An elicitation of attentional bias towards facial disfigurement using a visual dot probe task

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Supervised by: Elaine Reeves  March 2010
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ABSTRACT

Recent research has argued that the unfavourable treatment that people with facial disfigurements experience has emerged from an evolved motivation to avoid contagious disease. Humans have varying concerns about their vulnerability to disease which can be measured using the Perceived Vulnerability to Disease (PVD) Questionnaire. Yet little is known about basic perceptual and cognitive responses to disfigurement.

The aim of this study was to use the PVD questionnaire and a dot probe task, containing real disfigured and non-disfigured faces, to investigate whether people high in PVD have an attentional bias towards disfigured faces.

The results from the participants (N=51), suggested that those high in PVD did not have a faster reaction time when the dot probe was congruent (replaced a disfigured face) to when it was incongruent (replaced a non disfigured face). Furthermore there was no significant difference between those high and low in PVD reaction times when the dot probe was congruent and incongruent. It was concluded that facial disfigurement did not cause people to shift their attention towards it, even in those with relatively high PVD.

The implications of the results for people with and without facial disfigurements are discussed, and possible limitations and further studies are suggested.

<table>
<thead>
<tr>
<th>KEY WORDS:</th>
<th>PERCEIVED VULNERABILITY TO DISEASE (PVD)</th>
<th>DOT PROBE PARADIGM</th>
<th>ATTENTIONAL BIAS</th>
<th>DISFIGUREMENT</th>
<th>EVOLVED DISEASE AVOIDANCE MECHANISM</th>
</tr>
</thead>
</table>
Introduction

To draw a line between what is and what is not a facial disfigurement is not easy (Nishikura, 2009). Several researchers have defined disfigurement as "a difference from a culturally defined norm which is visible to others" (Rumsey & Harcourt, 2005 cited in Nishikura, 2009, p.1).

It is estimated that 542,000 (one in 111) people in the United Kingdom have a significant facial disfigurement (Changing Faces, January 2008: www.changingfaces.org.uk). The great value of this body area in interpersonal interaction and the symbolic significance of the face means that disfigurement can produce intense emotional reactions from others (Adsett, 1963).


A number of researchers have begun to investigate a reason for these negative responses to disfigurement and argue that they emerge from an evolved motivation to avoid contagious disease (Crandall & Moriarty, 1995; Duncan, 2005, 2009; Faulkner et al. 2004; Haselton & Nettle, 2006; Kurzban & Leary, 2001; McArthur, & Baron, 1983; Nesse, 2005; Ohman, 1993; Ohman & Soares, 1993; Park et al. 2003).

The behavioural immune system has evolved to minimize false negatives, making us sensitive to an over-general set of cues which imply pathogen presence. Therefore we fall on the side of false positive decisions when potential disease causing cues are concerned; we assume that a healthy person displaying a cue associated with pathogen presence is sick, which results in unnecessary avoidance of individual bearing disease cues (Schaller & Duncan, 2007). As a result, in the contemporary environment the disease-avoidance mechanism may cause people to respond to individuals with a physical disfigurement and/or facial disfigurement, as it may suggest the individual has a contagious disease, even though these features may be objectively unrelated to contagious disease (Park et al. 2003).

Humans have varying concerns of their vulnerability to disease, with chronic concerns of vulnerability to disease resulting in more prejudicial responses to individuals, for example individuals with physical disabilities who seem to hold a superficial threat to disease (Crandall et al. 1997; Faulkner et al. 2004; Park et al. 2003).

One method of assessing these varying concerns of vulnerability to disease is the 15 item Perceived Vulnerability to Disease (PVD) questionnaire which assesses beliefs about personal susceptibility to the transmission of infectious disease (7 items) and emotional discomfort in the presence of potential disease transmission (8 items); thus overall the questionnaire assesses individual differences in chronic vulnerability to disease (Duncan et al. 2009; Faulkner et al. 2004).
Psychometric evaluation of the PVD questionnaire indicates it has high internal validity with Cronbach’s alphas (α) from 0.70 to 0.82 (Duncan et al. 2009; Faulkner et al. 2004). The two subscales indicate high internal consistency; perceived infectability; α = 0.87 and germ aversion; α = 0.74 (Duncan et al. 2009). For the purpose of this study only the overall PVD score will be used. A number of recent investigations have successfully used an overall PVD score (Hodson & Costello, 2007; Navarrete & Fesslor, 2006; Welling et al. 2007) and found that individuals with high levels of PVD show more prejudicial and negative responses to individuals or groups which present disease- connoting cues (Faulkner et al. 2004, Park et al. 2003).

