belived to be unkown to the particpants. The face completed the sequence of gaze shifts depending on its condition. Each gaze shift was presented for 1,500ms, this was constant for all conditions.The object was presented for 4,500ms. The conditions and products were constant throughout the experiment however were counterbalanced across participants. Following this, each participant completed two rating scale questions which indicated their desirability for the object they had seen. "How appealing is Brand 'X' to you?" and "If Brand 'X' would be introduced on the market, would you buy it?" Participants were not sensitized to the purpose of the experiment. The results from this study showed a simple main effect for increased desirability in the experimental (three-step) condition, compared with the no-gaze control and direct-gaze control condition. Furthermore, it is apparent from the research that if a communicator (stimulus face) gazes away from an object the desirability appears not to be affected. Therefore, shifts towards an object indicate that it is of value. Their findings suggest that the higher ratings, caused by the three-step sequence of gaze shifts, result from inferences of the observer that the communicator cues that the gazed at object is desirable.

This research aimed to replicate the findings found by Weiden et al., to evaluate the importance of the three-step sequence of gaze-cueing in the judgement of object desirability, and determine whether emotional expression can influence the effect previously found. Through the use of a gaze cueing task, similar to that of the previous research, this study will see whether or not objects cued using a three-step sequence differ in response times when compared to a 'normal' (non three-step) sequence. The

design has also incorporated stimulus faces of males as well as females to further stretch the previous methodology.

The study will also investigate the role in which emotion can play in the three-step sequence to increase likeability. Bayliss et al, (2007) found that happy expressions can influence the judgements of objects positively. Their findings suggested that a target object looked at with a happy expression was liked more than when looked at with a disgusted expression. Pecchinenda, Pes, Ferlazzo and Zoccolotti, (2008) used two experiments to investigate how gaze direction and facial expression affect spatial attention. Digusted, fearful, happy and neutral faces were used followed by positive and negative words. The faces gazed to either the left or right. Particpants reponded to the target words indicating their valence. Results showed faster RT's for targets looked at by faces with negative emotion (disgusted/fearful). These findings suggest that negative facial expressions enhance the attentional shifts due to eye-gaze direction as long as there is a clear evaluative task. The literature therefore suggests that happy expressions can increase object desirability however negative expressions such as fear and disgust have also been found to enhance the gaze-cueing response producing faster RT's. This research will use both target faces with either positive or negative emotion (happy and angry) to investigate the role that they may play in the three-step sequence of gaze cueing.

If we consider the idea that increased likeability due to the three-step sequence may be a result of efficient gaze cueing to the object. It can be predicted that the three-step sequence will have a stronger cueing response (faster RT) than the normal cueing. This should also suggest that the angry target faces should enhance the shift in attention, which in turn should also produce faster RT making it a stronger condition that the '3 step happy' condition. However, with increased likeability of objects previously being found to be influenced by happy expression it will be interesting to investigate the role in which happy and angry emotion will play in the three-step sequence of gaze cueing.

Method

Design

The experiment had a within-groups design with three independent variables. One independent variable was the sequence in which the faces were presented, either in a three step sequence or a non three step sequence. In the three-step condition a face which had direct gaze at the observer was presented, the face then averted its gaze to an object and then finally returned its gaze to the observer. The non-three step condition the face did not shift its gaze and remained fixed to either the left or right side of the screen. The second variable was whether or not the faces were male or female models, two of each were presented. Each model was represented with either an angry or happy expression this was the third independent variable. The dependent variable in the experiment was the response time recorded. The objects were presented on either the left or right of the screen. However the gaze direction is not always the same as the side of the screen the object appears. This has been included to disguise the aims of the study.

Participants

Twenty-seven Leeds Trinity University students (five males and twenty-two females) participated in the experiment. All twenty-seven participants took part in all of the conditions. The participants were all Leeds Trinity University students, between the ages of 18 and 26 years (mean=19.81) who volunteered to participate in response to advertisements and opportunity sampling. There were no incentives for participation awarded.

