Sensitivity to differences between posed and genuine facial expressions: Are children easily fooled?

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Abstract

Adults and children can discriminate various emotional expressions, although there is limited research on sensitivity to the differences between posed and genuine expressions. Adults have shown implicit sensitivity to the difference between posed and genuine happy smiles in that they evaluate T-shirts paired with genuine smiles more favorably than T-shirts paired with posed smiles or neutral expressions (Peace, Miles, & Johnston, 2006). Adults also have shown some explicit sensitivity to posed versus genuine expressions; they are more likely to say that a model is *feeling* happy if the expression is genuine than posed. Nonetheless they are duped by posed expressions about 50% of the time (Miles, & Johnston, in press). There has been no published study to date in which researchers report whether children's evaluation of items varies with expression and there is little research investigating children's sensitivity to the veracity of facial expressions.

In the present study the same face stimuli were used as in two previous studies (Miles & Johnston, in press; Peace et al., 2006). The first question to be addressed was whether adults and 7-year-olds have a cognitive understanding of the differences between posed and genuine happiness (*scenario task*). They evaluated the feelings of children who expressed gratitude for a present that they did or did not want. Results indicated that all participants had a fundamental understanding of the difference between real and posed happiness. The second question involved adults' and children's implicit sensitivity to the veracity of posed and genuine smiles. Participants rated and ranked beach balls paired with faces showing posed smiles, genuine smiles, and neutral expressions. Adults ranked,

but did not rate beach balls paired with genuine smiles more favorably than beach balls paired with posed smiles. Children did not demonstrate implicit sensitivity as their ratings and rankings of beach balls did not vary with expressions; they did not even rank beach balls paired with genuine expressions higher than beach balls paired with neutral expressions.

In the explicit (*show/feel*) task, faces were presented without the beach balls and participants were first asked whether each face was *showing* happy and then whether each face was *feeling* happy. There were also two *matching* trials that presented two faces at once; participants had to indicate which person was *actually feeling* happy. In the *show* condition both adults and 7-year-olds were very accurate on genuine and neutral expressions but made some errors on posed smiles. Adults were fooled about 50% of the time by posed smiles in the *feel* condition (i.e., they were likely to say that a model posing happy was really feeling happy) and children were even less accurate, although they showed weak sensitivity to posed versus genuine expressions. Future research should test an older age group of children to determine when explicit sensitivity to posed versus genuine facial expressions becomes adult-like and modify the ranking task to explore the influence of facial expressions on object evaluations.

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SECTION I – THE FACE AND FACIAL EXPRESSIONS

The Importance of the Face

Individuals are exposed to a vast array of stimuli in everyday life and one of the most common and socially important categories of stimuli they encounter is the human face. Faces convey significant amounts of information to perceivers, such as identity, age, gender, ethnicity, and mood. Perceivers can process this information efficiently and quickly. Systematic studies have shown that by the time individuals reach adulthood they are experts at perceiving faces and interpreting social cues; adults can recognize thousands of individual faces rapidly and accurately and decipher cues such as facial expression and direction of eye gaze (Bruce & Young, 1998; Mondloch, Geldart, Maurer, & Le Grand, 2003). The information perceivers obtain from faces is imperative for everyday social interactions, in part because perceivers can interpret individuals' moods based on emotional expressions. The expressions that individuals display are not always indicative of their actual mood states. Therefore, the ability to correctly process other individuals' emotional expressions is especially important as it helps facilitate desirable social interactions and avoid potential harmful interactions (Peace, Miles & Johnston, 2006).

Development of Sensitivity to Facial Expressions

During the first year of life infants can discriminate facial expressions and respond appropriately to them. These abilities may develop rapidly because of the newborn's tendency to orient preferentially toward face-like stimuli (Valenza, Simion, Cassia, & Umilta, 1996; Mondloch, et al., 1999). There is also evidence that infants can

discriminate between emotional expressions. Soken & Pick (1999) used a preferential looking procedure with 7-month-old infants to investigate infants' perception of both positive (e.g., happy) and negative (e.g., sad) affective facial expressions. The infants saw videotapes of two different emotional expressions and heard an audio recording of a voice concordant with one of them. Infants showed differentiation among the dynamic facial displays for happy, interested, angry, and sad expressions by looking longer at the facial expression that was concordant with the audio recording.

