EMOTION DETECTION:

CAN PERCEIVERS IDENTIFY AN EMOTION FROM LIMITED INFORMATION?

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Abstract

Perceivers who can accurately identify an emotion are more likely to engage in successful social interactions. Research has shown that perceivers can accurately identify emotions from facial expressions. However, in real life not all the features of a displayer's face are always visible to the perceiver. The aim of this study was to discover if participants could accurately identify facial expressions of emotion from limited information. Two experiments were carried out to investigate this idea using static photographs of genuine and posed happy, sad and fearful facial expressions. Certain features for each expression have previously been identified to be more informative than others, for example, the eyes and mouth when identifying happiness and the forehead and eyes when identifying sadness and fear. Using this information, this study employed a mask to occlude four separate regions of the face: the forehead and eyebrows, the eyes, the nose and cheeks, and the mouth. In Experiment 1, the experimenter revealed the regions for participants, after each reveal the participants were asked to identify the emotion. In Experiment 2, participants revealed the regions in response to being asked to identify a happy, sad or fearful emotion, after each reveal the participants responded whether the target was feeling the emotion they were identifying. This study found that participants can accurately identify an emotion from limited information and their accuracy increased as more of the target's face was revealed. Specifically, participants who viewed the eyes and/or mouth regions were found to be more accurate identifying the emotions than participants who viewed other regions. The results are discussed with respect to contemporary theories of facial expressions of emotion.

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List of Abbreviations

AC	Alternatively Coded
AU	Action Unit
E	Eyes
F	Forehead
FACS	Facial Action Coding System
IADS	International Affective Digitized Sounds
IAPS	International Affective Picture System
M	Mouth
N	Nose

1 Introduction

1.1 Overview

One of the ways human emotional experiences can be perceived is through facial expressions. Facial expressions of emotion contain information that is important for survival in that the accurate identification of a facial expression can influence the success of social interactions. A number of facial expressions of emotion have been found to be universal, as research has shown that these facial expressions are accurately identified across a number of different cultures (Ekman, Sorenson & Friesen, 1969; Izard, 1971). It has been argued that because facial expressions of emotion are universal, there must be a specific facial expression corresponding to each emotional state (Ekman & Friesen, 1975). The present research looks at three of the universal facial expressions of emotion – happiness, sadness and fear. Specific facial movements have been identified that make up these expressions of emotion. The present research is interested in whether perceivers are sensitive to that information and if they are able to use the specific features of these expressions to accurately identify a specific emotion. A second aim is to find out if perceivers are able to accurately identify an emotion from limited information as it is not always possible for a perceiver to view another's entire face. Research has also established facial changes that differentiate a genuine expression of emotion from a posed expression and that perceivers can distinguish between genuine and posed facial expressions (Frank, Ekman & Friesen, 1993; McLellan, 2006; Miles, 2005; Peace, Miles & Johnston, 2006). Another challenge for perceivers is therefore, to accurately identify genuine expressions of emotion (when the displayer is feeling the emotion they are showing) from posed expression of emotion (when the displayer is not

feeling the emotion they are showing) in order to avoid a harmful outcome. Therefore, the present research aims to find out whether perceivers are sensitive to the differences between genuine and posed facial expressions and can accurate identify genuine and posed facial expressions of happiness, sadness and fear from limited information.

1.2 The Function of Emotion Expressions.

Facial expressions of emotion have been suggested to be a form of communication (Plutchik, 2003). This is supported by findings that facial expressions have been found to occur more frequently in the company of others compared to solitary situations (Chovil, 1990, cited in Fridlund, 1991; Fridlund, Sabini, Hedlund and Schaut, 1990). However, it is important to note that facial expressions do appear even when one is alone. People also have a strong inclination to share their emotional experiences with others (Manstead, 2005) and social sharing of an emotion takes place soon after a triggering event (Rime, Mesquita, Philippot, & Boca, 1991). Facial expressions of emotion are a form of communication because they can reflect the intentions of others. Therefore, they function to inform the perceiver of another's likely or intended actions and in turn can be used as a guide by the perceiver as to how they should act in response. For example, a person would be more likely to approach a happy person and less likely to approach an angry person, as a happy person would be more receptive and more enjoyable company compared to an angry person. Facial expressions of emotion also serve to communicate what one needs, for example, in order for an infant to survive they require attention from their caregivers, so a sad or crying face from the infant signals to the caregiver that they ready to receive attention (Fridlund, 1991). A facial expression of emotion can also be used as

a guide for the perceiver's own actions. Young children use the information obtained from a caregiver to specify how they feel about a certain situation. A good example is the visual cliff (Sorce, Emde, Campos & Klinnert, 1985), where the child is placed at the shallow end and the mother stands at the deep end. Children whose mothers smiled were much more likely to cross than children whose mothers looked anxious. This shows that from an early age children are making use of others' emotional displays to assist them in interpreting the meaning of the situation or event (Manstead, 2005). Facial expressions of emotion can also be used by a displayer to influence a perceiver's own behaviour. Genuine (enjoyment) smiles have been found to influence cooperative behaviour among interacting individuals. One study where participants were asked to deliver electric shocks to a confederate (an assistant to the experimenter) found that participants shocked victims who showed a facial expression of joy more than victims who showed an angry facial expression (Savitsky, Izard, Kotsch & Christy, 1974). Another study found that participants were more likely to cooperate with a partner who exhibited a genuine (enjoyment) smile compared to a partner who exhibited a posed (non-enjoyment) smile (Miles, 2005). These studies show that people can use facial expressions of emotion in order to influence how others behave and that perceivers are sensitive to the information provided by facial expressions and use it to guide their own actions.

Expressions of emotion are not only an important form of communication, but emotions are also important for human survival. This is because they serve as a way of coping with environmental challenges that humans encounter (Levenson, 1999) by helping them prepare to deal with particular events efficiently and spontaneously (Ekman, 2003). For example, when a person is faced with a challenge, the emotion

that is experienced can increase their cardiovascular activity beyond the normal range. This prepares humans to react to a situation and a number of emotions show this function, for example anger, fear and disgust (Levenson, 1999). When experiencing fear, cardiovascular levels increase beyond the normal range. This is needed in order to meet the needs that are required to cope with the threatening environment. More specifically, fear is associated with escape or flight. In order to flee a threatening environment, humans need extra cardiovascular output so the individual is able to flee at their maximum potential (Levenson, 1999). In order to survive certain situations, emotions provide humans with the potential to survive challenging situations.

The ability to extend the cardiovascular system is not the only successful adaptation that relates to human emotions. Human emotions can be perceived through a variety of mediums, such as voice, body movements, and from another person's face. The face is considered the primary non-verbal channel for the communication of emotion (Lanzetta & Englis, 1989) and almost from birth infants have been found to instinctively look at another's face. For instance, infants who are only 30 minutes old have been shown to track a moving face farther than other moving patterns (Johnson, Dziurawiec, Ellis & Morton, 1991). Based on his earlier theory of natural selection (Darwin, 1859), Darwin proposed that facial expressions are also successful adaptations that stemmed from responses in ancestral species. The ability to display an emotion, in the form of a facial expression, is important not only because it displays the intentions of the individual, but it also enables the perceiver to know about another individual's emotional state and their further actions and in turn use this information to guide their own actions. One example of how a successful adaptation of a facial expression of emotion and the ability to accurately detect that emotion

could occur is in a threatening situation in the ancestral environment. In a scenario where one individual encroaches on another's territory, the owner of the territory may become angry and in turn attack the individual in order to protect their territory. However, if the owner has inherited a signal (e.g. baring their teeth) that shows their anger and the encroaching individual happens to look at the owner's head, the individual will be able to see that the owner has their teeth bared and from this they will be able to infer that the owner is angry and as a result make an escape (Fridlund, 1991). In a situation where it is likely that one individual will have been killed, the ability to show anger and the ability to recognise it are successful adaptations. These enable the individuals to survive and in turn reproduce these adaptations and therefore only those cues to which recipients reliably attend can evolve (Fridlund, 1991).

If emotions and their facial expressions are vital for survival and communication then it must follow that emotions and their facial expressions must be common in all humans. Darwin (1872/1998) was among the first to claim that facial expressions of emotion are universal and not learned. Darwin's evidence for claiming facial expressions of emotion are universal was that some facial expressions appear in similar form among lower animals, in particular primates. Furthermore, he noted that some facial expressions that are found in adults could also be found in similar form among infants and young children. Darwin also noted that some facial expressions appear the same in children born blind as in children who are born normal-sighted (Galati, Sini, Schimidt & Tinti, 2003; Galati, Miceli & Sini, 2001); and that some facial expressions appear in similar form among culturally distinct populations (Plutchik, 2003). The face is an important predictor of emotion because facial expressions are a part of the emotional experience.

During investigations into Darwin's idea that facial expressions of emotion are universal a number of studies found high agreement of emotion recognition from posed facial expressions (Biehl, Matsumoto, Ekman, Hearn, Heider, Kudoh and Ton, 1997; Ekman et al., 1969; Hejmadi, Davidson and Rozin, 2000; Izard, 1971). Ekman and Friesen (1971) hypothesized that universal facial expressions of emotion are found in the relationship between distinctive patterns of the facial muscles and particular emotions. To eliminate the possibility that the findings were a result of learning (e.g. from magazines, movies, television), Ekman and Friesen (1971) carried out a study of the South Fore group in South-eastern New Guinea, who had little or no contact with the outside world. They found extremely high agreement for nearly all facial expressions, where the median agreement for happiness was 92%, sadness was 81%, and fear was 64%. Some facial expressions of emotion are found to be recognised more accurately than others. Overall in Western, non-Western and isolated cultures, happiness was the most accurately recognised emotion and sadness was found to be accurately recognised more often than fear (Russell & Fernandez-Dols, 1997). Ekman and Friesen concluded from their findings that at least some facial expressions of emotion are universal and they named six basic or universal emotions.[1] Izard (1977) reports interest and shame as also universal. Other researchers have proposed more or fewer basic emotions, for example, Tomkins (1963)[2] believed there to be more primary or basic emotions where Panksepp (1982)[3] thought that there were fewer. Evolutionary adaptations of facial expressions of emotion are a good explanation for universality, because if they are an evolutionary adaptation then some

[1] Ekman and Friesen's (1975) list of primary (basic) emotions includes anger, disgust, fear, happiness, sadness and surprise.
[2] Tomkins' (1963) list of primary (basic) emotions includes fear, anger, enjoyment, interest, disgust, surprise, shame, contempt and distress.
[3] Panksepp's (1982) list of primary (basic) emotions includes fear, rage, panic and expectancy.

facial expressions of emotion must have a biological basis, contain a function related to survival which should still be seen today and be similarly displayed and be highly recognised among humans. While there is strong evidence for universal facial expressions of emotion and messages on an emotional level can cross a barrier of cultural or species difference (Elfenbein & Ambady, 2003), there is also evidence that there are cultural differences in facial expressions of emotion, where an in-group advantage has been found. This is where perceivers who share the cultural background of the target have been found to be more accurate than perceivers who do not share the target's cultural background (Elfenbein & Ambady, 2003).

1.3 The distinction between Genuine and Posed Facial Expressions.

An important aspect to Ekman, Sorenson and Friesen's (1969) and Izard's (1971) research and along with other researchers (Biehl, et al., 1997; Hejmadi, et al., 2000) is that they have used created or posed expressions of emotion. Facial expressions are part of a person's emotional experience. However, people do not always show the emotions they feel through facial expressions. It is possible to feel an emotion but not have it showing on one's face (Plutchik, 2003). A posed expression of emotion is a deliberate attempt to appear as if an emotion is being experienced (Ekman, Hager & Friesen, 1981). It is important for perceivers to accurately perceive facial expressions of emotion as they can inform them of another person's intentions and in turn help with successful social interactions (Russell, Bachorowski, Fernandez-Dols, 2003). Lopes, Brackett, Nezlek, Schutz, Sellin and Salovey (2004) have shown that the ability to perceive the feelings of others and the ability to use this information to guide their actions is important for successful social interactions. Since it is not always beneficial to display one's underlying emotion, it can be important for

perceivers to accurately determine the difference between a truthful facial expression of emotion, where a person's facial expression is consistent with their underlying affect and one that is not, where a person's facial expression is different from their underlying affect (Russell, Bachorowski & Fernandez-Dols, 2003). It is not always valuable to display one's intentions because if one has decided to enact them, it is likely to heighten another's resistance (Fridlund, 1991). For example, when parents agree that their child can go to the movies, but not a concert, the best way for the child to ensure that their parents do not get suspicious is to appear upset about missing the concert, even if they are intending to go to the concert and not the movies. Therefore, it is in the perceiver's interest to not only accurately detect information that informs them of the person's emotion but also the ability to detect honest (genuine) expressions from deceptive (posed) expressions.

People can, to some extent, control their facial expressions in a number of ways, they can show an expression when they do not feel an emotion (*simulate*); they can show nothing when they are feeling a particular emotion (*neutralize*); or they can cover a felt emotion with the appearance of another emotion they do not feel (*mask*) (Ekman & Friesen, 1975). The reason a person may need to manipulate their facial expression may be due to display rules. Ekman and Friesen (1975) use the phrase "display rules" to describe what people learn throughout their lives about the need to manage the appearance of their expression of emotion in certain situations. Once learned, display rules function like habits. Ekman and Friesen outline four types of/reasons for these display rules. People control their facial expression of emotion because of deeply ingrained conventions: these are cultural display rules. Ekman and Friesen (1972) found that when participants watched stress-inducing films while another person was

in the room, Japanese participants masked their unpleasant feelings with a smile more often than American participants, showing that display rules differ as a function of culture and as a function of the social situation (alone or with others). Another type of display rule is idiosyncrasies in upbringing (personal display rules) or controlling one's face due to a vocational requirement, for example, a doctor would not want to show his/her fear to a severely injured patient. People also tend to control their facial expressions because of the need of the moment; a student would not want to laugh at an angry teacher, as they may be punished as a result. The most common emotion mask is the smile (Ekman & Friesen, 1975). Darwin suggested that this is because the muscular movements required for smiling are more different from the muscular movements involved in negative emotions. This is because smiling requires less muscular movements than negative emotions. Also the nature of the social situation may be one that requires concealment of the felt emotion with a smile, for example, during medal ceremonies, smiles of silver medallists were found to differ from the smiles of gold and bronze medallists. Gold and Bronze medallists displayed genuine smiles, whereas silver medallists concealed their sadness with a smile, they were found to be more likely to display controlled genuine smiles, posed smiles or smiles blended with sadness (Matsumoto & Willingham, 2006).

Another aspect that distinguishes a genuine facial expression from a posed facial expressions is that there is evidence of separate neural pathways for spontaneous (emotional) and deliberate (non-emotional) facial movement. Emotional (spontaneous actions) and non-emotional (deliberate actions) activity have been found to originate in different areas of the brain and arrive at the face through different motor systems. Spontaneous facial activity originates in the sub-cortical motor strip and arrives at the

face through the extrapyramidal motor system, while deliberate facial activity originates in the cortical motor strip and arrives at the face through the pyramidal motor system (Rinn, 1984). The distinct neural pathways are an important difference between genuine and posed facial expressions because each pathway creates a different type of facial movement. These differences in neural pathways have shown that facial actions are smoother and more ballistic-like (i.e. follow a set trajectory) when they are driven by the extrapyramidal motor system (spontaneous) compared to the pyramidal motor system (deliberate) (Frank, Ekman & Friesen, 1993). The cortical (pyramidal) motor system frequently competes with our more primitive systems in an attempt to gain control of our overt behaviour (Rinn, 1984). By having two separate motor systems, this explains how people can use deliberate facial actions in order to mask, neutralise or simulate our spontaneous facial actions.

There are several limitations when using only posed facial expressions in research, for example, posed facial expressions do not specifically reflect the distinct underlying emotional state. Rather, posed expressions provide an approximate expression, stereotypically associated with a particular emotional state. Therefore, the previous research shows that participants were able to identify the facial expression but it does not inform us whether participants were able to identify the underlying emotion. It is important for perceivers to make the distinction between a person's underlying emotion and his/her facial expression, because it is accurate perception of the underlying emotion, not the facial expression which guides the perceiver to have successful social interactions. Using posed facial expressions also raises the question of ecological validity and limits how one can generalise the results of research (Miles, 2005). Spontaneous facial expressions are the result of an eliciting situation which

happens in naturalistic settings, while posed expressions lack the corresponding emotion that is part of a spontaneous facial expression. This means that results from studies that have used posed facial expressions cannot be generalised into situations where spontaneous facial expressions occur as they lack both the eliciting situation and the corresponding underlying emotion. If spontaneous facial expressions had been included, the previous research may have yielded different results and could also be used as a comparison for the created posed expressions (Gosselin, Perron, Legault, & Campanella, 2002). For example, participants should be more accurate when identifying genuine expressions of emotion because genuine expressions contain all the relevant facial information. Genuine expressions of emotion contain the corresponding underlying emotion and are also a reaction to a natural event, whereas posed expressions may not contain all the relevant information. Therefore, participants should not be as accurate when identifying posed compared to genuine expressions. Also, participants may confuse posed expressions more often with other emotions as posed expressions do not contain all the corresponding information for the emotion that is posed.

It is important to include genuine and posed facial expressions in research in order to determine whether perceivers are sensitive to the different types of facial changes and the underlying emotion that makes up a genuine facial expression. There are distinctions between genuine and posed facial expressions of emotion; most importantly a posed facial expression lacks the underlying emotion. These distinctions can inform the perceiver the affective state of the displayer, provided that they are sensitive to the relevant information. The present research includes genuine and posed happy, sad and fearful facial expressions in order to determine whether perceivers are

sensitive to the differences between genuine and posed expressions. By including deliberately posed facial expressions and spontaneous genuine facial expressions in research, it allows the experimenter to compare any differences in responses to these expressions and also to attempt to explain why there may be differences in responses to spontaneous (genuine) and posed facial expressions. One way this could be carried out is by breaking down and isolating the various types of information that are available to a perceiver and to investigate what effect this has on the perceiver's responding. People can manipulate their facial expressions in a number of ways. Therefore, facial expressions are not always true representations of what people are feeling and perceivers need to be sensitive to differences in facial expressions. It is important to detect differences between posed and genuine expressions to succeed in social interactions. One way a perceiver can detect an emotion from a facial expression is by attending to the changes in another person's facial features.

1.4 The Appearance of Facial Expressions of Emotion.

Facial characteristics have been identified that differentiate a genuine facial expression of emotion from its posed counterpart. Gosselin, Kirouac and Dore (1995) outline three ways a genuine (spontaneous) expression of emotion can be distinguished from a posed (deliberate) expression of emotion. The first difference is posed expressions are more asymmetric than genuine expressions. Ekman, Hager and Friesen (1981) found that a symmetrical facial expression can inform a perceiver that an emotion is felt. In particular they found that asymmetries of smiles were more frequent in deliberate expressions as opposed to spontaneous expressions. They found asymmetries to be lateralised and that deliberate asymmetrical movements were far greater on the displayer's left than on the right side of his/her's face. This laterality of

movement was not seen in genuine happy expressions. In regards to negative emotions, Ekman, Friesen and Ancoli (1980) found that while posed negative emotions were asymmetrical there was no laterality of movement that can be seen in posed smiles. Another difference is that posed expressions of emotion are characterised by an irregular timing of muscle contraction where posed expressions lack the smoothness of a genuine expression, in the way that the expression flows on and off the face. The third difference is that posed expressions may have added or lack some of the components that make up a genuine facial expression of emotion, as described below (for happiness, sadness and fear). Ekman (1993) also suggests that genuine happy, sad and fearful facial expressions also contain one or more muscular actions that most people are unable to perform deliberately. Of particular interest is whether or not perceivers use this information (where posed facial expressions may lack or have added components) to accurately identify a genuine or posed facial expression. The lacking or added components of a posed facial expression may also mean that perceivers could confuse the facial expression with a different facial expression of emotion.

A number of researchers have created systems to describe facial expressions of emotion by labelling distinct facial appearances. The changes that are usually considered when studying emotion on a person's face are produced by muscle contractions and to some degree by alterations of blood flow and skin temperature (Plutchik, 2003). Examples of these systems include: Blurton-Jones' (1971) criteria for describing facial features in children; Maximally Discriminative Facial Movement Coding System (Max) (Izard, 1979) and The Facial Action Coding System (FACS). FACS was created by Ekman, Friesen and Hager (2002) and is a widely validated and regularly used method of describing a person's facial movements. Their method

measures changes in facial appearance by describing a person's facial movements based on anatomical analysis of facial action that human observers can reliably distinguish. FACS decomposes the facial behaviour into 46 action units (AUs), each of which is anatomically related to the contraction of a specific set of facial muscle movements. Ekman, Friesen and Hager labelled the individual facial movements in terms of action units (AUs), since the muscles themselves are not directly observable. They use the term action unit because they have found that a change in the appearance of the face can utilize a combination of more than one muscle and they have also separated more than one action unit from what is one muscle. Ekman and Friesen (1975) and Ekman (2003) have also given descriptive examples of the appearance of facial expressions for the basic emotions. Using these descriptions the key features that are part of each facial expression of emotion can be identified.

1.4.1 The appearance of happiness.

Figure 1

A Genuine Expression of Happiness.

Figure 2

A Posed Expression of Happiness.

Smiling is considered one of the simplest, most easily recognized, and yet confusing of the facial expressions. This is because there are many different types of smiles which have different meanings and a smile is commonly used to mask other emotions in social situations (Ekman, 1992). Ekman and Friesen (1975) describe a distinctive appearance in two areas of the face that make up a happy expression; this is in the mouth and the eyes. In a smile the corners of the lips are drawn back and up (AU 12, Lip Corner Puller) and the mouth may or may not have the teeth exposed (AU 25, Lips Part). Gosselin, et al. (1995) found that the Chin Raiser (AU 17) and the Lip Corner Puller (AU 12) were among the most frequent action units in a happy facial expression. Kohler, Turner, Stolar, Bilker, Brensinger, Gur and Gur. (2004) also thought that the Lip Corner Puller (AU 12) was essential for a happy facial expression, as it was always present in a happy expression. A wrinkle, known as the naso-labial fold, runs downwards from the nose to the outer edge of the corners of the lips. Both of these characteristics can be seen in Figures 1 and 2. However, Figure 1 has a deeper naso-labial fold than Figure 2 and in Figure 2 the smile is asymmetrical, where the displayer's bottom teeth are visible on her left side. A perceiver can use the information from the mouth to inform them whether or not the displayer is feeling happy. Other information a perceiver could use is found in the displayer's eyes. The lower eyelid may be raised and wrinkles may form below the eyes and Crow's feet wrinkles appear from the outer corners of the eyes. These Crow's feet wrinkles have been shown to be a reliable sign of genuine happiness, the action unit that creates these changes is AU 6 (Cheek Raiser/Lid Compressor), the muscle underlying this action unit circles the eye orbit and pulls the skin toward the eye (Ekman et al., 2002). In Figure 1, the displayer has Crow's feet wrinkles radiating from the outer corners of

each eye and is evidence of AU6 contraction. This characteristic cannot be not seen in Figure 2.

If someone is posing happiness (as seen in Figure 2), when he or she is not feeling happy, the forehead and eyebrows are regions that can inform a perceiver that the expression is posed. This is because there is no specific movement in the forehead and eyebrows in a genuine happy expression, therefore, if there is evidence of movement in these regions this can inform the perceiver that the expression is not genuine (Ekman & Friesen, 1975). Another way to distinguish between true enjoyment smiles (genuine) and non-enjoyment smiles (posed) was first described by the French neurologist, Duchenne de Boulogne (1862/1990). He studied how facial muscles change a person's appearance by electrically stimulating different parts of the face and photographing the result. Duchenne recognized that a true enjoyment is combined by the contraction of the *zygomatic major* muscle and the *orbicularis oculi* (as seen in Figure 1). Ekman, Roper and Hager (1980) have shown that very few people can voluntarily contract the *orbicularis oculi* muscle. There are two parts of the *orbicularis oculi*, an inner part that tightens the lids and skin directly below the eye and an outer part that runs all around the eye socket, which pulls down the eyebrows and the skin below the eyebrows, this pulls up the skin below the eyes and raises the cheeks (Ekman, 2003). The inner part of the eyelid tightener everyone can do, however, very few (around 10 percent) can voluntarily contract the outer part of the muscle (Ekman, 2003). This provides support for the idea that there are two separate neural pathways for voluntary (deliberate) facial movement and involuntary (spontaneous) facial movement. Additional supporting evidence that the Duchenne marker (AU 6, Cheek Raiser/Lid Compressor) is associated with spontaneous

(genuine) smiles is found in various studies where smiles which contain the Duchenne marker are observed more frequently in positive social contexts. Ekman, Davidson and Friesen (1990) observed that the Duchenne marker occurred more often while participants were watching pleasant films compared to when they were watching unpleasant films. Fox and Davidson (1988) also found that 10 month old infant's smiles that involved the *zygomatic major* (AU 12) and the *orbicularis oculi* (AU 6) were seen more often in response to the mother approaching whereas smiles that did not involve the *orbicularis oculi* (AU 6) were seen more often in response to the approach of a stranger. Gosselin, et al. (2000) also found that adults tended to report the stimulus person was really happy as a function of the activation of the *orbicularis oculi*. When asked what the differences were in the face when the stimulus person was happy and when the stimulus person was pretending to be happy, more than half of the adults referred to distinctions in the eye region. While children in their study were not able to distinguish between enjoyment and non-enjoyment smiles, they were able to locate regions of the face where enjoyment and non-enjoyment smiles which differed at a rate comparable to adults. Kohler et al. (2004) also found that with the presence of the Cheek Raiser/Lid Compressor (AU 6), correct identification of a happy facial expression increased by a factor of four times when AU 6 was present compared to when it was absent. Therefore, this means that perceivers were identifying faces where AU 6 was absent as not feeling happy.

1.4.2 The appearance of sadness.

Figure 3

A Genuine Expression of Sadness.

Figure 4

A Posed Expression of Sadness.

There are distinctive appearances in the forehead and eyebrows, the eyes and the mouth that can inform a perceiver that the displayer is feeling sad. Ekman (2003) calls the sad brows “powerful” because this movement can be all that is needed to identify sadness. Ekman and Friesen (1975) suggest that the brows are a strong and reliable sign of sadness, the corners of the brow angle upwards (AU 1 (Inner Brow Raiser)) and few people can do this voluntarily. A vertical wrinkle can also appear between the brows, as the brows are drawn up and together (Ekman & Friesen, 1975). This change is created by the combination of AU 1 (Inner Brow Raiser), which pulls the medial part of the brow and centre of the forehead upwards and AU 4 (Brow Lowerer), which causes a slight wrinkle or muscle bunching between the eyebrows when it occurs with AU 1 (Inner Brow Raiser). This eyebrow movement causes a change in the

appearance around the eyes, it triangulates the upper eyelids, and this characteristic can be seen in Figure 3. Kohler et al. (2004) found that only the Brow Lowerer (AU 4) and the Chin Raiser (AU 17) were the only action units positively associated with sad recognition. Ekman and Friesen (1975) also reported that the sadness conveyed is increased when the lower eyelid is raised. The mouth is another region which can inform the perceiver of sadness. The lips are stretched horizontally (AU 20 (Lip Stretcher)) and the lower lip is pushed up. The corners of the lips are pulled down, this movement is created by AU 15 (Lip Corner Depressor) and the chin muscle is pushed up by AU 17 (Chin Raiser) which creates a pout, which can also wrinkle the chin boss (as seen in both Figures 3 and 4). Gosselin et al. (1995) found that the Lip Corner Depressor (AU 15), Chin Raiser (AU 17) and Jaw Drop (AU 26) to be frequently observed in both genuine and posed sad expressions. Interestingly, Kohler et al. (2004) found that the Lip Corner Depressor (AU 15) was negatively associated with sad recognition. There is also a slight change around the nose area where, in a sad expression, the cheeks are pulled up (AU 6 (Cheek Raiser/Lid Compressor)). Kohler et al. (2004) concluded from their findings that recognition of a sad expression was less dependent on the presence of single action units, but on the combination of action units or the "Gestalt" of the facial expression. This means that perceivers can only accurately identify a sad expression when all information from the face is available to them.

When sadness is posed, it will probably be shown in the mouth and by a downward cast of the eyes. Furthermore, because the forehead and brows are a defining feature of sadness the absence of this movement or the upper eyelid movement would be a good clue that the sadness is posed (Ekman & Friesen, 1975). Gosselin et al. (1995)

also found that the Inner Brow Raiser (AU 1) and Brow Lowerer (AU 4) were common action units only in the genuine sad expression. Figure 4 compared to Figure 3 does not show this defining feature of sadness; while the brows are pushed upward, they are not drawn together, therefore, there is no triangulation over the upper eyelid. Figure 4 also has additional crease lines across the forehead, that are not reported as a characteristic of a genuine sad expression. Also asymmetry is also visible in the posed expression (Figure 4), the right corner of her mouth is pulled further downwards than her left and lines above her left brow appear to be higher than on her right.

1.4.3 The appearance of fear.

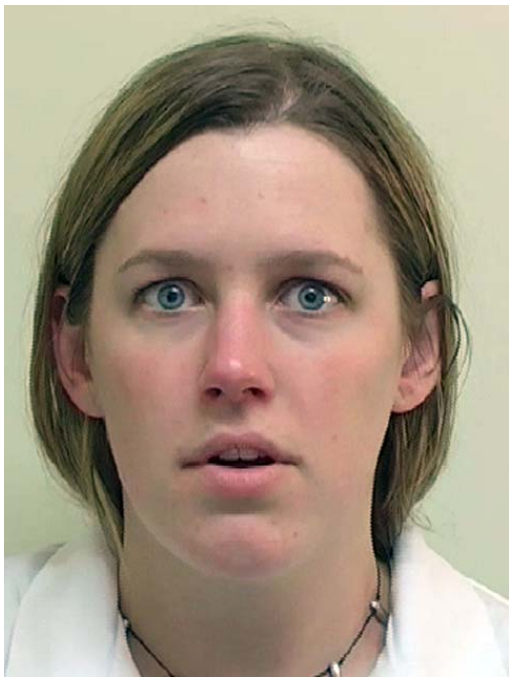


Figure 5

A Genuine Expression of Fear.

Figure 6

A Posed Expression of Fear.

There are distinctive changes in appearance in the forehead and eyebrows, eyes and mouth which can inform a perceiver that the displayer is feeling fear. Ekman and

Friesen (1975) suggest that fear brows on a neutral face always convey fear. The eyebrows in a genuine fear expression are raised and drawn together in a straightened appearance and horizontal wrinkles can appear on the forehead, this change is created by AU 1 (Inner Brow Raiser). The change that occurs around the eye area is that the upper eyelid is raised, created by AU 5 (Upper Lid Raiser) which pulls the upper eyelid back into the socket. The Upper Lid Raiser (AU 5), along with the Jaw Drop (AU 26), was found by Gosselin et al. (1995) and Kohler et al. (2005), as positively associated with fear recognition. This movement (AU 5) is also shared with a surprised expression and the lower lid is tense, which is not shared with a surprised expression, these movements expose the sclera (whites) above the iris. Both Figures 5 and 6 show a raised upper eyelid, but Figure 6 lacks the tense lower lid. There are two different changes in the mouth that can inform a perceiver that the displayer is feeling fear (Ekman & Friesen, 1975). The first type of fearful mouth is when there is tension in the upper lip and the beginning traces of the corners of the lips are being drawn back (as seen in both Figures 5 and 6). The second type of fearful mouth is when the lips are stretched and tense with the corners drawn back, created by AU 20 (Lip Stretcher) which pulls the lips laterally back towards the ears and AU 26 (Jaw Drop). Kohler et al. (2005) found that recognition of fear was associated with inner (but not outer) brows being raised and the widening of the eyes; this was impeded by the Brow Lowerer (AU 4), which was found to be negatively associated with recognition of fear.