Apparatus/ Materials

The experiment used four stimulus faces derived from the Karolinska Directed Emotional Faces set Lundqvist, Flykt and Ohman, (1998) examples as shown in appendix 1. Two models of each gender were used to further investigate the effect found by Weiden, Veling and Aarts (2010) with their procedure previously having used female faces. The previous research was limited to neutral expression therefore to investigate whether or not this effect extends to emotion each model was also presented with either happy or angry expressions. All images were colour images measuring 300 x 400 pixels and were full-face images (see appendix 1). Each of the images was edited using Photoshop to change the direction of the eye gaze. Each model had direct gaze and averted gaze to both left and right, for each of their expressions. These images were presented in either the three-step sequence (direct, averted and direct) or a non- step sequence (fixed gaze to left or right). In total eight images of objects were used, four packs of toilet roll and four water bottle brands. The previous study by Weiden, Veling and Aarts (2010) used water bottles as stimuli as these were seen to be objects the participant will see in everyday lives which are not novel objects. This experiment repeated the use of water bottles as stimuli however toilet roll has been added to ensure this effect extends past the original stimuli.

Procedure

The experiment was presented using Eprime, Schneider (2002). Each participant was tested individually in a computer lab at the university. The on screen instructions directed participants to focus on the fixation point which appeared in the centre of the screen for 1000ms before each trial, after this a face appeared for 1,500 ms. In the three-step condition each face (direct, averted and direct) appeared for 500 ms each, the non-step displayed the same image for the duration. The participants were aware that the eyes of the stimuli would often move and gaze at the object however this would not happen in every trial. After the sequence appeared an image of either a water bottle or pack of toilet roll was presented on either the left or right hand side of the face. The participant indicated which they had seen using either the 'p' key or 'w' key. Responses were made as quickly as possible using one of two allocated keys the response time was recorded for each trial. Initially the participant had four practice trials where they were given feedback which indicated the response time and accuracy. In total the experiment had 128 trials which were completed by all participants, the order in which they were presented was randomised to control for order effects.

Results

Data Treatment

Response times for incorrect answers were excluded from the analysis, along with individual response times shorter than 200ms and longer than 2000ms. No practise trial data were included in the analysis.

Data Collation

The independent variables were emotion (happy and angry), gaze cueing (3 step and normal) and gender (male and female). Each emotion was presented with both types of cueing. Gender of the target faces was also counterbalanced. Each trial required the participant to indicate, as quickly as possible, which object appeared on the screen (water bottle or toilet roll). The mean RT's for each condition were calculated for all participants.

Tests of Normality

A test of normality was performed for the conditions individually. No condition showed significance in the Shapiro-wilk test of normality. This therefore suggests the all RT data were normally distributed. Through examination of a box plot, showing the distribution of participant data for the '3 step happy' condition, there was indication of a statistical outlier. This participant's data was temporarily excluded from the analysis, results suggested minimal statistical difference in the results. Therefore the decision was made to keep the participants data in the analysis.

Descriptive Statistics

Table 1: Mean RT's, standard errors and 95% confidence intervals on an object identification task.

Condition	Mean	Standard Error	95% Confidence Interval	
			Lower bound	Upper bound
Angry-3Step-Female	553.37	13.82	524.86	581.68
Angry-3Step-Male	527.10	12.23	501.97	552.23
Angry-Normal-Female	563.20	16.24	529.81	596.59
Angry Normal-Male	572.48	16.78	537.99	606.98
Happy-3step-Female	564.50	15.05	533.57	595.43
Happy-3step-Male	533.26	12.48	507.61	558.90
Happy-Normal-Female	546.81	14.51	516.99	576.63
Happy-Normal-Male	582.58	32.58	515.62	649.55

As can be seen in Table 1, the three-step appears to have faster average response times, however only when paired with a male target face. The equality of variance has been checked with the largest being no larger than 4-5 times the smallest. The data therefore meets the assumptions for an ANOVA.