Park et al. (2003) gave 101 undergraduate students the PVD Questionnaire and asked them if they had any disabled friends and family. They found participants who felt chronically more vulnerable to disease reported having less contact with people with disabilities. This result can be interpreted in a number of ways; firstly that being in presence of people with disabilities may lead to individuals to habituate to illness, which consequently may lead to reduced chronic concerns about disease. Secondly, that individuals with chronically higher concerns about transmission of disease may avoid social contact, therefore avoid forming friendships, with physically disabled people. Crandall et al. (1997) also provide indirect support for this hypothesis.

A large piece of ground breaking research, commissioned by the charity Changing Faces, supports this idea that those with visible differences are marginalised. The survey technique used in the research was an Implicit Attitude Test (IAT) which seeks to explore dormant prejudices held in the subconscious mind (Greenwald et al. 1998).

The IAT survey, conducted by COG Research Ltd for Changing Faces, asked participants to sort a number of images of people with and without facial disfigurements, assigning positive and negative words to them from a supplied list (Changing Faces, April 2008: www.changingfaces.org.uk). Findings indicated that all participants claimed to have no prejudice against those with facial disfigurement. However, the results from the IAT indicated that 9 out of 10 participants held implicit prejudices (Changing Faces, April 2008: www.changingfaces.org.uk).

Recent research has combined both of the techniques mentioned above. Duncan (2009) carried out a study in which 103 participants completed the PVD questionnaire, then were presented with two biographies to read, one about Ken (not facially disfigured but had a contagious disease), and Alex (facially disfigured but healthy). Participants then completed two IATs tasks (1: Contagious concepts, 2: Unpleasant concepts). Correlations indicated people high in PVD having a stronger tendency to associate facial disfigurement with aversive concepts (r = .23, p <.05), thus supporting the idea that disfigurement is used as a strong heuristic cue of connoting disease and that the behavioural immune system is automatically triggered by perceptual cues connoting pathogen presence (Duncan, 2009).

There is also a substantial amount of research involving dot probe tasks which suggests that humans have an innate attentional bias towards threat related stimuli (Hou et al. 2008; Keogh et al. 2001; Koster et al. 2005; Koster et al. 2006; MacLeod et al. 1986; Ohman, 1993; Ohman & Soares, 1993).
Within the dot probe research it is clear there are two main methods for collecting suitable participants, which can be demonstrated by the literature on attentional bias and anxiety. Participants are obtained from either; a population who are known to have a clinically diagnosed anxiety disorders (Hou et al. 2008; MacLeod et al. 1986; Mogg & Bradley, 2005; Mogg et al. 1992) or participants are assessed on their levels of anxiety by the means of self report anxiety questionnaire, for example the Anxiety Sensitivity Index (Reiss et al. 1986) before being selected for the research (Bradley et al. 1998; Keogh et al. 2001; Roelofs et al. 2002). The known or pre-assessed groups are then often compared to a control group (Ehrman et al. 2002).

There is also a debate within the dot probe research over Stimulus Onset Asynchrony (SOA). Field et al. (2008) supported by evidence from Allport (1989) cited in Field and Cox (2008), Duncan et al. (1994), Koster et al. (2005), Field et al. (2004a), Fox et al. (2001), Fox et al. (2002) and Noel et al. (2006) suggest that findings from studies using 500ms SOA should be interpreted as attentional bias due to delayed disengagement as multiple shifts in attention between stimuli can take place at 500ms. However many studies argue that findings using a dot probe with a 500ms SOA indicate initial orientating of attention (Bradley et al. 1998; Bradley et al. 2003).

Nevertheless an innate attentional bias towards threat related stimuli in humans has been found in both individuals with clinically diagnosed anxiety disorders and also those without (Hou et al. 2008; MacLeod et al. 1986; Mogg & Bradley, 2005; Mogg et al. 1992). In the case of those with clinically diagnosed anxiety disorders, Asmundson and Stein (1994) carried out a study in which they found that patients with social phobia (vs. control participants) responded faster to dot probes that replaced social threat cues than dot probes replacing either neutral or physical threat cues (Asmundson & Stein, 1994).