As with sadness, when posing fear, it is probably shown in the mouth and eyes, also because the forehead and brows are a defining feature of fear, the absence of this movement would be a clue that fear is being posed. Ekman and Friesen (1975) also

indicate that the meaning conveyed by the expression differs if one can only see the mouth. Therefore, if perceivers are only able to see the mouth, they may confuse the fearful expression with another emotion (e.g. surprise), as they lack all the proper information that informs them that the expression is indeed fearful. An interesting difference between Figures 5 and 6 is that in Figure 6, the displayer appears to be leaning into the picture, whereas in Figure 5 she is further back. It is more likely that someone who is fearful will be more likely trying to get back rather than going forward.

1.5 Confusions between Facial Expressions.

Despite evidence that certain facial muscular patterns and emotions are universal some emotions are confused with others relatively often. For example, it has been found that fear is often confused with surprise (Ekman & Friesen, 1975). Russell (1994) found that by increasing the number of response options from the seven basic emotions also increases the range of interpretations; however, participants' choices were not random. Kimihiro and Naitoh (2003) presented photographs of male faces previously scored by FACS, which ranged from a neutral face to a maximally expressive face in a random order. They found a high correlation between the participants' judgments of the facial expressions and the action units scored. For happy facial expressions they found that as the stimulus approached the maximally expressed face the frequency of "neutral" responses decreased and responses for happiness increased and that other emotion responses were rarely chosen. For sadness, as the stimulus approached the maximally expressed face the frequency of "sad" responses increased as did "disgust" responses. Disgust was reported up until the last photo and the frequency of "neutral" responses decreased gradually, however,

they were still reported up until the last photo. They believed that the increase in “disgust” responses was due to the lack of AU1 (Inner Brow Raiser) in the expressions employed. For fear, the frequency of neutral responses vanished in the early photos and as the stimulus approached the maximally expressed face the frequency of “fear” responses increased, however, there were “disgust”, “anger” and “surprise” responses chosen up until the final face. At the sixth face all the action units that were needed for a maximally expressed fearful face were present, at this stage, the frequency of “anger” and “surprise” responses were less than “fear” responses, but the frequency of “disgust” responses was higher than “fear” responses up until the ninth photo. The FACS coder evaluated the brow parts as an anger expression and all other parts are a fearful expression. While ultimately each facial expression of emotion is unique in overall appearance, the action units that make up each facial expression can be shared with other facial expressions of emotion, making the overall combination of action units unique to each facial expression of emotion. One of the experiments in this study includes a number of response options, if participants are responding incorrectly one possible reason could be that perceivers are picking up clues that inform them of an incorrect response. Kimihiro and Naitoh give some examples of areas where perceivers could be led to give an incorrect response. Kimihiro and Naitoh explain that the confusions between facial expressions of emotions could be the result of shared action units by other emotions, for example, action units found in the mouth, AU 15 (Lip Corner Depressor) and AU 17 (Chin Raiser), are found in both sadness and anger, however, action units above the eye area are different. Kimihiro and Naitoh believe that this difference above the eye area is what leads participants not to select “anger” in response to a sad expression and “sad” in response to an angry expression. In addition, action units in the eyes and mouth

regions, AU 5 (Upper Lid Raiser) and AU 26 (Jaw Drop) are also needed for a maximally expressed surprised face as well as a maximally expressed fearful face, which could explain why surprise and fear are often confused with each other.

1.6 Previous Research: Comparing Posed and Genuine Expressions.

Previous research that has used deliberately posed and spontaneous genuine facial expressions of emotions have looked at whether perceivers could distinguish or are sensitive to the differences between the two types of expressions. The research thus far has primarily looked at posed (non enjoyment) smiles and genuine (enjoyment) smiles. Frank et al. (1993) were among the first to test whether observers could distinguish a true enjoyment smile from other types of smile. They showed observers videotapes of enjoyment and non-enjoyment smiles and asked them to identify the enjoyment smile. They found that participants were able to identify enjoyment smiles at rates greater than chance and that accuracy was positively related to increased salience of the *orbicularis oculi* (Duchenne marker) action. This means that the eyes are an integral region when perceivers are trying to accurately identifying a genuine or posed happy expression. Another finding was that observers who were able to compare the types of smiles were correct significantly more compared to observers who made single smile judgments. In a similar study, Miles and Johnston (2007) looked at perceivers' identification of affective state of the target. They also found that participants were sensitive to differences between enjoyment and non-enjoyment smiles, when participants were asked if the stimulus person was happy or not. Miles and Johnston reported that perceivers are sensitive to the affective state in a posed (non-enjoyment) and genuine (enjoyment) smiles and are able to distinguish between the two.

Other research has looked at the impact a genuine enjoyment smile can have on participants' responses when evaluating items. Peace et al. (2006) found that participants reported that they liked t-shirts worn by a target, who had an enjoyment (genuine smile) significantly more compared to when the target had a non-enjoyment (posed) smile. This was found to be true even when participants did not have an explicit goal to evaluate the t-shirts. Another finding was that participants' were faster to correctly categorize positive words when they were preceded (i.e. primed) by an enjoyment (genuine) smiles compared to the non-enjoyment (posed) smiles (Miles & Johnston, 2007). This shows participants were sensitive to the differences between the genuine and posed facial expressions, because genuine enjoyment smiles facilitated participants' responses whereas posed non-enjoyment smiles did not. Research has also shown that the genuine (enjoyment) smiles can also influence our impressions of others. In a second study, Frank et al. (1993) asked observers to rate their impressions of smiling women. They found that women who showed enjoyment smiles were rated more positively than women who showed non-enjoyment smiles.

Research has shown that perceivers can distinguish between felt and unfelt smiles and the underlying affective state of smiles. Other studies that have also included genuine and posed sad and fearful facial expressions of emotion have found mixed results. Davis and Gibson (2000) in their research investigating emotion-recognition deficits in schizophrenia found that their control participants were more accurate when identifying posed expressions of emotion compared to genuine expressions of emotion for happy expressions and negative emotions (sadness, anger, fear and disgust). Davis and Gibson analyzed the negative emotions together as previous

schizophrenia studies had found no reliable differences when they were analyzed separately. The current research aims to find out whether participants are able to distinguish between genuine and posed happy, sad and fearful facial expressions, therefore, it is important to compare a genuine facial expressions of emotion with its posed counterpart (i.e. to compare a genuine sad expression to a posed sad expression) in order to determine differences in participants' responses. It is also important to note that Davis and Gibson's study contained a low sample size of ten control participants.

In two studies, Kohler et al. (2004) used genuine and posed photographs and Gosselin et al. (1995) used videos of actors portraying felt facial expressions (using the Stanislawski technique, also known as 'method acting') and unfelt facial expressions. The Stanislawski technique is where actors attempt to imitate a real life emotional experience by remembering how they felt in a particular situation or by imagining how they would feel in a certain situation. Kohler et al. looked at participants' recognition rates, whereas, Gosselin et al. asked participants to make an intensity judgment of the six universal emotions. Overall, both studies found that happiness was the most accurately recognized emotion followed by sadness and then fear, for both conditions (felt/genuine or unfelt/posed). For the happy expressions, Kohler et al. found similar recognition rates between genuine and posed expressions; this means that participants were responding "happy" equally often to the genuine and posed expressions, however, Gosselin et al. found that participants accurately judged the happy expressions more in the felt (genuine) condition than the unfelt (posed) condition. For both studies, facial expressions of fear and sadness had higher recognition rates in the genuine (felt) condition than in the posed (unfelt) condition,

where participants' "sad" and "fearful" responses were greater for the genuine (felt) expressions compared to the posed (unfelt) expressions. Overall, Gosselin et al. found that participants' sensitivity was generally low when judging if the emotion was felt or unfelt and felt/unfelt judgments of happiness portrayals were better than sadness and fear judgments. To summarize, previous research has shown that perceivers are sensitive to differences between genuine and posed happy expressions and can distinguish between these expressions. However, the findings for genuine and posed expressions of sadness and fear are mixed, and therefore warrant further investigation. It would also be interesting to investigate whether perceivers are also sensitive to differences in genuine and posed expression when only a limited amount of information is available to them (i.e. by limiting the facial features the perceiver can see) .

1.7 Previous Research: Recognition of Emotion as a function of features of the Expression.

A small number of studies have looked at whether perceivers use the features or action units mentioned above when attempting to identify an emotion from a facial expression. Eye tracking studies have found that people tend to fixate on the eyes, nose and mouth, these are known as core features as well as the ears when examining faces (refer to Rayner, 1998 for a review). The earliest study that investigated the involvement of facial regions when recognizing an emotion was carried out by Bassili (1979) using videotapes of actors using point light displays which showed the full face, the bottom half of the face, or the top half of the face. A point-light display is a moving image that consists of small lights that are attached to a person as they move in the dark. From this research he found that the bottom half of the face was more useful than the top for the recognition of happiness, the action unit that creates this

movement is AU 12 (Lip Corner Puller). The top half of the face was found to be more useful than the bottom for the recognition of sadness and fear. According to Bassili's research the mouth should be more informative when identifying a happy expression and the forehead and eyes should be more informative when identifying a sad expression. Bassili's findings also supports Ekman's (2003) idea that the brows for sad expressions are "powerful" and that fear brows on a neutral face always convey fear (Ekman & Friesen, 1975). In another study, Bourel, Chibelushi, and Low (2001) looked at the recognition of (posed) joy and sadness when there was only the mouth, upper face, left and right sides of the face visible, as well as no occlusion. They found that recognition of joy was accurate even with the absence of the mouth; they believed that this result was due to the virtual lack of motion of the eyebrows during a smile. Another reason for this result could be the activation of the *orbicularis oculi* (AU 6), which causes crow's feet wrinkles around the eyes, this change could also be the reason participants were accurate even when the mouth was occluded. This finding shows that even when the mouth is not available to the perceiver they are still able to accurately identify a happy expression. When recognizing sadness, participants' recognition was found to be markedly less when the mouth was occluded compared to upper face and left and right sides of the face occlusion. They believed that this was because discriminative features for the expression of sadness are mainly conveyed by the mouth. However, there have been mixed results regarding the key features of a sad expression, this finding is different from Bassili's results and Ekman's (2003) prediction about how powerful the sad brows are. The action units that make up the sad mouth are AU 15 (Lip Corner Depressor) and AU 17 (Chin Raiser) and in Bourel et al.'s research these action units facilitated recognition of the expression of sadness.

Regions of the face that are important in the identification of a happy expression are the mouth and especially the eyes as the eyes are a defining feature that distinguishes a genuine expression from a posed expression. The lack of change in the forehead can also be an identifying feature of a happy expression. There are mixed findings regarding specific regions of the face that are important for identifying a sad expression. The forehead and eyebrows, eyes and mouth have all been identified as features important for the identification of sadness. It has been suggested that perhaps all the features need to be visible in order for a perceiver to accurately identify a sad expression. When identifying fear, the forehead and eyes have been identified as important regions, however, identification of fear is not possible when only the mouth region is visible.

Facial expressions of emotion are successful adaptations, which are important for survival. The ability to accurately perceive a facial expression of emotion has been found to influence successful social interactions. A facial expression of emotion can inform us of a person's intentions; the intentions may be honest or dishonest and could be harmful to the perceiver. Therefore, it is important for the perceiver to distinguish posed facial expressions of emotion from genuine expressions. Research has shown that perceivers are sensitive to differences reported between posed and genuine expressions. Research has also shown that some facial expressions of emotion are universal and that they are emotion-specific. Identifying features have been outlined to make up different facial expressions of emotion. Some studies have looked at the correlation between recognition rates and facial features, by using FACS criteria, however, there have been mixed results. People can accurately perceive

emotions from a facial expression, in particular, from a static photograph. People are also sensitive to differences between genuine and posed facial expressions of emotion and some features of the face, in a facial expression of emotion, have been shown to be more important that others. It would be interesting to determine if perceivers use these features to accurately identify genuine and posed facial expressions of emotion.

1.8 The Present Research

A key component of the present research is the consideration of genuine and posed facial expressions. Previous research has shown that people are very good at identifying emotions from static photographs of facial expressions; however, it is important to note that these studies have predominantly used posed facial expressions of emotions. Another key component of this study was the consideration of the relevant information value of different regions of the face. Research has identified key features of facial expressions of emotion that human observers can reliably identify as part of a facial expression of emotion. A final key component of this study was the control of the information that participants received in terms of the regions of the face that were made visible. By controlling the information, participants viewed regions they may not have spontaneously attended to.

It is important to consider both genuine and posed expressions, as genuine facial expressions are accompanied by a corresponding affective state, whereas a posed facial expression lacks the corresponding affective state. For example, posed expressions that were used in this research were accompanied by a neutral affective state while their facial expression appeared to be happy, sad or fearful. Therefore, the research that has used posed facial expressions has shown that participants are able to identify the facial expression being posed. However, it does not show whether

participants are sensitive to the affective state of a person, which corresponds to the person's facial expression in a genuine expression, but does not correspond for a posed expression. It is important for perceivers to be able to identify a posed expression as the person may have adverse reasons for the deception. This study investigated whether or not perceivers are sensitive to differences between genuine and posed expressions when only certain parts of the target's face were available, as previous research has shown that perceivers are sensitive to the difference between posed and genuine expressions, for example, expressions of happiness, sadness and fear (Frank et al., 1993; Peace et al., 2006; Miles, 2005; McLellan, 2006). This study, in Experiment 2, also investigated whether participants attended to regions that differentiated genuine facial expressions from posed. In both experiments, sensitivity to posed expressions was assessed by comparing genuine and posed expressions' "happy", "sad" and "fearful" responses for each of their respective expressions.

In everyday social interaction perceivers do not always have all the information available to them. People wear sunglasses that cover their eyes; they wear hats and scarves that also obscure features. Shadows, other objects, hand movements can all cover up features of the face. With this in mind, are people still able to accurately identify another person's emotion, even when the features are obscured?

Taking into account that previous research has shown perceivers can accurately identify emotions from facial expressions, perceivers are sensitive to the differences in genuine and posed facial expressions and that research has identified key features of facial expressions specific to the emotion, the present research investigated whether perceivers could accurately identify an emotion from limited information. This research also aimed to find out what features participants spontaneously attend to

when asked to make a judgement about a target's specific emotional state. Previous research has shown specific regions to be important indicators of certain emotions. This research was interested in whether participants attended to the regions that are important indicators more often than regions that have not been associated with the emotion. Also of interest was whether participants who viewed or attended to these regions have greater accuracy than participants who viewed or attended to regions that have not been associated with the emotion.

This study consisted of two experiments. The participants for these experiments were all females, as research has shown that females are more accurate at identifying emotions (Hall & Matsumoto, 2004; Thayer & Johnsen, 2000) and the target displayer used for all trials was from the same female, this was so that features specific to an individual face, for example wrinkles, did not affect participants' judgments. Furthermore, females have been shown to be more emotionally expressive than males (Kring & Gordon, 1998). To simulate the idea that parts of the face are not always available to the perceiver the following research used a mask on top of a photograph of a target facial expression to obscure certain features of the face. Four regions of the target's face were individually covered in strips across by the mask; these were the forehead and eyebrows, the eyes, the nose and cheeks and then mouth respectively. These regions were chosen because they were identified in previous research to contain key features for happy, sad and fearful expressions (Ekman & Friesen, 1975).

The first experiment investigated whether participants were sensitive to the information available to them. This involved an experimenter removing the mask's strips for different facial expressions. This was done in order to determine which

features of each expression participants were the most accurate compared to other features of that expression. The second experiment investigated which features participants attended to and whether they were sensitive to the information available in them. This involved the participant removing the mask's strips in order to determine what order participants spontaneously removed features. By removing the strips themselves in the second experiment the participants were able to show their preference for what features they preferred to reveal in order to identify the target's emotion, whereas, the participants in the first experiment were not given the choice. Therefore, the first experiment shows participants' accuracy and confidence after each region is removed for each expression, whereas the second experiment shows which regions participants elect to remove when identifying an emotion. The first experiment also has a selection of emotions as response options that the second experiment does not, because of this the first experiment will also enable systematic confusions between emotion categories to be revealed.

When investigating participants' accuracy a number of predictions were made. Previous studies (Ekman & Friesen, 1971, Gosselin et al., 1995; Kohler et al., 2004; Russell & Fernandez-Dols, 1997) have found that participants are more accurate identifying (both genuine and posed) happy facial expressions, followed by sad and the fearful facial expressions. Therefore, it was predicted that the participants in this study would also be more accurate identifying genuine happy, followed by genuine sad and genuine fearful facial expressions. This is because the genuine expressions contain all the relevant corresponding information and their posed counterparts do not. As the experimenter and the participants reveal more of the face it was predicted that their accuracy would also increase. This is because more information or

identifying features of the expression would become available and in turn increasing participants' accuracy. Participants' accuracy was also predicted to increase after viewing areas that were identified to contain key features relevant to the facial expression of emotion being identified. Various studies have identified key features pertaining to the facial expression of emotion (Bassili, 1979; Ekman & Friesen, 1975; Ekman, 2003; Gosselin et al., 1995; Kohler et al., 2004). However, the researchers of those studies have not looked at whether participants attend to these features or are sensitive to the information in the, in order to accurately identify the emotion of that expression. Based on previous research on identification of key features of facial expression of emotion, it was predicted that the following regions when revealed will be more accurate than others for genuine expressions of happiness, sadness and fear.

The following tables (1-3) highlight the regions that were predicted to have the highest – lowest participant accuracy for each genuine expression (happiness, sadness, or fear). The possible regions have been ranked 1 - 4 (for reveals one and three) and 1 – 6 (for reveal two), from predicted highest accuracy – predicted lowest accuracy. The regions ranked in the 1 column are the regions predicted where participants will have the highest accuracy and regions ranked 4 (for reveals one and three) and 6 (for reveal two) are predicted to be where participants will have the lowest accuracy. After two and three reveals the following regions available to the perceiver are considered regardless of what order the participants viewed them.

Table 1

Participants' predicted accuracy in rank order based on which region they viewed after one reveal, for each genuine expression.

	1	**2**	**3**	**4**
Happy	Mouth	Eyes	Nose	Forehead
Sad	Eyes	Forehead	Mouth	Nose
Fearful	Eyes	Forehead	Mouth	Nose

Table 2

Participants' predicted accuracy in rank order based on which regions they viewed after two reveals, for each genuine expression.

	1	**2**	**3**	**4**	**5**	**6**
Happy	Eyes Mouth	Nose Mouth	Eyes Nose	Forehead Mouth	Forehead Eyes	Forehead Nose
Sad	Forehead Eyes	Eyes Mouth	Eyes Nose	Nose Mouth	Forehead Mouth	Forehead Nose
Fearful	Forehead Eyes	Eyes Mouth	Eyes Nose	Forehead Mouth	Forehead Nose	Nose Mouth

Table 3

Participants' predicted accuracy in rank order based on which regions they viewed after three reveals, for each of the genuine expressions.

	1	**2**	**3**	**4**
Happy	Eyes Nose Mouth	Forehead Eyes Mouth	Forehead Nose Mouth	Forehead Eyes Nose
Sad	Forehead Eyes Mouth	Forehead Eyes Nose	Eyes Nose Mouth	Forehead Nose Mouth
Fearful	Forehead Eyes Mouth	Forehead Eyes Nose	Mouth Eyes Nose	Forehead Nose Mouth

Participants' accuracy and responses were also compared between the genuine and posed expressions. Studies have shown that participants can and do distinguish between genuine and posed happiness (Frank et al., 1993; Miles & Johnston, 2007; Peace et al., 2006). Results are mixed when investigating sadness and fear (Davis & Gibson, 2000; Gosselin et al., 1995; Kohler et al., 2004). However, notable differences have been identified that distinguish a genuine expression from a posed expression. It was predicted that participants will be sensitive to these differences and will be able to distinguish a genuine expression of happiness, sadness or fear from a posed expression of happiness, sadness or fear. Therefore, the results from this study should not be the same or similar to the previous studies when accuracy for posed

expressions is analysed in the same way as the previous studies. The posed expressions were alternatively coded in order to analyse them like they have been in previous studies. When alternatively coding a posed expression, a correct response was the identification of the facial expression instead of the emotion. For example, for the posed happy expression a correct response was to select “neutral” in Experiment 1 or “no” in Experiment 2, this is because no emotion is felt in this expression. When alternatively coding the posed happy expression a correct response was to select “happy” in Experiment 1 or “yes” in Experiment 2, this is because the displayer was posing a happy expression. By alternatively coding posed expressions it allows comparisons to be made between previous studies and allows a direct comparison between response of the genuine and posed expressions. Posed expressions, when analysed in the same way as previous studies (e.g. by comparing responses of the identification of the expression rather than emotion responses), will be less accurate and will have more error responses than their genuine counterparts, because they lack the relevant corresponding information.

When investigating participants’ confidence ratings the following predictions were made: Participants should be more confident responding to expressions where they are more accurate. Therefore as predicted for accuracy, participants should be most confident when identifying the genuine happy expression, followed by the genuine sad and then the genuine fearful expressions, as they all contain the relevant information corresponding to an underlying emotional state. Participants confidence ratings should also increase (as with accuracy) as more of the face is revealed. This is because as more information is made available the more confident participants should be that their response is correct.

In Experiment 2, participants are able to reveal their own choice of regions in response to identifying a happy, sad or fearful emotion. It was predicted that participants will reveal regions that would increase their accuracy as opposed to regions that did not. Therefore, regions that have been identified to contain key features relevant to the facial expression of emotion should be revealed before regions that do not. Participants who revealed these regions should also be more accurate than participants who did not. Therefore, the same predictions (see Tables 1-3) that were made for accuracy as a function of region(s) are the same as the prediction made for the order of region removal (i.e. a region(s) that participants were predicted to be more accurate than others should also be a region(s) that participants reveal before others).

In Experiment 1, participants were given a set of response options. Participants are not always completely accurate; research has noted that incorrect responses are not random (Russell, 1994). It was predicted that participants' incorrect response will not be random and they will identify the expression more with particular response options. For example, fear is often confused with surprise (Ekman & Friesen, 1975) and sadness has been found to be confused with a neutral facial expression (Kimihiro & Naitoh, 2003).

2 Experiment 1: Experimenter Reveals

2.1 Overview

The ability to accurately perceive the feelings of others from a facial expression and the ability to use this information to guide their actions is important for successful social interactions (Lopes et al., 2004). Previous research (Gosselin et al., 1995; Kohler et al., 2004) has shown that perceivers can identify expressions of happiness, sadness and fear at high rates. Researchers have also identified key features that are specific to genuine expressions of happiness, sadness and fear (Bassili, 1979; Ekman, 2003; Ekman & Friesen, 1975; Gosselin et al., 1995; Kohler et al., 2004). These also include reliable features that a displayer cannot replicate (e.g. the Duchenne marker for a genuine happy expression and the triangulation of the brows for a genuine sad expression). Other features have also been identified that distinguish a genuine expression of emotion from a posed expression (Ekman, 1993; Ekman et al., 1980; Ekman et al., 1981; Gosselin et al., 1995). Of interest is whether participants use the features identified and if they are sensitive to the information available in them, in order to accurately identify an emotion. In real world situations it is not always possible to see all of a displayer's face. This research also aims to find out whether participants can identify an emotion from limited information.

This study uses static photographs of genuine and posed happy, sad and fearful facial expressions, from a single displayer. Four regions were identified to contain key features of happy, sad and fear expressions. These regions were the forehead/eyebrows, eyes, nose/cheeks and mouth. These regions were obscured by an overlying mask that was cut into the four regions, so that they could be revealed individually. In order to ensure all possible region combinations were viewed by

participants, the experimenter revealed combinations of regions in a counter-balanced order. Therefore, in order accurately identify an emotion participants need to be sensitive to the information available. After each reveal the participant then selected a response from a set of options. The participants identified from these options, what the displayer was feeling and gave a rating of how confident they felt that their answer was correct. A correct identification of a genuine happy, sad or fearful expression was to select “happy”, “sad” or “fear” respectively. Correct identification of a posed expression was to select “neutral” as no emotion was felt.

It was hypothesized that participants would be more accurate identifying the genuine expressions compared to the posed expressions, as genuine expressions contain all the relevant features as well as the corresponding underlying emotion. It was also hypothesized that as more of the face is revealed by the experimenter, participants’ accuracy would increase. The research reviewed above identified key features of genuine happy, sad and fearful facial expressions of emotions. It was hypothesized that participants’ accuracy would increase after regions that were identified to contain key features pertaining to the facial expression of emotion was revealed (Refer to Tables 1-3). The research reviewed above showed that perceivers could differentiate between genuine and posed facial expressions of emotion. It was hypothesized that like these studies, participants would be sensitive to differences between genuine and posed facial expressions of emotion and would respond differently for each expression.

3 Method

3.1 Participants.

Fifty-six female students from the University of Canterbury volunteered to participate in return for a $5 voucher redeemable at campus stores.

3.2 Experimental Materials.

Each participant received a response sheet (see Appendix A for an example)

3.3 Target Faces

Seven target faces, each from the same female, were used in this experiment. Each of the seven target faces displayed a different expression: genuine happiness, genuine sadness, genuine fear, posed happiness, posed sadness; posed fear and a neutral expression (see Appendix B). The target was selected from a pool of faces that had been generated in the University of Canterbury's Social Perception Laboratory for previous research (McLellan, 2006). The target used was chosen due to the availability of all the target emotions from one individual. Furthermore, in previous research, facial expressions from this target had been accurately identified (McLellan, 2006).

3.3.1 Generation of Target Displays.

The participant was seated in front of a computer monitor that had a digital video camera mounted above it. She was in a room separate from the experimenter; however, the experimenter was still able to communicate with the participant. The participant was informed that all instructions would be presented on the computer

screen and she was asked to look into the camera as much as possible. The participant was first asked to look into the camera with a neutral expression. The following procedure then consisted of the presentation of 12 pictures, 12 sounds, and 6 recollective instructions that were designed to elicit specific emotional states. The pictures were selected from the International Affective Picture System (IAPS) database (Lang, Bradley & Cuthbert, 2005), which is a set of 823 emotionally evocative photographs. The sounds were selected from the International Affective Digitized Sounds (IADS) database (Bradley & Lang, 1999), which is a set of 111 digital sound clips. Both databases have established norms for ratings of valence, arousal, and dominance associated with each image or clip. All pictures and sounds selected for eliciting a happy emotion were selected based on high valence ratings (>7 on a 9 point scale where ‘9’ represents ‘very positive’) and adequate arousal ratings (>5 on a 9 point scale where ‘9’ represents ‘very aroused’). The pictures and sounds selected for eliciting a sad emotion and a fearful emotion were selected based on low valence ratings (>3 on a 9 point scale where ‘9’ represents ‘very positive’). The recollective instructions asked the participant to imagine or remember specific emotion-eliciting situations (happy, sad and fearful). The eliciting materials were presented in groups; the first group of materials was design to elicit fear, the second group sadness and the third group happiness. Each group of materials consisted of a picture block (containing the pictures from the IAPS database), an instruction block (e.g. “pose for a passport photo”), a scenario (e.g. “imagine you are walking home at night”) and a sound block (containing sounds from the IADS database, e.g. screaming). Generation of the posed expressions was interspersed between the genuine expression groups; this was presented as a task block (e.g. by asking the participant to replicate how they thought their face had looked during the previous

emotion). Once the participant had completed all of the expressions they then recorded on 7 separate affective thermometers, which consisted of each of the 6 basic emotions: anger, happy, fear, sad, surprise, disgust and neutral, how each item (picture, sound, and recollection) made her feel. The affective thermometer consisted of an analogue scale made up of a 200 mm line measuring the intensity of the emotion. The top of the scale was labelled “High”, the bottom of the scale was labelled “Low” and the mid-point of the scale was labelled “Medium”, the participant then recorded her mood on the scale by drawing a horizontal line. The participant’s mood was recorded by measuring the distance from the mid-point (Medium) to the mark made by the participant. Therefore, a participant’s mood score could vary from 100 (High) to -100 (Low). Only items that were rated from medium to high on the relevant emotion were used. The entire procedure took approximately 35 – 45 minutes to complete.

Each of the genuine target faces had to meet the following criteria: the target needed to report being in the correct emotional state to elicit the required expression (items that were recorded on the affective thermometer that corresponded with the desired emotion were used – e.g. items that were scored highly on the ‘happy’ affect thermometer by the participant, were items that were used to select a genuine happy expression), the context was one that had been previously associated with the emotion (items which the participant reported to be “sad”, also had previously been reported as “sad”) and the expression generated had to fit criteria determined by McLellan (2006) as described bellow. Each of the posed target displays had to meet the following criteria: the target needed to report being in a neutral emotional state, the context was

not previously associated with the emotion being posed and the expression generated had to fit with the criteria determined by McLellan (2006) as described below.

McLellan (2006) based the following criteria for each of the emotions (happiness, fear and sadness) on previous studies (Bassili, 1979; Ekman & Friesen, 1975; Ekman et al., 1980; Gosselin et al., 1995; Kimihiro & Naitoh, 2003; Kohler et al., 2004) and FACS (Ekman, Friesen, & Hager, 2002) criteria. The following criteria are given using the FACS measurement units called action units (AUs); each action unit is anatomically related to the contraction of a specific set of facial muscle movements. For genuine happy AU6 (Cheek Raiser/Lid Compressor, *orbicularis oculi, pars orbitalis*) and AU12 (Lip Corner Puller, *zygomaticus major*) had to both be present, for the posed happy expression there must be activation of AU12 (Lip Corner Puller, *zygomaticus major*) with the absence of the AU6 (Cheek Raiser/Lid Compressor, *orbicularis oculi, pars orbitalis*) contraction (Ekman & Friesen, 1975). For the sad expressions activation of an AU 1 + 4 combination (Inner Brow Raiser, *frontalis, parsmedialis* and Brow Lowerer, *corrugator supercilii, depressor supercilli*), AU15 (Lip Corner Depressor, *depressor anguli oris*) and AU17 (Chin Raiser, *mentalis*) were considered to be critical units, however, other units may also be present. The criteria for the two sad expressions, both genuine and posed, were that they must contain at least 1 of the 3 critical units. For the fearful expressions activation of an AU5 (Upper Lid Raiser, *Levator palpebrae superioris*), AU1 (Inner Brow Raiser, *frontalis, pars medialis*), AU20 (Lip Stretcher, *risorious with platysma*) and an AU26 (Jaw Drop, *Masseter, relaxed temporalis and internal pterygoid*) were considered to be critical units, however, other units may also be present. The criteria for the two fearful expressions, both genuine and posed, were that they must contain at least 2 of the 4

critical units. McLellan (2006) determined the criteria for Sadness and Fear, as there has been no prior research identifying the critical units.