Inferential-Statistics

A 2x2x2 repeated measures ANOVA showed that there was a significant main effect of the type of gaze cueing, with means for '3-step' and 'normal' 544.53ms and 566.27ms, respectively, $F(1,26) = 5.75$, $p = .024$, $\eta_p^2 = .181$ This is a significant 22ms difference. There was no main effect of the type of emotion, with the means for 'Angry' and 'Happy' being 554.01ms and 556.79ms, respectively, $F < 1$, $\eta_p^2 = .008$. There was also no main effect found for gender type with means of 556.95ms and 553.86ms, respectively, $F < 1$, $\eta_p^2 = .004$

No significant interaction was found between the type of gaze cueing and emotion. $F(1,26) = .457$, $p = .505$, np2= .017. However a significant interaction has been found between gaze and gender, $F(1,26) = 8.27$, $p = .008$, $\eta_p^2 = .241$.

Summary

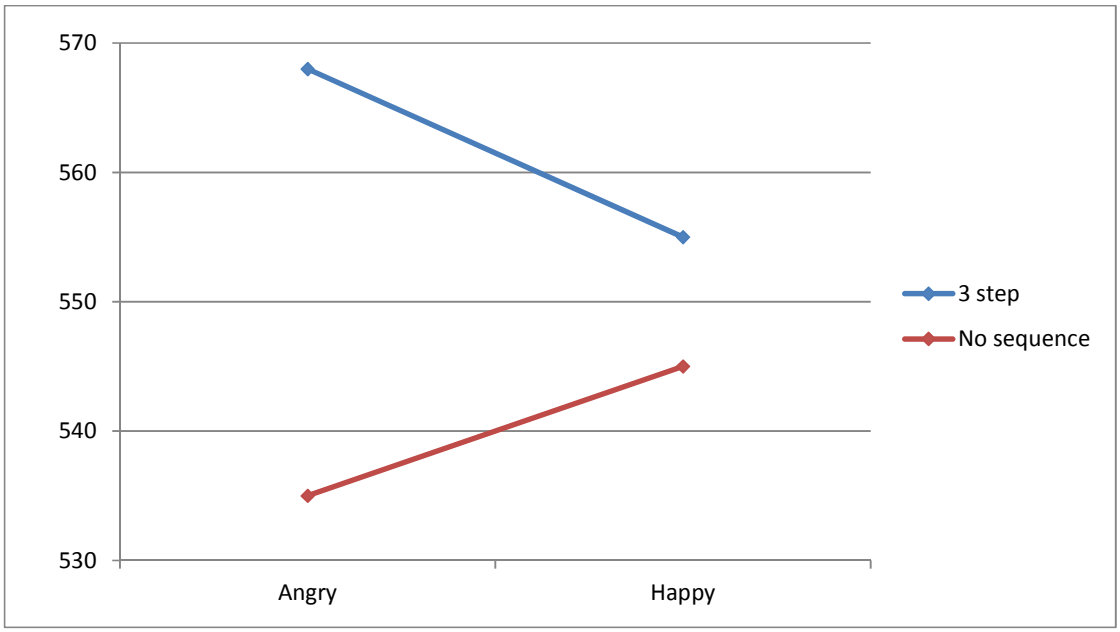

Figure 1: A graph showing the interactions between gaze sequence and emotion measured in RT(ms).

These findings support the hypothesis that the effect of the three-step sequence will produce a stronger cueing response (faster RT) than the normal cueing (non three-step). With three-step cueing producing 20ms faster average response times. It was also hypothesised that happy expressions would exceed angry and therefore when paired with either 3 step or normal should reflect this with faster response times. No significant interaction has been found, however the interaction graph (Figure 1) shows an interesting pattern between the variables.