Infants also demonstrate the ability to respond appropriately to expressions. For example, Sorce and colleagues (1985) placed one-year-old infants facing their mothers on the opposite side of a visual cliff (a 30-cm drop covered by plexiglass). Infants' mothers were instructed to show different emotional expressions (i.e., fearful and happy) while the infants approached the visual cliff. Seventy four per cent (14 out of 19) of the one-year-old infants crossed the visual cliff if their mother was smiling, but no infants crossed the visual cliff if their mother showed a "fear" face. Accordingly, the mothers' facial expression of emotion communicated either a positive appraisal of the cliff (happy expression) or a warning of the cliff (fearful expression) to their infants. The finding that no infants crossed while mothers displayed fearful expressions demonstrates that infants use social referencing when they want to clarify ambiguous situations. Infants' sensitivity to discrete expressions of emotion may contribute to the ability to use social referencing in this type of situation.

Using preferential looking procedures, it has been shown that infants are able to discriminate a variety of facial expressions of emotion in the first year of life (Nelson,

1987). We also know that infants prefer to interact with adults who are expressive versus adults who are posing a still-face (Toda & Fogel, 1993). This ability to use emotional expressions as cues about others' intentions or behaviour starts developing as early as the first year of life. Phillips, Wellman, and Spelke (2002) showed that infants are able to make a connection between emotional expressions and others' actions (grasping an object). An actor attended to one of two objects and displayed a positive facial expression toward only one of the objects and was then shown holding that object. Infants were habituated to this (consistent event). The actors were also shown holding the object that they did not emote positively towards (inconsistent event). Measurements of 12-month old infants' looking times indicated that they looked longer at the inconsistent events. That is, they recognized that the actor would grab the object that he/she displayed a positive expression toward. Infants at 8 months of age did not demonstrate this capability. This is evidence for the importance of emotional expressions in predicting others' actions.

Infants' sensitivity to facial expressions of emotion has been tied to the idea that facial expressions of emotion are universal and that humans are born with a biological preparedness to display and decipher facial expressions of emotion (Ekman & Friesen, 1976). Infants' ability to use others' facial expressions to guide their behaviour may be protective, enabling infants to cry in the presence of others who look threatening or angry and to avoid potential danger (Sorce, et al., 1985). Steiner (1979) found that infants also show expressions that resemble emotions shown in adulthood (e.g., disgust in response to unpleasant tastes).

Cross-cultural studies also suggest universality of expressions. Ekman & Friesen (1971) studied expressions of isolated tribes (not exposed to Western culture) and found that there are six universal expressions that are easily recognized across cultures: happiness, sadness, anger, fear, surprise and disgust. Children can discriminate these six basic emotions before more complex emotions (e.g., they can discriminate happy from sad before bored from nervous). Widen and Russell (2003) found that when children ages 2 to 6 years are asked to label prototypical expressions of basic emotions, correct classification of emotions emerge in a systematic order: happy, sad, angry, fearful, surprised and disgust. By age 2 to 3 years, children can classify happy and to some extent, sad and angry. By the age of 4 or 5 years, children can classify happy, sad, angry, fearful and surprised. By age 6, classification of disgust emerges.

Children are more adult-like when discriminating positive facial expressions than negative expressions (De Sonneville et al, 2002). Children ages 7 to 10 years of age completed a facial expression identity task in which they were shown a series of faces and asked whether each face was showing a particular expression (e.g., "is this person showing happy"). The expressions were happy, sad, anger, fear, disgust, surprise, shame, and contempt. They also completed a matching task in which they were asked to judge whether two photos were showing the same expression. Children's accuracy and speed were better for identifying positive than negative expressions in the identification task. Further, positive expression-matched pairs were classified correctly more often than the negative expression-matched pairs, and there was a main effect of age in that adults were more accurate than children.

SECTION II – SENSITIVITY TO POSED AND GENUINE EXPRESSIONS

People often use their emotions to influence others' responses such as when they mask their true feelings in order to dupe others. For example, imagine a child receiving a birthday gift of which she is not fond. The gift is from her grandmother and she does not want her grandmother to know she is disappointed. To mask her disappointment, the child may smile despite not actually feeling happy. An emotion that is displayed, but not actually felt is considered a *posed expression* (e.g., smiling when not happy). Another example of a posed expression is when a parent is very tired after a long day but poses excitement about something that their child has just shown to them, although they may not actually feel very enthusiastic. In contrast, an expression that is displayed when an individual is actually experiencing the associated emotion is a *genuine expression* (e.g., frowning when angry) (Peace et al., 2006).