In the case of those without clinically diagnosed anxiety disorders, Keogh et al. (2001) carried out a study in which 100 undergraduate students completed the Anxiety Sensitivity Index (Reiss et al. 1986). Participants were then asked to complete a dot probe task which contained physically threatening, socially threatening or positive stimuli (Keogh et al. 2001). The results indicated that non-clinical high physical anxiety sensitive (PAS) participants showed a selective attentional bias towards physically threatening words compared to those low in physical anxiety who showed a relative avoidance towards this stimuli (Keogh et al. 2001). Keogh et al. (2001) also found individuals high in PAS showed a selective avoidance of positive material, whereas those low in PAS seemed to attend towards this material.

These results support the view that those without a clinically diagnosed anxiety disorders, also have an attentional bias towards threat related stimuli, and that high and low trait anxious individuals use different strategies when processing threat (William et al. 1997). Keogh et al. (2001) findings are also supported by Broadbent & Broadbent (1988) cited in Keogh et al. (2001), Koster et al. (2006), Koster et al. (2005), MacLeod and Matthews (1988), Ohman (1993) and Ohman and Soares (1993).

The more traditional method of using a dot probe is that stimuli are words, often threatening and non threatening words which represent the participants' fears or
concerns, however one’s responses to words representing one’s concerns may not be identical to one’s responses to real life threat cues (Mansell et al. 1999).

Many dot probe studies now use stimuli that are more directly related to stimuli that are likely to be encountered in a feared situation. (Lavy & van den Hout, 1996). For example Ehlers & Breuer (1995) used photos of spiders in a dot probe task on people suffering from arachnophobia. In these pictorial dot probe tasks the pictures or photographs are often matched a number of perceptual qualities; for example for colour and content (Bradley et al. 2000; Mansell et al. 1999).

Bradley et al. (1998) carried out a study in which 87 participants were divided into two groups (low and high trait anxiety), on the basis of their scores on the STAI (State Trait Anxiety Inventory; Spielberger et al. 1983 cited in Tilton, 2008) obtained in the test session. Participants then completed a dot probe task which contained photographs of neutral, happy and angry facial expressions (Bradley et al. 1998). They found that the participants with high levels of self reported trait anxiety were significantly more vigilant for angry faces ($F(1, 36) = 5.99, p < 0.05$) compared with the low trait anxiety group (Bradley et al. 1998), thus indicating that those with high levels of trait anxiety have an attentional bias towards threat-related stimuli (Bradley et al. 1998).

This idea that those with high trait anxiety have an attentional bias towards pictorial threat-related stimuli is also supported by Bradley et al. (1997), Bradley et al. (1999) and Brotman et al. (2007) and Waters et al. (2010). However a study by Mansell et al. (1999) found that high socially anxious individuals showed an attentional bias away from emotional faces (happy and angry), but this effect was only observed under conditions of social evaluative threat.

Like the aggression in groups between and within in-group and out-group members, disease causing organisms have also been a recurrent problem in human evolution (Gangestad & Buss, 1993; Low, 1990). It is argued that people therefore may have acquired specific cognitive strategies for managing disease-relevant cues such as disfigurement; for example be being able to detect and encode threats in order to respond properly, i.e. an attentional bias towards facial disfigurement (Ackerman et al. 2009). Other research suggests that another factor which contributes to an individual’s attentional bias towards facial disfigurement is whether a participant has been primed or not with disease contagion (Duncan, 2005, 2009; Faulkner et al. 2004; Park et al. 2003). By priming participants with disease contagion it creates a context in which the wariness of disease is temporarily heightened (Park et al. 2003).

Ackerman et al. (2009) used this method and the dot probe paradigm when investigating the extent to which normal and disfigured faces capture visual attention. The study involved 255 undergraduate students; who were first primed into a disease sensitivity or a control state by viewing a slideshow presentation of images and text relating to disease contagion or architecture (Ackerman et al. 2009).