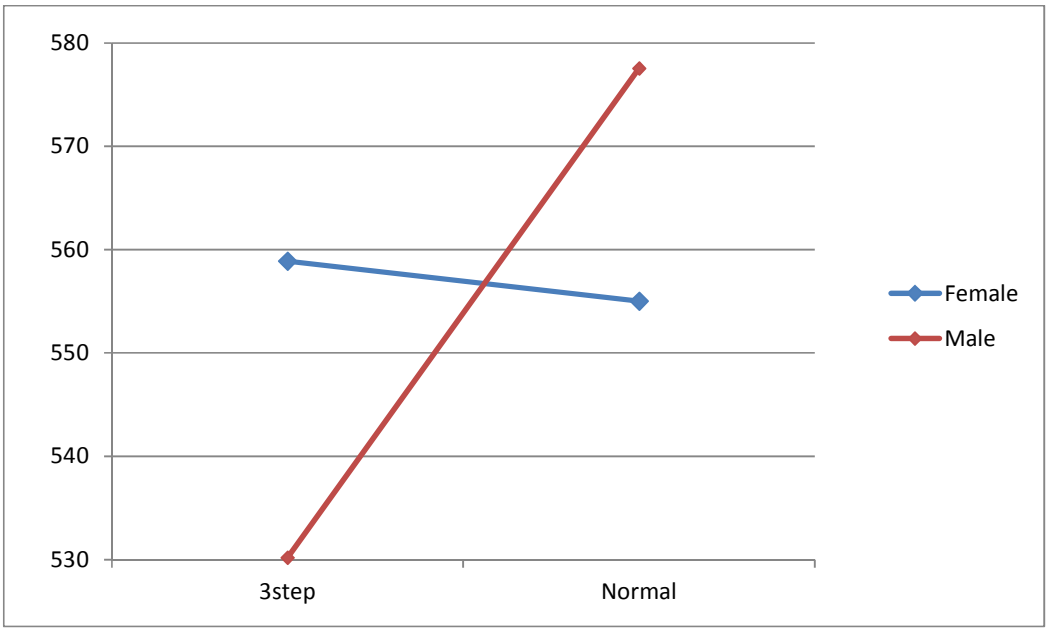

Figure 2: An interaction graph between gaze sequence and gender measured in RT(ms).

The second interaction graph (Figure 2), shows the interesting relationship between the three-sequence and gender. Specifically the post hoc paired samples t tests, comparing the three step sequence and normal sequence paired with both male and female faces, suggests that when the target face is male, participants respond to the three-step sequence significantly faster than the normal cueing $t(26) = 2.94$, $p = .007$. However when the target face is female, no significant difference was recorded $t(26) = .485$, $p = .631$. This therefore suggests that the three-step sequence is enhanced when portrayed using a male rather than female model.

Discussion

In the present experiment, a computer-based object recognition task was used to investigate the three-step sequence of gaze cueing. The previous research by Weiden et al. found that when a participant observed the 'three-step sequence' of gaze cueing toward an object it positively influenced their affective judgement of this object. The current research investigated the differences in response times between 'three-step' and 'normal' gaze cueing, while also investigating the effect of emotional expression. It was hypothesised that the effect of increased likeability due to the three-step sequence was a result of efficient gaze cueing. Gender of the target models was also compared, due to previous research relying on only female model faces to test their theories (Bayliss et al. 2006; Bayliss et al., 2007; Weiden et al., 2010).

Three key findings emerged from the present study. Firstly, as previously hypothesised, participants responded significantly faster in the three-step gaze cueing conditions than the normal gaze cueing conditions. Secondly, no interaction was found between emotional expression and the three-step sequence of gaze cueing. Finally, and most importantly, gender of the model was found influence the first finding of efficient gaze cueing to the object. In particular, it was only when male target faces

were used, that an effect was observed for differences in response to the 'three-step' sequence.

With regard to the first finding, the significant difference in response times between the two conditions suggests, as previously found by Weiden et al., the three step sequence does have an effect on observers processing. The previous research however, suggested that this difference in sequencing resulted directly in increased likeability of an observed object. The current study, hypothesised that this increased likeability due to the three-step sequence is a result of efficient gaze cueing to the object. This is supported by the 20ms difference found in response times therefore suggesting an underlying difference. It is well known that objects looked at by an observer are liked more than those that are not (Bayliss, et al. 2006) and that gaze direction can be an excellent indicator of the interest toward objects (Baron-Cohen, Campbell, Karmiloff-Smith, Grant, & Walker, 1995; Shimojo, et al. 2003). It is therefore a possibility that the objects which a participant is cued to are more likely to be attractive to them than those that gaze is averted from. Therefore resulting in the particpant making an affective judgement of that object. As previously suggested by Manera, et al. (2014) cued objects are responded to faster than those that are not.Objects that are believed by the participant to have been looked at by the target face are also evaluated more affectively. This may be explained by Bry et al.'s (2011) research which highlighted the importance of object-gaze association. It is believed that all particpants in the current study were aware of the object-gaze association due to being told that the target face would often change their gaze and sometimes look at the target object but this would not always be the case. They were also instructed to focus on the cross in the centre of the screen between each trial which should have kept them focused on the eyes.