Individuals may pose emotional expressions for different reasons. Some circumstances in which people pose emotions include protecting others' feelings, trying to manipulate others, and masking a negative emotion (Peace et al., 2006). Gosselin, Warren, & Diotte (2002) argued that people hide their emotions based on two categories of display rules: pro-social and self-protective. Pro-social display rules include protecting others' feelings (e.g., smiling at someone who is nervous in order to put them at ease). Self-protective display rules include masking negative emotions in order to protect oneself from embarrassment (e.g., young boys may hide emotions such as sadness for fear of the embarrassment of crying in front of others) or posing an emotion in order to manipulate someone's behaviour for personal gain. For example, Tom Sawyer may have

been posing expressions of happiness/enjoyment while he was white washing the fence, although he was not necessarily happy to be performing that task. Tom did this in order to dupe his friends into thinking that it would be fun to help him.

Given the strong link between individuals' moods and behaviors it is important for perceivers to be aware of other individuals' true emotional states in order to avoid being duped or manipulated. In some cases, it is beneficial to the person masking an expression if their true emotional state is detected; if an individual is able to detect a loved one's hidden sadness, it enables him/her to provide appropriate comfort. The ability to judge the authenticity of emotions is socially important because it may help perceivers avoid potential harmful manipulations by others and regulate relationships effectively.

Fortunately for perceivers, there are ways to detect the authenticity of emotions on the basis of cues in the facial expression of the emotion. Ekman and Friesen (1976) developed a method to explore the differences between posed and genuine expressions. The Facial Action Coding System (FACS) maps the subtle differences in muscles and muscle groups (Action Units) that are involved in varying expressions. Ekman and Friesen have documented subtle physiognomic differences between posed and genuine expressions. In both posed and genuine expressions of happiness for example, Action Unit 12 (the zygomatic major) is activated, which pulls the lips up toward the cheekbones, producing a curved mouth. Genuine happy expressions are unique in that they also contain crow's feet (lines) and bulges around the eyes, which are produced by contraction of Action Unit 6 (obicularis oculi) (Miles & Johnston, in press; Ekman & Friesen, 1976); this action unit is not involved in posed expressions of happiness. Posed

expressions of enjoyment also are more asymmetrical, longer in duration, and less irregular in speed of muscle contraction than genuine expressions (Ekman, Friesen, & O'Sullivan, 1988).

Influence of Affect on Evaluations of Objects

Affective facial expressions not only influence how people react to other individuals, but also can have an influence on how individuals evaluate objects, even when the objects are affectively neutral. For this reason advertisers may use smiles to increase sales. One method that has been used to assess people's sensitivity to emotional expressions is subliminal priming. Channouf (2000) showed that evaluations of both products and people improve after subliminal priming with positive (e.g., happy, smiling) facial expressions. Female participants were shown positive (e.g, happy) and negative (e.g., sad) facial expressions through subliminal exposure. They then were asked to judge whether advertisements presented immediately afterwards were true or false. Results indicated that true judgments were made more often following priming with positive emotional expressions versus negative ones. Positive affect primes can moderate perceiver's evaluation of objects, even if the perceiver is not aware of any change in their own affective state (Winkielman, Zajonc & Schwartz, 1997). Advertisers have capitalized on this concept in order to increase sales; the more positive a perceiver's affective reaction to an advertised product, the more positively he or she evaluates the product and the more likely it is that he or she will purchase the product (Batra & Ray, 1986). It is important then to assess adults' sensitivity to posed versus genuine expressions when evaluating items and when making explicit judgments about emotions.