Participants then completed a dot probe task containing photos of 64 colour male and female front-orientated faces (Ackerman et al. 2009). For one version of these stimuli, computer software was used to add flat pink coloration to a random area of the face (simulating a port wine stain) or to adjust the location of one pupil (simulating strabismus), features that are both salient and yet not symptomatic of contagious disease (Ackerman et al. 2009).
The dot-probe task required participants to view faces appearing in one quadrant of a computer screen. After 500 ms, the photo was replaced by a shape (circle or square) in one of the quadrants and the participants had to identify the shape as quickly as possible (Ackerman et al. 2009).

The results suggest that disfigured faces held attention longer than normal faces, $F(1, 249) = 16.17, p < .001$, and that being in the disease sensitivity prime made it harder to disengage from disfigured targets than from normal targets, $F(1, 249) = 4.86, p < .03$; thus suggesting that people, especially those with heightened disease sensitivity, have an attentional bias towards facial disfigurement (Ackerman et al. 2009). It can be concluded from this study that this elevated attention given to physical disfigurement, as with other types of threat cues, represents an immediate form of threat management (Ackerman et al. 2009).

However, it is important to note that this study has one major methodological flaw, which is its ecological validity. As mentioned above Ackerman et al. (2009) superimpose disfigurements onto neutral faces to produce the threat-related stimuli for their dot probe task. Furthermore they do not provide any justification for not using real disfigured faces, which would have made the study more ecologically valid.

Taking into account all the research mentioned, this aim of this study will be investigate whether people high in PVD have an attentional bias towards disfigured faces. Participants will complete the PVD questionnaire (Duncan et al. 2009; Faulkner et al. 2004) and a dot probe task containing images of real disfigured and non disfigured faces.

The experimental hypothesis’ is; ‘Participants who have a high PVD score will respond quicker to the dot probe when it replaces a disfigured face (i.e. the congruent position) then when it replaces a non disfigured face (i.e. the incongruent position).’

There are a number of reasons for this study; the first being that little research has been done on the basic cognitive processing of disfigurement so this research will allow for further insight into this area which could be beneficial to those with and without disabilities. Secondly, a number of media events at the end of 2009 suggest that facial disfigurement is becoming a more prominent issue in the UK with James Partridge, Chief Executive of Changing Faces, presenting Five News, and Blue Peter’s annual appeal aiming to help children with cleft lip in India.

Method

Design

The design for the study is an experimental mixed 2x2 factorial design. The between subject variable is PVD score (high vs. low), the within- subject variable is dot probe position (congruent; when the dot replaces a disfigured face, or incongruent; when the dot replaces a non disfigured face), and the dependent variable is the reaction time of identifying the location of the dot probe.
Participants

The total number of participants in the study was 51: 41 females, 10 males.

The target population for the study were staff at Stainburn School, and students attending Manchester Metropolitan University and the University of Manchester. The age range of participants was 19-60.

The participants were obtained from within the target population by opportunity sampling. In Stainburn School, staff were obtained over a two day period and by means of announcements in the school’s staff room by two members of staff; Peter Harlow and Jo Daulby, who informed the staff about the study and classroom I was located in to go to if they wished to take part.

The Manchester Metropolitan University and the University of Manchester students were obtained by contacting students the researcher knew by means of email and phone calls, which informed them about the study and asked them if they would like to take part.

Each participant was given a number (1-50) to ensure their anonymity.

Materials

Materials for this study included; a PSC Application for Ethics Approval Form (see Appendix 1), a PSC Ethics Check Form (see Appendix 2), a brief and consent form (see Appendix 3 and 4), a set of standardised instructions for the PVD questionnaire and demographic questions (see Appendix 5) and a debrief form (see Appendix 6).

The Perceived Vulnerability to Disease (PVD) Questionnaire

The PVD questionnaire (see Appendix 7) consists of 15 items. All items are scored so that the higher values indicate greater perceived vulnerability to disease (6 items are reversed scored). For the purpose of this study an overall PVD score will be calculated by averaging responses across all 15 items. The PVD questionnaire has high internal validity with Cronbach’s alphas (α) from 0.70 to 0.82 (Duncan et al. 2009; Faulkner et al. 2004). A self report questionnaire was used because they are easily administrated in groups, they can be widely distributed online e.g. by email, and can be scored easily and quickly by the experimenter. (Oosterwegel & Oppenheimer, 1993).