The target faces were printed in colour and laminated. Each target face was then covered with a mask. This mask was generated by applying an image filter (stained glass) using Adobe Photoshop to obscure the neutral expression of the target face (see Appendix C for an example of the mask used). The outline was then shown to 6 individuals to ensure that no emotion was perceived from this mask. The experimenter asked the individuals what emotion the masked person was feeling. All 6 individuals gave different responses and none of the individuals said that masked person was feeling “neutral”. The mask was then cut into four strips, with each strip covering a specific region on the target face. The first region included the forehead and eyebrows, the second region included the eyes, the third region included the nose and cheeks and the fourth region included the mouth. These strips were cut individually for each of the seven target faces, as the exact position of some regions of the face differed depending on the expression that was shown. After all the strips were cut, they were then fitted with half a Velcro circle on each side. The strip was then secured by Velcro to the actual target photograph.

3.4 Procedure.

Participants completed the task individually. Each participant was seated at a table with the experimenter sitting by her side. First, the participant was given an Information Sheet (see Appendix D) that outlined the experiment. The Information Sheet informed the participant that she was required to make a number of judgements about an individual’s emotional state from seven faces each of which was blurred by a

mask. The Information Sheet also informed participants that the experiment was interested in whether perceivers could tell what another person is actually feeling. Particular emphasis was put on “what the target is feeling rather than showing”. The experimenter then described the following scenario “You are walking along and you run into a person you do not like, however, you smile and wave at them. Do you understand that you can look happy to see this person but you are not actually happy to see them?” The participant then responded that she understood. The experimenter then answered any questions participants had before beginning the trials.

Each participant completed seven trials, one for each of the target faces. The order of the expressions for each participant was determined by using a Latin-square design (see Appendix E). Prior to completing the experimental trials, the participant was shown a picture of the target individual with a neutral expression. She was told that she would see seven pictures of the target and that this was the target’s neutral expression. It was further explained that a neutral expression was to be considered to be equivalent to a display of no emotion. The participant was also reminded that even though a person may be smiling, for example, that this did not necessarily mean that the person was feeling “Happy”. The participant was also told that she did not have to use all of the response options available on the response sheets as the photos were varied per participant.

The participant was then presented with the first trial expression, which consisted of one of the target faces covered by the obscuring mask. The experimenter then removed one of the covering strips to reveal part of the target face underneath. The participants were then free to view the visible section and make their response on the

sheet made available to them in their own time. The participant was asked two questions. First, she was asked: “What is this person FEELING?” and was to select one response from the following options: Anger, Happy, Disgust, Fear, Sad, Surprise, Neutral and None of these. A correct response was to select “happy” for the genuine happy expression; “sad” for the genuine sad expression and “fear” for the genuine fearful expression. A correct response to the posed happy, sad and fearful expressions was to select “neutral”; this is because the displayer is not feeling any emotion. When recoding the posed expressions in the same way as previous studies (e.g. Ekman et al., 1969; Izard, 1971), for comparison purposes, a correct response to an alternatively coded posed expression would be for the participant to select “happy” for the alternatively coded posed happy expression; “sad” for the alternatively coded posed sad expression and “fear” for the alternatively coded posed fearful expression. Second, she was asked: “How confident are you that the answer you circled is indeed what the person is feeling?” The participant made a vertical mark on an analogue scale that measured 133 mm, where the left hand of the scale was labelled “Extremely Unconfident” and the right hand “Extremely Confident”. Participant’s confidence ratings were scored (in mm) by measuring the distance from the left hand side labelled “Extremely Unconfident” to the participant’s mark. Therefore, confidence ratings could potentially range from 0 – 133. The experimenter then removed a second strip from the target face and the two questions were repeated. This procedure continued for the removal of all four strips from the target face. The order of removal of the strips was in a unique random order for each expression (see Appendix E). This procedure was repeated for the seven target faces for each participant.

After completing all of the trials, the participant was debriefed, thanked for her participation and paid. This experiment was reviewed and approved by the University of Canterbury Human Ethics Committee.

4 Results and Discussion

The data from Experiment 1 were analysed in terms of accuracy and confidence as a function of emotion (happiness, sadness or fear), and the nature of the expression (genuine or posed). The first analyses considered accuracy and confidence as a function of the amount of information available to participants – that is, the number of regions of the face that had been revealed. The second set of analyses considered accuracy as a function of the nature of the information available, that is, specifically which regions of the face were visible to perceivers when they made their judgments of the target's emotional state. The final set of analyses considered the alternative responses made by participants.

4.1 Accuracy.

The following analyses looked at the accuracy of participants' identification of the emotion that was being felt by the target, as specified by the target's facial expression. Accuracy was determined by using the criteria that were outlined in the method section, where a correct response for a genuine expression was to identify the target emotion, and a correct response for a posed expression was to select "neutral", this was because the target was not feeling any emotion. As no specific predictions were made for the neutral expression, this was not included in the following statistical analyses. It should be noted, however, that overall, participants were very accurate in identifying the neutral expression although they had been shown the target's neutral expression at the beginning of the experiment.

For each of the posed expressions there was zero accuracy after at least one of the reveals (see Table 4) and therefore analysis could not be performed. However, past

research (Ekman et al., 1969; Izard, 1971) on which the present study was based, have used posed expressions and have considered a response to be accurate if the expression is identified as the emotion being posed. For example, a “happy” response to a posed happy expression would have been coded as correct in the past research. For comparative purposes, the posed expressions in the present experiment were re-coded in the same way. The posed expressions were scored according to the identification of the expression being posed rather than the underlying emotion, therefore, posed happiness was scored as correct in the recoding if the participant responded “happy” as this was the expression being displayed, even though the target was not feeling that emotion (as she is with the genuine expressions). The following analyses compared the proportion of correct responses made by the participants in identifying emotions, using the alternative coding of correct responses for the posed expressions.

4.2 Accuracy as a function of the amount of information available.

Table 4

The proportion of correct target emotion identification responses for each expression, including alternatively coded (AC) posed expressions after each reveal.

Emotion:	Expression Type:	After 1 reveal	After 2 reveals	After 3 reveals	After 4 reveals
Happiness	*Genuine*	0.82 $_{b}$	0.88 $_{b}$	0.98 $_{a}$	0.98 $_{a}$
	Posed	0.21 $_{hc}$	0.18 $_{c}$	0.18 $_{c}$	0 $_{i}$
	AC Posed	0.63 $_{d}$	0.88 $_{ab}$	0.95 $_{ag}$	0.95 $_{a}$
Sadness	*Genuine*	0.27 $_{fc}$	0.54 $_{dg}$	0.68 $_{de}$	0.75 $_{e}$
	Posed	0.13 $_{h}$	0 $_{i}$	0 $_{i}$	0.18 $_{h}$
	AC Posed	0.38 $_{f}$	0.43 $_{gf}$	0.36 $_{f}$	0.30 $_{fh}$
Fear	*Genuine*	0.18 $_{hc}$	0.30 $_{cf}$	0.43 $_{f}$	0.41 $_{f}$
	Posed	0.21 $_{hc}$	0.18 $_{c}$	0 $_{i}$	0 $_{i}$
	AC Posed	0.13 $_{h}$	0.34 $_{f}$	0.45 $_{f}$	0.39 $_{f}$

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were computed both within emotion (between the number of reveals) and within the number of reveals (between emotions) as shown in Table 4. To further investigate these findings a 3 (Emotion: happiness/sadness/fear) x 2 (Expression Type: Genuine/Posed) x 4 (Number of reveals: 1/2/3/4) repeated measures ANOVA was conducted on accuracy.

A significant main effect was found for emotion F (2, 110) = 142.86, $p < 0.01$, for expression type F (1, 55) = 8.19, $p < 0.01$, and for the number of reveals F (3, 165) = 33.71, $p < 0.01$. In addition there was a significant 3-way interaction between emotion, expression type and the number of reveals F (6, 330) = 5.56, $p < 0.01$, as shown in Figure 7.

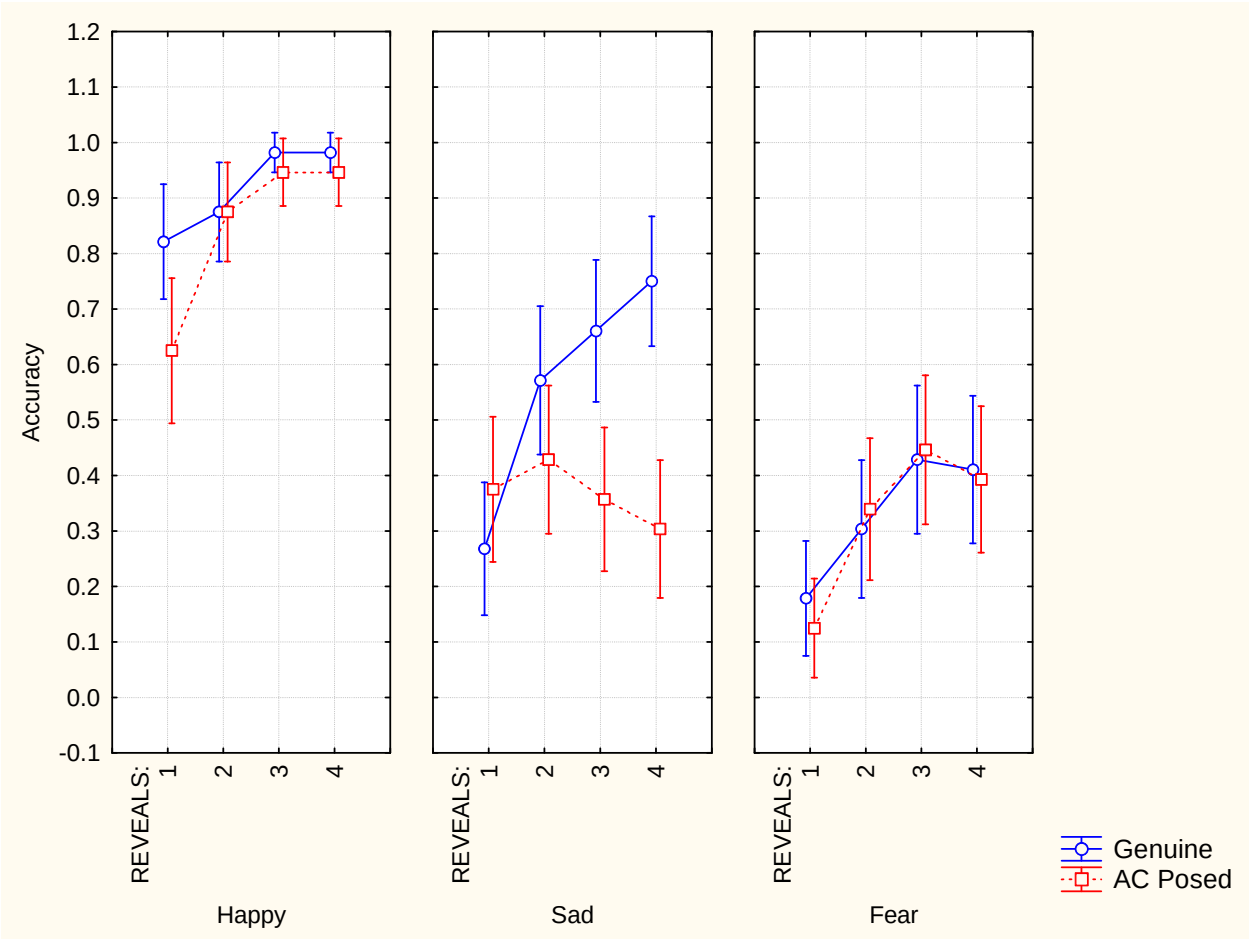


Figure 7:

Accuracy as a function of emotion, expression type and the number of reveals.

To analyse this 3-way interaction further, separate 2 (Expression: genuine/posed) x 4 (Number of reveals: 1/2/3/4) repeated measures ANOVAs were computed for each of the target emotions – happiness, sadness and fear.

4.2.1 Happiness.

A significant main effect was found for the number of reveals F (3,165) = 20.73, p < 0.01, which was qualified by an interaction between expression type and the number of reveals F (3,165) = 2.92, p < 0.01. Post hoc tests (Tukey, *a*, p < 0.01) were computed to analyse this interaction effect. For each of the number of reveals a comparison was made between accurate for the genuine and alternatively coded posed expressions. This revealed a significant effect only after one reveal where the genuine happy expression was significantly more accurate than the alternatively coded posed expression (Ms = 0.82 vs. 0.63). For each of the expression types, comparisons were made between the number of reveals. For the genuine happy expression, after three reveals, participants' accuracy was significantly greater than after one reveal (Ms = 0.98 vs. 0.82) and after four reveals, participants' accuracy was significantly greater than after one reveal (Ms = 0.98 vs. 0.82). For the alternatively coded posed expression, after two reveals, participants' accuracy was significantly greater than after one reveal (Ms = 0.88 vs. 0.63). After three reveals, participants' accuracy was significantly greater than after one reveal (Ms = 0.95 vs. 0.63). After four reveals, participants' accuracy was significantly greater than after one reveal (Ms = 0.95 vs. 0.63), with no other differences reaching significance.

4.2.2 Sadness.

Significant main effects were found for expression type F (1, 55) = 9.73, p < 0.01, and for the number of reveals F (3,165) = 6.89, p < 0.01. This was qualified by an interaction between expression type and the number of reveals F (3,165) = 8.00, p < 0.01. Post hoc tests (Tukey, *a*, p < 0.01) were computed to analyse this interaction

effect. For each number of reveals a comparison was made between accurate responses for the genuine and alternatively coded posed expression. This revealed a significant effect after three reveals (Ms = 0.66 vs. 0.36) and after four reveals (Ms = 0.75 vs. 0.30) where participants' were significantly more accurate identifying the genuine expression compared to the alternatively coded posed expression. For each of the expression types, comparisons were made between the number of reveals. For the genuine sad expression, participants' accuracy was significantly greater after two reveals than after one reveal (Ms = 0.57 vs. 0.27). After three reveals, participants were significantly more accurate than after one reveal (Ms = 0.66 vs. 0.27), and after four reveals, participants were significantly more accurate than after one reveal (Ms = 0.75 vs., 0.27). No significant differences were found for accuracy between reveals for the alternatively coded posed sad expression.

4.2.3 Fear.

A significant main effect was found for the number of reveals F (3,165) = 13.18, $p <$ 0.01. Post hoc tests (Tukey, *a*, $p < 0.01$) showed that for the fearful expressions, participants were significantly more accurate after two reveals than after one reveal (Ms = 0.32 vs. 0.15). After three reveals, participants' were significantly more accurate than after one reveal (Ms = 0.44 vs. 0.15), and after four reveals, participants were significantly more accurate than after one reveal (Ms = 0.40 vs. 0.15), with no other differences reaching significance.

As hypothesized, overall, for the genuine expressions, participants were significantly more accurate for the happy expression compared to the sad and fearful expression and participants were significantly more accurate for the sad expression compared to

the fearful expression. Also as hypothesized, participants became more accurate identifying the genuine expressions as more of the face was revealed. This shows that even though participants can accurately identify an emotion from limited information, their accuracy does increase as more information becomes available. Also hypothesized was that participants would be sensitive to differences between a genuine and posed expression. After some reveals, when identifying happiness and sadness, participants' accuracy significantly differed between the genuine expression and the alternatively coded posed expression. However, participants were not sensitive to differences between the genuine and posed fearful expressions, as accuracy between the genuine fearful expression and the alternatively coded posed fearful expression did not significantly differ after any reveals.

4.3 Confidence Ratings.

The following analyses compared participants' confidence ratings as a function of emotion, expression type and number of reveals. Confidence ratings refer to how confident the participant felt that her answer to the question "How confident are you that the answer you have circled is indeed what the person is feeling?". Confidence ratings could range from 0 (extremely unconfident) to 133 (extremely confident). Participants' average confidence ratings were tabled by expression and number of reveals (Table 5). As with the accuracy judgments, no specific predictions have been made for the neutral expression and hence the neutral expression was not included in the following analyses. As seen in Table 5 after one and two reveals participants were less confident when identifying the neutral expression. However, participants gained in confidence and by four reveals, the neutral expression had the highest average confidence rating following genuine and posed happiness.

Table 5

Average confidence ratings as a function of emotion, expression type and number of reveals.

Expression:	**After 1 reveal**	**After 2 reveals**	**After 3 reveals**	**After 4 reveals**
Genuine Happiness	71.00	81.13	95.11	106.63
Genuine Sadness	51.09	59.98	61.13	87.82
Genuine Fear	54.32	59.43	68.05	80.34
Neutral	49.04	54.70	69.43	89.61
Posed Happiness	60.93	72.70	91.98	105.71
Posed Sadness	60.80	71.29	70.18	79.50
Posed Fear	59.20	68.25	79.12	86.18

A 3 (Emotion: happy/sad/fear) x 2 (Expression Type: Genuine/Posed) x 4 (Number of reveals: 1/2/3/4) repeated measures ANOVA was conducted on the confidence ratings. Significant main effects were found for emotion F (2, 110) = 31.28, $p < 0.01$, and for the number of reveals F (3, 165) = 88.18, $p < 0.01$. Significant 2-way interactions were found between emotion and expression type F (2, 110) = 5.18, $p < 0.01$, and between emotion and the number of reveals F (6, 330) = 5.63, $p < 0.01$. In addition there was a significant 3-way interaction between emotion, expression type and the number of reveals F (6, 330) = 5.00, $p < 0.01$, as shown in Figure 8.

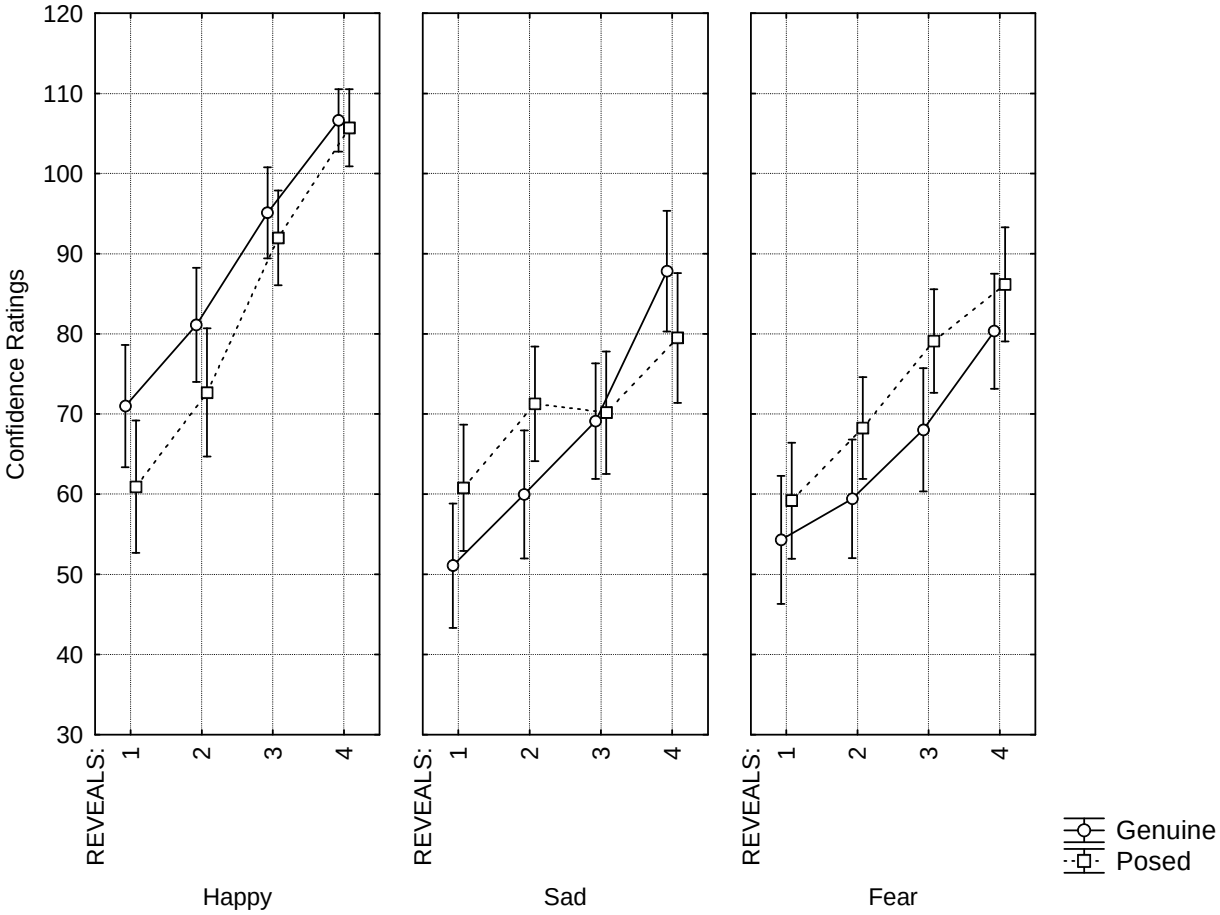


Figure 8

Confidence ratings as a function of emotion, expression type and number of reveals.

To analyse this 3-way interaction further, separate 2 (Expression: genuine/posed) x 4 (Number of reveals: 1/2/3/4) repeated measures ANOVAs were computed for each of the target emotions – happy, sad and fear.

4.3.1 Happiness.

Significant main effects were found for expression F (1, 55) = 4.75, $p < 0.04$, and for the number of reveals F (3,165) = 57.85, $p < 0.01$. Post hoc tests (Tukey, *a*, $p < 0.01$) showed that participants gave significantly higher confidence ratings for the genuine happy expression compared to posed happy expression (Ms = 88.46 vs. 82.84). Participants were also significantly less confident after one reveal than after all other

reveals (Ms = 65.97 vs. 76.91, 93.54 and 106.17). After two reveals participants were significantly less confident than after either three or four reveals (Ms = 76.91 vs. 93.55 and 106.17) and after three reveals participants were significantly less confident than after four reveals (Ms = 93.55 vs. 106.17). No other significant differences were found.

4.3.2 Sadness.

A significant main effect was found for the number of reveals F (3,165) = 30.82, $p < 0.01$, which was qualified by an interaction between expression type and the number of reveals F (3,165) = 7.64, $p < 0.01$. Post hoc tests (Tukey, *a*, $p < 0.01$) were computed to analyse this interaction effect. For each of the number of reveals a comparison was made between the confidence ratings for the genuine and posed expressions. This revealed a significant effect only after two reveals, where participants' confidence ratings were significantly lower for the genuine than the posed expression (Ms = 59.98 vs. 71.29). For each of the expression types, comparisons were made between the number of reveals. For the genuine expression after one reveal, participant's confidence ratings were significantly lower than after either three or four reveals (Ms = 51.09 vs. 69.13 and 87.82). After two reveals, participants' confidence ratings were significantly lower than after four reveals (Ms = 59.98 vs. 87.82). After three reveals, participants' confidence ratings were significantly lower than after four reveals (Ms = 69.13 vs. 87.82). For the posed expression, participants' confidence ratings were significantly lower after one reveal than after either two reveals (Ms = 60.80 vs. 71.29) or four reveals (Ms = 60.80 vs. 79.50), with no other differences reaching significance.

4.3.3 Fear.

Significant main effects were found for expression type F (1, 55) = 5.14, $p < 0.04$, and for the number of reveals F (3,165) = 37.08, $p < 0.01$. Post hoc tests (Tukey, *a*, $p < 0.01$) showed that participants gave significantly higher confidence ratings for the posed fear expression compared to the genuine fear expression (Ms = 73.18 vs. 65.54). Participants were also significantly less confident after one reveal than after all other reveals (Ms = 56.76 vs. 63.84, 73.58 and 83.26). After two reveals, participants were significantly less confident than after three or four reveals (Ms = 63.84 vs. 73.58 and 83.26) and after three reveals, participants were significantly less confident than after four reveals (Ms = 73.58 vs. 83.26). No other significant differences were found.

As predicted, participants' overall confidence ratings for both the genuine and posed happy expressions were significantly higher compared to both the genuine and posed sad expressions (Ms = 88.46, 82.84 vs. 67.00, 70.44), and both genuine and posed fearful expressions (Ms = 88.46, 82.84 vs. 65.54, 73.18). Also as hypothesised, participants' confidence ratings did increase as more of the face was revealed for each expression. Therefore, the more information participants had available, the more confident they felt that their response was correct. It was also hypothesised that genuine expressions would have higher confidence ratings than their posed counterparts. This was only true for the happy expressions, where participants were more confident identifying genuine happy compared to posed happy. Interestingly, both the posed sad and posed fear expressions had higher ratings by participants than their genuine counterparts. This finding, taken in context with the low accuracy rates from Table 4 for posed expressions, shows that participants were more confident that

their answer was correct when in fact they were not accurately identifying the posed expressions as “neutral” (no emotion).

It would, of course, have been interesting to look at whether participants’ accuracy impacted on their confidence ratings. Table 6 shows a breakdown of confidence ratings as a function of accuracy this includes accuracy coding for the expressions and the alternative coding for the posed expressions. The missing values and low participant numbers in several of the cells preclude any meaningful statistical comparisons of confidence as a function of accuracy. Overall participants’ confidence ratings were high, even after the first reveal for all expressions. In terms of accurate/inaccurate, the differences between confidence ratings for accurate/inaccurate are slight.

Table 6

Average confidence ratings as a function of emotion, expression type and number of reveals for incorrect and correct responses.

Expression	**Accuracy**	**After 1 Reveal:**	**After 2 Reveals:**	**After 3 Reveals:**	**After 4 Reveals:**
Genuine Happiness	*Correct:*	74.0 N = 46	85.6 N = 49	96.7 N = 55	106.9 N = 55
	Incorrect:	57.1 N = 10	49.7 N = 7	63.0 N = 1	94 N = 1
Genuine Sadness	*Correct:*	57.1 N = 15	67.6 N = 32	77.3 N = 37	95.1 N = 42
	Incorrect:	48.9 N = 41	49.8 N = 24	53.2 N = 19	66.1 N = 14

Genuine Fear	*Correct:*	63.3 N = 10	67.3 N = 17	68.5 N = 24	80.9 N = 23
	Incorrect:	52.4 N = 46	56.0 N = 39	67.8 N = 32	80.0 N = 33
Posed Happiness	*Correct:*	37.3 N = 12	61.0 N = 1	83.0 N = 1	0 N = 0
	Incorrect:	67.4 N = 44	72.9 N = 55	92.1 N = 55	105.7 N = 56
Posed Sadness	*Correct:*	54.1 N = 8	0 N = 0	0 N = 0	86.0 N = 1
	Incorrect:	61.9 N = 48	71.3 N = 56	70.2 N = 56	79.5 N = 55
Posed Fear	*Correct:*	55.6 N = 12	66.0 N = 1	0 N = 0	0 N = 0
	Incorrect:	60.2 N = 44	68.3 N = 55	79.1 N = 56	86.2 N = 56
Alternatively Coded Posed Happiness	*Correct:*	76.57 N = 35	75.65 N = 49	92.30 N = 53	107.28 N = 53
	Incorrect:	34.90 N = 21	52.00 N = 7	86.33 N = 3	78.00 N = 3
Alternatively Coded Posed Sadness	*Correct:*	69.81 N = 21	77.29 N = 24	85.65 N = 20	96.18 N = 17
	Incorrect:	55.4 N = 35	66.78 N = 32	61.58 N = 36	72.23 N = 39
Alternatively Coded Posed Fear	*Correct:*	72.29 N = 7	69.16 N = 19	81.24 N = 25	91.18 N = 22
	Incorrect:	57.33 N = 49	67.78 N = 37	77.39 N = 31	82.94 N = 34

4.4 Accuracy as a function of region(s) revealed.

The above analyses have considered accuracy and confidence as a function of the amount of information available to participants (i.e., number of reveals). The following analyses considered the impact of the nature of the information available (i.e., the regions of the face) to the perceiver on accuracy. The following analyses focused on the nature of the information available to perceivers when making each judgment rather than the order in which that information became available to the perceiver. So, for example, viewing the forehead followed by the eyes is considered to be equivalent to viewing the eyes followed by the forehead, since the same information is available to the perceiver when making her judgment in these two cases. For the first reveal there were four possible regions that could have been revealed - the forehead, the eyes, the nose or the mouth. For the second reveal there were four possible combinations – the forehead and eyes, the forehead and nose, the eyes and mouth, or nose and mouth.[4] After the third reveal there were four possible combinations – the forehead, eyes and nose, the forehead, eyes and mouth, the forehead, nose and mouth or the eyes, nose and mouth.

Note that in the following analyses the alternative coding of the posed expressions (AC Posed) was used, such that a correct response was the accurate identification of the emotion felt when a genuine expression was displayed and the identification of the intended target emotion when a posed expression was displayed. As for the earlier analyses, no specific predictions were made for the neutral expression, and so it is not included in the reported analyses.

[4] There was an error in the counter-balancing order in Experiment 1 where two region combinations – the forehead and mouth and the eyes and nose were not included in the combinations that were revealed.

4.4.1 First Reveal.

Table 7

Proportion of participants' correct responses when identifying the expression when one region was revealed, as a function of emotion, expression type and region. Number of participants in each cell is shown in parentheses.

Emotion:	**Expression Type:**	**Forehead**	**Eyes**	**Nose**	**Mouth**
Happiness	*Genuine*	0.14_{c} (7)	0.88_{d} (18)	0.85_{db} (13)	1.00_{d} (18)
	AC Posed	0.16_{c} (19)	0.83_{db} (12)	0.78_{db} (19)	0.94_{db} (16)
Sadness	*Genuine*	0.10_{cf} (21)	0.36_{a} (14)	0.27_{af} (11)	0.50_{ae} (10)
	AC Posed	0_{c} (14)	0.47_{a} (15)	0.29_{a} (17)	0.90_{db} (10)
Fear	*Genuine*	0_{c} (14)	0.62_{ab} (13)	0.07_{cf} (15)	0.07_{c} (14)
	AC Posed	0_{c} (15)	0.50_{ab} (12)	0_{c} (13)	0.06_{c} (16)

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were computed both within emotions (between regions) and within regions (between emotions) as seen in Table 7.

4.4.1.1 Happiness.

No significant differences were found between responses for the genuine and alternatively coded posed happy expressions as a function of regions. For both the genuine and alternatively coded posed happy expressions, participants who viewed the forehead responded “happy” significantly less often compared to participants who viewed the eyes, nose or mouth.

4.4.1.2 Sadness.

Significant differences were found between the genuine and alternatively coded posed sad expressions as a function of regions. After viewing the mouth participants responded “sad” significantly more often to the posed sad expression compared to the genuine sad expression. For the genuine sad expression, participants who viewed the forehead were significantly less accurate than participants who viewed the eyes or mouth. For the alternatively coded posed sad expression, participants who viewed the forehead responded “sad” significantly less often compared to participants who viewed the eyes, nose and mouth. Participants who viewed the eyes or nose responded “sad” significantly less often than participants who viewed the mouth.

4.4.1.3 Fear.

No significant differences were found between responses for the genuine and alternatively coded posed fearful expressions as a function of regions. For both the genuine and alternatively coded posed fear expressions, participants responded “fear” significantly less often when they viewed the forehead, nose or mouth compared to participants who viewed the eyes.