Different methods have been used to investigate whether individuals are sensitive to the subtle differences between posed and genuine facial expressions of happiness. Adults' explicit sensitivity to this information was revealed by Miles and Johnston (in press) when participants were given instructions to make judgments about individuals' emotional states (see Experiment 1 below). Adults' implicit sensitivity to posed versus genuine expressions was revealed when adults completed a semantic priming task without being given explicit instructions concerning emotion or authenticity of expression (Miles & Johnston, in press; Experiment 2 below) and when pairing products with posed and genuine smiles affected adults' evaluations of the products (Peace et. al, 2006). Collectively these studies show that adults are sensitive to the difference between posed and genuine expressions. Adults are more likely to say that someone is *feeling* happy if their expression is genuine than if their expression is posed, their reaction times to target words are faster if primed with a genuine expression than a posed expression and they rate products more positively when paired with a genuine expression than a posed expression. I used two of these methods to test children's sensitivity to posed versus genuine facial expressions.

Adults' explicit sensitivity to posed and genuine facial expressions. In Experiment 1, Miles and Johnston (in press) showed adult female participants photographs (static presentation) or video clips (dynamic presentation) of targets displaying posed or genuine happy smiles. In each condition there were two types of smiles—open and closed. Participants were asked to make two judgements about each target stimulus: i) whether or

not the target was *showing* the emotion happiness (emotion shown condition) and ii) whether or not the target was *feeling* the emotion happiness (emotion felt condition).

Adults were sensitive to the differences between posed and genuine expressions of happiness. Neutral expressions were rarely classified as happy in either condition. Adults responded, "showing happy" almost 100% of the time to *genuine smiles* and about 90% of the time to *posed smiles*. Adults responded, "feeling happy" about 90% of the time to *genuine smiles*, but only about 54% of the time to *posed smiles.* Therefore, both posed and genuine smiles were often classified as showing happy, but genuine smiles were classified as feeling happy more often than posed smiles. Smiles with teeth showing (i.e., open mouth smiles) were more likely to be classified as showing and feeling happy for both posed and genuine smiles and in both static and dynamic presentation (Miles & Johnston, in press). Thus, adults do demonstrate a sensitivity to the difference between posed and genuine expressions, but they still made many errors (i.e., participants classified posed smiles as *feeling* happy 54% of the time), especially in the posed open mouth condition.

These data suggest that posed expressions do serve a functional purpose in that as adults we can still be fooled by others posing expressions. This may be advantageous as others may mask their emotions for pro-social reasons. For example, to be encouraging, a friend may smile and tell you that they are enjoying listening to you, but may actually be quite bored. If we were sensitive to others' posing emotions at all times, then the functionality of posing emotions would be lost. That is, if you knew your friend was posing a smile and actually bored with the conversation, it might have a negative impact

on the relationship. Children may be exposed to a higher proportion of pro-social rather than self-protective posed expressions. For example, teachers or parents may pose happy expressions to put children at ease, etc. In this case, it may be adaptive for children to be less sensitive to posed and genuine expressions than adults. Therefore, in the current study, I assessed whether or not 7-year-olds were able to explicitly distinguish posed versus genuine expressions using a method similar to what was used by Miles and Johnston (in press) (i.e., "Is the individual showing happy?"/ "Is the individual feeling happy?").

Adults' implicit sensitivity to posed and genuine facial expressions. In Experiment 2, Miles and Johnston (in press) assessed participants' sensitivity to the authenticity of smiles in such a way that did not include explicit instructions to make judgments about the facial expressions. Adult male and female participants who did not participate in the study measuring explicit sensitivity focused on a completely different task; they were required to categorise the semantic valence (i.e. positive or negative) of target words. The target words were preceded by a facial expression prime (posed, genuine, and neutral) that was visible for 50 msecs. This is known to be sufficient time for participants to process the emotional state, but not enough time for detailed examination (Miles & Johnston, in press). Participants were asked to make judgements about the target words (positive or negative meaning) as quickly and accurately as possible. Results indicated that genuine smile primes facilitated identification of positive words but posed and neutral smiles did not. From this experiment, it is evident that adults are sensitive to the veracity of smiles even when there is no explicit goal of judging the emotion or

authenticity of the facial expressions. This research also suggests that the ability to decipher posed expressions may generalise to actual social interactions, where explicit judgments about emotional state or veracity of expressions do not occur (Miles & Johnston, in press). In one recent study (Melak & Maurer, unpublished data) researchers have shown that 7.5-year-old children show a similar pattern of results. Thus children may be sensitive to posed versus genuine expressions when the test is implicit.

