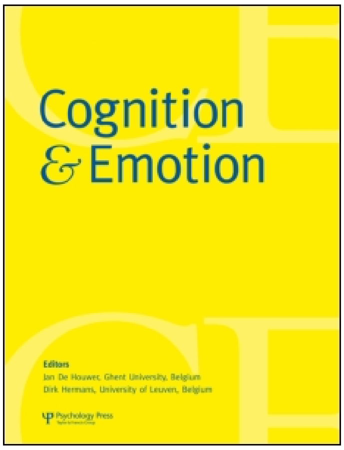

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Sensitivity to genuine versus posed emotion specified in facial displays

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Sensitivity to genuine versus posed emotion specified in facial displays

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Two experiments were performed to investigate whether social perceivers were sensitive to the veracity of sad and fear facial displays as well as happiness. In Experiment 1, participants were asked to consider in blocks whether targets were happy or not, sad or not, fearful or not. Triads of photographs (neutral, posed, genuine) were displayed and results showed participants were sensitive to whether each emotion was present and distinguished posed from genuine displays. This sensitivity was emotion specific. In Experiment 2, participants completed a priming task to eliminate instructions to judge target displays. Neutral, posed and genuine displays from a single target were used as primes in a word valance identification task. The results revealed faster responding to positive words following genuine than posed happiness and faster responding to negative words following genuine than posed fear. Together the two experiments demonstrated perceiver sensitivity to negative emotion in an explicit and implicit context.

Keywords: Emotion; Facial expression; Sensitivity; Spontaneous.

INTRODUCTION

Accurately perceiving the emotional state of an interaction partner is a fundamental aspect of social functioning that allows individuals to act in adaptive ways. It allows for smooth communication and enhances the quality of social relationships (Keltner & Haidt, 2001), which is an important aspect of quality of life (Seeman, Lusignolo, Albert, & Berkman, 2001). Emotions have expressive, observable components that allow perceivers to know about the emotional state of another. The dynamic and highly visible nature of the face permits arguably the most accessible and

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efficient communication of emotion via facial expressions (Buck, 1994; Ekman & Rosenberg, 2005; Frijda & Mesquita, 1994).

Not all facial expressions reflect actual emotional experience although the terms expression and emotion are often used as if synonymous. It is therefore preferable to utilise the term “facial display” as a term inclusive of both posed and genuine facial configurations and as a means to highlight the differences in the information that is specified. Individuals utilise display rules (Ekman, Sorenson, & Friesen, 1969; Frank, Neil, & Paul, 2001) to manage their facial displays. Only spontaneous genuine displays are coupled with emotion, that is, they occur as part of an emotional experience. Deliberate posed displays are not coupled with the corresponding emotion and occur as a means to fake, mask or suppress emotional experience (Ekman, Friesen, & O’Sullivan, 1997). As such, the posed display merely represents an emotional experience and provides limited information regarding the actual affective state of another person.

The human ability to both spontaneously express and deliberately pose facial displays means they are routinely utilised for a variety of reasons other than to specify emotional experience. Individuals can smile as part of cursory social etiquette regardless of whether they are happy or not. They can smile to disguise other feelings (Gosselin, Beaupre, & Boissonneault, 2002), communicate friendliness and likeability (Hecht & LaFrance, 1998), and to convey trustworthiness (Ekman & Friesen, 1982; Hecht & LaFrance, 1998). Similarly, individuals can look sad because they feel sad or because they wish to communicate that they understand that sadness is the appropriate or desired response. They may even feign a sad expression to solicit sympathy or forgiveness. Consequently, the differentiation of information that does specify emotion from the information that does not is crucial to the functionality of emotion perception. Mistaking posed displays for genuine displays could result in negative outcomes for the social perceiver. Offering sympathy, help or social proximity to someone disingenuous could leave an individual vulnerable to manipulation or exploitation. Likewise, approaching an individual who is smiling yet angry can lead to an avoidable confrontation.

Within the vast facial expression recognition literature very few studies that have examined emotion processing have actually provided participants with information that specifies genuine or felt emotion. More often than not posed displays are employed, under the erroneous assumption that the information provided by posed and genuine displays is largely the same and that differences between the two types of displays are unimportant. It is argued both here and elsewhere (Davis & Gibson, 2000; Gosselin, Kirouac, & Dore, 1995; Hess & Kleck, 1990; Miles & Johnston, 2007; Motley & Camden, 1988), however, that the two types of displays, both of which are ubiquitous, are indeed different. They are different not only because they provide the social perceiver with different information about the emotional state of an interaction partner, but as a result the social implication of each is also different. It is important that the social perceiver be sensitive to this meaningful difference to ensure that their subsequent behaviour is appropriate. The facial display itself would lose utility as an observable indicator of affective state if individuals were not able to reliably discriminate between these two types of displays.