As hypothesized some regions were more accurate than others when identifying an expression. The forehead, which was noted, by Ekman and Friesen (1975) not to contain any movement to inform a perceiver of a happy emotion was the region that had the least “happy” responses for the genuine happy expression. For the genuine sad expression, participants who viewed the forehead were significantly less accurate than all other regions. This finding is interesting because Ekman (2003) says that the brows are all that can be needed to identify sadness. As hypothesized, for the genuine fear expression, participants responded “fear” to the eyes more than any other region.

It was predicted that participants would be sensitive to the differences between a genuine and posed expression. After one reveal, only the sad expressions significantly differed in responses as a function of region and this was only after participants viewed the mouth, the posed sad expression had more “sad” responses than the genuine sad expression. This finding is surprising, as Ekman and Friesen (1975) said that when sadness is posed it will most likely be shown in the lower face. However, participants responded that the posed sad expression was significantly more “sad” than the genuine sad expression. Another interesting finding was that those who viewed the eyes for both the genuine and posed fear expressions had significantly more “fear” responses than all other expressions. Ekman and Friesen (1975) said that when posing fear it will most likely be shown in the eyes (and mouth). However, with the posed fear expression participants were responding “fear” significantly more often after viewing the eyes than any other region.

4.4.1.4 Forehead.

There were no significant differences in participants' accuracy for each of the expressions for participants who viewed the forehead.

4.4.1.5 Eyes.

Participants who viewed the eyes were significantly less accurate when identifying the sad expressions compared to participants identifying the happy expressions, participants were also significantly less accurate identifying the fear expressions compared to participants who identified the genuine happy expression.

4.4.1.6 Nose.

Participants who viewed the nose were significantly less accurate when identifying the fear expressions compared to participants who were identifying the posed sad and happy expressions, participants were also significantly less accurate when identifying the posed fear expression compared to participants who identified the genuine sad expression. Also, participants who were identifying the sad expressions were significantly less accurate compared to participants who were identifying the happy expressions.

4.4.1.7 Mouth.

Participants who viewed the mouth were significantly less accurate when identifying the fear expressions compared to the sad and happy expressions, participants who identified genuine sad were also significantly less accurate compared to posed sad and the happy expressions.

Interestingly there was no difference in accuracy between the expressions when viewing the forehead. The forehead was said to contain features important for the identification of sad and fear (Ekman & Friesen, 1975; Ekman, 2003). However, only a low proportion or no participants accurately identified sad or fear from the forehead. Participants were significantly more accurate identifying the genuine happy expression from the eyes than the genuine sad or fear expressions. This finding could be due to participants correctly identifying the genuine happy expression at greater rates overall than the sad or fear expressions. Another reason could be that participants were sensitive to the information in the eyes (the Duchenne Marker) in order to accurately identify the genuine happy expression. Unsurprisingly, participants were significantly more accurate identifying the genuine happy expression than the genuine sad or fear expressions when viewing the nose. This is because the nose was predicted to have the least accurate responses for sad and fear. As hypothesized, participants identifying genuine happy were significantly more accurate after viewing the mouth compared to all other expressions. This is not surprising as the mouth region contains the Lip Corner Puller (AU 12) which creates a smile. Participants in this experiment were sensitive to this change and used information from the mouth to accurately identify the genuine happy expression.

4.4.2 2nd Reveal.

Table 8

Proportion of participants' correct responses when identifying the expression when two regions were revealed, as a function of emotion, expression type and region. Number of participants in each cell is shown in parentheses. (Where: F = forehead, E = eyes, N = nose and M = mouth).

Emotion:	**Expression Type**	**F + E**	**F + N**	**E + M**	**N + M**
Happiness	*Genuine*	0.67 $_{ad}$ (12)	0.75 $_{ab}$ (8)	1.00 $_{c}$ (21)	0.93 $_{bc}$ (15)
	AC Posed	0.83 $_{dc}$ (18)	0.86 $_{bdc}$ (14)	1.00 $_{c}$ (15)	0.78 $_{bd}$ (9)
Sadness	*Genuine*	0.61 $_{ad}$ (18)	0.07 $_{ef}$ (14)	0.67 $_{a}$ (9)	0.80 $_{abd}$ (15)
	AC Posed	0.08 $_{e}$ (12)	0 $_{e}$ (17)	0.94 $_{c}$ (17)	0.50 $_{d}$ (10)
Fear	*Genuine*	0.58 $_{ad}$ (19)	0 $_{ef}$ (9)	0.43 $_{ag}$ (14)	0.07 $_{e}$ (14)
	AC Posed	0.71 $_{ad}$ (14)	0.27 $_{f}$ (11)	0.37 $_{fg}$ (19)	0 $_{e}$ (12)

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were computed both within emotions (between regions) and within regions (between emotions) as seen in Table 8.

4.4.2.1 Happiness.

No significant differences were found between responses for the genuine and alternatively coded posed happy expressions as a function of regions. For the genuine happy expression, participants who viewed the forehead and eyes were significantly less accurate than those who viewed the eyes or mouth and nose and mouth. Participants who viewed the forehead and nose were significantly less accurate than those who viewed the eyes and mouth. For the alternatively coded posed happy expression, participants who viewed the nose and mouth were significantly less accurate compared to participants who viewed the eyes and mouth.

4.4.2.2 Sadness.

Significant differences were found between the genuine and alternatively coded posed sad expressions as a function of regions. Participants who viewed the forehead and eyes responded “sad” significantly more often to the genuine expression compared to the alternatively coded posed expression. However, participants who saw the eyes and mouth combination responded “sad” significantly more often to the alternatively coded posed expression compared to the genuine expression. For the genuine sad expression, participants who viewed the forehead and nose were significantly less accurate compared to participants who viewed the forehead and eyes, eyes and mouth or nose and mouth. For the alternatively coded posed sad expression, participants who viewed the forehead and eyes or forehead and nose were significantly less accurate

than participants who viewed the eyes and mouth or nose and mouth. Participants who viewed the nose and mouth were also significantly less accurate compared to participants who viewed the eyes and mouth.

4.4.2.3 Fear.

No significant differences were found between responses for the genuine and alternatively coded posed fearful expressions as a function of regions. For the genuine fear expression, participants who viewed the forehead and nose or nose and mouth were significantly less accurate compared to participants who viewed the forehead and eyes or eyes and mouth. For the alternatively coded posed fear expression, participants who viewed the nose and mouth were significantly less accurate than the forehead and eyes or forehead and nose or eyes and mouth. Participants who viewed the forehead and nose or eyes and mouth were significantly less accurate than those who viewed the forehead and eyes.

Participants' accuracy for each of the expressions varied depending on which combination of regions they viewed. When identifying the genuine happy expression, participants who viewed the forehead and eyes were significantly less accurate compared to those who viewed the eyes and mouth or nose and mouth combinations. This is because the forehead does not contain much information value, whereas the mouth does, in the form of a smile (Lip Corner Puller (AU12). For the genuine sad expression participants who viewed the forehead and nose combination were significantly less accurate than combinations that contained the eyes or mouth. It is possible that participants are sensitive to information in the eyes or mouth regions, opposed to the forehead, which was suggested to be an important identifying feature

of a genuine sad expression (Ekman, 2003, Ekman & Friesen, 1975). The eyes, as predicted, were important for there accurate identification of the genuine fear expression. This is shown by the finding that participants who viewed the forehead and nose or nose and mouth were significantly less accurate than those who revealed the forehead and eyes or eyes and mouth.

It was predicted that participants would be sensitive to the differences between a genuine and posed expression. After two reveals, only the genuine and posed sad expressions significantly differed in responses as a function of region, after viewing the forehead and eyes or eyes and mouth. When participants viewed the forehead and eyes, participants responded “sad” significantly more to the genuine sad expression compared to the posed sad expression. However, when participants viewed the eyes and mouth, participants responded “sad” significantly more to the posed sad expression compared to the genuine sad expression. This is surprising, as Ekman and Friesen (1975) suggested that when sadness is being posed it is most likely seen in the mouth. However, it appears that the forehead is a more informative than the mouth, for perceivers to detect a posed sad expression. Participants did not differ in responses between the genuine and posed happy and fear expressions as a function of regions.

4.4.2.4 Forehead and eyes.

Participants who viewed the forehead and eyes were significantly less accurate when identifying the alternatively coded posed sad expression compared to all other expressions.

4.4.2.5 Forehead and nose.

Participants who viewed the forehead and nose were significantly less accurate when identifying the alternatively coded posed sad expression compared to participants identifying both happy expressions and the alternatively coded posed fear expression. Participants who identified the genuine sad and fear expressions were significantly less accurate than those who identified the happy expressions.

4.4.2.6 Eyes and mouth.

Participants who viewed the eyes and mouth were significantly less accurate when identifying alternatively coded posed fear compared to participants who were identifying the happy and sad expressions. Participants who were identifying genuine fear and genuine sad were significantly less accurate compared to participants who were identifying alternatively coded posed sad and the happy expressions.

4.4.2.7 Nose and mouth.

Participants who viewed the nose and mouth were significantly less accurate when identifying the fear expressions compared to participants who were identifying the happy and sad expressions. Participants who were identifying the alternatively coded posed sad expression were significantly less accurate compared to participants who were identifying the genuine happy expression.

Accuracy did differ between expressions depending on the regions they viewed. Overall the genuine happy expression was significantly more accurate than genuine sad or fear on the second reveal. In particular when participants viewed the forehead and nose and eyes and mouth, where genuine happy was significantly more accurate than genuine sad or fear. As hypothesized, the genuine fear expression was the least

accurately identified expression when participants viewed the nose and mouth. This was because the nose and mouth were thought to contain less information value than the forehead or eyes.

4.4.3 3rd Reveal.

Table 9

Proportion of participants' correct responses when identifying the expression when three regions were revealed, as a function of emotion, expression type and region. Number of participants in each cell is shown in parentheses. (Where: F = forehead, E = eyes, N = nose and M = mouth).

Emotion:	**Expression Type:**	**F + E + N**	**F + E + M**	**F + N + M**	**E +N + M**
Happiness	*Genuine*	0.86_{ab} (7)	1.00_{a} (18)	1.00_{a} (13)	1.00_{a} (18)
	AC Posed	1.00_{b} (19)	1.00_{ab} (12)	0.89_{abc} (9)	0.88_{abc} (16)
Sadness	*Genuine*	0.70_{ac} (20)	0.71_{cf} (14)	0.67_{c} (12)	0.70_{cf} (10)
	AC Posed	0.07_{d} (14)	0.33_{e} (15)	0.29_{de} (17)	0.80_{cf} (10)
Fear	*Genuine*	0.57_{af} (14)	0.39_{ef} (13)	0.15_{eg} (13)	0.56_{f} (16)
	AC Posed	0.79_{a} (14)	0.54_{ef} (13)	0_{g} (13)	0.50_{f} (16)

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were computed both within emotions (between regions) and within regions (between emotions) as seen in Table 9.

4.4.3.1 Happiness.

No significant differences were found between responses for the genuine and alternatively coded posed happy expressions as a function of regions. For both of the happy expressions, there were no significant differences in accuracy as a function of the combination of regions viewed by the participants.

4.4.3.2 Sadness.

Significant differences were found between the genuine and alternatively coded posed sad expressions as a function of regions. Participants who viewed the forehead, eyes and nose or forehead, eyes and mouth or forehead, nose and mouth all responded "sad" significantly more often to the genuine expression compared to the alternatively coded posed expression. For the genuine sad expression there were no significant differences in accuracy as a function of the combination of regions viewed by the participants. For the alternatively coded posed sad expression, participants who viewed the forehead, eyes and nose were significantly less accurate than those who viewed the forehead, eyes and mouth or eyes, nose and mouth. Participants who viewed the forehead, eyes and mouth or forehead, nose and mouth were significantly less accurate than those who viewed the eyes, nose and mouth.

4.4.3.3 Fear.

No significant differences were found between responses for the genuine and alternatively coded posed fear expressions as a function of regions. For the genuine fear expression, participants who viewed the forehead, nose and mouth were significantly less accurate than those who viewed the forehead, eyes and nose or eyes, nose and mouth. For the alternatively coded posed fear expression, participants who viewed the forehead, nose and mouth were significantly less accurate than those who viewed the forehead, eyes and nose; forehead, eyes and mouth or eyes, nose and mouth. Participants who viewed the forehead, eyes and mouth or eyes, nose and mouth were also significantly less accurate than the forehead, eyes and nose.

For both the genuine happy and sad expressions, there were no significant differences in accuracy between region combinations after three reveals. It is possible that on three reveals, after seeing half of the face it does not matter which regions participants view as they have enough information to accurately identify the emotion. However, when participants were identifying the genuine fear expression, those who viewed the forehead, nose and mouth were significantly less accurate compared to the forehead, eyes and nose or eyes, nose and mouth. This shows that the eyes are still a key feature when participants are trying to identify the genuine fearful.

It was predicted that participants would be sensitive to the differences between a genuine and posed expression. After three reveals, only the genuine and posed sad expressions significantly differed in terms of responses after viewing the forehead, eyes and nose or forehead, eyes and mouth or forehead, nose and mouth. Participants who viewed these region combinations responded “sad” significantly more often to the genuine sad expression compared to the posed sad expression. This could be due

to information in the posed sad expression's forehead that participants are sensitive to that informs that the expression is not feeling sad. They eyes, nose and mouth combination (the only region that does not include the forehead) was the only combination where participants responses to the genuine sad expression does not significantly differ from the posed sad expression. Therefore, there must be information in the forehead of the posed sad expression that does not inform participants of a genuine sad expression. Participants did not differ in responses between genuine and posed happy and fear expressions as a function of regions.

4.4.3.4 Forehead, eyes and nose.

Participants who viewed the forehead, eyes and nose were significantly less accurate identifying alternatively coded posed sad compared to all other expressions. Participants who were identifying genuine sad and the fear expressions were significantly less accurate than those who were identifying alternatively coded posed happy.

4.4.3.5 Forehead, eyes and mouth.

Participants who viewed the forehead, eyes and mouth were significantly less accurate identifying alternatively coded posed sad than those who were identifying the happy expressions and genuine sad expression. Participants who were identifying the fear expressions and genuine sad were significantly less accurate than the happy expressions.

4.4.3.6 Forehead, nose and mouth.

Participants who viewed the forehead, nose and mouth were significantly less accurate identifying alternatively coded posed fear than those who were identifying the happy and sad expressions. Participants who were identifying alternatively coded posed sad and genuine fear were significantly less accurate than the happy expressions and genuine sad expression. Participants who were identifying the genuine sad expression were significantly less accurate than the genuine happy expression.

4.4.3.7 Eyes, nose and mouth.

Participants who viewed the eyes, nose and mouth were significantly less accurate identifying the fear expressions than those who were identifying the happy expressions. Participants who were identifying the sad expressions were significantly less accurate than those who were identifying the genuine happy expression.

Accuracy did differ between expressions depending on the regions they viewed. Overall, for the genuine happy expression, participants were significantly more accurate after viewing the forehead, eyes and mouth or eyes, nose and mouth compared to the genuine sad or fear expressions. It was predicted that region combinations that contained the eyes and mouth for the genuine happy expression would be more informative and accurate than combinations that did not contain these regions. Participants were also significantly less accurate identifying the genuine fear expression after viewing the forehead, nose and mouth compared to the genuine happy and sad expressions. This is the only combination that does not include the eyes, which contain information important to identifying fear.

4.5 Alternative Responses.

Even when the target's whole face was available to participants, participants were still incorrectly identifying the target's emotion. Table 10 shows participants' responses after the last reveal (when the whole face is visible) for each expression. The following analysis looked at the nature of incorrect responses as opposed to whether the participant was correct, as analysed in the above analyses. Of interest here was whether participants were making any systematic errors, that is, whether participants were more likely to mistakenly identify an emotion as another specific emotion as opposed to an even distribution of errors across all of the remaining response options. As before, as no specific predictions have been made for the neutral expression, neutral was not considered in the following analysis.

Table 10

The proportion of responses made as a function of expression after the last reveal.

	Anger	**Happy**	**Disgust**	**Fear**	**Sad**	**Surprise**	**Neutral**	**None of these**
Genuine Happiness	0_{b}	0.98_{a}	0_{b}	0_{b}	0_{b}	0_{b}	0_{b}	0.02_{b}
Posed Happiness	0_{b}	0.94_{a}	0_{b}	0_{b}	0_{b}	0.04_{b}	0_{b}	0.02_{b}
Genuine Sadness	0.05_{c}	0_{b}	0.02_{bc}	0_{b}	0.75_{d}	0_{b}	0.16_{a}	0.02_{b}
Posed Sadness	0.05_{c}	0_{b}	0.21_{a}	0.02_{b}	0.30_{a}	0.20_{a}	0.02_{b}	0.20_{a}
Genuine Fear	0_{b}	0.02_{b}	0.11_{ac}	0.41_{d}	0_{b}	0.43_{d}	0_{b}	0.04_{bc}
Posed Fear	0.02_{bc}	0_{b}	0.07_{c}	0.39_{d}	0_{b}	0.48_{d}	0_{b}	0.04_{bc}

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were computed within each expression (between response options) as seen in Table 10.

Previous research has shown that when participants respond incorrectly to an expression their choices are not random (Russell, 1994). Genuine happy was the most accurately identified emotion. However, considering the available response options it is only one of two possible “positive” responses (other than surprise). This could be one possible region why happiness was not confused with others. However, happiness has also been shown to be highly accurately identified in previous studies (Ekman et al., 1969; Izard, 1971), showing that perceivers are very good at identifying genuine happy expressions. The genuine sad expression after being accurately identified as “sad”, the next significant number of responses was “neutral”. Kimihiro and Naitoh (2003) also found that even up until their last maximally expressed sad photo there were still “neutral” responses. As hypothesized, for genuine fearful, participants confused this expression with surprise. This finding was the same as that found by Kimihiro and Naitoh. Also Ekman and Friesen (1975) say that fearful and surprised facial expressions share similar characteristics.

5 Experiment 2: Participant Reveals

5.1 Overview

Experiment 2 was carried out in order to extend the findings of the previous Experiment. This experiment utilised the same facial expressions from Experiment 1 (genuine and posed expressions of happy, sad and fearful emotions), including the mask that was divided into four sections (these regions included: forehead/eyebrows, eyes, nose/cheeks and mouth). However, instead of an experimenter revealing regions, participants were asked to reveal their own choice of region in response to identifying a happy, sad or fearful emotion. After revealing the region, participants then had to respond if the displayer was feeling the emotion they were identifying by selecting “yes” or “no”, as well as a rating of how confident they felt that their answer was correct. A correct response to a genuine expression was to select “yes” as the displayer was feeling the emotion and “no” to a posed expression as they were not feeling the emotion. Participants continued revealing until the entire face was visible.

It was hypothesized that participants would first reveal regions that would be more informative than others and therefore, reveal regions that would increase their accuracy. The regions that were predicted to be more informative and therefore, increase accuracy will also be regions that participants reveal before others. Participants were hypothesized to be more accurate identifying the genuine expressions of emotion compared to the posed expressions. It was also hypothesized that participants would be more accurate as more of the face is revealed. Regions that were predicted to contain more information value were regions participants would reveal before others and also be regions where participants would be more accurate than others (Refer to Tables 1 – 3).

6 Method

6.1 Participants.

Thirty females from the University of Canterbury who had not participated in Experiment 1, volunteered to participate in return for a $5 voucher that could be redeemed at campus stores.

6.2 Experimental Materials.

Each participant received a response sheet (see Appendix F for an example)

Twenty one target faces were used, consisting of three sets of the 7 target expressions (genuine happiness, posed happiness, genuine sadness, posed sadness, genuine fear, posed fear and neutral) that were used in Experiment 1 (see Appendix B for each target face used). The same faces were masked with four strips in the same manner as Experiment 1. Each strip was numbered 1 – 4 along the right hand side, 1 = Forehead, 2 = Eyes, 3 = Nose and 4 = Mouth. The faces were labelled 1 through to 21 on the left hand side of each strip and on the left hand corner of the target face, where each face represented a different expression paired with a different question. Each of the seven target expressions was paired with each of the three questions: “Is this person feeling happy?” “Is this person feeling sad?” “Is this person feeling fearful?” The faces were shown to each participant in a unique random order (See Appendix I).

A practice trial face, with a neutral expression that was generated in the University of Canterbury’s Social Perception Laboratory (McLellan, 2006), from an individual who is not in the experimental trials was used. A separate mask was generated by applying an image filter (stained glass) in Adobe Photoshop software to obscure the neutral

expression of the practice target's face (See Appendix C for an example of the mask used). The practice trial face was masked with four strips in the same manner as Experiment 1.

6.3 Procedure.

Participants completed the task individually. Each participant was seated at a table with the experimenter sitting by her side. First, the participant was given an Information Sheet (see Appendix G) that outlined the experiment. The Information Sheet informed the participant that she would see a number of faces and for each face she would be asked to make a judgment about whether the person was feeling a specific emotion (happiness, sadness, fear) or not and record a confidence rating on a horizontal line to show how confident she was that her judgment was correct; it also informed her that there were twenty-one faces in total and each face was blurred by a mask. The Information Sheet also informed participants that the experiment was interested in whether perceivers could tell what another person is actually feeling. Particular emphasis was put on "what the target is feeling rather than showing". The experimenter then described the following scenario "You are walking along and you run into a person you do not like, however, you smile and wave at them. Do you understand that you can look happy to see this person but you are not actually happy to see them?" The participant then responded that she understood. The experimenter then answered any questions participants had before beginning the trials.

The participant first took part in a practice trial with the experimenter. The practice trial consisted of a sex identification task. Half the participants were asked if the person was male the other half were asked if the person was a female. The participant

then had to remove a strip of her choice in order to determine the sex of the practical trial face. She then had to respond “yes” or “no” and record the number of the number of the strip that she had removed. The participant was then asked “How confident are you that the answer you have circled is correct?” The participant made a vertical mark on an analogue scale that measured 133 mm, where the left hand of the scale was labelled “Extremely Unconfident” and the right hand “Extremely Confident”. The participant’s confidence ratings were scored (in mm) by measuring the distance from the left hand side labelled “Extremely Unconfident” to the participant’s mark. Therefore, confidence ratings could potentially range from 0 – 133. The participant responded to all three questions after each of the four strips had been removed until the face was completely exposed.

The participant was then shown the neutral photograph of the target for the subsequent trials. She was told that the following trials were now the actual experimental trials and the participant was also reminded that even though the person may appear “happy”, for example, this did not necessarily mean that the person was feeling happy. Each trial consisted of 21 photographs which were made up of one of three questions paired with one of the seven expressions seen in a unique random order for each participant. The participant was told then to write the emotion she was looking for: “happy”, “sad” or “fearful” at the top of the page beside “Emotion”. The participant was also told to make sure that the number on the left hand side of the photograph corresponded to the number of the face on the top left hand side of her response sheet for each photograph and that she could not start the next photograph until she had answered all of the questions for the current photo. She then had to remove a strip from the target face, record the number of the strip that she had

removed. The participant then had to decide if the target face was happy/ sad/ fearful by selecting “yes” or “no”. A correct response to the genuine happy, sad or fear expression was for the participant to respond “yes”. A correct response to the posed happy, sad or fear expression was for the participant to respond “no” as the displayer was not feeling any emotion. When recoding the posed expressions in the same way as previous studies (e.g. Ekman et al., 1969; Izard, 1971), for comparison purposes, a correct response to an alternatively coded posed expression would be for the participant to respond “yes”. The participant then answered the question “How confident are you that the answer you have circled is correct?” The participant recorded her confidence on an analogue scale that measured 133 mm, where the left hand side represented “extremely unconfident” and the right hand side represented “extremely confident”. She then repeated this for all strips, placing the strips in a pile. After revealing the target photo she then placed the target photo upside down beside her in a separate pile. After completing the practice trial the experimenter left the participant to complete the remaining 21 trials by herself. However, she remained in the room or nearby to ensure that the participant was following instructions or in case the participant had any questions.

After completing all of the trials, the participant was debriefed, thanked for her participation and paid. This experiment was reviewed and approved by the University of Canterbury Human Ethics Committee.

7 Results and Discussion

The first set of analyses considered the proportion of "yes" responses as a function of the emotion (happy, sad or fearful), the nature of the expression (posed or genuine expression of the target emotion) and the number of reveals. The second set of analyses considered the proportion of participants revealing each region, as a function of the target question for the first reveal and as a function of the emotion and expression types for the second and third reveals. This was followed by analysis of participants' "yes" responses when they were identifying whether the target was feeling the target emotion as a function of the nature of the information available, specifically the regions of the face that were available to the perceivers when they made their judgments of the target's emotional state after the first, second and third reveals. Only the posed and genuine expressions of each of the target emotion (happy, sad or fear) are considered in all the following analyses.[5] That is, when the question being asked of participants was "Is the person feeling happy?" only the posed and genuine expressions of happiness are analyzed and similarly for posed and genuine expressions of sadness and fear when the question was focused on the target feeling sad or fearful respectively.

7.1 Accuracy as a function of the amount of information available.

Accuracy was determined using the criteria outlined in the method section, such that an accurate response to a genuine expression was to identify that the target was indeed feeling the specified emotion, which is to respond "yes" to the question of whether the target was feeling happy/sad/fearful. An accurate response to a posed expression was

[5] All other expressions were accurately identified by a high proportion of participants (> .60) as the target not feeling the specified emotion (happy, sad or fearful), after one or more regions of the face had been revealed.

to identify that the target was not feeling the specified emotion, and hence to respond "no" to the question of whether she was feeling happy/sad/fearful. Given the propensity of participants to respond "yes" to the question of whether the target was feeling happy/sad/fearful (mean "yes" response = .81), rather than comparing mean accuracy rates across condition, we compared mean "yes" responses (for genuine expressions "yes" response rate and accuracy rate are synonymous and for posed expressions the "yes" response rate is the antonym of accuracy rate). The ability of perceivers to differentiate between posed and genuine expressions will be manifested in significant differences in the "yes" response rate. The proportion of "yes" responses shown in Table 11 shows that overall participants were very accurate in identifying that a target displaying a genuine expression was feeling the specified emotion but were rather inaccurate in identifying that a target displaying a posed expression was not feeling the specified emotion. Therefore, Table 11 shows that for the posed expressions (happy, sad and fear), participants identified the posed expressions as feeling happy, sad or fear for their respective expressions.

Table 11

Proportion of participants who responded "yes" to the question of whether the target was feeling the specified emotion as a function of emotion, expression type and number of reveals.

Emotion:	**Expression Type:**	**After 1 Reveal:**	**After 2 Reveals:**	**After 3 Reveals:**	**After 4 Reveals:**
Happiness	*Genuine*	1.00_{d}	1.00_{d}	1.00_{d}	1.00_{d}
	Posed	0.83_{a}	0.90_{a}	0.87_{ae}	0.80_{ac}
Sadness	*Genuine*	0.70_{a}	0.87_{ab}	0.93_{bde}	0.90_{bcd}
	Posed	0.63_{a}	0.70_{a}	0.63_{a}	0.57_{a}
Fear	*Genuine*	0.63_{a}	0.80_{ae}	0.83_{ce}	0.80_{ace}
	Posed	0.80_{a}	0.80_{a}	0.73_{ac}	0.63_{a}

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were computed both within emotion (between reveals) and within reveals (between emotions) as seen in Table 11.

To further investigate these findings, a 3 (Emotion: happy/sad/fear) x 2 (Expression Type: Genuine/ Posed) x 4 (Number of reveals: 1/2/3/4) repeated measures ANOVA was conducted on "yes" responses. Significant main effects were found for emotion F (2, 58) = 7.49, $p < 0.01$, expression type F (1, 29) = 6.64, $p < 0.01$, and for the number of reveals F (3, 87) = 2.80, $p < 0.04$. In addition there was significant 2-way

interaction between expression type and the number of reveals F (3, 87) = 4.40, $p < 0.01$.

Post hoc tests (Tukey, *a*, $p < 0.01$) were carried out to analyse these main effects. For the main effect of emotion, participants responded “yes” significantly more when identifying the happy expressions compared to the sad (Ms = 0.92 vs. 0.74) and fear (Ms = 0.92 vs. 0.77). For the main effect of expression type, participants responded “yes” significantly more when identifying the genuine expressions compared to the posed expressions (Ms = 0.87 vs. 0.75). For the main effect of the number of reveals, no significant differences were found between reveals however, participants were responding “yes” more after the second reveal compared to the first reveal (Ms = 0.84 vs. 0.77) and this difference tended towards significance ($p < 0.05$). Post hoc tests (Tukey, *a*, $p < 0.01$) were carried out in order to analyse the significant 2-way interaction between expression type and the number of reveals, for the genuine expressions, participants responded “yes” significantly more after four reveals than after one reveal (Ms = 0.90 vs. 0.78). Participants also responded “yes” significantly more after three reveals than after one reveal (Ms = 0.92 vs. 0.78). No differences were found between reveals for the alternatively coded posed expressions. Participants responded “yes” significantly more when identifying the genuine expressions compared to the alternatively coded posed expressions after three reveals (Ms = 0.92 vs. 0.74) and after four reveals (Ms = 0.90 vs. 0.70).