Although many studies have shown that adults rate products more favourably when they are associated with happy facial expressions than neutral facial expressions, Peace et al. (2006) were the first to show that the effect is limited to genuine facial expressions; posed happy expressions confer no benefit. Peace and colleagues paired consumer products (T-shirts) with neutral, posed, and genuine happy expressions and participants were asked to evaluate the T-shirts. In Experiment 1, 39 female participants were asked to evaluate 6 identical T-shirts of varying colour. Two T-shirts were paired with the model displaying a genuine happy expression, two were paired with the same model displaying a posed happy expression and two were paired with the model displaying a neutral expression. The model chosen for the study was one who displayed distinct genuine and posed expressions that were matched on intensity (Peace et al., 2006). The T-shirts were visible to participants while they evaluated them in three ways: i) like/dislike, ii) on 9 bipolar items (e.g., attractive/unattractive), and iii) rank order of preference. There was no limit to viewing times, although participants were instructed to respond as quickly as possible. It was found that the smile veracity had an effect on adults' evaluations of the product. That is, participants rated the T-shirts more favourably

when paired with genuine positive facial expressions versus when the T-shirts were paired with posed positive or neutral facial expressions. There were no significant differences in ratings between posed and neutral expressions.

In a follow-up study, Peace and colleagues (2006) only presented the models for 150 ms. Unlike the results of priming studies, T-shirt ratings did not differ between posed and genuine expressions, although both were higher than neutral. The participants rating the T-shirts may not have had sufficient time to attend to the expression as they were concentrating on evaluating the T-shirts while the expressions were presented whereas in the word priming task (see Miles & Johnston, in press; Experiment 2) the emotional facial expressions were presented briefly but prior to the presentation of the words.

Thirty additional female participants completed a different evaluative task of the T-shirts in Experiment 3. Participants were told to identify the colours of three T-shirts each of which was paired with a different expression (genuine smile, posed smile, and neutral expression) and once all of the T-shirts were viewed, they were asked to rank them in order of preference in absence of any stimuli. Results were comparable to Experiment 1, in that T-shirts paired with genuine smiles were rated more favourably than those shirts paired with neutral and posed expressions. The participant's evaluations of the products were influenced implicitly because ratings of the T-shirts paired with genuine expression were still more favourable than ratings of the T-shirts paired with a neutral or posed expressions, even though they had viewed the T-shirts with no product evaluation goals. Participants were also unaware of any change in their own affective state (Peace et al., 2006).

In summary, genuine versus posed expressions have different effects on adults' decision-making regarding products. Adults rate products more favourably and are more likely to select a product when it is paired with a genuine happy expression than when paired with a posed happy expression. Although children are reported to be sensitive to word priming (Melak & Maurer, unpublished data), no one has yet determined whether children's product evaluations are influenced by posed versus genuine expressions, which will be the focus of the current study.

Development of the Ability to Decipher Posed and Genuine Expressions

Do children understand that some emotional expressions are fake? Very few studies have been designed to investigate children's understanding of real versus posed emotions. With one exception researchers have tended to focus on whether children *understand* that people sometimes pretend to feel an emotion. There is some evidence that even 3-year-olds understand social display rules (Banerjee, 1997). Three-year-old participants were read scenarios about characters that experienced a given emotion but were motivated to hide it from other characters. Children were presented with a story about a character who had a "yucky" casserole at her grandmother's house that tasted so bad it made her want to scruntch up her face and spit it out but her grandma was right there. The participants were then asked whether the story character should express the emotion and what would happen if the character displayed the emotion. Results indicated that children aged 3 were able to distinguish between situations in which hiding (e.g., eating 'yucky' food at Grandma's house) or not hiding (e.g., receiving a desired gift) an

emotion was appropriate. This ability in young children is thought to be indicative of the very beginning of a mentalistic understanding of emotion (Harris, 2000).

Harris and colleagues (Harris, Donnelly, Guz, & Pitt-Watson, 1986) found that 6-year-olds and, to some extent, 4-year-olds, understand that emotional communication can involve the use of appearances to mislead others about one's actual mental state. Participants were told stories about characters motivated to hide their actual felt emotions. For example, "A big boy runs past Diana. Diana thinks that it is funny, but she doesn't want the boy to know how she feels in case he gets cross with her" (Harris et al., 1986, p. 908). The participants were asked: i) how they thought the character really felt and ii) how they thought the character tried to look. Six year-olds demonstrated a more firm understanding of the distinction between real and apparent emotion than 4 year-olds. That is, 4 year-olds did show sensitivity to differences between real (i.e., actually felt) and apparent (i.e., shown) emotions. However, the ability to articulate a justification of why someone may be showing happy but not feeling happy is less developed in children 4 years old compared to children 6 years old.