The Dot Probe Task

A dot probe task method similar to the one used by Koster et al. (2005) was used in the study. The dot probe for this study has been created by psychology technicians at Manchester Metropolitan University using Microsoft Visual basic. Net software and was presented on a Dell Inspiron 6400 laptop.
The practice trials consisted of 4 presentations of pairs of household objects that were test irrelevant. The main dot probe task contained pictures of both front-orientated disfigured (6 male and 6 female) and non disfigured faces (6 male and 6 female). See Appendix 8 and 9 for the experimental picture pairs used in the dot probe task. The pictures of the 12 non-disfigured faces can be obtained from the Psychological Image Collection of Stirling (PICS). The pictures of the disfigured faces can be obtained from Jackson & Sommerlad (1996), emedicine: www.emedicine.medscape.com, and various other online databases. The 12 disfigured faces were rated by ten independent judges on how much they related to disease contagion (see Appendix 10). This was to ensure that the disfigured faces had little or no relation to disease contagion.

A method similar to Mansell et al. (1999) was used to match and edit the pictures. The pictures of the disfigured faces and the non disfigured faces were matched on eye shape, skin tone, facial expression and hairstyle. Pictures that were not originally in a black and white format were converted into black and white using Microsoft Office Picture Manager 2007. All the pictures had white backgrounds and were edited to fit an upright rectangle measuring 14cm x 11.5cm.

There were 96 trials and the background display was black. On each trail, a white central fixation cross (2x2cm) appeared for 1000ms, then the pair of pictures (a disfigured face and non disfigured face) were presented simultaneously side by side (one on the left and one on the right side of the screen) for 500ms. Immediately after the offset of the two pictures, the dot probe appeared, 5mm in width, in the spatial location of one of the pictures, which had to be identified as quickly as possible. Across all the trials, the following variables were counterbalanced; face position (right: left) and probe position (congruent: incongruent).

A large number of studies have used the dot probe to reveal selective attention towards threat-related stimuli, indicating the dot probe task is a objective measure of attentional processing (Ackerman et al. 2009; Bradely et al. 1998; Fox et al. 2001; Fox et al. 2002; MacLeod & Matthews,1988; Mansell et al. 1999; William et al. 1988; Yuen, 1994 cited in Mansell et al. 1999).

Procedure

Before the research was conducted a PSC Application for Ethics Approval Form and a PSC Ethics Check Form were completed to ensure the research followed the British Psychological Society Ethical Guidelines (March, 2008), and were signed off by the supervisor.

Participants were first given a booklet containing a brief and consent form to read and sign, a set of standardised instructions for completing the PVD questionnaire to read, a set of demographic questions to complete and the PVD Questionnaire to complete. The participants completed the questionnaire in a room alone and then called for the researcher once they had completed it.

Participants were then asked to complete the dot probe task. Before completing the dot probe task, participants were given a visual acuity test by using a Snellen chart at 3 metres to check their visual acuity was within normal limits.
The participants were seated with their eyes 80cm from the monitor and level with
the centre of the screen. The researcher then left the room and the participant
started the dot probe task. First a set of standardized instructions appeared on the
screen informing the participants on how to complete the dot probe task (see
Appendix 11), then they were asked to enter their ID number (see Appendix 12).

A set of instructions then appeared on the screen informing the participant they will
first complete a set of 4 practice trails, then the actual task (see Appendix 13). Once
the participants had completed the practice trials, instructions informing them that the
experimental trials are about to begin appeared on the screen (see Appendix 14).

Participants focused on a white central fixation cross (2x2cm) for 1000ms. The pair
of pictures was presented for 500ms. Immediately after the offset of the two pictures
participants were asked to press one of two buttons on a standard QWERTY
keyboard as quickly and accurately as possible to indicate the probe position. They
had to press the f key which was covered with a label with a left-pointing arrow on it
( ← ) when the probe was presented at the left location and the k key which was
covered with a label with a right-pointing arrow on it ( → ) when the probe appeared
at the right location. See Appendix 15 for two examples of typical a trail from the dot
probe task used.

At the end of the dot probe task, further instructions appeared on the screen
informing the participant the study had finished (see Appendix 16). Participants were
then asked to read a debrief form which informed them of the research’s aims and
the contact details of the researcher if they require any more information about the
study.