The few studies that have examined differences between different types of displays have focused on smiles and shown that young adult perceivers are sensitive to the differences between genuine and posed smiles, both when making judgements about the type of smile (Frank, Ekman, & Friesen, 1993) or when judging the affective state of targets (Hess, Kappas, McHugo, Kleck & Lanzetta, 1989; Miles, 2005; Miles & Johnston, 2007). The difference is also manifest in findings that individuals report higher levels of enjoyment and pleasure when viewing genuine compared to posed smiles (Surakka & Hietanen, 1998) and that people exhibit different mimicry to posed and genuine smiles. Specifically they mimic genuine smiles by smiling genuinely and mimic posed smiles by posing a smile (Lundqvist & Dimberg, 1995). Further, greater co-operation was shown toward individuals displaying genuine than posed smiles (Miles, 2005), as was a greater willingness to purchase items displayed by models displaying genuine rather than posed smiles (Peace, Miles, & Johnston, 2006). These previous findings demonstrate that social perceivers are sensitive to the meaningful differences between different types of smiles. Further, they show that being sensitive to positive emotion as specified in smiles impacts subsequent behaviour, specifically and importantly, the way in which individuals engage with the social environment and their interaction partners. To date, there has not been any research to establish whether individuals are also sensitive to genuine versus posed negative emotion specified in facial displays.

It is as important to accurately detect negative emotion as it is to detect positive emotion, not only to avoid missing the emotion and subsequently the opportunity to act adaptively, but also to avoid the potential negative outcomes associated with disingenuous signals. The showing of negative facial displays can warn others not to approach (angry), can signal that help or sympathy are required (sadness) and can signal that danger exists (fear), for example. Each of these facial displays can be the impetus for social perceivers to engage in behaviours that might be physically or emotionally risky. It is important, therefore, that such actions are aided by accurate social perception and social perceivers are sensitive to displays that do specify negative emotion and those that do not.

Consequently, the present research extended the current literature by considering whether individuals were sensitive to sadness and fear as specified in facial displays, in addition to happiness. The consideration of multiple emotions in the present study also allowed examination of whether sensitivity to emotion in facial displays is a generalised skill demonstrated across different types of emotion or rather whether sensitivity is emotion specific and being sensitive to one emotion is unrelated to being sensitive to others. Many previous studies have shown that some emotions are easier to recognise than others (e.g., Calder et al., 2003; Kohler, Turner, Gur, & Gur, 2004a; Ruffman, Henry, Livingstone, & Phillips, 2008) and that individuals can show selective deficits with specific emotions (Adolphs, Tranel, & Damasio, 2003; Boraston, Blakemore, Chilvers, & Skuse, 2007). Furthermore, evidence from imaging studies suggests at least partially dissociable neural networks are recruited in response to the different basic emotions (Loughead, Gur, Elliott, & Gur, 2008; Vuilleumier & Pourtois, 2007).

Ecologically valid facial displays were generated specifically for this research to provide the perceiver with information relevant to affective state. It was important that the genuine facial displays were valid displays of experienced emotion that were recognisable as indicative of the respective emotions and that the posed displays were also recognisable as happy, sad or fear expressions but were not displayed during the experience of any emotion. Given the importance of the facial displays as experimental stimuli, the procedure used to elicit expressions is presented in more detail below. The facial displays were then employed in a categorisation task to investigate sensitivity to emotion when individuals were explicitly asked to make judgements about other people (Experiment 1) and a priming task when individuals were not explicitly asked to attend to the displays or make judgements (Experiment 2). While happy facial displays are often more recognisable than negative displays (Calder et al., 2003; Ruffman et al., 2008; Suzuki, Hoshino, & Shigemasu, 2006), the relative advantages and risks for each associated with misperceiving posed as genuine and vice versa is similar (Ekman & Rosenberg, 2005). It was predicted, therefore, that healthy young adults would be sensitive to each of the target emotions and would be able to specifically differentiate between posed and genuine displays. This sensitivity was expected to be robust and manifest in both the categorisation and priming tasks. Further, it was predicted that participants would demonstrate that sensitivity is emotion specific, that is, being sensitive to one emotion is not related to being sensitive to the others, as evidenced by a lack of significant relationships between the three target emotions.

Generation of facial displays

We sought to capture genuine displays of happiness, sadness and fear that spontaneously occurred as part of emotional experience. In addition, we sought to capture posed displays of these emotions that occurred due to a deliberate attempt to communicate the respective emotional states in the absence of actual emotional experience. A neutral display was also sought to create what is referred to from this point as a triad of facial displays from a single target.

To limit the differences between targets, only females were recruited given that previous research has found them to be more expressive than males (Buck, Miller, & Caul, 1974; Kring & Gordon, 1998; Zuckerman, Lipets, Koivumaki, & Rosenthal, 1975). Seventeen female participants were recruited to take part in a pilot study investigating the feasibility of stimulus material and whether specific recording procedures could be used in future research. Each participant was asked to watch various slides and think about how each one made her feel. She was asked to look into the camera as much as possible. Stimulus materials were presented on a computer screen and each participant was recorded by a digital video camera in PAL format at 25 frames per second. The camera was mounted above the monitor.