In a similar study Gosselin et al. (2002) presented 6- and 11-year-old children with six scenarios in which the protagonist felt happy or sad and was trying to hide their emotions from the other characters in the stories for either pro-social reasons (i.e., to protect the feelings of other characters) or self-protective reasons. Children were asked to indicate the protagonist's real feelings on a 'feeling thermometer' and then to indicate the expression the protagonist would show using a 5-point apparent emotions scale ranging from very sad to very happy. Results indicated that children 6 and 11 years old had

comparable and very high accuracy levels when distinguishing between real and apparent emotions. The older group (age 11) appeared to be slightly better at making the distinction with negative stories than was the younger group (age 6), however this difference did not reach significance. The method used stories that were designed to reduce memory load, which may have increased the simplicity of the task for these age groups resulting in this ceiling effect (Gosselin et al., 2002).

In summary, although 3 year olds understand some social display rules, a cognitive understanding, or ability to articulate the difference between felt versus displayed emotion continues to develop during the school years. Although children begin developing this understanding at a fairly young age, their ability does not become advanced until later years (Gosselin, et al., 2002; Harris, et al., 1986). Differences between adults and children's emotional processing ability is not surprising given that there are cognitive and perceptual prerequisites for authenticating emotional expression. In order for children to appreciate the difference between real and apparent emotions, they most likely need to understand that what a person feels and what a person shows on his or her face may not always correspond. This ability may take some time to develop.

Only two studies have investigated children's sensitivity to posed and genuine facial expressions. Children's ability to discriminate differences between posed and genuine expressions in an explicit form has been shown to continue to improve into early adolescence. Soppe (1988) had children ages 7 to 9 ($M = 7.7$) and 11 to 13 ($M = 11.9$) as well as adults judge the authenticity of genuine and posed positive and negative expressions. Participants were shown genuine expressions paired with posed expressions

and were asked which facial display was false. Both groups of children could identify posed happy smiles (i.e., models who were actually feeling sad but smiling) and neutral expressions as well as adults but were fooled when shown posed sad (i.e., models who were actually feeling happy but showing sad) expressions. Adults were significantly better at detecting posed sad expressions than children ages 7 and 13 years and the two groups of children did not differ from each other. However, even adults were systematically fooled on simulated negative expressions (i.e., the individual displayed sad when they actually felt neutral).

Whereas Soppe (1998) asked children to make explicit judgments about pairs of facial expressions, a recent study by Melak & Maurer (unpublished data) was the first study to assess 7.5-year-old children's sensitivity to posed versus genuine facial expressions using an implicit method. The method was adopted from the priming study mentioned previously (Miles & Johnston, in press). To be more suitable for children, the words that were used by Miles and Johnston (in press) were replaced with positive and negative pictures and set up in a game format. Participants were primed with genuine and posed happy smiles as well as neutral expressions. These primes were presented 50 ms before the target stimuli (pictures). The target pictures were either negative valence (i.e. Captain hook items) or positive valence (Peter Pan items). Individuals had to indicate whether the target picture was a Peter Pan item (positive) by pressing the 'Yes' key or a Captain Hook item (negative) by pressing the 'No' key. Results indicated that children's response times were faster with genuine happy primes compared to posed or neutral, indicating that children aged 7.5 are indeed sensitive to the difference between posed and

genuine happy expressions. Unlike adults in the Miles and Johnston (in press) study, however, 8-year-olds were faster for both positive and negative items following a genuine happy prime. This may have been because the target stimuli were not inherently negative or positive.