There are two possible explanations as to why the efficient gaze cueing produced by the three step sequence results in this affective judgement.The first plausible explanation is the sequence of images in this experimental design is more realistic in comparison to the control. In the experimental condition, the sequence of images is presented like that of a video with only the gaze direction being altered. This in turn creates the effect of moving gaze and therefore more naturalistic. This explanation is supported by Jovancevic-Misic and Hayhoe (2009) who argued that the majority of attempts to explain gaze behaviour have implicated two-dimentional displays that do not accuratley reflect everyday life. Although this stimuli is still two dimensional, the three-step reflects that of three dimension with realistic eye movements. This therefore may explain the differences in response time between the experimental and control conditions. With many of the control trials presenting constant averted gaze to the object, therefore presenting unrealistic eye gaze behaviours.

It is apparent from the results that there must be something specific about the sequence of gaze cues which effects how they are processed, which in turn resulted in this finding of faster response times and in line with our explanation affective judgements. The second possible explanation for this could be the effect of direct gaze. In the experimental condition the particpant was presented with direct gaze from the observer before and after the averted gaze to the object. As previously found by Strick et al. (2007) object evaluations can be affected by direct gaze. With more positive evaluations being made for direct gaze than averted gaze. It has also been suggested that direct gaze (eye contact) is a salient social stimulus in social cognition,

which participants are very sensitive to (Anstis, Mayhew, & Morley, 1969). A study by George and Conty (2008) which used a recognition task, asked particpants to indicate images of direct gaze among averted gaze distractor images. The detection of averted images was also investigated. Each of the images were of the same representation with only gaze direction being altered. It was found that direct gaze targets were detected significantly faster than averted gaze targets. This finding is supported by Anstis et al. who, as previously discussed, suggested that participants detection of direct gaze is extrememly sensitive. Conty, Tijus, Hugueville, Coelho and George (2006) also found that direct gaze targets were detected quickly and efficiently. In relation to the current study's findings, this may explain why the experimental condition which used a three-step sequence, produced faster response times. It is possible that participant's quicker detection of the direct gaze, which was step one of the three step sequence, grasped their attention quicker due to cognitive sensitivity encouraging them to attend to the eye area. This in turn produced more efficient cueing to the object, through observing the averted gaze cues, which as a result increased the response time in detection of the object. This therefore explains the variance between the conditions in response times. The effect of increased likelability found by Weiden, et al., may therefore be the same effect as found by previous research (Bayliss et al., 2006; Bayliss et al., 2007) in which participants liked objects that were looked at more in comparison to those that were not. The second step of the sequence in which the stimulus has averted gaze to the object iniates this effect of increased liking. In summary step one of the sequence (direct gaze) attracts the observers attention very quickly this inturn increases efficiency of the gaze cue to the object due to already attending to the eye area. As a result of this, the object which the particpant observes the stimulus face looking at will be evaluated more effectively (Bayliss, et al. 2006). Therefore the three step sequence is a result of efficient cueing to the object.