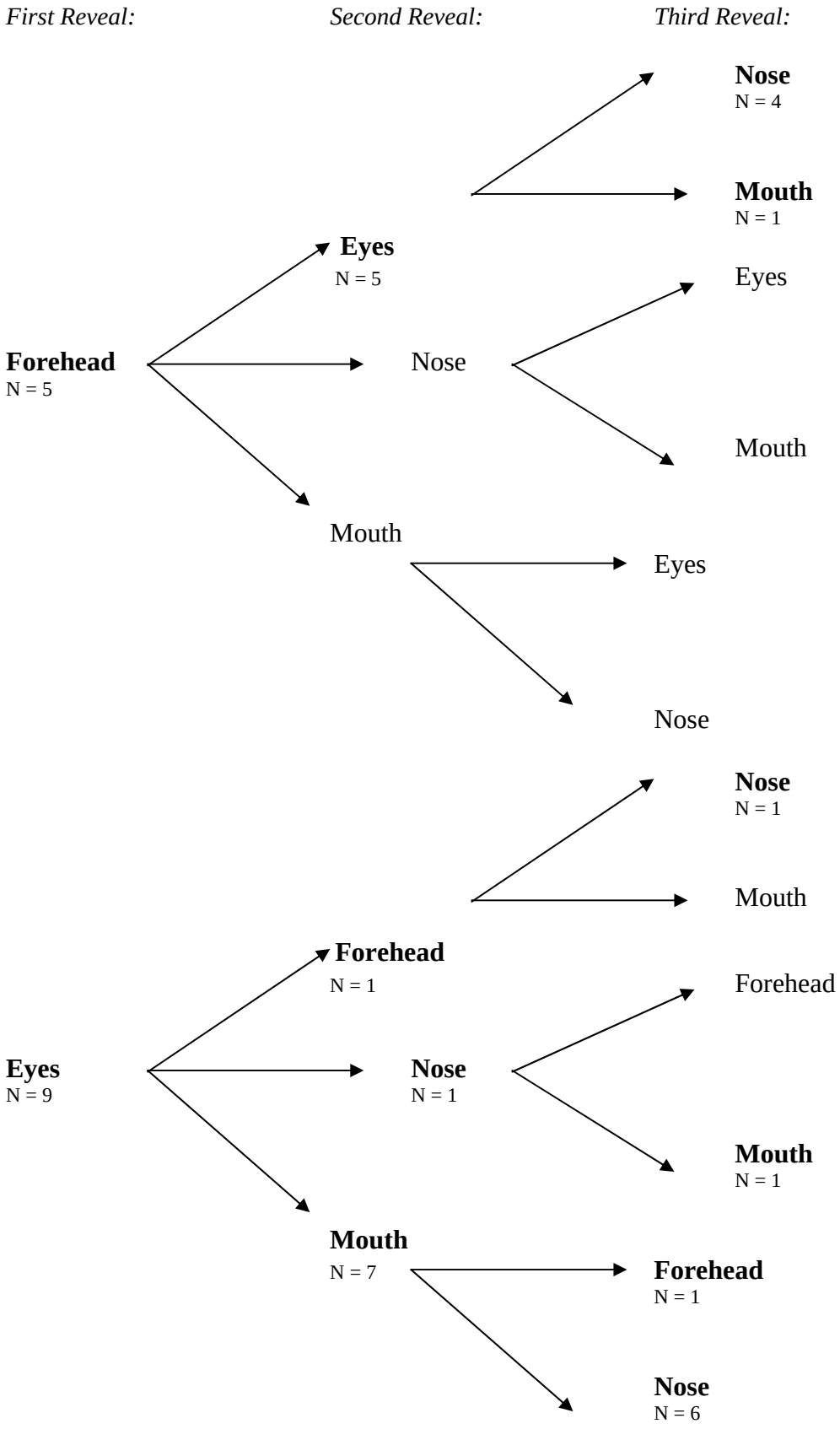
Participants’ accuracy was very high, even after the first reveal, showing that participants can accurately identify a genuine expression of emotion, even when the information is limited. As hypothesized, the genuine happy expression was

significantly more accurate than either the genuine sad or genuine fear expressions. Most interesting are the results from Table 11, which show that participants “yes” responses significantly differ between genuine and posed expressions of happy and sad. After each reveal, the genuine happy expression has significantly more “yes” responses than the posed happy expression. However, only after reveals three and four does the genuine sad expression significantly differ from the posed sad expression in terms of “yes” responses. This shows that participants require more information in order to differentiate between genuine and posed sad. Unlike the happy and sad expressions, participants did not differentiate between a genuine and posed fear expression in terms of “yes” responses.

7.2 Order of Revealing of Regions of the Face.

By allowing participants’ to reveal their own choice of region, it shows which regions participants are attending to in order to accurately identify an emotion. Tree diagrams are presented (Figures 9-14) for each of the target expressions (genuine happy, posed happy, genuine sad, posed sad, genuine fear and posed fear), when asked if the displayer was feeling the respective emotion (happy, sad or fearful). Each tree diagram begins on the left-hand side, with four individual tree diagrams for each region that participants are able to reveal first - the forehead, the eyes, the nose, or mouth. The number of participants who revealed the respective region is given underneath the region. The second reveal then consists of the three remaining region options; these options follow on from the first region by right facing arrows. The number of participants who then selected the second region is given underneath the second region selected. The third reveal then consists of the two remaining region options; these options follow on from the second region by right facing arrows. The

number of participants who selected the third region is given underneath the third selected region. The fourth reveal is not shown as by choosing to reveal a region for their third reveal; participants are also choosing what region they reveal for their last reveal. All region combinations that were revealed by participants are highlighted in bold and region combinations that were not revealed are not in bold.


First Reveal:
Second Reveal:
Third Reveal:
Nose
N = 4
Mouth
N = 1
Eyes
N = 5
Eyes
Forehead
N = 5
Nose
Mouth
Mouth
Eyes
Nose
Nose
N = 1
Mouth
Forehead
N = 1
Forehead
Eyes
N = 9
Nose
N = 1
Mouth
N = 1
Mouth
N = 7
Forehead
N = 1
Nose
N = 6

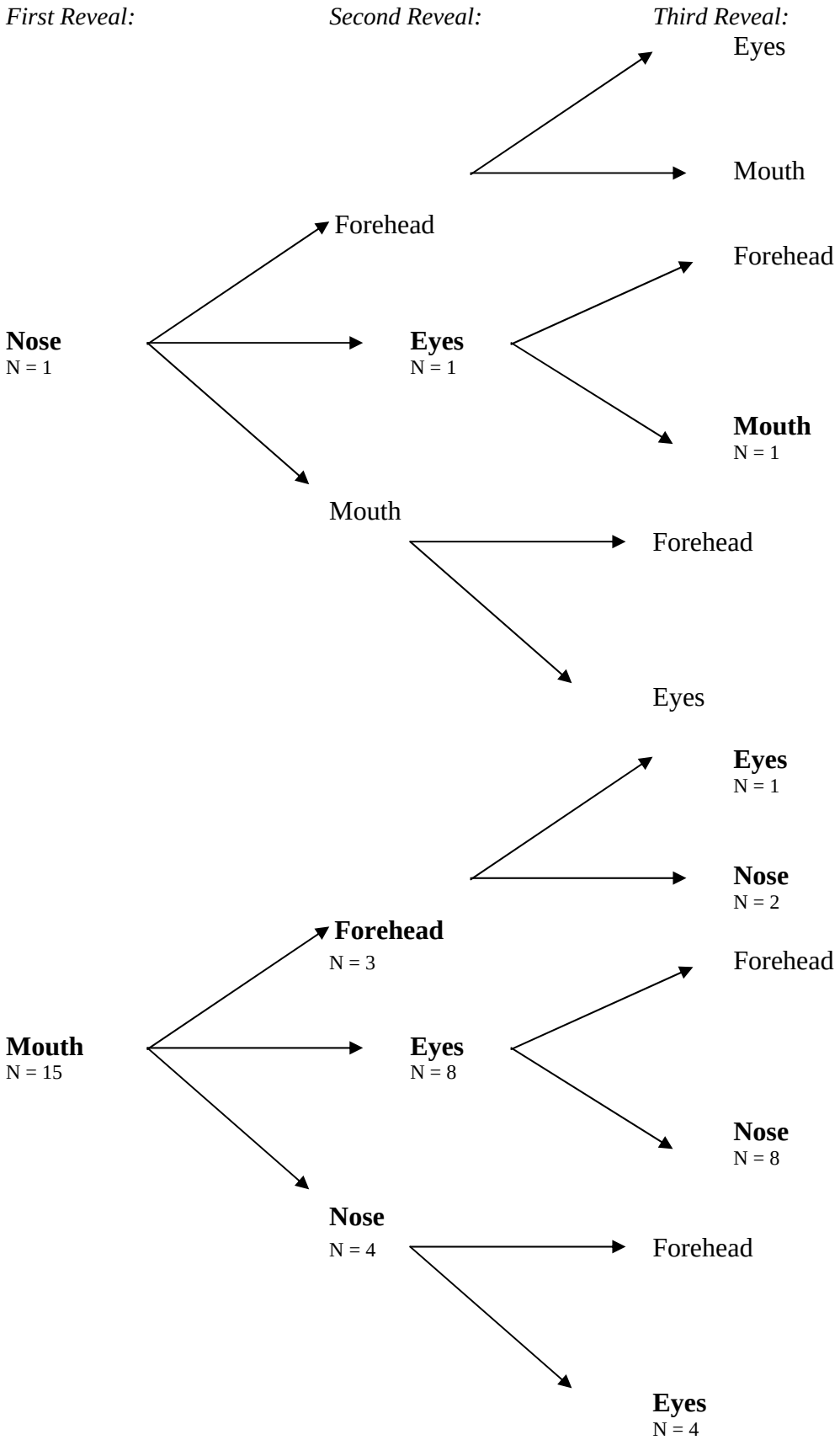
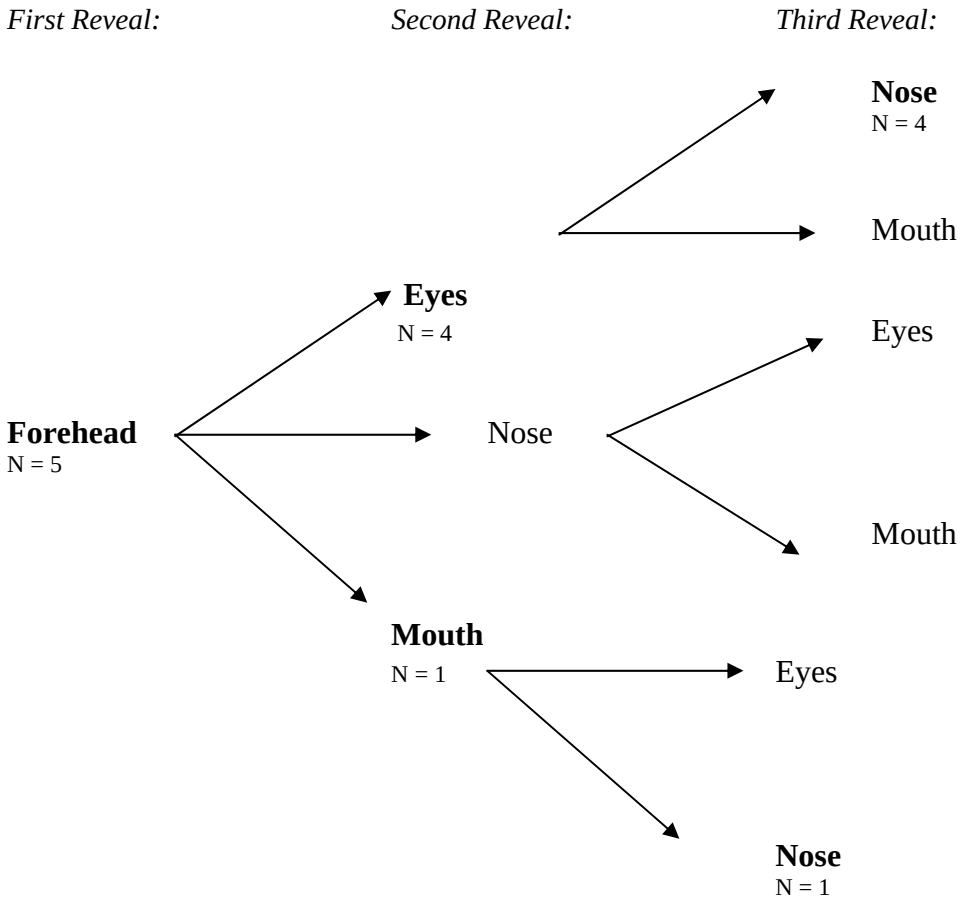
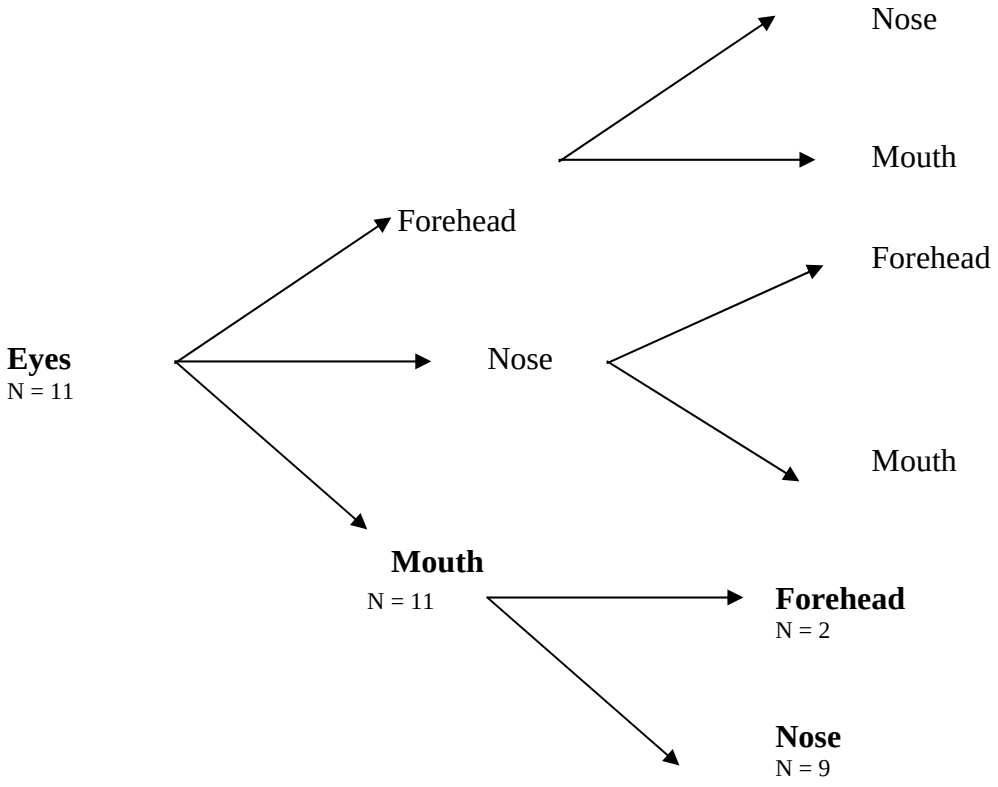


Figure 9. Regions of the face revealed for the genuine happy expression in response to the question “Is this person feeling happy?”.


First Reveal:
Second Reveal:
Third Reveal:
Nose
N = 4
Mouth
Eyes
N = 4
Eyes
Forehead
N = 5
Nose
Mouth
Mouth
N = 1
Eyes
Nose
N = 1


Nose
Mouth
Forehead
Forehead
Eyes
N = 11
Nose
Mouth
Mouth
N = 11
Forehead
N = 2
Nose
N = 9

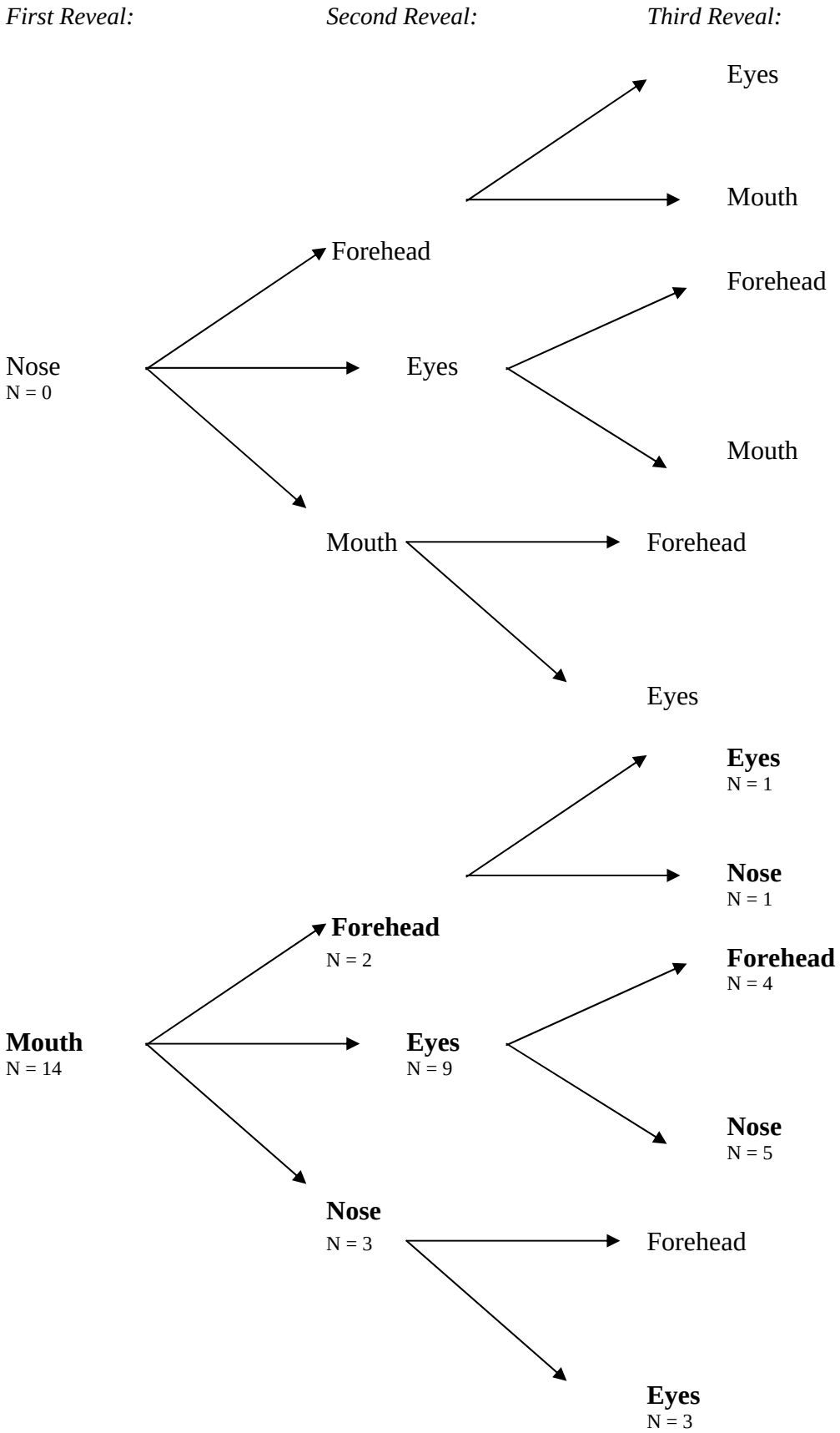
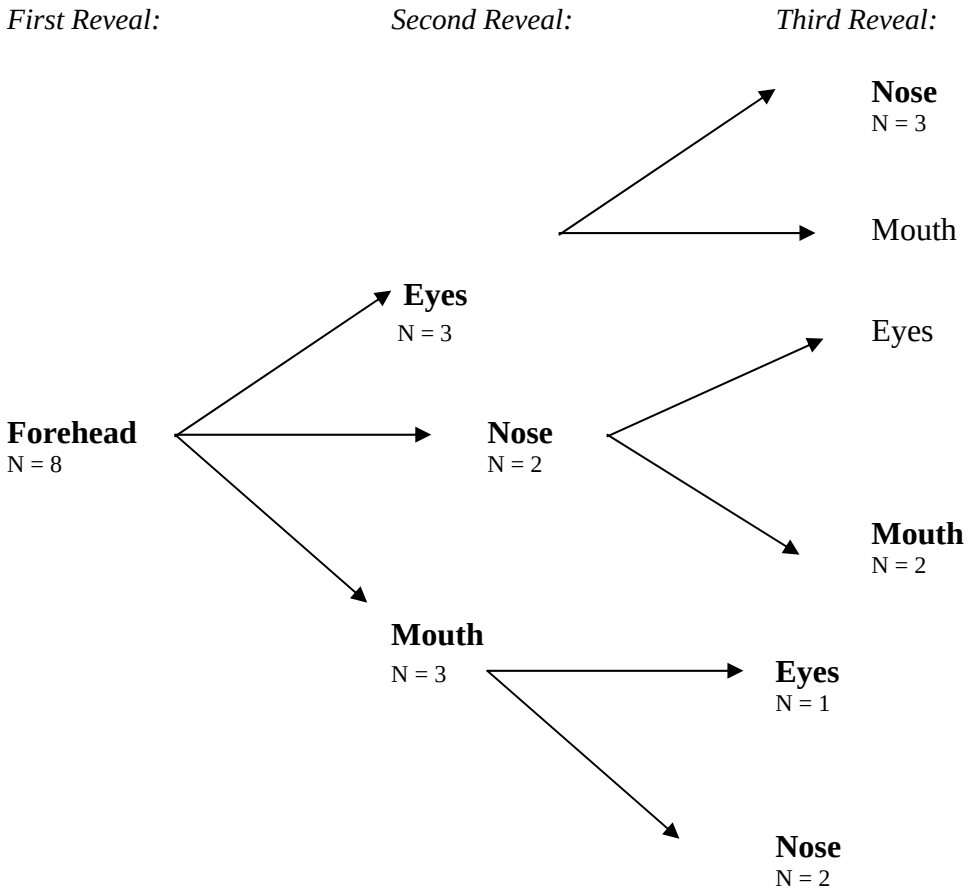
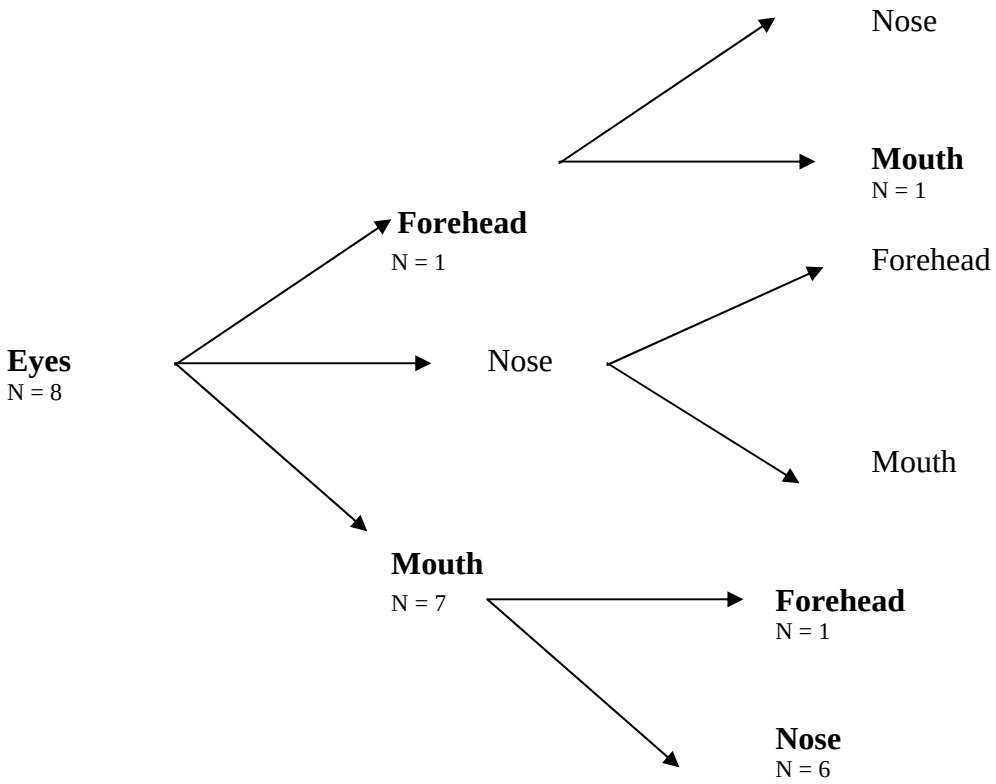


Figure 10. Regions of the face revealed for the posed happy expression in response to the question “Is this person feeling happy?”.


First Reveal:
Second Reveal:
Third Reveal:
Nose
N = 3
Mouth
Eyes
N = 3
Eyes
Forehead
N = 8
Nose
N = 2
Mouth
N = 2
Mouth
N = 3
Eyes
N = 1
Nose
N = 2


Nose
Mouth
N = 1
Forehead
N = 1
Forehead
Eyes
N = 8
Nose
Mouth
Mouth
N = 7
Forehead
N = 1
Nose
N = 6

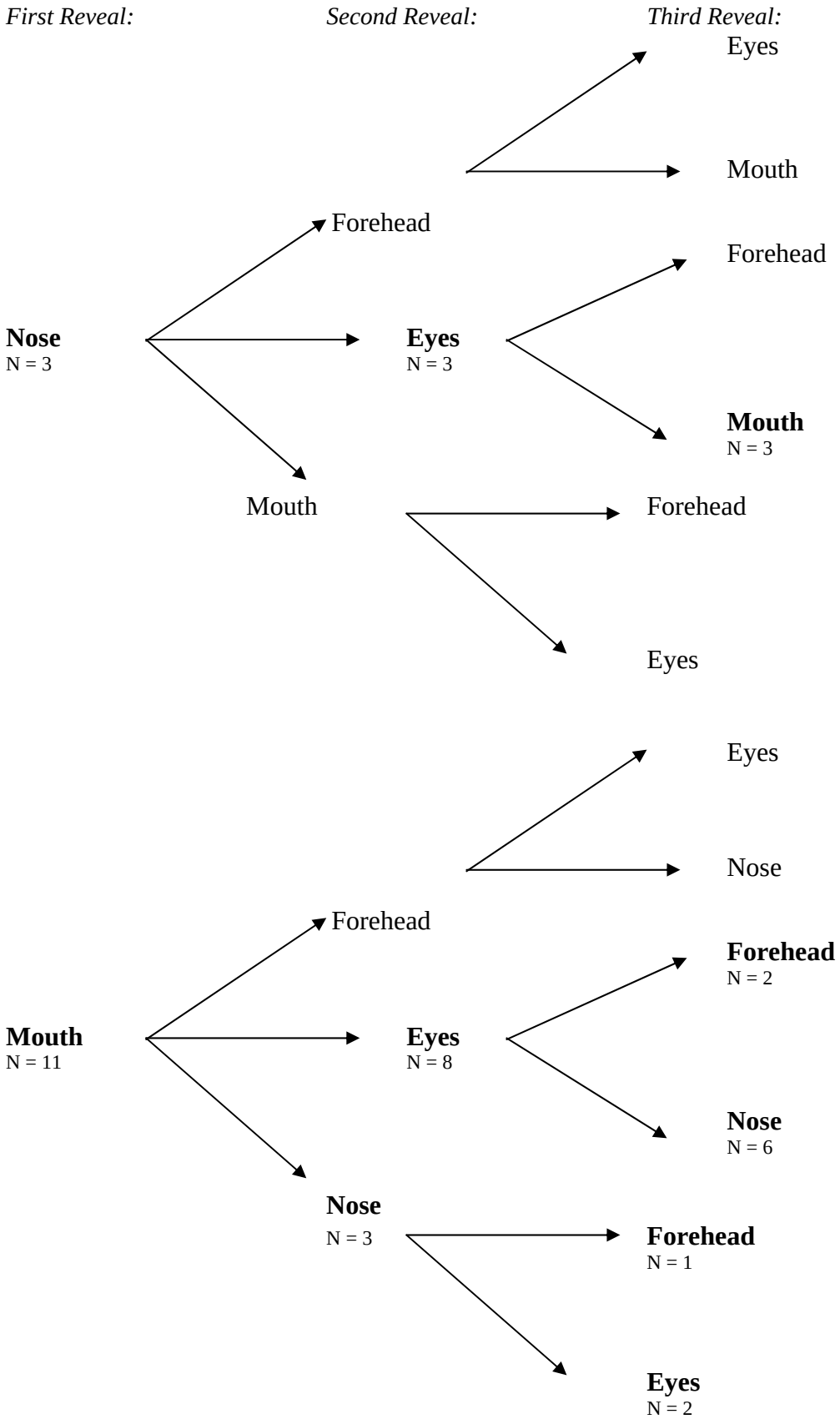
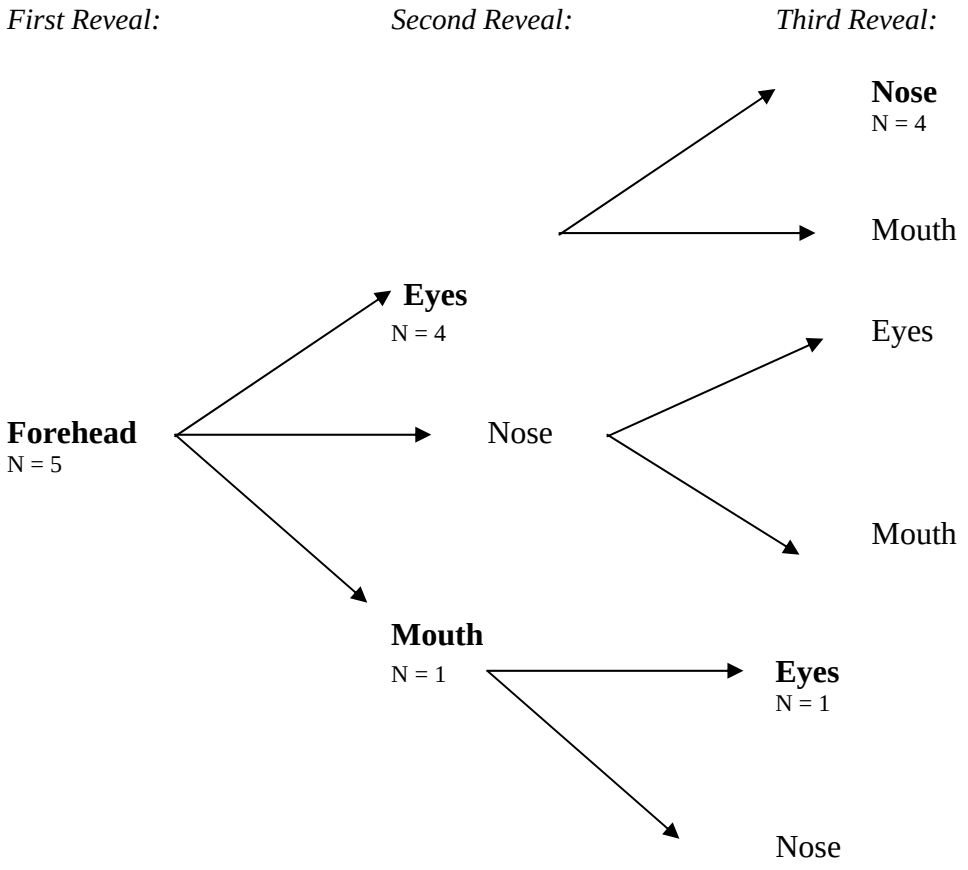
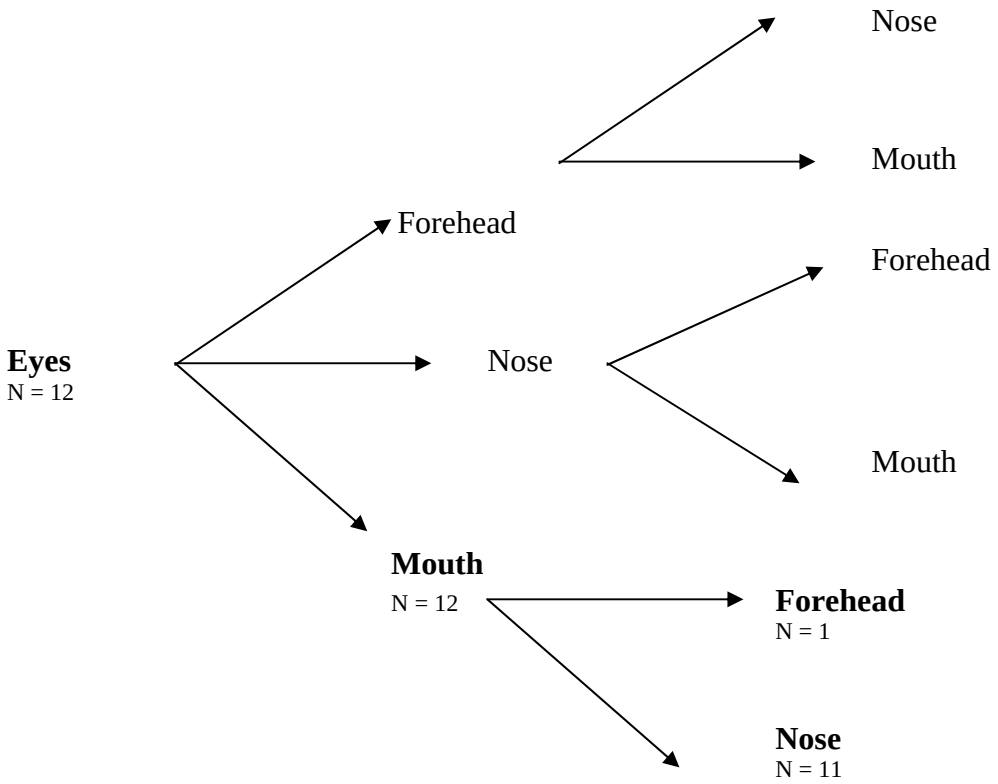


Figure 11. Regions of the face revealed for the genuine sad expression in response to the question “Is this person feeling sad?”.