Adults' sensitivity to posed versus genuine facial expressions has been shown using three evaluation methods: 1) asking adults to indicate what emotions individual targets are showing and feeling (Miles & Johnston, in press) 2) priming with affective genuine and posed primes (Miles & Johnston, in press) and 3) pairing consumer items with posed and genuine expressions (Peace et al., 2006). Little is known about children's sensitivity to this distinction, with the exception of the recent priming study (Malek & Maurer, unpublished data). It is interesting to assess children's sensitivity to posed and genuine expressions as they may have less exposure to posed expressions than adults and therefore show less sensitivity than adults. It may also be more adaptive for children not to pick up on the subtle differences between posed and genuine facial expressions, at least not until they are exposed to other people posing expressions for manipulative reasons, (e.g., a classmate posing an expression to manipulate them on the playground), in which case, developing sensitivity to posing expressions would be adaptive.

SECTION III – ASSESSING CHILDREN'S SENSITIVITY TO POSED AND GENUINE EXPRESSIONS

The Present Study

As a first step in an investigation of the development of sensitivity to posed versus genuine facial expressions I tested adults and 7-year-old children on three of the tasks mentioned previously: 1) ratings of a commercial product (Peace et al., 2006), 2) ranking of commercial products (Peace et al., 2006), and 3) show/feel judgments (Miles & Johnston, in press). The methods were modified to be more suited to children in that participants were asked to evaluate beach balls instead of T-shirts. An additional scenario task was added to verify each participant's understanding that emotional expressions displayed and emotions felt do not always have a one-to-one correspondence.

Although Soppe (1998) found that children aged 7-13 years of age were at chance when discriminating posed versus genuine happy expression, these results have not been replicated and the stimuli used by Soppe were not verified using the Facial Action Coding System (FACS; Ekman & Friesen, 1976). The present study used stimuli selected using FACS and that were previously validated with adults (Miles & Johnston, in press; Peace et al., 2006). The age of children was selected because of their ability to decipher emotional expressions of happiness at a level comparable to adults (Gosselin, et al., 2002) and because Malek and Maurer (unpublished data) have shown that 7.5-year-olds are sensitive to posed versus genuine happy expressions in a priming task.

The evaluations of the beach balls started with *ratings* of 6 beach balls presented sequentially (*Task 1*). Next, the participant *rank-ordered* the beach balls from most to

least liked; all 6 beach balls were visible at this time (*Task 2*). The storybook *scenarios* that were used to assess participants' cognitive understanding of posed and genuine facial expressions were modeled on a previous study conducted with children 6- to 8-years old (Happé, 1994; *Task 3*). Participants also completed a *show/feel* evaluation that asked specifically about the emotional states of the target models (*Task 4*). The show/feel method provided an explicit measure of sensitivity to posed and genuine expressions in contrast to the rating and ranking methods that provided an implicit measure.

Hypotheses

The following hypotheses are based on: 1) knowledge of adult performance in previous studies (Miles & Johnston, in press; Peace et al., 2006) and 2) previous work done with children involving posed and genuine emotional expressions (Melak & Maurer, unpublished data; Soppe, 1988).

Cognitive Understanding of Emotional Expressions. If adults and children are able to infer that facial expressions and emotions felt do not always have a one-to-one correspondence, they will demonstrate this sensitivity by answering the questions about the characters in the scenarios (*Task 3*) appropriately (Appendix A).

Implicit Sensitivity to Posed and Genuine Happy Expressions. If participants' ratings (*Task 1*) and/or rankings (*Task 2*) of the beach balls are affected by the nature of the target model's expression it would replicate the adult findings of Peace and colleagues (2006) and show implicit differentiation of posed versus genuine expressions.

Explicit Sensitivity to Posed and Genuine Happy Expressions. If adults and children are sensitive to the differences between real and apparent emotions when given

specific instruction to attend to emotional expression (*Task 4*), they will recognize that some of the smiles were showing, but not actually feeling happy (Miles & Johnston, in press). If accuracy is higher on the open mouths than closed mouths, this will mean that adults and children discriminate posed from genuine expressions differently depending on the mouth (the open mouth posed smiles may be mistaken as genuine more often than closed mouth posed smiles) (Miles & Johnston, in press). Findings from these evaluations will provide novel insights into children's development of sensitivity to the authenticity of emotional expressions and assess whether or not the previous findings from adults are replicable.