Each participant was shown 15 static pictures from the International Affective Pictures System (IAPS; Lang, Bradley, & Cuthbert, 2001) and 11 sound clips from the International Affective Digitised Sounds database (IADS; Bradley & Lang, 1999). Pictures and sound clips with high female arousal ratings (ratings $>$ 4.5 on a 9-point scale) were included to elicit affective reactions and pictures with low arousal ratings (ratings $<$ 3.5 on a 9-point scale) were included to elicit neutral reactions. Pictures and sound clips with a range of pleasure ratings (1.4 to 8 on a 9-point scale) were included given both positive and negative reactions were sought.

Each participant was also asked to view several task slides some of which were included to generate their posed displays (facial configurations without emotional experience) and some to generate their genuine displays (facial configurations with emotional experience). Slides to generate posed displays included instructions to: smile for an ID and passport photo; look into the camera and pretend that she was sad and then fearful; reproduce how she thought she would have looked when experiencing previously elicited happy, sad and fearful reactions to stimuli; and imagine scenarios like playing along with a small child and "keeping up" the game by feigning a sad reaction. Slides to generate genuine displays included the unexpected presentation of a high arousal–low pleasure scream during a slide that instructed the participant to imagine walking alone at night. The scream was played while the participant was encouraged to concentrate on what she might be experiencing and feeling. Each participant also listened to a portion of one of several songs listed as the saddest songs ever written according to *Rolling Stone* magazine while thinking about sad events in their own personal experience.

Reactions to each of the stimuli were made using a forced choice label option accompanied by strength of reaction analogue scale. Stimuli were replayed and the response booklet was completed at set intervals in the procedure. The response options were always the same and consisted of happy, sad, fear, surprise, angry, disgust and neutral labels, presented in several different orders. The participant circled the option that best described her reaction and if a choice other than neutral was selected, she marked the strength of her reaction on the accompanying scale.

At the completion of the procedures each of the seventeen response booklets was inspected for self-reported reactions to the eliciting material. To remain in consideration a participant had to report feeling a medium to high level of happiness, sadness or fear and report feeling neutral to at least one prompt to pose a deliberate display of the corresponding emotion. The information from three participants did not meet these criteria.

Two participants did not report a neutral reaction to the posed display of sadness or happiness and one participant did not report any genuine medium to high happy, sad or fear reaction. The remaining participants reported reactions that were consistent with the eliciting situation, that is, happy reactions were made to positive stimuli and sad and fear reactions to negative stimuli. The video tapes were then inspected for identifiable movement of facial muscles during reports of emotional experience. At this stage the information from two participants was removed due to a lighting problem and excessive body movement. Finally, facial movements were coded to establish that each display contained action units (AU) regarded as typical for the respective emotion, as detailed below. The core AUs identified for the present study are summarised in the appendix.

The action units indicative of happy displays are generally well agreed upon (Ekman, Hager, & Friesen, 1981; Frank, Ekman, & Friesen, 1997; Hess & Kleck, 1990; Williams, Senior, David, Loughland, & Gordon, 2001). Expression of positive emotion (a genuine smile) involves AU12 and AU6, while a deliberate expression of happiness (a posed smile) involves contraction of AU12 but not AU6. The criterion set for coding was, therefore, that all displays contained AU12 and that genuine displays (those accompanied by self-reported happy experience) in addition contained contraction of AU6. To minimise differences within and between participants, AU25 and/or AU26 were added as criteria to ensure that all smiles displayed teeth.

The action units indicative of genuine sad displays are less well defined. Ekman (2001) suggested that the AU1 + 4 combination is potentially a reliable marker specifying genuine sadness given that less than 15% of people tested could deliberately produce this movement. To establish a specific physiognomic difference between posed and genuine expressions, the criterion set for coding was that all displays contained at least two of the core units (AU1, AU4, AU15, AU17) reported to occur consistently across four sources (Ekman, Friesen, & Hager, 2002; Gosselin & Kirouac, 1995; Kohler et al., 2004b; Suzuki & Naitoh, 2003) and that self-reported genuine but not posed displays contained the AU1 + 4 combination. Coding revealed that posed displays of sadness contained more of the core AUs that did the genuine sad displays, which is in line with previous findings that posed negative facial expressions are more exaggerated than genuine facial expressions (Gosselin et al., 1995). This resulted in there being two distinct differences between posed and genuine sad displays; the presence or not of the AU1 + 4 combination and the presence of additional and more intense AUs in the posed displays.

There is no established reliable marker specifying genuine fear displays, although, as with sadness, posed fear displays have been shown to be more exaggerated than genuine displays. In the absence of a specific physiognomic difference between posed and genuine fear displays, differentiation was based on self-reported affective state, that is if targets reported feeling fearful and their facial display contained action units indicative of fear then the display was deemed genuine. If targets reported feeling neutral and their facial display also contained units indicative of fear then their facial expression was deemed posed. The core action units selected in the present study are AU4, AU5, AU7 and AU20. While AU1 and AU2 are also consistently associated with fear across four sources (Ekman et al., 2002; Gosselin et al., 1995; Kohler et al., 2004b; Suzuki & Naitoh, 2003), both of these action units are also associated with surprise. Accordingly, these units may be contracted in the current facial displays but only in association with contraction of AU4, which is not associated with surprise.