Results

After all the data had been collected it was entered into SPSS 16.0 (see Appendix
17). Once the raw data had been entered into SPSS 16.0 scores on items of the
PVD Questionnaire which were reversed scored were reversed. These items were
item 3, 5, 11, 12, 13, 14 and 15.

A number of tests were then were carried out on the data. The first was a normality
check of the data which indicated that the incongruent variable; when the dot probe
replaced a non disfigured face was skewed; 1.09 (see Appendix 18). It was indicated
by the use of a boxplot (see Figure 1) that participant 26 was an outlier, as they were
more than 2 standard deviations above the mean for incongruent reaction time, thus
their data was removed from the study.
Figure 1: Boxplot of the all participants' reactions times when the dot probe was incongruent

The means and standard deviations of the data were then calculated (see Table 1 and Appendix 19).
Table 1
Overall, Group One (low PVD) and Group 2 (high PVD) means and standard deviations of PVD score, Congruent reaction time and Incongruent reaction time, and Cronbach’s Alpha of the PVD Questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Group 1 (low PVD)</th>
<th>Group 2 (high PVD)</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=49</td>
<td>N=26</td>
<td>N=23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>PVD Score</td>
<td>48.18</td>
<td>12.42</td>
<td>38.85</td>
<td>8.45</td>
</tr>
<tr>
<td>Congruent Reaction Time</td>
<td>.478</td>
<td>.151</td>
<td>.475</td>
<td>.140</td>
</tr>
<tr>
<td>Incongruent Reaction Time (msecs)</td>
<td>.474</td>
<td>.140</td>
<td>.465</td>
<td>.117</td>
</tr>
</tbody>
</table>

The internal consistency reliability of the PVD questionnaire was calculated (See Table 1, and Appendix 20). Cronbach’s Alphas of .70 and above are generally considered acceptable (Nunnally, 1978). The results indicated that the questionnaire as a whole was reliable with a Cronbach’s alpha (α) = .795.

An attentional bias score was then calculated, in which the overall congruent reaction time was subtracted from the incongruent reaction time. A Pearson’s r bivariate correlation was then carried between the attentional bias score and the overall PVD score, which was found to be non significant with r (49) = .388, p > .05, two tailed (see Appendix 21). As no correlation was found between the attentional bias score and overall PVD score, it was decided to split the participants into groups by a median split.

The median was then calculated for the overall PVD score, which was 51. Two groups were then formed on this basis, Group 1: for participants who scored 51 or lower (n= 26), and Group 2: for participants who scored 52 or higher (n =23).

An Independent samples T-test was carried out to see whether there was a significant difference between the two groups on their PVD scores. The results indicated that there was a significant difference between the two groups, t (47) = 3.60, p < .001 (see Appendix 22).

An experimental mixed 2x2 ANOVA test was then carried out on the data (see Appendix 23). The within-subject variable was dot probe position (incongruent when it replaced a non-disfigured face or congruent when it replaced a disfigured face), the between- subject variable was PVD score (51 or lower or 52 and higher), and the dependent variable was the reaction time of indentifying the location of the dot probe.
The results of the ANOVA indicated that the Mauchly’s test was not significant; $p>.05$, therefore sphericity was assumed.

The results indicated there was a non significant main effect of probe position when the dot was congruent or incongruent on reaction time, $F (1, 47) = .28$, $p > .05$. This indicates that when the dot replaced a disfigured face it did not result in a faster reaction time to when it replaced a non disfigured face. In fact on examining the overall mean scores (see Table 1) participants had faster reactions when the dot was incongruent (mean of .474), than when the dot was congruent (mean of .478), but it is clear from the means that this difference is very small.

Looking at between subject effects was there was no significant main effect of PVD score (51 or lower or 52 and higher) on reaction time, $F(1, 47) = .08$, $p > .05$, this indicates that a high PVD score did not result in a faster reaction time. However on examining the means for the two groups (see Table 1) its shows that group 1 (51 or lower) responded faster overall to the dot (mean of .470) then group 2 (52 or higher) (mean of .482), however as the results indicate this difference was non significant.