First Reveal:
Second Reveal:
Third Reveal:
Nose
N = 4
Mouth
Eyes
N = 4
Eyes
Forehead
N = 5
Nose
Mouth
Mouth
N = 1
Eyes
N = 1
Nose


Nose
Mouth
Forehead
Forehead
Eyes
N = 12
Nose
Mouth
Mouth
N = 12
Forehead
N = 1
Nose
N = 11

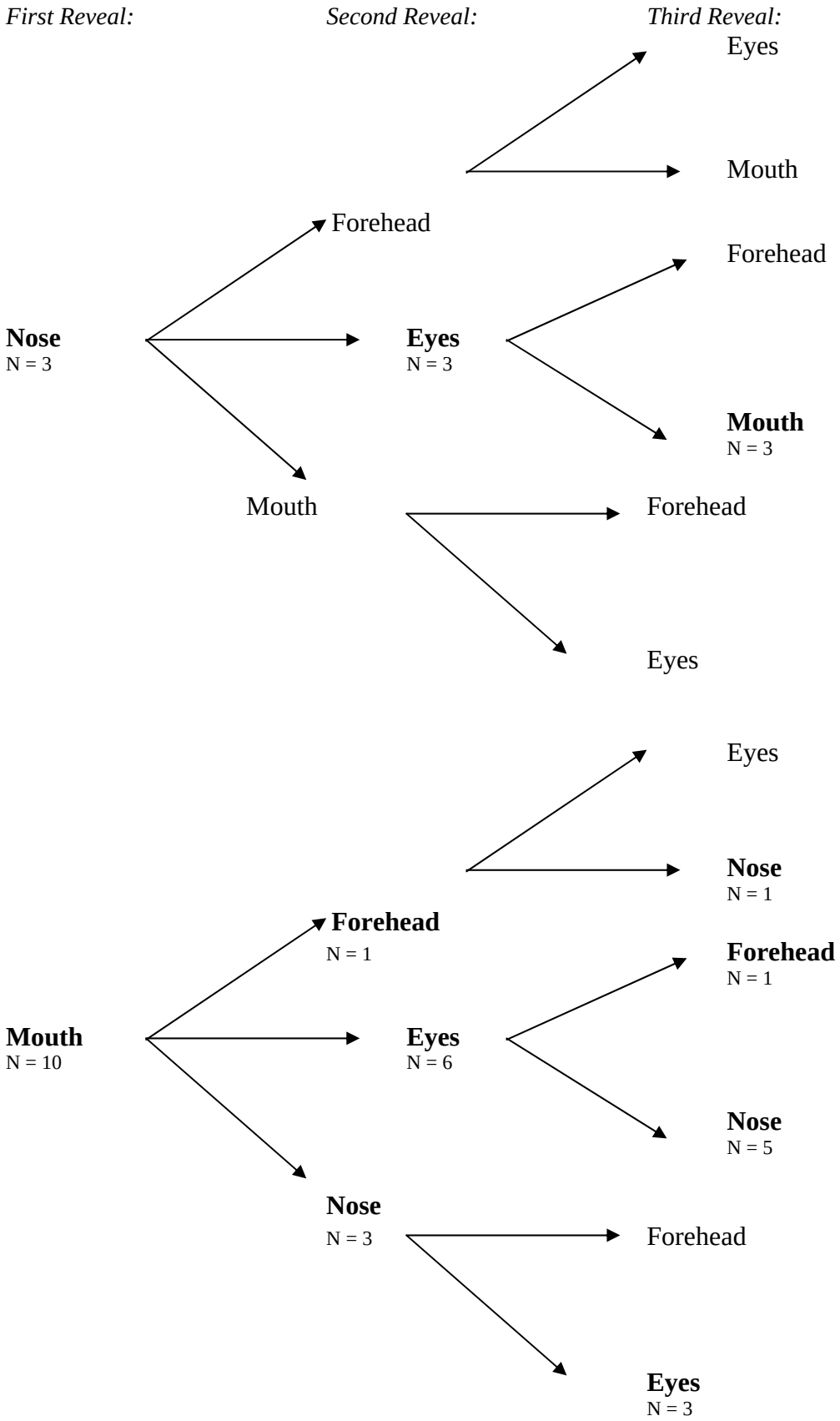
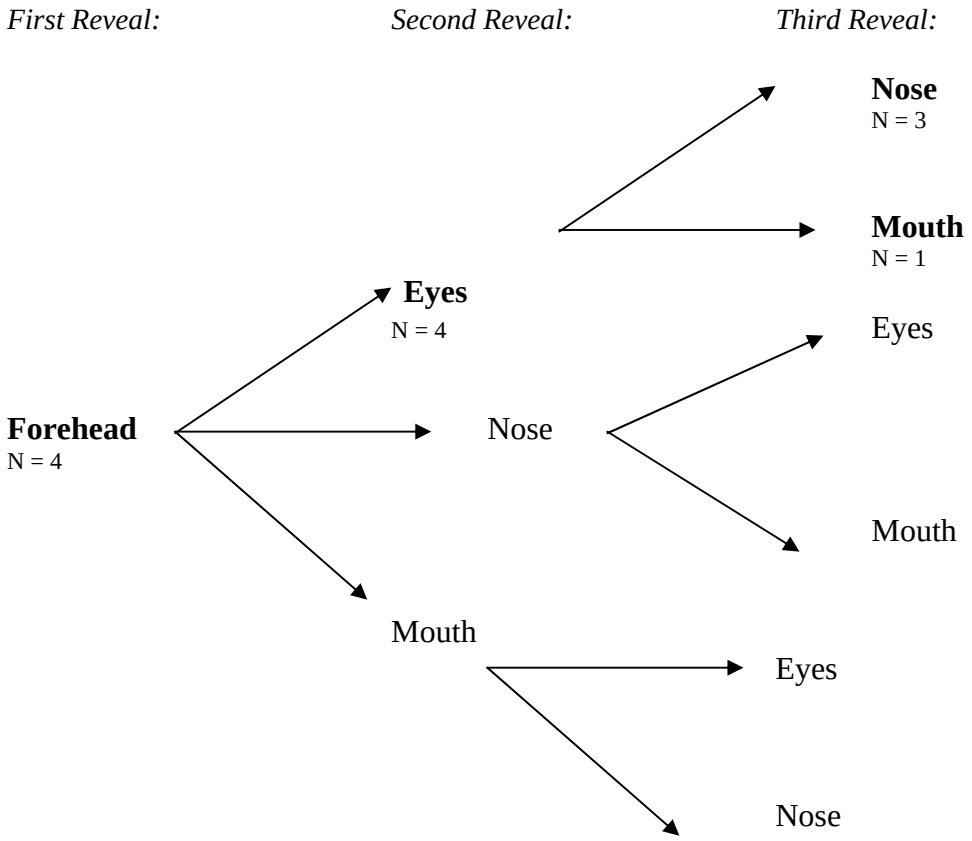
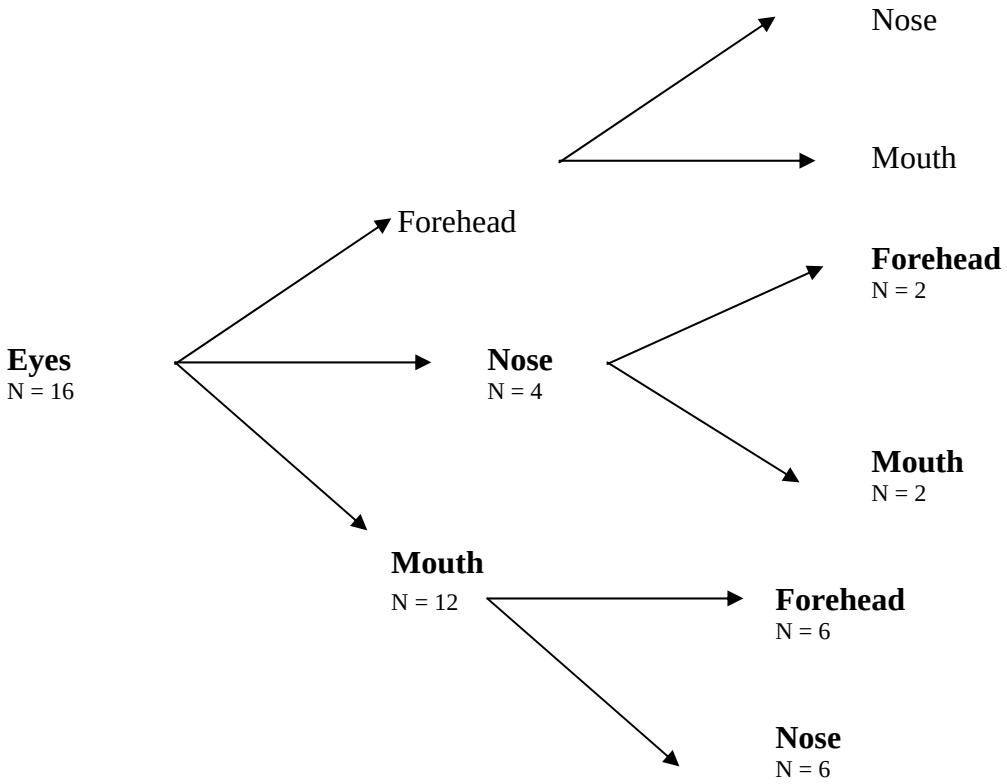


Figure 12. Regions of the face revealed for the posed sad expression in response to the question “Is this person feeling sad?”.


First Reveal:
Second Reveal:
Third Reveal:
Nose
N = 3
Mouth
N = 1
Eyes
N = 4
Eyes
Forehead
N = 4
Nose
Mouth
Mouth
Eyes
Nose


Nose
Mouth
Forehead
Forehead
N = 2
Eyes
N = 16
Nose
N = 4
Mouth
N = 2
Mouth
N = 12
Forehead
N = 6
Nose
N = 6

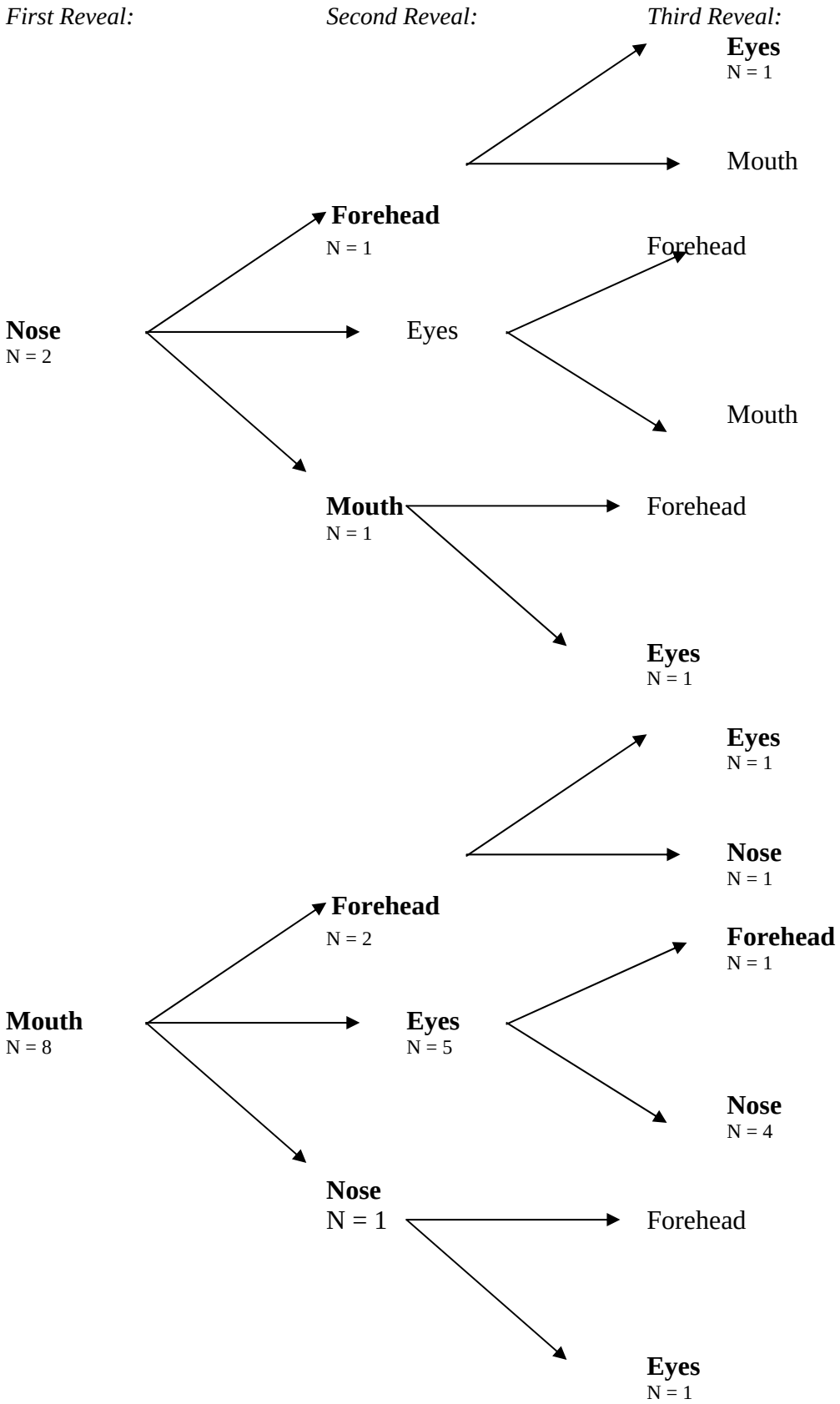
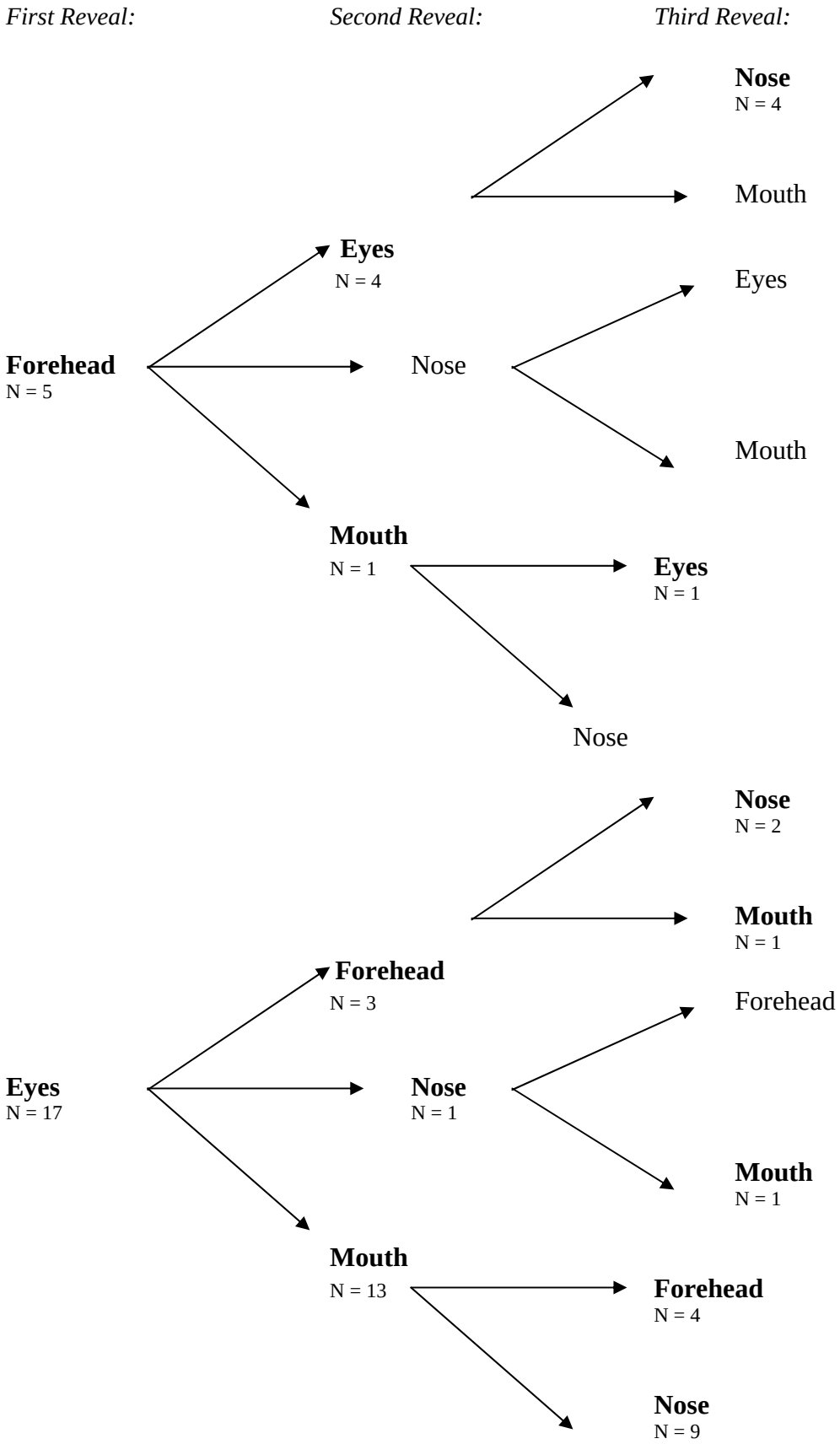


Figure 13. Regions of the face revealed for the genuine fear expression in response to the question “Is this person feeling fearful?”.


First Reveal:
Second Reveal:
Third Reveal:
Nose
N = 4
Mouth
Eyes
N = 4
Eyes
Forehead
N = 5
Nose
Mouth
Mouth
N = 1
Eyes
N = 1
Nose
Nose
N = 2
Mouth
N = 1
Forehead
N = 3
Forehead
Eyes
N = 17
Nose
N = 1
Mouth
N = 1
Mouth
N = 13
Forehead
N = 4
Nose
N = 9

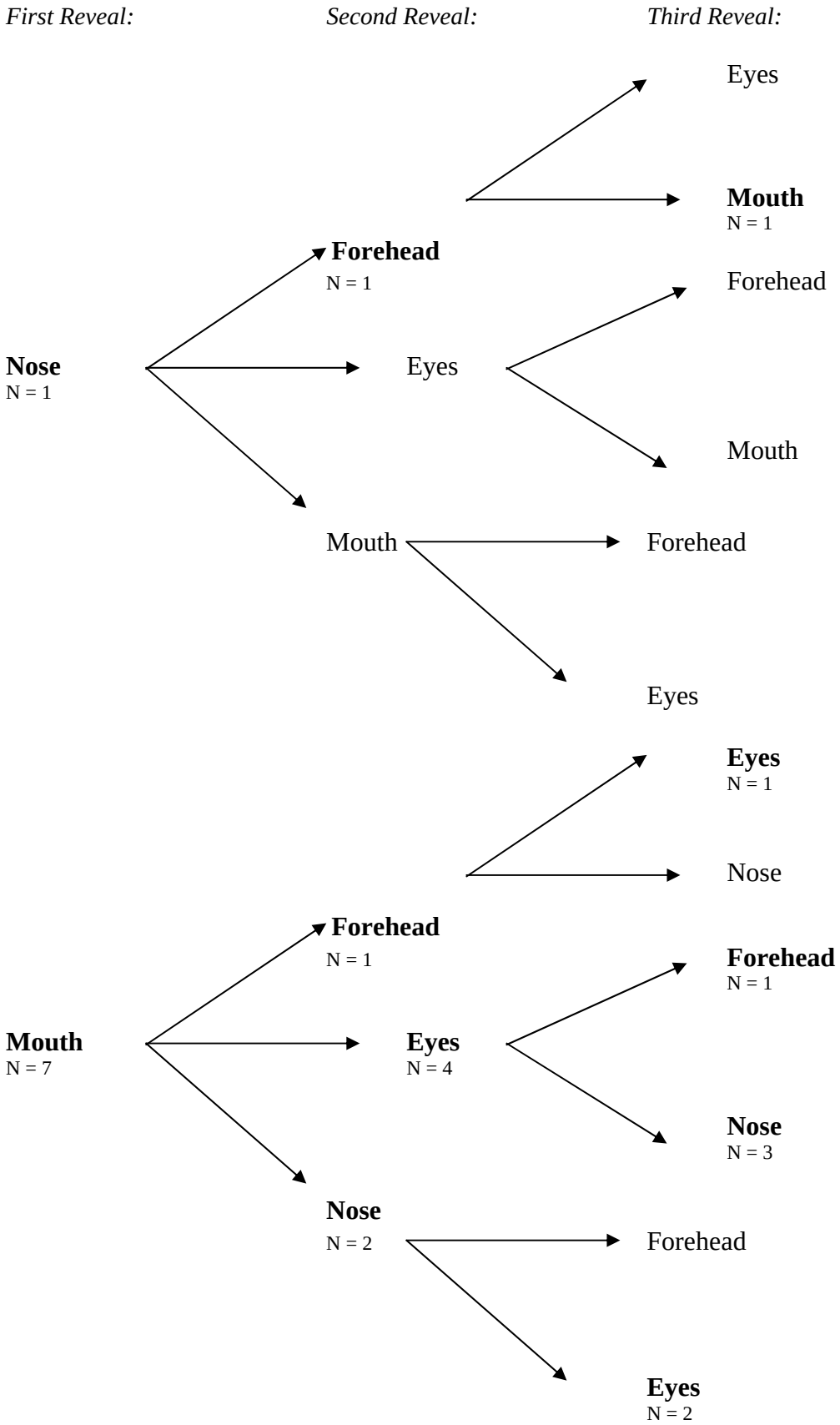


Figure 14. Regions of the face revealed for the posed fear expression in response to the question “Is this person feeling fearful?”.

7.2.1 First Reveal

The proportion of participants who revealed each region of the face for their first reveal as a function of the target question – is this person feeling happy/sad/fearful? – is shown in Table 12. Since no part of the target face was visible to participants before the first reveal, no distinction between genuine and posed expressions of emotion needed to be considered. Therefore the genuine and posed expressions are considered together as happiness, sadness or fear in Table 12.

Table 12

Proportion of participants removing each region of the face as the first reveal for each target emotion.

	Forehead	**Eyes**	**Nose**	**Mouth**
Happiness	0.17_{a}	0.35_{b}	0.02_{ae}	0.47_{b}
Sadness	0.22_{a}	0.33_{ab}	0.10_{ce}	0.45_{b}
Fear	0.15_{a}	0.55_{c}	0.05_{be}	0.25_{ad}

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were computed both within emotion (between regions) and within region (between emotions) as seen in Table 12.

7.2.1.1 Happiness.

Participants revealed the eyes or mouth significantly more than the forehead or nose when trying to identify a happy expression.

7.2.1.2 Sadness.

Participants revealed the mouth significantly more than any other region and also revealed the forehead or eyes significantly more than the nose when trying to identify a sad expression.

7.2.1.3 Fear.

Participants revealed the eyes significantly more than any other region and the nose significantly less than any other region when trying to identify a fearful expression.

Participants generally revealed either the eyes or mouth for the first reveal regardless of which emotion they were identifying. As hypothesized the mouth or eyes were revealed more often than the nose or forehead when identifying happiness. As these regions contain key features of a happy expression and participants were using these regions (Ekman & Friesen, 1975). Also as hypothesized the eyes were revealed more often than any other region when identifying fear. This is because the eyes contain a key feature of a fearful expression and participants were attending to the eyes to identify fear (Ekman & Friesen, 1975). However, the mouth was revealed significantly more than any other region when identifying sadness. This is a surprising finding because the eyes or forehead were predicted to be revealed more than the mouth. This is because the eyes or forehead were said to contain features important for a sad expression (Ekman 2003, Ekman & Friesen, 1975). It could be that the mouth is a better identifying feature for perceivers than the forehead or eyes, one way to show this would be the accurate identification of the genuine sad expression when the mouth was revealed.

7.2.1.4 Forehead/Nose.

No significant differences were found between emotions when participants revealed the forehead or nose.

7.2.1.5 Eyes.

Participants revealed the eyes significantly more when they were trying to identify a fearful expression compared to when they were trying to identify a happy or sad expression.

7.2.1.6 Mouth.

Participants revealed the mouth significantly more when they were trying to identify a happy or sad expression compared to when they were trying to identify a fearful expression.

No differences were found between emotions for the forehead or nose. This finding is surprising as the forehead was predicted to be revealed sooner for the sad and fear expressions compared to the happy expression, where the forehead was ranked last (refer to Table 1). Participants were not using the forehead or nose on the first reveal very often to identify an emotion. As hypothesized, the eyes were revealed significantly more for the fear expressions and the mouth was revealed significantly more for the happy expressions. Surprisingly, the mouth was also revealed significantly more when participants were identifying a sad expression.

7.2.2 Second Reveal

In considering the second reveal, region combinations were considered. For example, a participant who revealed the eyes for the first reveal and the mouth for the second reveal was considered equivalent to a participant who had revealed the mouth for the first reveal and the eyes for the second reveal. Therefore, for the second reveal there

are six possible region combinations – forehead and eyes; forehead and nose; forehead and mouth; eyes and nose; eyes and mouth or nose and mouth. As regions of the face are visible to participants when they are making their selection for their second reveal distinction between genuine and posed expressions had to be considered. The proportion of participants revealing each region combination is shown in Table 13.

Table 13

Proportion of participants revealing each region combination for the second reveal for each emotion and expression type (where: F = forehead, E = eyes, N = nose and M = mouth).

Emotion:	**Expression type:**	**F+E**	**F+N**	**F+M**	**E+N**	**E+M**	**N+M**
Happiness	*Genuine*	0.20_{a}	0_{be}	0.10_{ab}	0.07_{ab}	0.50_{cg}	0.13_{a}
	Posed	0.10_{a}	0_{ae}	0.13_{ab}	0_{a}	0.67_{cg}	0.10_{a}
Sadness	*Genuine*	0.13_{a}	0.07_{ae}	0.13_{a}	0.10_{a}	0.50_{bg}	0.10_{a}
	Posed	0.13_{a}	0_{be}	0.07_{ab}	0.10_{ab}	0.60_{cg}	0.10_{ab}
Fear	*Genuine*	0.13_{a}	0.03_{ae}	0.07_{a}	0.13_{a}	0.57_{bg}	0.07_{a}
	Posed	0.23_{a}	0.03_{be}	0.07_{ab}	0.03_{b}	0.57_{cg}	0.07_{ab}

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were again computed both within emotion (between regions) and within region (between emotions) as seen in Table 13.

7.2.2.1 Happiness.

For both the genuine and posed expressions, participants revealed the eyes and mouth combination significantly more than all other combinations. No participants revealed the forehead and nose for both the genuine and posed expressions and no participants revealed the eyes and nose combination for the posed expression.

7.2.2.2 Sadness.

For both the genuine and posed expressions, participants revealed the eyes and mouth combination significantly more than all other combinations. For the posed expression, no participants chose to reveal the forehead and nose combination.

7.2.2.3 Fear.

For both the genuine and posed expressions, participants revealed the eyes and mouth combination significantly more than all other combinations. For the posed expression, participants revealed the forehead and eyes significantly more than the forehead and nose or eyes and nose combinations.

Regardless of the emotion participants were identifying, participants revealed the eyes and mouth combination significantly more than any other combinations after two reveals. This combination was predicted to be revealed the most when identifying the genuine happy expression. However, it was predicted that the forehead and eyes combination would be revealed the most when identifying a sad or fearful emotion. Despite key features of sad and fearful located in the forehead (Ekman, 2003, Ekman & Friesen, 1975); it is possible that the participants do not use the forehead to identify a sad or fearful emotion.

7.2.3 Third Reveal

In considering the third reveal region combinations (as they were for the second reveal) were considered. For the third reveal there are four possible region combinations – forehead, eyes and mouth; forehead, eyes and nose; forehead, nose and mouth or eyes, nose and mouth. As regions of the face are visible to participants when they are making their selection for their third reveal distinction between genuine and posed expressions had to be considered. The proportion of participants revealing each region combination is shown in Table 14.

Table 14

Proportion of participants removing each region combination for the third reveal for each emotion and expression type (where: F = forehead, E = eyes, N = nose and M = mouth).

Emotion:	**Expression type:**	**F+E+N**	**F+E+M**	**F+N+M**	**E+N+M**
Happiness	*Genuine*	0.17_{a}	0.10_{a}	0.07_{a}	0.67_{bde}
	Posed	0.13_{a}	0.23_{a}	0.07_{a}	0.57_{bde}
Sadness	*Genuine*	0.07_{a}	0.17_{a}	0.17_{a}	0.57_{bde}
	Posed	0.13_{ac}	0.07_{ac}	0.03_{cf}	0.73_{bd}
Fear	*Genuine*	0.20_{a}	0.30_{ac}	0.03_{f}	0.47_{ce}
	Posed	0.20_{a}	0.27_{ac}	0.03_{f}	0.50_{cde}

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were again computed both within emotion (between regions) and within region (between emotions) as seen in Table 14.

7.2.3.1 Happiness.

For both the genuine and posed expressions, the eyes, nose and mouth combination was revealed significantly more than all other combinations.

7.2.3.2 Sadness.

For both the genuine and posed expressions, participants revealed the eyes, nose and mouth combination significantly more than all other combinations.

7.2.3.3 Fear.

For both the genuine and posed expressions, participants revealed the eyes, nose and mouth combination significantly more than the forehead, eyes and nose or forehead, nose and mouth combinations. The forehead, eyes and mouth was revealed significantly more than the forehead, nose and mouth. For the posed expression, the forehead eyes and nose was revealed significantly more than the forehead, nose and mouth.

When identifying the happy and sad expressions, after three reveals, participants revealed the eyes, nose and mouth combination significantly more than any other combination. This means that on the third reveal, participants chose to reveal the nose significantly more than the forehead. This finding is not surprising as eye-tracking studies identified the eyes, nose and mouth as core features (Rayner, 1998). This combination was predicted to be revealed the most when participants were identifying the genuine happy expression. However, this combination was predicted to be less preferred when participants identified the genuine sad expression, with combinations

containing the forehead and eyes predicted to be revealed before the eyes, nose and mouth. When identifying a fearful emotion, participants did not significantly reveal the nose or forehead after three reveals after revealing the eyes and mouth.

7.2.3.4 Forehead, eyes and nose and Forehead, eyes and mouth.

No differences in revealing each combination was found between expressions.