In summary, clear full-face facial displays that were elicited to a congruent referent situation, involved contraction of muscles commonly associated with the target emotion, and were accompanied by self-report experience (genuine) or not (posed) of the target emotions were obtained from seven of the targets. When multiple displays were obtained from a single target, the closest matches with regard to intensity of core units ($\pm$ 1 level), head position and lighting were made so that four triads were selected for each emotion. This resulted in a set of 36 facial displays that could be employed in the following experiments. A still photograph was captured at the perceived apex of each of the displays and was converted to a 640 × 480 bitmap file. Each photograph was standardised by applying auto levels and auto contrast in Adobe Photoshop™. An example of a happy, sad and fear triad is shown in Figure 1.

EXPERIMENT 1

Method

Participants

Twenty-four participants (female = 11) recruited from the University of Canterbury and the local community volunteered to participate in return for a $10 shopping voucher. They ranged in age from 18 years to 34 years ($M = 22.9$ years, $SD = 4.3$). Twenty participants (83%) were right handed and all had normal or corrected-to-normal vision. Participants had no history of alcohol dependence, poorly controlled diabetes, and had no history of major depression or significant psychiatric condition requiring hospitalisation in the prior six-month period. Participants had no history of neurological, thyroid, or cardiovascular disorder and none were involved in trials of psychoactive drugs at the time of data collection.

Materials

Emotion-categorisation task. The recognition of emotional state via facial displays was assessed using custom-written software (Walton, 2004). Separate happy, sad and fear blocks of photographs were presented individually on a 14″ laptop computer accompanied by an external keyboard displaying only YES and NO buttons.[1] The participant was provided with an instruction sheet informing him/her that judgements would be made twice, once judging whether the emotion was being shown and once judging whether the emotion was being felt by the target. The order of emotion (3) and judgement condition (2) was counterbalanced and within each block (6), the twelve facial displays (1 triad from 4 targets) were presented in a unique random order for each participant. Each block began with three practice trials. The displays remained on the screen until a response was made and the inter-stimulus interval was randomly varied between 1500 and 3000 milliseconds to prevent anticipatory responses.

Procedure

Participants were invited to take part in a study investigating the ability of perceivers to detect

Figure 1. *Example of a triad (from left: neutral, posed and genuine) of happy, sad and fear (from top) facial expressions from target 1.*

[1] A sex categorisation task (Walton, 2004) with the same methodology was used to control for possible impairments in face perception that might influence emotion recognition[0]. The task employed a neutral display from eight targets. The mean accuracy rate was 99%, showing that participants were able to detect information relevant to sex identification from facial displays and consequently no participant was excluded based on difficulties perceiving this information.

posed and genuine facial expressions of emotion. Participants were tested individually. On arrival at the laboratory the participant was given an instruction sheet, which stated that they would see photographs of people appear one at a time on the computer screen and: "Your job is to decide whether or not they are showing each emotion and whether or not they are feeling each emotion. For instance, sometimes when people smile it does not necessarily mean that they are actually feeling happy". Signed consent was obtained. The experimenter stayed with the participant during the practice trials to ensure that there were no difficulties but then the participant was left alone to complete each block of trials in the emotion-categorisation task. This research was reviewed and approved by the University of Canterbury Human Ethics Committee.

Results and discussion

Sensitivity to emotion

The percentage of YES responses for each participant in the emotion-categorisation task was calculated as a function of emotion, condition and display type and is shown in Table 1. If participants differentiated between posed and genuine displays we would expect to find that genuine displays were identified as both showing and as feeling the target emotion, but that posed displays were identified as showing but not feeling the target emotion. Neutral displays would not be identified as showing or feeling emotion. Visual inspection of the data suggests that this is the case for each emotion. To confirm this observation, data were analysed using a non-parametric signal-detection analysis. Two analyses were conducted. The first analysis examined sensitivity to emotion in facial displays; that is, the ability of perceivers to detect information in the face that specifies affective state from information that does not, specifically to differentiate between genuine displays of emotion and other facial displays (posed and neutral displays). In the second analysis, neutral displays were removed to examine specifically sensitivity to the differences between posed and genuine displays of emotion.