It would appear from the second finding that there is no influence of emotion on the three step sequence. However as suggested from the interaction graph there is an interesting pattern between the two variables. The results suprisingley infer no significant interaction between emotion (anger and happiness) and the three-step sequence. Although no significant effect has been found with regard to emotion influence, there is still evident research which suggests that emotion does effect likeability of objects. Therefore consistant with the previous explaination of the three-step sequence, it is efficient cueing to the object which creates this effect of increased likeability. Recent studies for example Adams, Gordon, Baird, Ambady and Kleck, (2003) have shown that reaction times to expressions of anger and fear are dependent on the type of gaze. Their research argues that anger that is directed away from the observer is more ambiguous than an angry face with direct gaze. They argue therefore that the cognitive processing required to resolve the ambiguity produces longer RT in averted gaze. This would therefore follow our argument that the three-step sequence's efficient cueing should be enhanced with the direct gaze presented in the first step. This has been taken further by Benton (2010) who investigated reactions to fearful and angry faces with direct or averted gaze. Each participant was shown a series of faces displaying fearful angry, or neutral expressions coupled with direct or averted gaze. All trials were counterbalanced so an equal amount of faces from each condition were presented. They were instructed to make rapid responses indicating whether or not the faces were showing emotion. They found that, when compared to anger with direct gaze, anger with averted gaze showed a reduced mean

RT. The current research presented no differences in response times between angry and happy expressions. It was expected that the three-step sequence which starts with direct gaze would be influenced by both direct gaze itself as suggested by Conty et al.(2008), and the influence of angry expression coupled with this direct gaze as Adams et al., (2003) and Benton (2010) suggest. With regard to happy expressions, it was expected that happy expression would enhance the effect presented by the three step sequence and the two would interact significantly. With Bayliss et al.'s (2007) research finding that a target object looked at with a happy expression was liked more than objects looked at with a disgusted expression. Possible limitations as to why no significant interaction was found between expression and gaze may be the sample size in which was used. The current study only tested twenty-seven participants. With further investigation and a larger sample size it is highly likely that an interaction may be found.

The third finding suggests that the gender of the target face presented to the observer can influence whether or not the observer is affected by Weiden et al.'s three-step sequence. Results from the analysis suggested that the three-step sequence only influences response time when the face is of a male gender. A significant difference of 47 ms was found between the two cueing responses when a male target face was shown. In line with the first finding, this therefore suggests that increased likeability is a result of efficient gaze cueing to the object but only when presented with a male face. Despite of this finding, previous research has generally used female models in their experiments and found increased likeability, this would suggest the finding of increased likeability is not due to efficient gaze cueing or the sequence itself is not a necessary component of producing affective evaluation. It is well supported that people tend to like objects more that are looked at compared to those that are not (Bayliss et al., 2006). Therefore further research is necessary to ascertain whether or not this effect of gender affects the rating of objects. This experiment had a predominantly female sample (23/27). Research by Amon, (2015) found that a woman's appearance gains more attention, from an observer, than a male appearance. It was found that both female and male observers looked at women more than men overall. Women were also viewed more frequently and for longer periods. However females were found to observe men longer than males were likely too. The study investigated this visual attention orientating in groups, 76 participants viewed photographs of various groupings of people. Their eye gaze was recorded using an eye-tracking device. In terms of this study's findings it may be possible that participants spent more time observing the face of the target female, instead of responding to the sequence of gaze shifts, therefore the target female face may have acted as distraction to both the male and female participants. In contrast it is also possible that the female participants, as suggested by Amon (2015), attended to the male target face more, because of the unequal balance of females in the sample. This as a result could have promoted the efficient cueing to the target object, and more awareness of the three-step sequence. If this is so, it is likely the target male face will also encourage higher object ratings than the female with more time spent observing the face therefore more opportunity to perceive the facial cues which have been found to signal the valence of that object to the observer (Bayliss, et al., 2006).

Research by Ohlsen, van Zoest and van Vugt, (2013) has also found that participants are more likely to follow a dominant male target face over a non-dominant female face. It is therefore possible that the male faces may be perceived as more dominant

than the females in this research. Their study found that males produced an overall larger gaze cueing effect, which may be a possible explanation as to this difference in responses to the two target faces in this study. Ohlsen et al.'s research suggests that processing of the male and female faces is predominantly influenced by higher-level social and contextual effects.

Following this research, it may be helpful to investigate the role of gender in the gaze cueing response, specifically looking at its influence to object evaluation. Further research is warranted to investigate this, with the majority of the previous studies using female models. To fully understand how gaze can influence effective evaluation of objects replication of these findings is essential.

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