7.2.3.5 Forehead, nose and mouth.

Participants revealed this combination significantly more when identifying the happy expressions and the genuine sad expression compared to when they were identifying the posed sad and the fearful expressions.

7.2.3.6 Eyes, nose and mouth.

Participants revealed this combination significantly more when identifying the posed sad expression compared to when they were identifying the genuine fear expression.

Overall participants showed a tendency to reveal the eyes or mouth region and, subsequently, combinations of regions including the eyes and mouth. There were few differences between emotions in terms of the regions of the face revealed by participants and few differences between genuine and posed expressions of emotion.

7.3 Accuracy as a function of region(s) revealed.

The following analyses considered the accuracy of participants' judgements of whether the target was feeling the specified emotion as a function of the nature of the information available whilst making the judgment. Again, combinations of regions rather than the order in which they were revealed were considered. As with the analysis of accuracy as a function of the amount of information available reported above, proportion of "yes" responses rather than accuracy were considered. For each of the expressions, the proportion of "yes" responses was considered as function of the nature of the information available after each reveal. For the first reveal there were 4 possible regions – the forehead, the eyes, the nose, and the mouth. For the second reveal there are six possible combinations of regions – the forehead and eyes, the eyes and nose, the forehead and mouth, the eyes and mouth, the mouth and nose, and the forehead and mouth. After the third reveal there were four possible combinations of regions - the forehead, eyes and mouth, the eyes, nose and mouth, the forehead, mouth and nose, and the forehead, eyes and nose.

7.3.1 First Reveal

Table 15

Proportion of participants' "yes" responses when identifying whether the target was feeling the specified emotion when one region was revealed, as a function of emotion, expression type and region. Number of participants in each cell is shown in parentheses.

Emotion:	Expression type:	Forehead	Eyes	Nose	Mouth
Happiness	*Genuine*	1.00 (5) $_{a}$	1.00 (9) $_{ac}$	1.00 (1) $_{ae}$	1.00 (15) $_{a}$
	Posed	.60 (5) $_{ac}$	.82 (11) $_{a}$	.00 (0) $_{b}$	.93 (14) $_{a}$
Sadness	*Genuine*	.38 (8) $_{bcd}$	.88 (8) $_{aceg}$	.33 (3) $_{bcef}$	.91 (11) $_{ag}$
	Posed	.20 (5) $_{bc}$	.50 (12) $_{bg}$	1.00 (3) $_{aeg}$	.90 (10) $_{a}$
Fear	*Genuine*	.00 (4) $_{b}$	.94 (16) $_{ace}$	.00 (2) $_{bf}$	.50 (8) $_{bh}$
	Posed	.80 (5) $_{ad}$	1.00 (17) $_{c}$	.00 (1) $_{bf}$	.43 (7) $_{bdf}$

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were again computed both within emotion (between regions) and within region (between emotions) as seen in Table 15.

7.3.1.1 Happiness.

There were no significant differences in the proportion of participants' "yes" responses across regions when identifying a happy emotion and responses did not differ as a function of expression type, with the exception of the nose, which no participants revealed for the posed happy expression.

7.3.1.2 Sadness.

When identifying a sad emotion, the proportion of participants' "yes" responses did not differ as a function of expression type. However, when identifying the genuine sad expression, the proportion of participants who revealed the mouth responded "yes" significantly more often than those who revealed the forehead or nose. When identifying the posed expression, the proportion of participants who revealed the nose or mouth responded "yes" significantly more often than the forehead or eyes.

7.3.1.3 Fear.

When identifying a fearful emotion, the proportion of participants' "yes" responses did differ as a function of expression type. The proportion of participants who revealed the forehead, participants responded "yes" significantly more often for the posed fear expression compared to the genuine fear expression. For both the genuine and posed fear expressions, the proportion of participants who revealed the eyes responded "yes" significantly more often than the forehead, nose or mouth and for the posed fear expression, the proportion of participants who revealed the forehead responded "yes" significantly more often than the nose or mouth.

Interestingly, participants were able to 100% accurately identify genuine happy after one reveal, no matter which region they revealed. This was not the same when participants tried to identify a genuine sad or fearful emotion. When identifying genuine sad, participants who revealed the mouth were significantly more accurate than those who revealed the nose or forehead. This is a surprising finding as the forehead was said to contain key features important for identifying sad (Ekman, 2003,

Ekman & Friesen, 1975). This is also interesting because participants were attending to the mouth significantly more than any other region. As predicted, when the eyes were revealed, participants accurately identified the genuine fear expression significantly more than any other region.

Surprisingly no differences were found in responses between genuine and posed happy and sad expressions as a function of regions. However, genuine and posed fearful expressions did differ in responses when the forehead was revealed. Ekman and Friesen (1975) described the forehead to be a defining feature of fear. They said that the absence of this movement is a clue that a fear expression is being posed. However, participants who revealed the forehead responded “yes: significantly more often that the emotion being felt was fear for the posed expression compared to the genuine expression.

Differences in the proportion of “yes” responses were found between emotions and expression types as a function of the region revealed.

7.3.1.4 Forehead.

The proportion of participants’ “yes” responses, when the forehead was revealed, was significantly greater for the genuine and posed happy and posed fear expressions compared to genuine and posed sad and genuine fear; however the proportion of “yes” responses did not significantly differ between the genuine sad and posed fear expressions.

7.3.1.5 Eyes.

The proportion of participants’ “yes” responses, when the eyes were revealed was significantly greater for the posed fearful expression compared to the posed happy expression. Participants also responded “yes” significantly more to the genuine and posed happy, genuine sad and genuine fear expressions compared to the posed sad expression.

7.3.1.6 Nose.

Although few participants revealed the nose, the proportion of participants’ “yes” responses was significantly greater for the genuine happy and posed sad expressions compared to the posed happy and genuine and posed fearful expressions.

7.3.1.7 Mouth.

The proportion of participants' "yes" responses when they revealed the mouth was significantly greater for the happy (genuine and posed) and sad (genuine and posed) expressions compared to the fear expressions (genuine and posed).

There were significant differences in accuracy among the genuine expressions, surprisingly when the forehead was revealed (which was predicted to be the region where participants would be the least accurate for happy), was significantly more accurate for the genuine happy expression compared to the genuine sad and fear expressions. Participants were attending to and were sensitive to the lack of movement in the forehead and this was enough to inform them that the target was feeling happy. Unsurprisingly, participants were found to be significantly more accurate identifying the genuine happy expression compared to the genuine fear expression after the nose was revealed. This would be because the nose contains information for a genuine happy expression, but not for the genuine fear expression. Participants who revealed the mouth were significantly more accurate identifying the genuine happy and sad expressions compared to the genuine fear expression. While it was not hypothesized that participants were be more accurate identifying the genuine sad expression compared to the genuine fear expression after the mouth was revealed, the same result was also found for Experiment 1.

7.3.2 Second Reveal.

Table 16

Proportion of participants' "yes" responses when identifying whether the target was feeling the specified emotion when two regions were revealed, as a function of emotion, expression type and region combination. Number of participants in each cell is shown in parentheses. (Where: F = forehead, E = eyes, N = nose and M = mouth).

Emotion:	**Expression type:**	**F+E**	**F+N**	**F+M**	**E+N**	**E+M**	**N+M**
Happiness	*Genuine*	1.00 (6) $_{a}$	.00 (0) $_{e}$	1.00 (3) $_{ad}$	1.00 (2) $_{ab}$	1.00 (15) $_{a}$	1.00 (4) $_{ag}$
	Posed	1.00 (4) $_{ab}$	.00 (0) $_{e}$	1.00 (3) $_{ad}$	.00 (0) $_{e}$	.85 (20) $_{ad}$	1.00 (3) $_{a}$
Sadness	*Genuine*	.75 (4) $_{ab}$	.50 (2) $_{bcd}$	1.00 (3) $_{bd}$	.33 (3) $_{be}$	1.00 (15) $_{ab}$	1.00 (3) $_{ab}$
	Posed	.50 (4) $_{bf}$	.00 (0) $_{e}$	.50 (2) $_{fd}$	.67 (3) $_{bf}$	.67 (18) $_{fd}$	1.00 (3) $_{af}$
Fear	*Genuine*	1.00 (4) $_{abg}$	.00 (1) $_{ce}$	1.00 (2) $_{gd}$	.75 (4) $_{bg}$	.82 (17) $_{gd}$	.50 (2) $_{aeg}$
	Posed	1.00 (7) $_{a}$	.00 (1) $_{ce}$	.50 (2) $_{cd}$	1.00 (1) $_{abd}$	.76 (17) $_{d}$	1.00 (2) $_{ad}$

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were again computed both within emotion (between regions) and within region (between emotions) as seen in Table 16.

7.3.2.1 Happiness.

The proportion of participants' "yes" responses did not significantly differ between the happy expressions as a function of expression type, with the exception that no participants revealed the eyes and nose for the posed happy expression. No significant differences were found for the proportion of "yes" responses as a function of region combinations within the genuine and posed happy expressions, with the exception the forehead and nose regions combination, which was not revealed for the genuine or posed happy expressions and the eyes and nose regions combination, which was not revealed for the posed happy expression.

7.3.2.2 Sadness.

The proportion of participants' "yes" responses did differ as a function of expression type across some regions combinations for the sad expressions. The proportion of participants who revealed the eyes and mouth responded "yes" significantly more often for the genuine sad expression compared to the posed sad expression and the proportion of participants who revealed the forehead and nose responded "yes" significantly more often for the genuine sad expression compared to the posed sad expression. There were no differences across the regions for the genuine and posed sad expressions, with the exception of no participants revealing the forehead and nose for the posed sad expression.

7.3.2.3 Fear.

The proportion of participants' "yes" responses did not differ as a function of expression type across regions combinations for the fear expressions. The proportion of participants for the genuine fearful expression who revealed the forehead and eyes, forehead and mouth, eyes and nose or eyes and mouth combinations had significantly

more “yes” responses than those who revealed the forehead and nose regions combination. The proportion of participants who revealed the forehead and eyes for the posed fear expression had significantly more “yes” responses than those who revealed the forehead and nose, forehead and mouth, or eyes and mouth combinations. The proportion of participants who revealed eyes and mouth combination had significantly more “yes” responses than those who revealed the forehead and nose.

No significant differences were found in accuracy as a function of region, with the exception of the forehead and nose when identifying a fearful emotion, participants were significantly less accurate than all other combinations. However, only one participant revealed this combination. This finding could be the result of participants being able to reveal their own choice of region and that participants are revealing regions that increase their accurate.

No significant differences were found between responses as a function of regions between the genuine and posed happy and fear expressions. However, after revealing the eyes and mouth participants were significantly more accurate identifying genuine sadness compared to posed sadness. Ekman and Friesen (1975) thought that sadness, when posed, would be shown in the lower face (e.g. mouth) and by a downward cast of the eyes. In Experiment 1, combinations that contained the eyes and/or mouth were more accurate than those that did not.

Differences in “yes” were found between emotions as a function of the region combinations that were revealed.

7.3.2.4 Forehead and eyes.

The proportion of participants who revealed the forehead and eyes had significantly more “yes” responses when identifying the genuine happy and posed fear expressions compared to the posed sad expression.

7.3.2.5 Forehead and nose.

The proportion of participants who revealed the forehead and nose had significantly more “yes” responses when identifying the genuine sad expression compared to the happy expressions (genuine and posed) and the posed sad expression where the forehead and nose were not revealed.

7.3.2.6 Forehead and mouth and nose and mouth.

No significant differences were found between regions when participants revealed the forehead and mouth and the nose and mouth.

7.3.2.7 Eyes and nose.

The proportion of participants who revealed the eyes and nose had significantly more “yes” responses when identifying the genuine happy, posed sad, and the genuine and posed fear expressions compared to the posed happy expression where eyes and nose were not revealed.

7.3.2.8 Eyes and mouth.

The proportion of participants who revealed the eyes and mouth had significantly more “yes” responses when identifying the genuine happy and genuine sad expression

compared to the posed sad expression and the fearful expressions (genuine and posed).

Participants who revealed the eyes and mouth had 100% accuracy when identifying genuine happiness and sadness. These expressions were significantly more accurate than the genuine fear expression, where not all participants were accurate.

7.3.3 Third Reveal

Table 17

Proportion of participants' "yes" responses when identifying whether the target was feeling the specified emotion when three regions were revealed, as a function of emotion, expression type and region combination. Number of participants in each cell is shown in parentheses. (Where: F = forehead, E = eyes, N = nose and M = mouth).

Emotion:	**Expression type:**	**F+E+N**	**F+E+M**	**F+N+M**	**E+N+M**
Happiness	*Genuine*	1.00 (5) $_{ab}$	1.00 (3) $_{ab}$	1.00 (2) $_{a}$	1.00 (19) $_{ac}$
	Posed	1.00 (4) $_{ab}$	.86 (7) $_{b}$	1.00 (2) $_{ab}$	.82 (17) $_{b}$
Sadness	*Genuine*	.67 (3) $_{ab}$	.80 (5) $_{abe}$	1.00 (5) $_{abc}$	1.00 (17) $_{c}$
	Posed	.50 (4) $_{bd}$	.67 (3) $_{be}$	.00 (1) $_{d}$	.65 (22) $_{b}$
Fear	*Genuine*	.83 (6) $_{ab}$	.89 (9) $_{b}$	1.00 (1) $_{ab}$	.79 (14) $_{b}$
	Posed	1.00 (6) $_{ab}$	.62 (8) $_{b}$	.00 (1) $_{d}$	.73 (15) $_{b}$

Note. Within each row and column, numbers that share a letter of their subscript do not significantly differ from one another at $p < 0.01$ by comparison tests of proportions.

Comparison tests of proportions (Statistica; StatSoft 1994, 2006) were again computed both within emotion (between regions) and within region (between emotions) as seen in Table 17.

7.3.3.1 Happiness.

When identifying happiness, the proportion of participants who revealed the eyes, nose and mouth combination responded “yes” significantly more often for the genuine happy expression than the posed happy expression. No significant differences in the proportion of “yes” responses were found for the genuine and posed happy expressions as a function of the region combinations that were revealed.

7.3.3.2 Sad.

When identifying sadness, there were no differences between posed and genuine expressions when participants revealed the forehead, eyes and nose or forehead, eyes and mouth. However, participants who revealed the forehead, nose and mouth combination or eyes, nose and mouth combination responded “yes” significantly more often to the genuine sad expression compared to the posed sad expression. When identifying the genuine sad expression, the proportion of participants who revealed the eyes, nose and mouth regions combination responded “yes” significantly more compared to the forehead, eyes and nose or forehead, eyes and mouth regions combinations. When identifying the posed sad expression, the proportion of participants who revealed the forehead, eyes and mouth and eyes, nose and mouth regions combinations responded “yes” significantly more than when they revealed the forehead, nose and mouth regions combination.

7.3.3.3 Fear.

When identifying fear, “yes” responses differed as a function of expression type, this was when participants revealed the forehead, nose and mouth, which had significantly more “yes” responses for the genuine fear expression compared to the posed fear expression. No significant differences were found for genuine fear as a function of the region combinations revealed. For the posed fear expressions, the proportion of participants’ “yes” responses was significantly greater when participants revealed the forehead, eyes and nose, forehead, eyes and mouth or eyes, nose and mouth regions combinations compared to the forehead, nose and mouth combination.

Over half of the participants revealed the eyes, nose and mouth when identifying the genuine sad expression and these participants were 100% accurate making them significantly more accurate than those who revealed the forehead, eyes and nose or the forehead, eyes and mouth. This finding shows that the lower face (nose and mouth) contains more information that participants use to accurately identify sad – as participants who revealed the forehead, nose and mouth were also all 100% accurate. There were no differences after three reveals between region combinations when participants were identifying happiness and fear.

As predicted the genuine expressions were more accurate than the posed expressions. For the genuine expressions, participants’ responses did differ from posed expressions after three reveals as a function of regions. Participants who revealed the eyes, nose and mouth were significantly more accurate identifying the genuine happy and genuine sad expressions compared to their posed counterparts. It is possible that the inclusion of the eyes and mouth, when identifying happiness gave participants clues that participants used to accurately identify a genuine and posed expression. For the

sad expressions, this result shows that participants are not using the forehead (including the eyebrows) to differentiate genuine and posed sadness. However, they are using the lower face, as suggested by Ekman and Friesen (1975) to identify a posed sad expression. The genuine fear expression was significantly more accurate than the posed fear expression after revealing the forehead, nose and mouth. However, only one participant revealed this combination.

Differences in “yes” were found between emotions as a function of the region combinations that were revealed.

7.3.3.4 Forehead, eyes and nose and forehead, eyes and mouth.

No differences were found between emotions for participants who revealed the forehead, eyes and nose and forehead, eyes and mouth region combinations.

7.3.3.5 Forehead, nose and mouth.

Few participants revealed the forehead, nose and mouth regions combination, the proportion of “yes” responses was significantly greater for the genuine and posed happy, genuine sad and genuine fear expressions compared to the posed sad and posed fear expressions.

7.3.3.6 Eyes, nose and mouth.

After revealing the eyes, nose and mouth, the proportion of participants identifying the genuine happy and genuine sad expressions had significantly greater “yes” responses than participants identifying the posed happy, posed sad, and genuine and posed fear expressions.

There were differences in responses were found between genuine expressions as a function of regions. Participants who revealed the eyes, nose and mouth were more accurate identifying genuine happy and genuine sad expressions compared to genuine fear. This result could be a reflection of the overall accuracy, where participants were more accurate overall identifying genuine happiness and sadness compared to genuine fear.

8 General Discussion

The present research investigated, in two experiments, whether participants can accurately identify an underlying emotion from a facial expression when there is limited information available. If they can, of interest was whether they attended to the features identified in previous studies to accurately identify happy, sad or fearful expressions (Ekman 2003; Ekman & Friesen, 1975) when making these judgments. Differences have also been found that distinguish genuine expressions of emotion from posed expressions (Ekman, 1993; Ekman et al., 1980; Ekman et al., 1981; Gosselin et al. 1995) and research has shown that perceivers can differentiate between genuine and posed expressions (Frank et al., 1993; Gosselin et al., 1995; Kohler et al., 2004; Miles & Johnston, 2007; Peace et al., 2006). Participants in this research were identifying the emotion displayed by a facial expression from limited information; however, facial expressions included both genuine and posed expressions of emotion – where there was no underlying emotion. Therefore, the present research also investigated whether, when judging from limited information, participants were sensitive to the lack of emotion underlying posed expressions, and if their responses differed from the genuine counterparts. The present research also investigated how confident participants felt that their answers were correct and also examined participants' alternative responses.

8.1 Accuracy.

After each reveal, for Experiment 1, participants were significantly more accurate identifying the genuine happy expression than the genuine sad expression, which in turn was identified more accurately than the genuine fear expression. This finding is consistent with previous studies (e.g. Biehl et al., 1997; Ekman, et al., 1969; Hejmadi

et al., 2000; Izard, 1971), which, interestingly, have used posed expressions of emotions. Similar results were also found for Experiment 2, all participants accurately identified the genuine happy facial expression, even after one reveal. Participants in this experiment were also significantly more accurate identifying the genuine happy expression compared to the genuine sad expression and the genuine fearful expression. However, accuracy did not significantly differ between genuine sad and genuine fear. Despite the different methodologies the results across the experiments are similar, confirming that happy expressions are more readily identified than sad and fearful expressions, even when the information available is limited.

As hypothesized, participants' accuracy when identifying the genuine expressions increased significantly as more information (in the form of regions) became available for participants in both Experiments 1 and 2. However, one important difference between Experiments 1 and 2 was how participants were able to view the information. In Experiment 1, participants had no control over which region they viewed, as an experimenter revealed the regions, so all possible combinations of regions were viewed. In order to accurately identify the emotion, participants in Experiment 1 needed to be sensitive to the information revealed by the experimenter. In Experiment 1, participants' accuracy significantly differed as a function of regions, for the genuine expressions. This showed that participants were more sensitive to the information in some regions compared to others for genuine happy, sad and fearful expressions. However, because the regions that were available to the participants were controlled by the experimenter, regions where participants were sensitive to the information became visible to them after a certain number of reveals. Therefore, although accuracy increased as a function of reveals, differences emerged as function

of both region and expression. Regions where participants were significantly more accurate were the eyes or mouth for genuine happy and sad expressions and the eyes for the genuine fearful expression. However, participants in Experiment 2 were able to control the information they viewed by revealing their own choice of region in response to identifying a happy, sad or fearful emotion. In order to accurately identify an emotion in Experiment 2, participants needed to attend to the relevant information by revealing regions that contained greater information value before others, participants also needed to be sensitive to this information. Participants in Experiment 2 were attending to regions where participants in Experiment 1 were significantly more accurate. Yet, participants' accuracy still increased as a function of reveals for Experiment 2. This shows that when participants were revealing regions where they were significantly less accurate than other regions, their accuracy was still increasing. This shows that all regions of the face contain some information value that participants are sensitive too. However, certain regions have been identified to contain more information value than others and are better features for participants to attend to in order to accurately identify an emotion.

8.1.1 Genuine Happy Expression.

In Experiments 1 and 2, when identifying a genuine happy expression, participants attended to and were sensitive to information in the eyes and mouth. These regions contain key features of a happy facial expression, the change of appearance in the mouth is due to the Lip Corner Puller (AU 12) and the change around the eyes is due to the Cheek Raiser/Lid Compressor (AU 6), also known as the Duchenne Marker, which is a reliable sign of happiness. In Experiment 1, participants who viewed the bottom half of the face (nose and mouth) were significantly more accurate than those

who viewed the top half of the face (forehead and eyes), and participants' accuracy was significantly lower after the forehead was revealed compared to all other regions. This is consistent with Bassili's (1979) finding, where the bottom half of the face compared to the top half of the face was better for the identification of a genuine happy expression. However, in Experiment 2, participants correctly identified the genuine happy expression after each reveal. Therefore, participants' accuracy did not significantly differ as a function of region(s) in Experiment 2. Participants in Experiment 2 opted to reveal the nose significantly more than the forehead, for their third reveal. This is because there are no distinctive changes in the forehead unlike the nose in a genuine happy facial expression. Therefore, participants were revealing a region that contained more information value before revealing a region that contained less. Participants who were attending to the forehead in Experiment 2 were using the lack of facial changes in this region to accurately identify a happy emotion. Overall, these findings support Bourel et al. (2001) who found that their participants could accurately identify joy, even when the mouth was occluded.

8.1.2 Genuine Sad Expression.

It was hypothesized that participants in these experiments will be able to identify an emotion from a facial expression, even from limited information. However, Kohler et al. (2004) posed the idea that sad recognition was less dependent on single action units, but on a combination of action units or the "Gestalt" of the facial expression. If this was indeed true, then participants in Experiments 1 and 2 should not have been able to accurately identify the sad facial expressions at a high rate without the whole face being visible. If the accurate identification of a sad expression was reliant on viewing the whole face, then participants' accuracy should not significantly differ as a

function of regions, as the information available in the region should not be effective by itself. However, participants in both Experiments 1 and 2 were able to accurately identify the genuine sad expression after one, two and three reveals and accuracy did significantly differ as a function of region. This shows that participants can accurately identify a genuine sad expression without having to view the displayer's entire face.

Other researchers have suggested certain regions to contain more information than others when trying to identify a genuine sad expression. Ekman (2003) suggested that the sad brows are "powerful" and can be all that are needed to identify sadness and Bassili (1979) found that the top half of the face was better for identifying sad than the bottom half of the face. Based on these reports it was predicted that the forehead contained more information value than either the nose or mouth and therefore, participants would reveal the forehead more often than the nose or mouth and would be more accurate identifying sad expressions when the forehead was visible. However, this study shows that while the forehead is visible, participants were not sensitive to the information available from it to accurately identify a genuine sad expression. Participants in this study were very poor at identifying genuine sadness from the forehead. Bourel et al. (2001) found that recognition of sadness is markedly less accurate when the mouth was occluded compared to other types of occlusion. The eyes were also identified by Ekman and Friesen (1975) as an informative region for sad identification; they said that sadness conveyed is increased when the lower lid is raised. The results from this study support the findings by Bourel et al. and Ekman and Friesen, in Experiments 1 and 2, when identifying a genuine sad expression, participants attended to and were sensitive to information in the eyes and mouth. Participants who viewed combinations containing the eyes and/or mouth were

significantly more accurate than those who viewed the forehead and eyes. Participants in Experiment 2 also attended to this combination significantly more than other combinations. The results from this study favour Bourel et al.'s finding, that recognition of sad is markedly less when the mouth was occluded and Ekman and Friesen's idea that the eyes are an informative region for sad identification. However, the results from this study failed to support Kohler et al.'s idea that perceivers need the whole face to be visible in order to accurately identify a sad facial expression. The results also did not support Ekman and Bassili's idea that the forehead or top half of the face is important for accurate identification of a sad expression.

8.1.3 Genuine Fear Expression.

In Experiments 1 and 2, when identifying a genuine fear expression, participants attended to and were sensitive to information around the eyes. The eye region is vital for the identification of a genuine fearful facial expression of emotion, as participants who viewed combinations that did not contain the eyes were significantly less accurate than those who viewed combinations that did. The changes around the eye region, of a genuine fear expression is created by the Upper Lid Raised (AU 5), which pulls the upper eyelid back into the socket and exposes the sclera (whites) above the iris. The finding that the eyes are important to the accurate identification of a genuine fearful expression is supported by Kohler et al. (2004) who found that fearful recognition was associated with the widening of the eyes. Other researchers, such as Ekman and Friesen (1975) have proposed that the brows would be more important for the identification of a genuine fear expression, while Bassili (1979) also found that the top half of the face was more useful for the identification of genuine fear, compared to

the bottom half of the face. However, participants in Experiment 2 were not attending to the information available in the forehead to identify the fearful expression.

8.1.4 Posed Happy Expression.

Participants in Experiment 1, for the posed happy expression, who viewed the forehead for the first reveal responded “happy” less compared to all other regions. The only other significant difference was the participants in Experiment 1 who viewed the nose and mouth combination had significantly less “happy” responses than the eyes and mouth. This finding is surprising as the criteria for the posed happy expression was that it did not have the Duchenne Marker or the Cheek Raiser/Lid Compressor (AU 6). The Duchenne Marker is a reliable sign of genuine happiness and the lack of this change around the eyes would be a good clue that the happiness portrayed is posed. However, participants in this study were not sensitive to the information around the eye region to accurately identify the posed happy expression.

8.1.5 Posed Sad Expression.

In both Experiments 1 and 2, participants who were able to view the forehead (either by itself or in combination with other areas) responded “sad” less compared to other regions. The opposite was found for the mouth (either by itself or in combinations), participants who viewed this region responded “sad” more compared to other regions. Therefore, participants were sensitive to information in the forehead that informed them that the expression was not sadness, whereas, participants who viewed the mouth were sensitive to information that informed them that the expression was sadness. The forehead of the posed sad expression contained additional crease lines that had not been identified as a characteristic of a genuine sad expression. The

participants could be using this to identify the expression as something other than sadness.

8.1.6 Posed Fear Expression.

Participants responded to the posed fear expression in the same way that they responded to the genuine fear expression. Participants who viewed the eyes responded "fear" significantly more compared to other regions. Also, participants who saw the forehead, nose and mouth responded "fear" significantly less compared to all other combinations that contained the eyes. Therefore, participants are sensitive to information in the eyes that informs them of a fearful emotion.

8.2 Posed and Genuine Facial Expressions.

Comparisons were made between participants' responses to the genuine and posed expressions. Participants in both experiments were unable to accurately identify the posed happy, sad or fear expressions. In Experiment 1, participants were not identifying the posed expressions as "neutral" and in Experiment 2, participants were not selecting "no" in response to whether the displayer was feeling happy, sad or fearful. One possibility for this is that the displayer's neutral expression was shown to participants in both Experiments 1 and 2 as a basis for comparison. Participants may have thought that the "neutral" response option was exclusively for that expression and may not have considered "neutral" for anything else as it had previously been designed. In future research it may be a good idea not to define any facial expressions of the displayer that are shown to participants as a basis for comparison, as participants may consider the expression strictly for that definition. Previous research (Biehl et al., 1997; Ekman et al., 1969; Hejmadi et al., 2000; Izard, 1971) using posed

expressions coded their responses in a different way. They deemed that a corrected response to a posed happy expression was to respond “happy”, a correct response to a posed sad expression was to respond “sad” and a correct response to a posed fear expression was to respond “fear”. In order to determine if there were any differences in responses between the genuine and posed expressions, the posed expressions were alternatively coded as they were in the previous studies. This allowed comparisons to be made between the same responses for the genuine and posed expressions.

Participants’ responses for the genuine and posed happy and sad expressions differed significantly as a function of reveals. However, participants did not significantly differ in responses between the genuine and posed fear expressions. One possibility for this result is that only one genuine and one posed fear expression was used in these experiments (however, only one example of genuine and posed happy and sad expressions was used as well). It is possible that by using different targets, participants may be sensitive to the differences between a genuine and posed fear expression. Another possibility is that more information is needed regarding the displayer when trying to identify fear. Perhaps the perceiver needs to know the displayer personally, such as knowing what type of situations would cause the displayer to be afraid. Participants’ responses significantly differed between the genuine and posed happy and genuine and posed sad expressions. While, in Experiment 2, participants’ responses to genuine and posed happy differed significantly after each reveal; participants needed more than half of the face to be visible in order for their responses to significantly differ between genuine and posed sad, showing that more information was required for the sad expressions.

8.2.1 As a Function of Regions.

No predictions were made regarding which features participants would be more accurate identifying after viewing or revealing for the posed expressions. This research did identify regions that contained information value that differentiated genuine expressions from posed expressions; these are called reliable markers (e.g. the Duchenne Marker for a genuine happy expression and the triangulation of the brow for a genuine sad expression). These are called reliable markers because very few people can perform these movements deliberately (Ekman & Friesen, 1975; Ekman et al., 1980). Therefore, if the change created by a reliable marker is missing it means that the displayer is unlikely to be feeling the emotion that is consistent with their facial expression. Responses between genuine and posed expressions did significantly differ as a function of regions. The genuine and posed sad expressions differed in terms of participants' responses as a function of regions more often than the happy or fear expressions. In Experiment 1, participants who viewed the mouth by itself or in combinations with the eyes responded "sad" significantly more frequently to the posed sad expression. This finding is interesting as Ekman and Friesen (1975) suggested that if sadness was posed, it would be visible in the lower face. However, participants in Experiment 2 who were attending to the eyes and mouth and in combination with the nose; responded that the genuine sad expression was significantly more "sad" than the posed sad expression. Participants in Experiment 1 must have been responding to information in the mouth that specified the target was sad, whereas, participants in Experiment 2 responded differently to the same information. In Experiment 1, participants who viewed combinations that included the forehead responded "sad" significantly more to the genuine sad expression compared

to the posed sad expression. Participants were sensitive to information in the forehead of the posed sad expression that informed them that the expression was not feeling sad because of this; participants' sad responses significantly differed between the genuine and posed sad expressions. Participants' responses also significantly differed between the genuine and posed fear expressions. Ekman and Friesen (1975) reported that the forehead was a defining feature of a genuine fear expression. However, in Experiment 2, participants responded that the posed fear expression was feeling "fear" more often than the genuine fear expression after viewing the forehead. This shows that while participants were attending to this region, they were not sensitive to the defining feature of a genuine fear expression. Participants' responses also significantly differed between the genuine and posed happy expressions. In Experiment 2, participants' responded that the target was feeling happy significantly more for the genuine happy expression compared to the posed happy expression when they viewed the eyes and mouth, showing that they were using the cues in the eyes and mouth.