The data from each participant was collated into hits and false alarms separately for each emotion, judgement condition and facial display. A hit was defined as correctly responding YES to a genuine display, while a false alarm was defined as responding YES to either a neutral display or a posed display. Both hits and false alarms were calculated to estimate a measure of sensitivity rather than rely on accuracy rates, whereby a participant could ensure 100% accuracy by always responding YES. The correction recommended by Snodgrass and Corwin (1988) was applied to the frequency of hits and false alarms to convert to the associated rates of hits and false alarms and these rates were then used to calculate measures of sensitivity[2] for each participant as a function of emotion and judgement condition, as seen in Table 2. In analysis 1, the higher the sensitivity scores[3] the greater the discrimination of genuine displays that specify emotion from displays that do not (posed and neutral displays). Single-sample t-tests ($p < .05$) showed that all sensitivity scores were significantly greater than expected by chance (0.5), indicating that participants were indeed sensitive to the differences between experienced and non-experienced emotional states. In the context of the second analysis, sensitivity refers to the ability to differentiate between posed and genuine displays. Single-sample t-tests ($p < .05$) showed that the sensitivity scores were significantly greater than expected by chance (0.5) in the feel condition, indicating that participants were

[2] A measure of response bias (B′) was also calculated to confirm that participants adopted a more stringent response criterion in the feel than in the show condition. Response bias was compared to 0 using single-sample t-tests. A response bias was found in the show but not in the feel condition, therefore, participants did not demonstrate a proclivity to respond with one response over the other in the feel condition. The formula used to calculate sensitivity takes response bias into account and therefore it is not considered further.

[3] It is accepted that the meaningful range of A′ is from 0 to 1.00. Higher scores are indicative of higher sensitivity. A sensitivity score of 0.5 is indicative of chance-level responding.

Table 1. *Percentage of YES responses by judgement condition and facial expression for each emotion: Experiment 1*

	Judgement condition	
Facial expression	*Show (% yes)*	*Feel (% yes)*
Happy		
Neutral	17	11
Genuine	99_a	95_a
Posed	96_a	40_b
Sad		
Neutral	12	17
Genuine	75_a	64_a
Posed	78_a	28_b
Fear		
Neutral	4	2
Genuine	76_a	73_a
Posed	94_b	54_c

Notes: Different subscripts within a row indicate significant differences between the percentage of yes responses in the show and feel conditions for a given expression type for a specific target emotion. Different subscripts in a column indicate significant differences between expression types for each condition (show and feel). These comparisons were only made within emotion, no comparison of differences in responses across emotions are indicated by the subscripts in this table.

sensitive to the differences between posed and genuine displays of each emotion. The sensitivity scores in the show condition were not, however, significantly greater than chance. This indicates that without the explicit instruction to attend to the felt state of the targets participants did not systematically differentiate between posed and genuine displays.

Analysis of variance (ANOVA) was used to confirm these observations. Preliminary analysis showed that sex and handedness[4] did not influence sensitivity and these factors are not considered further. Separate 3 (Emotion: happy/sad/fear) × 2 (Condition: show/feel) repeated-measures ANOVAs were conducted for each sensitivity analysis. The first analysis revealed only main effects of Emotion, $F(2, 46) = 9.37$, $p < .01$, $\eta_p^2 = .289$, and Condition, $F(1, 23) = 20.36$, $p < .01$, $\eta_p^2 = .470$. Post hoc tests (Tukey $p < .05$) on the Emotion main effect showed participants were more sensitive to happiness than to sadness and fear, which did not differ from one another (*M*s = 0.82 vs. 0.73 and 0.72). Participants were also more sensitive when asked how targets were feeling than when asked what targets were showing (*M*s = 0.80 vs. 0.72). The second ANOVA also revealed only main effects of Emotion, $F(2, 46) = 9.67$, $p < .01$, $\eta_p^2 = .296$, and Condition, $F(1, 23) = 50.19$, $p < .01$, $\eta_p^2 = .686$. Sensitivity to the difference between posed and genuine displays of happiness and sadness did not differ from one another and both were significantly higher than for fear (*M*s = 0.66 and 0.62 vs. 0.50, Tukey, $p < .05$). Sensitivity in the feel condition was also higher than sensitivity in the show condition (*M*s = 0.70 vs. 0.48).

Sensitivity across emotions

Kendall's tau rank order correlations were used to assess the relationship between sensitivity scores across emotions. Significance levels were set at $p < .01$ to control for multiple comparisons. Because only one significant relationship was found between conditions (sensitivity to fear, analysis 2), scores could not be collapsed across the show and feel conditions, and hence are considered separately. For the sensitivity to emotion scores (analysis 1) there was only one significant correlation in the feel condition, with those who were more sensitive to happiness also being more sensitive to fear, $\tau(24) = 0.48$, $p < .01$. For the sensitivity to the difference between displays (analysis 2) there were no significant correlations across emotions, indicating that distinguishing posed from genuine displays of one emotion was not related to being able to do so with other emotions.

As predicted, participants demonstrated they were sensitive to emotion specified in facial

[4] Although there was a main effect of handedness, $F(1, 20) = 5.4$, $p < .05$, on sensitivity scores with left-handed individuals being more sensitive than right-handed individuals (*M*s = 0.82 vs. 0.75), there were no interaction effects between handedness and any of the key IVs (emotion; condition) and the same pattern of results was seen for both right- and left-handed individuals. Hence handedness was not considered further.