The results also showed a non significant interaction effect between probe position and PVD score (51 or lower or 52 and higher) on reaction time, $F(1, 47) = .887$, $p>.05$, this indicates that having a high PVD score compared to a low PVD score, and vice versa did not affect an individual's reaction time to when the dot replaced a disfigured face or a non disfigured face. On examining the means (see Table 1) it shows that for Group 1 when the dot was congruent; when it replaced a disfigured face, their reaction time was in fact slower (mean of .475) to when the dot replaced a non disfigured face; was incongruent (mean of .465). For group 2 when the dot replaced a disfigured face their reaction time was in fact faster (mean of .481) to when the dot replaced a non disfigured face (mean of .484), but it is clear from the means that the difference in these reaction times is very small.

The graph below (see Figure 2) illustrates the apparent non-significant interaction between the two groups, probe position and reactions times.
Overall it can be interpreted from the results that those high in PVD did not have a faster reaction time in identifying the location of dot probe when the dot probe was congruent; when it replaced a disfigured face, to when it was incongruent; when it replaced a non disfigured face, and there was no significant difference between those high in PVD and low in PVD reaction times when the dot probe was congruent and incongruent.

Discussion

The main finding of this study is that those high in PVD did not have a faster reaction time in identifying the location of the dot probe when the dot probe was congruent; when it replaced a disfigured face, to when it was incongruent; when it followed a non disfigured face.

In relation to the experimental hypothesis that ‘Participants who have a high PVD score will respond quicker to the dot probe when it follows a disfigured face (i.e. the
congruent position) then when it follows a non disfigured face (i.e. the incongruent position) the main finding does not support this hypothesis, therefore it must be rejected. However on examining the means of the data it can be seen that for the high PVD group when the dot replaced a disfigured face (i.e. congruent) their reaction time was in fact faster (mean of .481) to when the dot replaced a non disfigured face (i.e. incongruent) (mean of .484).

Nevertheless, this finding of those high in PVD having no attentional towards the disfigured faces does not support the research which suggests that negative responses towards facial disfigurement have emerged from an evolved motivation to avoid contagious disease due to disease causing organisms being a recurrent problem in human evolution (Crandall & Moriarty, 1995; Duncan, 2005, 2009; Faulkner et al. 2004; Haselton & Nettle, 2006; Kurzban & Leary, 2001; McArthur, & Baron, 1983; Nesse, 2005; Ohman, 1993; Ohman & Soares, 1993; Park et al. 2003). Also it does not provide specific support that this evolved motivation may have resulted in people acquiring specific cognitive strategies for managing disease-relevant cues such as disfigurement (Gangestad & Buss, 1993; Low, 1990), with Ackerman et al. (2009) arguing one of these strategies may be being able to detect and encode threats in order to respond properly, i.e., an attentional bias towards facial disfigurement. Thus it furthermore does not provide support for the finding that disfigurement is used as a strong heuristic cue of connoting disease, and that the behavioural immune system is automatically triggered by perceptual cues connoting pathogen presence (Duncan, 2009).

Moreover, the finding does not provide further support from the literature which suggests that those with a high level of concern regarding the threat-related stimuli in a dot probe task will have an attentional bias towards it (Bradley et al. 2001). For example those with high physical trait anxiety having an attentional bias towards physically threatening words (Keogh et al. 2001). As it was expected that those in the high PVD group would have attentional bias to the disfigured faces, which are thought to connote pathogen presence (Park et al. 2003).

In addition to this finding, no significant difference was found between those high in PVD and low in PVD reaction times when the dot probe was congruent and incongruent. Furthermore on examining the means for the two groups the low PVD group did respond in fact faster to the dot overall (mean of .470) then high PVD group (mean of .482).