8.3 Confidence Ratings.

Analysis on confidence ratings was only carried out on the data from Experiment 1. As confidence ratings did not add any more information given by participants' accuracy, confidence ratings were not considered for analysis in Experiment 2. As hypothesized confidence ratings for each expression increased as more of the target face was revealed. As more information became available, the more confident participants felt that their answer was correct. It was also hypothesized that participants would have higher confidence ratings for the genuine expressions compared to their posed counterparts. This was true only for the happy expressions, where participants identifying the genuine expression were significantly more

confident than when they were identifying the posed expression. Surprisingly, for the sad and fearful expressions, participants reported more confidence in the response when judging the posed compared to the genuine expressions. This is interesting as participants were inaccurately identifying the posed expressions as feeling “sad” or “fear” and then reporting that they felt more confident that their answer was correct compared to the genuine expressions. This result could be because participants, when identifying the posed sad and fear expressions, were sensitive to the wrong information to identify the emotion. Therefore, when participants see a posed sad or fearful expression they are misidentifying the posed expression as a genuine expression and they are feeling more confident that they are correct compared to the genuine expressions.

8.4 Alternative Responses.

Participants were not always 100% accurate identifying emotions from facial expressions. In Experiment 1, participants were given eight different response options (anger, happy, sad, surprise, disgust, fear, neutral and none of these). Russell (1994) found that even when the number of response options was increased, participants’ choices were not random. Based on his findings, it was hypothesized that, in Experiment 1, participants’ response options would not be random. Participants’ responses were analyzed after all reveals.

8.4.1 Happiness.

No significant differences were found between responses for the genuine and posed happy expressions. This could be because there were only two possible “positive” response options – “happy” and “surprise”, therefore participants were less likely to

confuse the expressions with any other response options. This was true for the posed happy expression where a small proportion of participants identified the expression as "surprise".

8.4.2 Sadness.

For the genuine expression, participants who did not respond "sad" responded "neutral" significantly more than any other response option. Kimihiro and Naitoh (2003) also found their participants responded "neutral" right up until the maximally expression sad facial expression. For the posed expression, participants' responses spread across four different responses options: "disgust", "sad", "surprise" and "none of these" significantly more than any other response options. Kimihiro and Naitoh found that participants also responded "disgust" to their sad facial expression. However, they did not state any shared action units between sad and disgust. It could be that in attempting to appear sad the target displayed action units that were part of these expressions as well as the action units that were included in the criteria. Therefore, the information in the posed facial expression did not fit with any one particular emotion, confusing the participants. Alternatively, participants may have required additional information to be able to differentiate sadness from other expressions.

8.4.3 Fear.

For the genuine and posed expressions, participants who did not respond "fear" responded "surprise" and "disgust" significantly more than any other response options. Kimihiro and Naitoh (2003) also found that their participants responded "disgust" and "surprise". They explained that the confusions between facial

expressions of emotions could be due to shared action units by other emotions. For example the upper lid raiser (AU 5) and the jaw drop (AU 26) are both part of a surprise facial expression and therefore, surprise is often confused with surprise.

8.5 Future Research Recommendations.

Although the present results can be generalized to the wider population; it is important to consider that the participants in this research were all females. Females as opposed to males have been shown to be more accurate at identifying emotions (Hall & Matsumoto, 2004; Thayer & Johnsen, 2000). It is possible that males will not be as accurate as the females in these experiments. Therefore, further research needs to be carried out that include both male and female participants. Furthermore, additional research needs to include various displayers (both male and female) because this research employed facial expressions of emotion from one female target. Females have been found to be more emotionally expressive than males (Kring & Gordon, 1998). By including various target displayers and participants, the research can then be generalized to include the various male and male, female and female or male and female, perceiver – displayer interactions that take place every day. Further research also needs to consider participants and targets from different ethnic backgrounds as an in-group advantage has been found, where participants who share the same cultural background as the target have been found to be more accurate when identifying facial expressions (Elfenbein & Ambady, 2003). While participants can accurately identify facial expressions of emotion from different cultures, participants who share the same ethnic backgrounds with the displayer are more likely to be more accurate than those who do not share the same ethnic background as the displayer. By including male participants and displayers as well as females and by considering

ethnic background, the overall pattern of results should not differ, however, accuracy may decrease with male participants or when participants and displayers do not share ethnic backgrounds.

This research only investigated three emotions, however, in everyday interactions facial expressions are not only restricted to happy, sad and fearful emotions. It would be interesting to include other universal emotions in future research, such as anger, surprise and disgust, to investigate which regions perceivers attend to and are sensitive to in order to accurately identify the emotion. Comparisons could then be made between facial expressions of emotion, to see if perceivers use the eyes and/or mouth, as participants did in this research, or if they use other regions to accurately identify anger, surprise and disgust facial expressions of emotions. The inclusion of anger, surprise and disgust facial expressions could also be used to determine whether perceivers are sensitive to genuine and posed expressions of these emotions. Based on findings reported by Ekman et al. (1969) and Izard (1971), perceivers should be less accurate identifying surprise, disgust and anger than a happy facial expression. Perceivers should accurately identify surprise at a similar rate to identifying a sad facial expression. Perceivers should also be less accurate identify disgust and anger compared when they identify a fear facial expression and accuracy rates between disgust and anger should be similar to each other.

Ekman and Friesen (1975) outlined three different ways that displayers can pose facial expressions of emotion. This research only included facial expressions where a displayer simulated the emotion when they were feeling no emotion. Participants in Experiment 1 had low or no “neutral” responses to these posed expressions. It would

be interesting to include the other types of posed expressions of emotion, outlined by Ekman and Friesen, where the displayer is neutralizing (hiding a felt emotion behind a neutral expression) or masking (hiding a felt emotion behind an expression of another emotion) an emotion. In order to see whether participants could accurately identify the underlying emotion from these types of posed expressions. It would be important to include these types of posed expressions because displayers can try to hide a felt emotion in real world interactions. The accurate identification of the emotion means that the perceiver will be more likely to engage in successful social interactions (Lopes et al., 2004). For example, a displayer may be trying to control their anger by appearing calm or happy; however, it would be in the perceiver's best interest to stay away from the displayer to avoid any negative consequences. Ekman and Friesen (1975) say that posed facial expressions of emotion may have added or lack some components that make up a genuine facial expression of emotion, when a displayer is neutralizing or masking an emotion, components of the underlying emotion may be leaked into the current facial expression. Perceivers may be attentive to this information. Perceivers may also be sensitive to information in facial expressions resulting from the competition between different facial muscles. Comparisons between accuracy could then be made between genuine expressions of emotion and the different types of posed expressions. It would also be interesting to investigate whether participants can accurately identify these types of expressions from limited information. It would then enable researchers to determine which regions perceivers spontaneously attend to and are sensitive to in order to accurately identify different kinds of posed facial expression of emotion.

It would also have been interesting to use experimental materials that better reflect

real world situations. This would also have made the study's results more generalizable to the population, as the identification of an emotion would better reflect real world interactions. There was only a certain amount of information available to the perceiver in the static photographs. It is possible that more information available to the perceiver would result in increasing perceivers' accuracy. One way to increase the information available to perceivers would be by using video recordings of displayers' facial expressions of emotion. A video recording of a displayer's emotion would allow the perceiver to see the facial changes. The perceiver would be able to use the displayer's initial expression as a basis for comparison and also be able to see all the muscle changes flow on and off the face in its entirety rather than a single segment of the facial expression of emotion.

In Experiment 1, only four of the six region combinations possible were revealed after two reveals. The forehead and mouth or eyes and nose were not included in the six region combinations. However, in Experiment 2, participants were able to reveal their own choice of regions. Participants in Experiment 2, revealed the eyes and mouth significantly more than any other regions, tending to reveal the forehead or nose for reveals three or four, for each expression. Only 8.3% of participants revealed the forehead and mouth combination and only 7.2% of participants revealed the eyes and nose combination for all six expressions, for Experiment 2.This shows that very few participants are attending to these region combinations in order to accurately identify a facial expression of emotion.

The findings from this research could be used by displayers who wish to successfully hide certain emotions from perceivers. They can cover certain features that will make

it harder for perceivers to accurately identify their emotional state. For example, if a person wants to hide their fear, they would cover their eyes by wearing dark sunglasses. In order to succeed in the card game poker, it is not just having skills with the cards that enables a person to win, it is also the ability to perceive emotions in others and use this as a guide to successful identify if the displayer is bluffing or not. The ability to accurately perceive whether your opponent is bluffing (where the displayer is posing a facial expression of emotion) can mean the difference between winning and losing. The results from this research can also help perceivers become more accurate at perceiving emotions in others, by knowing which regions to attend to in order to accurately identify a facial expression of emotion. The better at perceiving emotions people are, the more likely they are to engage in successful social interactions.

8.6 Conclusions.

While previous research has outlined features or action units specific to facial expressions of emotion. The present research has shown that perceivers do attend to and are sensitive to particular features of the face when detecting emotion. The present research has shown which features of the face perceivers use when identifying facial expressions of emotion. This research has demonstrated the importance of the eyes and mouth regions when perceivers are detecting happiness, sadness and fear in others. This research has also demonstrated the lack of importance perceivers place on the forehead/brow region, even though this region had been identified as containing key features of expressions of sadness and fear.

Further research is needed to investigate facial features that perceivers spontaneously

attend to and are sensitive to when identifying emotion from the face. The present research has demonstrated that participants can accurately identify an emotion from limited information, showing that perceivers do not need the whole face to be visible in order to do so. This is important because in day-to-day interactions, all of a displayer's face is not always available to a perceiver. The present research has identified regions (in particular the mouth and eye regions) that perceivers attend to when accurately identifying genuine happy, sad or fearful facial expressions. The present research has also shown that perceivers do not use information in the forehead to identify genuine sad or fearful facial expressions, despite this area being potentially relevant to this task (Ekman, 2003, Ekman & Friesen, 1975). Further research using these expressions is needed to strengthen these findings. In the real world, displayers do not always show what they are feeling through a facial expression. In order to avoid unfavorable outcomes it is important for perceivers to accurately perceive an underlying emotion, even when the facial expression is not consistent with the felt emotion. The present research has also demonstrated that participants in this study are sensitive to differences in genuine and posed happiness and sadness in terms of responses. However, further investigation is needed to compare genuine and posed fearful facial expressions, as participants in this studied failed to differentiate between these expressions. The accurate identification of an emotion, through a facial expression, even when parts of the face are obscured is important for a perceiver.

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10 Appendices

10.1 Appendix A: Response Sheet: Experiment 1

The same answer sheet was seen for each of the seven target faces.

Experiment 1: Participant Response Sheet

You will be shown 7 faces in total. Each face is covered by 4 strips of a blurred image. The experimenter will remove these strips one at a time to reveal different parts of the face. After each strip has been removed you will be asked two questions. You will be asked to indicate what emotion you think the person is FEELING. Do this by circling the appropriate emotion from the list provided. You will then be asked to indicate how confident you feel in your judgment – that is, how sure are you that the emotion that you circled is indeed the one being experienced by the person in the photograph. Do this by making a vertical line on the horizontal line provided. The more confident you are about your judgment the further to the right you should mark the line.

Face 1:

Section 1.

1. What is this person **FEELING**?

Anger Happy Disgust Fear Sad Surprise

Neutral None of these

2. How confident are you that the answer you have circled is indeed what the person is feeling?

_____

Extremely Unconfident Extremely Confident

Section 2.

1. What is this person **FEELING**?

Anger Happy Disgust Fear Sad Surprise

Neutral None of these

2. How confident are you that the answer you have circled is indeed what the person is feeling?

_____

Extremely Unconfident Extremely Confident

Section 3.

1. What is this person **FEELING**?

Anger Happy Disgust Fear Sad Surprise

Neutral None of these

2. How confident are you that the answer you have circled is indeed what the person is feeling?

_____

Extremely Unconfident Extremely Confident

Section 4.

1. What is this person **FEELING**?

Anger Happy Disgust Fear Sad Surprise

Neutral None of these

2. How confident are you that the answer you have circled is indeed what the person is feeling?

_____

Extremely Unconfident Extremely Confident

10.2 Appendix B: Target Facial Expressions:

10.2.1 Neutral Expression

10.2.2 Genuine Happy Expression

10.2.3 Posed Happy Expression

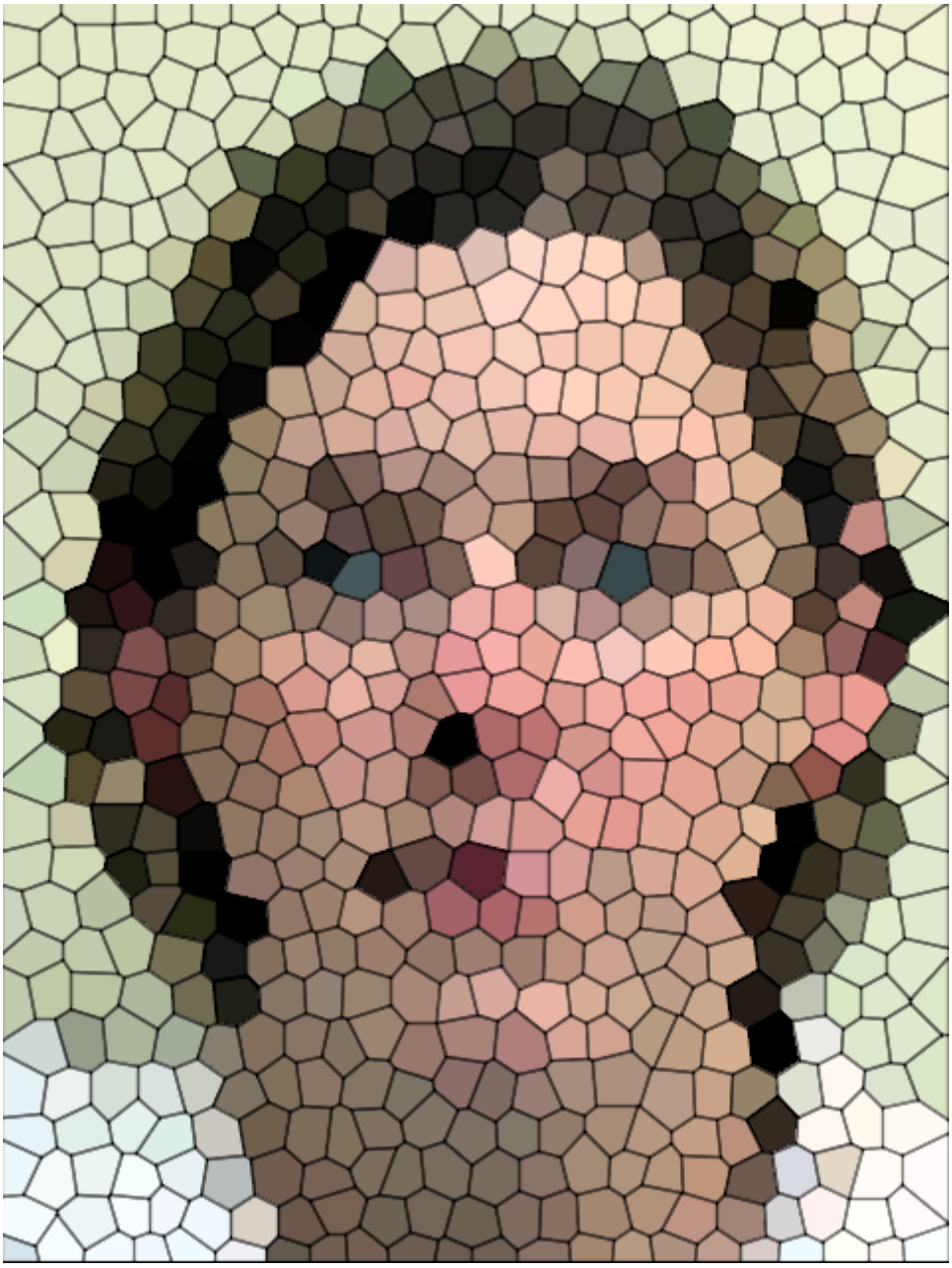
10.2.4 Genuine Sad Expression

10.2.5 Posed Sad Expression

10.2.6 Genuine Fear Expression

10.2.7 Posed Fear Expression

10.3 Appendix C: Target's Mask



10.4 Appendix D: Information Sheet: Experiment 1

Department of Psychology *University of Canterbury*

Emotion Detection: Information Sheet (E1)

You have been invited to participate in the above-named research project. The aim of this experiment is to find out whether perceivers can accurately identify the emotion being experienced by another person from seeing their facial expression, even when certain regions of the face are not visible.

We are particularly interested in whether perceivers can tell what another person is actually feeling. In some situations the *expression of* and *experience of* emotional states are not necessarily the same. Sometimes an individual may experience an emotional state but not display it, and at other times an individual may display an emotion that they are not actually experiencing it. For instance, if you may smile when you encounter a person who you do not particularly like even though you are not happy to see them. We are interested in seeing how well perceivers can tell what another person is **FEELING** by looking at their facial expression only.

For this experiment you will be required to make a number of judgments about an individual's emotional state. You will see seven faces. Each face you will see will be concealed by a blurred image. The experimenter will remove strips of the blurred image to reveal a face below. After each strip of the blurred image has been removed you will then be asked to decide what emotion the person is actually **FEELING** and how confident you feel that your judgment is correct.

In total, participation will take approximately half an hour. In return you will be given a $5 voucher. You are free to withdraw from this project at any time, including withdrawal of any information you have provided.

The results of this project may be published, but you can be assured of the complete confidentiality, you are not asked to provide any identifying information that can be linked to your responses at any stage of the project. By completing the study, however, it will be understood that you have consented to participate in the project, and that you consent to the publication of the results of the project with the understanding that anonymity will be preserved.

This project is being carried out as part of a Masters Thesis by Laura Halliday under the supervision of Associate Professor Lucy Johnston and Dr Lynden Miles. If you have any questions regarding this study please contact Laura (lah50@student.canterbury.ac.nz), Lucy (lucy.johnston@canterbury.ac.nz) or Lynden (lynden.miles@canterbury.ac.nz).

This research has been reviewed and approved by the University of Canterbury Human Ethics Committee.

10.5 Appendix E: Order of Removal for Participant's Trials: Experiment 1

a. Face strips:

1	Forehead	Instructions:
2	Eyes	1. Determine participant number (begin at 1)
3	Nose	2. Determine photo presentation order (chart E)
4	Mouth	3. Determine strip removal order (chart B) for each photo (chart D)

b. Order of removal:

1	**1234**
2	**2143**
3	**2413**
4	**4231**
5	**4321**
6	**3412**
7	**3142**
8	**1324**

c Photo:

Posed Smile	**A**
Genuine Smile	**B**
Posed Sad	**C**
Genuine Sad	**D**
Posed Fear	**E**
Genuine Fear	**F**
Neutral	**G**

d Photo by removal order: Photo

Participant	A	B	C	D	E	F	G
1	4	5	6	6	4	6	5
2	1	4	7	6	3	4	1
3	4	6	3	8	6	2	3
4	3	1	4	3	8	5	2
5	7	3	3	5	8	1	6
6	3	4	1	1	4	2	6
7	1	2	6	6	3	4	4
8	5	3	1	3	6	1	4
9	1	1	2	3	5	1	1
10	1	7	2	2	1	8	3
11	7	3	4	1	2	5	2
12	4	4	6	7	5	4	4
13	3	6	5	8	8	7	2
14	5	8	1	1	5	7	1
15	1	5	8	1	7	4	4
16	1	2	6	5	2	2	4
17	2	4	7	1	8	4	8
18	2	8	8	1	1	1	2
19	8	6	3	2	4	4	7
20	1	4	1	5	3	8	1
21	2	8	2	2	8	6	4
22	3	5	2	1	2	3	2
23	3	3	8	8	3	6	2
24	1	4	1	3	6	7	1
25	4	2	4	8	1	1	8
26	5	5	3	4	7	4	7
27	5	4	3	2	7	2	5
28	5	3	4	1	8	3	3
29	1	7	7	4	3	6	3
30	1	3	3	3	8	4	2
31	6	7	1	2	4	1	5
32	2	3	6	8	4	3	3
33	5	5	7	1	7	8	1
34	3	3	6	1	6	7	5
35	8	3	7	2	1	6	7
36	2	8	7	2	1	5	1
37	2	2	8	8	6	2	6
38	4	5	3	5	4	2	4
39	2	2	8	6	1	3	8
40	7	4	4	8	3	1	3
41	1	5	5	6	3	5	7
42	1	6	3	6	7	2	8
43	4	3	1	7	1	3	4
44	4	4	1	5	4	6	8
45	8	6	2	2	4	1	7
46	8	1	7	2	6	1	6
47	6	4	3	7	1	6	5
48	8	1	5	5	4	6	2
49	5	2	7	7	2	7	6
50	4	6	8	6	1	5	7
51	4	7	3	5	7	1	8
52	2	7	4	3	3	4	3

53	8	6	4	8	6	7	4
54	8	5	2	8	5	2	2
55	7	6	7	1	3	6	4
56	7	4	2	8	5	6	7
	222	**246**	**243**	**239**	**242**	**229**	**233**

e Photo order per participant:

Participant	A	B	C	D	E	F	G
1	1	2	7	3	6	4	5
2	2	3	1	4	7	5	6
3	3	4	2	5	1	6	7
4	4	5	3	6	2	7	1
5	5	6	4	7	3	1	2
6	6	7	5	1	4	2	3
7	7	1	6	2	5	3	4
8	5	4	6	3	7	2	1
9	6	5	7	4	1	3	2
10	7	6	1	5	2	4	3
11	1	7	2	6	3	5	4
12	2	1	3	7	4	6	5
13	3	2	4	1	5	7	6
14	4	3	5	2	6	1	7
15	4	5	7	6	1	2	3
16	5	6	1	2	3	7	4
17	6	7	2	3	4	1	5
18	2	4	5	7	1	3	6
19	6	1	2	3	5	4	7
20	3	4	6	7	1	5	2
21	4	5	7	1	2	6	3
22	2	3	5	6	7	1	4
23	4	6	7	2	1	3	5
24	5	7	6	1	2	4	3
25	3	5	7	6	1	2	4
26	7	2	1	3	4	6	5
27	1	3	4	5	7	2	6
28	6	1	2	4	5	3	7
29	3	5	4	6	7	2	1
30	6	7	2	3	4	1	5
31	2	4	5	7	1	3	6
32	6	1	2	3	5	4	7
33	3	4	6	7	2	1	5
34	5	7	3	1	2	4	6
35	2	4	3	5	6	1	7
36	7	2	1	3	5	4	6
37	4	6	7	1	3	2	5
38	1	2	4	5	7	3	6
39	6	1	7	2	3	5	4
40	7	2	1	3	4	6	5
41	1	3	2	4	5	7	6
42	2	4	5	6	1	3	7
43	7	2	3	5	6	1	4
44	5	7	1	3	2	4	6
45	3	4	6	7	2	1	5
46	5	7	2	1	3	4	6
47	2	4	3	5	6	1	7
48	7	2	1	3	5	4	6
49	4	6	7	1	3	2	5
50	5	7	1	2	4	3	6
51	2	3	5	6	7	4	1

52	3	4	6	7	1	5	2
53	1	2	4	5	6	3	7
54	2	3	5	6	7	1	4
55	5	7	2	1	3	4	6
56	2	4	5	6	1	3	7

10.6 Appendix F: Response Sheet: Experiment 2

The answer sheets for happy, sad and fearful were seen for each of the seven target faces.

Experiment 2: Participant Response Sheet 1A

You will see a total of 21 faces. Each face is covered by 4 strips of a blurred image. You are asked to remove the strips one at a time, in whatever order you wish. For each trial you will be given a target emotion. After you have removed a strip you are asked to answer three questions. You will first have to record the number of the strip you have removed. Then you will be asked to indicate whether you think that the person in the photograph is FEELING the target emotion. Do this by circling the appropriate response. You will then be asked to indicate how confident you feel in your judgment. Do this by making a vertical line on the horizontal line provided. The more confident you are about your judgment the further to the right you should mark the line.

Practice Trial:

Section 1.

1. Number of strip removed: 1 2 3 4

2. Is this person a male?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 2.

1. Number of strip removed: 1 2 3 4

2. Is this person a male?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 3.

1. Number of strip removed: 1 2 3 4

2. Is this person a male?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 4.

1. Number of strip removed: 1 2 3 4

2. Is this person a male?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Face: ***Order:*** ***Emotion:***

Section 1.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** happy?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 2.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** happy?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 3.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** happy?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 4.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** happy?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Face: ***Order:*** ***Emotion:***

Section 1.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** sad?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 2.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** sad?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 3.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** sad?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 4.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** sad?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Face: ***Order:*** ***Emotion:***

Section 1.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** fearful?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 2.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** fearful?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 3.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** fearful?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

Section 4.

1. Number of strip removed: 1 2 3 4

2. Is this person **FEELING** fearful?

YES / NO

3. How confident are you that the answer you have circled is correct?

Extremely Unconfident Extremely Confident

10.7 Appendix G: Information Sheet: Experiment 2

Department of Psychology *University of Canterbury*

Emotion Detection: Information Sheet (E2)

You have been invited to participate in the above-named research project. The aim of this experiment is to find out whether perceivers can accurately identify whether or not another person is experiencing a particular emotional state from seeing their facial expression, even when certain regions of the face are not visible.

We are particularly interested in whether perceivers can tell what another person is actually feeling. In some situations the *expression of* and *experience of* emotional states are not necessarily the same. Sometimes an individual may experience an emotional state but not display it, and at other times an individual may display an emotion that they are not actually experiencing it. For instance, you may smile when you encounter a person who you do not particularly like even though you are not happy to see them. We are interested in seeing how well perceivers can tell what another person is **FEELING** by looking at their facial expression only.

For this experiment you will be required to make a number of judgments about an individual's emotional state. You will see a number of faces and for each face you will be asked to make a judgment about whether the person is feeling a specific emotion (happiness, sadness, fear) or not. Each face will be concealed by a blurred image. You are asked to remove strips of the blurred image, one at a time, to reveal a face below. After you have removed each strip of the blurred image you will then be asked to decide whether the person is **FEELING** the target emotion or not and how confident you feel that your judgment is correct.

In total, participation will take approximately half an hour. In return you will be given a $5 voucher. You are free to withdraw from this project at any time, including withdrawal of any information you have provided.

The results of this project may be published, but you can be assured of the complete confidentiality, you are not asked to provide any identifying information that can be linked to your responses at any stage of the project. By completing the study, however, it will be understood that you have consented to participate in the project, and that you consent to the publication of the results of the project with the understanding that anonymity will be preserved.

This project is being carried out as part of a Masters Thesis by Laura Halliday under the supervision of Associate Professor Lucy Johnston and Dr Lynden Miles. If you have any questions regarding this study please contact Laura

(lah50@student.canterbury.ac.nz), Lucy (lucy.johnston@canterbury.ac.nz) or Lynden (lynden.miles@canterbury.ac.nz).

This research has been reviewed and approved by the University of Canterbury Human Ethics Committee.

10.8 Appendix H: Order of Target Faces: Experiment 2

Is this person feeling happy?		Is this person feeling sad?		Is this person feeling fear?	
1	Neutral	8	Neutral	15	Neutral
2	Genuine Happy	9	Genuine Happy	16	Genuine Happy
3	Posed Happy	10	Posed Happy	17	Posed Happy
4	Genuine Sad	11	Genuine Sad	18	Genuine Sad
5	Posed Sad	12	Posed Sad	19	Posed Sad
6	Genuine Fear	13	Genuine Fear	20	Genuine Fear
7	Posed Fear	14	Posed Fear	21	Posed Fear

1	21	10	14	9	1	12	20	4	6	2	13	5	11	19	7	18	17	3	16	8	15
2	7	18	19	5	8	4	11	14	15	1	20	13	21	6	15	2	9	10	3	12	16
3	14	19	3	18	7	11	6	5	17	1	13	16	4	15	2	21	8	9	20	10	12
4	7	20	17	16	3	9	15	8	13	2	14	10	6	12	11	4	1	21	18	19	5
5	2	9	5	17	3	8	7	1	11	20	21	10	12	15	18	4	16	19	13	6	14
6	1	8	4	13	14	12	3	16	10	7	1	18	20	15	19	17	21	11	9	5	2
7	21	17	9	5	20	15	4	12	6	2	8	18	16	11	19	13	7	14	3	1	10
8	1	3	8	9	21	4	17	6	5	10	14	7	15	20	12	18	13	11	16	2	19
9	14	12	10	13	17	9	5	16	21	19	15	8	4	1	20	2	3	6	11	18	7
10	7	20	3	1	9	15	11	8	2	21	10	17	19	13	12	6	14	4	5	16	18
11	12	19	5	3	6	14	20	8	16	17	13	2	11	10	4	7	1	18	15	21	9
12	9	16	18	21	11	13	3	17	2	7	6	1	12	14	8	19	15	20	4	10	5
13	8	21	17	20	9	10	16	12	6	11	15	19	3	7	2	8	5	13	4	1	4
14	1	21	10	6	18	4	2	15	19	3	9	1	12	14	20	17	5	16	13	8	7
15	7	3	1	14	15	19	21	8	2	16	4	17	10	13	18	12	20	5	6	9	11
16	9	10	14	18	19	20	2	4	6	5	11	7	16	1	17	3	13	15	8	12	21
17	20	15	10	5	2	4	12	21	11	17	6	8	16	19	9	1	14	13	3	18	7
18	16	9	13	3	10	12	21	18	11	2	8	7	14	1	20	15	4	19	17	6	5
19	11	7	21	6	10	17	14	9	5	13	16	1	3	12	18	15	2	19	20	8	4
20	20	6	16	2	17	4	11	13	5	9	18	12	14	3	8	21	10	15	19	1	7
21	5	17	16	14	10	21	18	11	8	9	7	15	1	12	2	3	20	19	13	4	6
22	4	2	1	17	21	5	15	10	11	14	19	20	18	8	6	16	13	9	3	7	12
23	17	19	6	7	2	4	11	12	1	15	5	13	3	20	18	8	9	10	21	14	16
24	20	7	21	18	13	17	8	5	16	4	9	1	2	6	11	10	14	12	3	19	15
25	3	9	17	8	14	11	10	5	13	15	2	21	7	6	4	19	18	16	20	1	12
26	16	2	4	9	11	19	15	6	7	13	17	12	14	5	1	18	20	8	10	3	21
27	18	20	17	14	8	5	21	10	7	9	3	6	11	13	19	2	4	12	1	15	16
28	9	17	14	11	21	6	19	20	4	16	13	12	10	18	8	1	15	5	2	3	7
29	6	9	18	11	1	15	8	2	5	14	3	4	19	21	13	10	20	16	12	17	7
30	2	1	15	19	6	11	3	21	7	20	14	17	5	16	9	4	10	18	13	8	12