Table 2. *Mean hit (HIT), false alarm (FA) rates and estimates of sensitivity (A′) by judgement condition for each emotion: Experiment 1*

	Analysis 1			*Analysis 2*		
Judgement condition	*HIT*	*FA*	*A′*	*HIT*	*FA*	*A′*
Show						
Happy	0.89	0.55	0.79*	0.89	0.86	0.53
Sad	0.71	0.45	0.75*	0.71	0.71	0.53
Fear	0.71	0.49	0.68*	0.71	0.84	0.39
Feel						
Happy	0.85	0.29	0.86*	0.85	0.43	0.78*
Sad	0.62	0.26	0.76*	0.62	0.32	0.71*
Fear	0.69	0.31	0.77*	0.69	0.53	0.61*

Notes: Analysis 1 includes posed, genuine and neutral expressions and Analysis 2 includes posed and genuine expressions. Mean estimates of sensitivity (A′) with * are significantly different from 0.5 ($p < .05$).

displays, regardless of whether they were instructed to attend to felt state or not. That is, they were sensitive when asked to judge whether the target was showing a given emotion as well as when asked to judge whether the target was feeling the emotion. Furthermore, participants were sensitive to the differences between posed and genuine displays of each emotion, but only when instructed to consider how the target was feeling. The explicit instruction to attend to felt state, therefore, facilitated the differentiation between posed and genuine displays. In line with many other studies showing that positive expressions are easier to recognise than negative expressions (Calder et al., 2003; Gosselin et al., 1995; Hargrave, Maddock, & Stone, 2002; Kohler et al., 2004b; Motley & Camden, 1988; Rosen et al., 2006; Sullivan & Ruffman, 2004), participants in the present study were more sensitivity to happiness specified in facial displays than to sadness and fear. They could establish, however, the veracity of happiness and sadness equally well. That is, when asked how the target was feeling, participants could tell the difference between posed and genuine displays of happiness and sadness equally well.

Taken together, we have provided evidence that individuals detect whether happiness is present or not more readily than sadness but there is no difference between these emotions when it comes to specifically differentiating between posed and genuine displays, whereas this is a more difficult task with fear displays. Also as predicted, being sensitive to one emotion was not related to being sensitive to the others. In other words those who were more likely to be sensitive to one emotion were not the ones more likely to be sensitive to the others. Sensitivity to emotion as specified in facial displays appears, therefore, to be emotion specific rather than a generalised skill. Perhaps being a good judge of the authenticity of the smiles should not install confidence in making such discriminations among negative facial expressions, specifically avoidance-related emotions like fear, where the negative consequences of failing to detect and then avoid perhaps render even close approximations of fear signals as real.

The results of Experiment 1 suggest that the instructions to actively attend to affective state influenced whether participants were sensitive to emotion in facial displays or not. Of particular interest, however, is whether individuals spontaneously perceive emotion from the information provided in facial display, that is "do they" rather than "can they" detect the affective state of others. The following experiment sought to establish whether participants would attend to the different information provided by posed and genuine displays when not explicitly required to make overt judgements of either the facial display or of the target.

EXPERIMENT 2

The priming task involved participants making judgements about the valence of words that were preceded by facial display primes. That is, each participant was ostensibly engaged in a separate task that did not require him/her to attend to the facial displays. Several studies have shown that facial expressions can be detected automatically (Batty & Taylor, 2003; Dimberg & Oehman, 1996; Stenberg, Wiking, & Dahl, 1998) and are effective primes that can moderate subsequent behaviours such as the response latency to identify word valence (Aguado, Garcia-Gutierrez, Castaneda, & Saugar, 2007). Previous research has shown that word valence is categorised in less time when preceded by a prime of the same valence as the target (Fazio & Olson, 2003). We argue that only genuine not posed displays specify positive or negative affect and are therefore conceptually related to the target words. A genuine smile is conceptually related to positive words but a posed smile is not. Likewise, a genuine display of sadness or fear is conceptually related to negative words whereas the posed counterparts are not. A difference in the time taken to correctly identify the valance of words as a function of the type of display prime (genuine, posed and neutral) would demonstrate that participants were sensitive to the emotion specified in the displays.

Miles (2005); Miles & Johnston (2007) found that the type of smiles employed as primes had an impact on the response time taken to judge the valence of words. Genuine smiles facilitated a faster correct recognition of positive words compared to neutral primes, whereas posed smiles did not. A priming methodology was employed in the present study with the aim of replicating this finding and further establishing whether individuals were also spontaneously sensitive to the differences in posed and genuine displays of sadness and fear. Evidence of faster responding to positive words preceded by genuine happy displays (congruent stimuli) compared to posed and neutral displays (incongruent stimuli) was sought along with evidence of faster responding to negative words preceded by genuine sadness and fear displays (congruent stimuli) compared to posed and neutral displays (incongruent stimuli). Given the potential consequences of inefficient perception of sadness and fear it was predicted that the veracity of these displays would also moderate subsequent behaviour. Specifically, it was predicted that responses would be faster to words when primed with emotion (genuine displays) than when primed with simulations of emotion (posed displays) or no emotion (neutral display). Consequently, planned comparisons were employed to directly examine the relevant difference in response latency between judgements preceded by posed, genuine and neutral primes.