However, this finding perhaps does provide support for the literature on the theory of delayed disengagement (Field et al. 2008). Like most studies the stimuli in this study were presented for 500ms, but there is evidence to suggest that attentional bias exhibited in dot probes with SOA’s of less than 200ms is due to initial orientating of attention (Allport, 1989 cited in Field & Cox, 2008; Duncan et al. 1994; Koster et al. 2005; Field et al. 2004a; Fox et al. 2001; Fox et al. 2002; Noel et al. 2006). Thus it is argued findings from studies using dot probes with a 500ms SOA should be interpreted as attentional bias due to delayed disengagement, rather than initial shift of attention (Field et al. 2008). As the high PVD group responded slower to the dot overall (mean of .482), in comparison to the low PVD group (mean of .470) this could be interpreted as the high PVD group being unable to disengage from the stimuli, due its presentation time of 500ms.
Furthermore this leads on to support the finding by Ackerman et al. (2009) that heightened sensitivity to disease, which in the case of their study was being in the disease sensitivity prime, made it harder to disengage from disfigured targets than from normal targets. Even though the high PVD group in this study responded faster to the dot when it was congruent than when it was incongruent, they did as the means suggest have a slower overall reaction time to the dot than the low PVD group, therefore supporting Ackerman et al. (2009) that heightened sensitivity disease, or in the case of this study being high in PVD, causes delayed disengagement from stimuli. Nevertheless, overall the findings provide evidence against the idea that having a higher perceived vulnerability to disease did affect ones response to facial disfigurement.

**Broader Implications of the Study**

The main implication of the study is that the lack of significant findings does not aid the hoped for benefits of this study to help those with and without disabilities. It was hoped significant results would support the idea that many people’s anxiety about disfigurement is due to irrational concerns, which in turn could help people accept that their anxiety about disfigurement is due to this reason, and that methods could be designed to reduce people’s anxiety about disease, thus resulting in potential improved social interactions between people with and without disabilities.

The impact of the lack of significant results on disabled individuals is that they are still left without another explanation as to why interactions with those without disabilities are often awkward, as significant results would have provided evidence for humans having a process of threat management and irrational concerns about disease, which could have helped those with disabilities to understand this is one of the reasons behind the prejudices that they experience.

Therefore the main of implication of this study is that it highlights that more research needs to be done in the area of facial disfigurement and the reason why those with visible differences often experience prejudice and discrimination.

**Improvements to the study**

There are a number of possible reasons as to why the study did not produce any significant results. The pictures were matched on a number of perceptual qualities; brightness, colour, facial expression and content, which is considered an important procedure within dot probe research (Bradley et al. 2000; Mansell et al. 1999), so it is unlikely it was a problem with the stimuli. However it was the first time the stimuli had been used in a dot probe task, so further investigation using real disfigured faces needs to be carried out in the future.

One possible explanation is that the sample population were unable to be tested prior to collecting the results due to time restrictions on collecting on data, and that the method to obtain participants was through opportunity sampling. Thus it was unknown that the sample would not contain many high PVD individuals. Furthermore the majority of the participants were staff working in the special educational needs department of Stainburn School, a school where children with physical difficulties are
placed by Cumbria Children’s Services, or were other members of staff working in the school. Therefore as Park et al. (2003) suggest being in presence of people with disabilities may lead to individuals to habituate to illness, which consequently may lead to reduced chronic concerns about disease. This thus may explain why the sample did not contain many individuals with high PVD, as the staff spend a lot of time around those with disabilities it could have led them to habituate illness, which consequently led them to have reduced PVD.

As the research suggests it is important to try and compare attentional bias to threat-related stimuli, for example from a known sample who have been clinically diagnosed with a disorder associated with the stimuli, or to test the sample prior to see whether it has high levels of the ‘anxiety’ you wish to study (Bradley et al. 1998; Hou et al. 2008; MacLeod et al. 1986; Mogg & Bradley, 2005; Mogg et al. 1992; Roelofs et al. 2002). Therefore this limitation could be overcome by assessing the sample for high PVD before collecting the data, or collecting the data from a known population of those suffering from high PVD.

Another possible explanation is the stimuli were presented at 500ms and, as mentioned above, there is some debate on how an attentional bias at a 500mc SOA should be interpreted. Therefore this limitation could be overcome by testing the hypotheses at different SOAs, for example at 200ms and 2000ms.

Further Studies

A number of further studies could be conducted in this research area. The first being a study to investigate if those high in PVD have an attentional bias to facial disfigurement at different presentation times, for example using a 50ms, 200ms, 800ms and a 2000ms SOA. The second being a study to investigate the hypothesis using a known or pre tested and larger population of those high in PVD, and control group. Finally, this study did not look at gender differences, so a further study could look at gender differences as men and women have different personality characteristics which could affect their perceptions to disfigurement.

References


Websites

British Psychological Society’s Code of Ethics and Conduct (March, 2008) retrieved 14th February 2009:

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