Method

Participants

The same 24 participants (female = 11) who completed Experiment 1 also completed Experiment 2 during the same testing session.

Materials

Word-judgement task. The priming task was presented on a 14″ colour computer monitor using custom-written software (Walton, 2004). Seven facial displays (neutral, genuine happy, genuine sad, genuine fear, posed happy, posed sad and posed fear) from a single female target were used as primes in a word-judgement task. Ten target words (5 positive: good, honest, sincere, loyal, kind; and 5 negative: bad, mean, cruel, liar, selfish) were chosen from a previous rating scale (Anderson, 1968) based on clear positive or negative likeableness ratings (above 3.5 or below 1.5 on a 5-point scale). The participant was instructed that he/she would see several words appear on screen one at a time and his/her task was simply to judge whether the word was positive or negative, as quickly and as accurately as possible. The participant was also informed that before each word appeared he/she would see a photograph of a person, but his/her task was to attend to the meaning of the word.

He/she was asked to respond to each word by pressing either the POSITIVE button or the NEGATIVE button on the external response keyboard. The procedure began with four practice items. A fixation cross appeared in the middle of the screen for a time varying from 1500 to 3000 milliseconds before being replaced by the facial display, which was presented for 100 ms. The facial display was immediately replaced by the target word, which remained on screen until a response had been made. Each participant made a judgement on all 70 word and facial display prime combinations, which were presented in a unique random order for each participant.

Procedure

Following the completion of Experiment 1 each participant was advised they would begin another task that involved making judgements about the valence of common words. At the completion of the priming task the participant was fully debriefed, paid and thanked for his/her time.

Results and discussion

The response latency served as the dependant variable for this study. Data cleaning began with the removal of incorrect responses. A $\log_{10}$ transformation was then applied as the data were positively skewed. Data remaining outside individual $M \pm 3.0$ *SD*s were removed as outliers. Data cleaning removed 15 (0.9%) incorrect responses and 12 (0.7%) outliers. The analyses was performed on $\log_{10}$-transformed data but are reported as raw response times in Figure 2. The dashed line in Figure 2 represents the mean response time to words following neutral primes ($M = 632$ ms) compared to which no significant differences were found. A 3 (Emotion: happy/sad/fear) × 2 (Display: genuine/posed) × 2 (Word Valence: positive/negative) repeated-measures ANOVA revealed a three-way interaction effect $F(2, 46) = 5.20$, $p < .01$, $\eta_p^2 = .184$. Subsequently, separate 3 (Emotion: happy/sad/fear) × 2 (Display: genuine/posed) repeated-measures ANOVAs were calculated for each word valance.

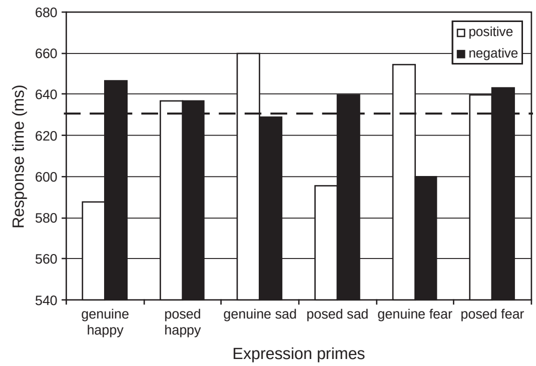

Figure 2. *Response time to categorise words as a function of facial expression prime and word valence: Experiment 2.*
Note: Dashed line is the mean response time to words preceded by neutral primes.

There was an interaction between Emotion and Display for positive words, $F(2, 46) = 6.92$, $p < .01$, $\eta_p^2 = .231$. Univariate tests of significance for planned comparisons ($p < .05$) were performed to assess the hypothesised effects on response times and revealed a significant difference between the time taken to identify positive words preceded by genuine and posed happy displays (*M*s = 588 vs. 637 ms). Specifically, participants were faster to identify positive words following genuine happy displays. Likewise, there was an interaction between Emotion and Display for negative words, $F(2, 46) = 3.37$, $p < .05$, $\eta_p^2 = .128$, and the planned comparisons ($p < .05$) showed a significant difference in response time when words were preceded by genuine than posed fear displays (*M*s = 600 vs. 643 ms). Participants were faster following exposure to genuine fear. No significant differences were found between posed and genuine sadness conditions. Although there were no intentions to consider comparisons between negative displays following positive words (an inhibition rather than facilitation effect), it is noteworthy that response to positive words was significantly slower when preceded by genuine than posed sadness (*M*s = 590 vs. 660 ms).

As expected, Experiment 2 showed that sensitivity to affective state was manifest without explicit instructions to attend to the information or make overt judgements. In this sense, the priming study engaged the participant in a task that more closely resembled real-life interactions where attention to affective state is predominantly spontaneous. Participants were faster to respond to positive words following exposure to genuine rather than posed displays of happiness and were faster to respond to negative words following exposure to genuine rather than posed displays of fear. In addition, and unexpectedly, participants were slower to judge positive words following exposure to genuine sadness than posed sadness. The results indicate that sensitivity to affective state is not reserved simply for explicit judgement. In addition to establishing that individuals "can" detect affective state in others, the present study has established that individuals "do" detect information that specifies the affective state of other people with consequences for subsequent behaviour.

GENERAL DISCUSSION

Healthy young adults could reliably detect whether targets were experiencing happy, sad and fear emotion or whether they were simulating the display of such emotion. This suggests that they were sensitive to the meaningful differences between these two types of displays and did not simply regard them as equivalent. In addition the present research found that sensitivity to emotion was emotion specific rather than a generalised skill. Individuals appear to be selectively sensitive to specific emotions, as there were no consistent relationships found across emotions. This finding is consistent with many previous findings from behavioural and imaging research that suggests the ability to identify facial displays, as investigated by traditional facial expression recognition tasks, is an emotion-specific skill (see Calder & Young, 2005; Vuilleumier & Pourtois, 2007, for reviews). This is underpinned by the findings that at least partially disparate neural substrates underlie the perception of different emotions. Such a conclusion relating to the present paradigm remains tentative however, pending replication with a larger sample. Indeed, the main findings of the present study also require replication among larger samples of various populations.

The finding that sensitivity to emotion is specific is also consistent with an experiential explanation (Tanaka, Kiefer, & Bukach, 2004) insofar as individuals become more sensitive to some emotions because of their direct experience with some emotions more than others (Pollak, Messner, Kistler, & Cohn, 2009). For example, the unique environment of different individuals may not offer as much opportunity to develop sensitivity to some emotions compared to others. Individuals who have more experience or are highly motivated to differentiate between genuine and posed facial displays of happiness, for instance, do not necessarily also encounter the same opportunities or have the same investment in detecting such differences in sad displays and vice versa.

Future research is needed to more fully examine the influence sensitivity to emotion has on subsequent behaviour. Johnston (Johnston, Miles, & Macrae, in press) reported that healthy young individuals were more likely to co-operate with interaction partners expressing genuine rather than posed smiles, and hence, empirically demonstrated a functional role of sensitivity to smile veracity within social interaction. Similar future research is required to empirically demonstrate the behavioural outcomes associated with the accurate perception of the emotional state specified by posed and genuine displays of negative expressions also. It is important to understand more about the consequences of accurate social perception so that better predictions can be made about the types of behaviours that result from inaccurate social perceptions.

In conclusion, the present research developed and employed ecologically valid facial displays to investigate perceiver sensitivity to the affective state of others. Each of the facial displays generated specifically for the present research provided the participant with information about whether emotion was being experienced or not by the targets from whom they were asked to make affective judgements. It should be acknowledged that the present generation methodology relied on self-report to establish the experience of emotion. Future procedures may benefit from establishing a means by which to validate this information without of course compromising the need for ecological real-life information. By providing individuals with information that did or did not specify emotion, the present research was able to offer empirical evidence that individuals are sensitive to sadness and fear specified in facial displays as well as support previous findings relating to happiness.

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APPENDIX

Description of the relevant action units discussed in relation to happy, sad and fear expressions

Action unit		*Facial muscle*	*Main appearance changes*
AU1	Inner brow raiser	Frontalis (pars medialis)	Pulls the inner portion of the eyebrow upwards and may result in an oblique shape. Often causes horizontal wrinkles in the centre of the forehead.
AU2	Outer brow raiser	Frontalis (pars lateralis)	Pulls the outer portion of the eyebrow upwards and often produces an arched shape. Causes lateral portion of the eye cover to be stretched upwards. May see horizontal wrinkles in the lateral portion of forehead.
AU4	Brow lowerer	Corrugator supercilii Depressor supercilii	Lowers the eyebrow/inner portion of the eyebrow. Pulls the eyebrows together and may produce vertical wrinkles between brows.
AU 1+4			Pulls the medial portion of the eyebrow upwards and together. Produces an oblique shape or a dip in the centre with a pull at the corners. Produces a triangular shape to the upper eyelids.
AU5	Upper lid raiser	Levator palpebrae superioris	Widens the eye aperture.
AU6	Cheek raiser	Orbicularis oculi (pars orbitalis)	Pulls the skin surrounding the eyes toward the eye ball causing wrinkles or crow's feet.
AU7	Lid tightner	Orbicularis oculi (pars palpebralis)	Tightens eyelids and narrows eye aperture.
AU15	Lip corner depressor	Depressor anguli oris	Pulls the corners of the lips down.
AU17	Chin raiser	Mentalis	Pushes the chin boss upwards.
AU20	Lip stretcher	Risorius often with platysma	Pulls the lips back laterally.
AU25	Lips part	Depressor labii inferioris	Teeth are showing and there is space between the lips.
AU26	Jaw drop	Masseter	By relaxation rather than pulled wide open (AU27).

Notes: Intensity scores are added to each AU according to FACS manual: A = trace, B = slight, C = marked, D = severe, E = maximum.
Source: Adapted from Ekman, Friesen, & Hager (2002).