SECTION IV – METHODOLOGY

Participants

Forty-two adult students (31 females) at Brock University volunteered to participate in a study concerning emotional expressions in exchange for course credit. Adults ranged in age from 18-35 years (M = 22, SD = 6.2). Forty-two children 7.0- 7.11 years old (19 females) were recruited from local school boards in the St. Catharines/ Niagara region and by contacting parents who had placed their child in our lab database for possible participation in future studies. Children received a "Junior Scientist" award and a small gift from the "Treasure Chest" at the end of the experiment. All participants were required to have normal or corrected-to-normal vision (tested using a Lighthouse eye chart and the Titmus stereoacuity test). Two additional adults (female) were excluded due to failing visual criteria. Four additional children were excluded from the experiment: 1 female and 2 males were excluded because they failed visual screening and one child (male) was excluded for failing to answer questions correctly in the storybook scenarios (Task 3).

Testing Apparatus

The displays were shown on a MacIntosh, Cinema HD display monitor, powered by a MacPower book G4 computer. The tasks were run using Powerpoint and Superlab (1.77) software programs. Subjects were seated approximately 50 cm from the screen. An experimenter was present throughout testing to ensure this distance was maintained throughout the study and to record participants' responses. Testing took place in the Infant and Child Development Lab or a quiet room in a school.

Stimuli

In the first two tasks of the study (rating and ranking) participants were presented with the same model used in the comparable tasks by Peace et al (2006) and Miles and Johnston (in press). In *Task 4* (show/feel) of the study, 4 additional models (2 males) were used that were also used by Miles & Johnston (in press). The four additional models were shown displaying each of three expressions (posed, genuine and neutral). One male and one female had open-mouthed smiles and the other two had closed-mouth smiles. Miles and Johnston (in press) used the same models in their show/feel experiment (see Figure 2).

The expressions of all models were created by capturing images at the apex of expressions from videotape. The expressions were elicited by sounds and images that have previously been shown to evoke positive or negative emotion (Haberstadt & Niedenthal, 1997). The expressions were also validated for cues related to posed smiles, genuine smiles and neutral expressions using the Facial Action Coding System (FACS) criteria (Ekman & Friesen, 1976). For example, both genuine and posed smiles involve the contraction of the zygomatic major action unit (AU12) which pulls up the corners of the mouth into what is known as a typical smile. Genuine smiles involve the activation of the obicularis oculi action unit (AU6) which when contracted causes tiny wrinkles around the eyes (crow's fee) in addition to the AU12 activation. Genuine smiles are also less asymmetrical and longer in duration than posed smiles (Ekman, Friesen, & O'Sullivan, 1988).

The models chosen had posed and genuine smiles that were matched in intensity according to the FACS criteria (Ekman & Friesen, 1976). More specifically, trained observers assessed the contraction of the zygomatic major action unit (AU12) on 3 levels of intensity according to the FACS criteria for each of the models' posed and genuine smiles. Models with the same level of AU12 contraction for both posed and genuine smiles were used.

In the first two tasks (rating/ranking) the model was presented displaying 2 posed happy smiles, 2 genuine happy smiles and 2 neutral expressions to every participant. The stimuli were modified only slightly so that the model was holding six different colours of beach balls (red, yellow, blue, green, light green and orange) whereas in Peace et al. (2006) that same model was shown wearing six different coloured T-shirts. We changed the evaluation item to beach balls to be more appropriate for testing children 7.0- 7.11 years old. Each of the three expressions (posed, genuine and neutral) was paired with two of the beach balls. The facial expression with which each beach ball was paired varied across participants therefore each participant saw all six colours of beach ball once and each of the three expressions twice. The backgrounds of the pictures were altered so they were matched across stimuli and the beach balls' size and position was standardized across stimuli. The target stimuli measured 21.59 cm x 25.40 cm and were presented on a beach scene background. All changes made to the stimuli were made using Adobe Photoshop 8.0 (see Figure 1).

Procedure

This research received clearance from the Brock University Ethics board. First, written consent was obtained from the adult participants. Written consent was obtained from the parent(s)/legal guardian of children who were participating at an off-campus location (i.e., school). Once permission was granted to conduct this research in the local school boards, parents of children in the schools received information about the study as well as a consent form to sign. Children tested off-campus were given a debriefing letter to take home. If children were tested in the lab, parent(s)/legal guardians gave consent before testing began and after they received a brief explanation of the procedure. Children gave verbal assent before testing began in all circumstances. Approximately 5 minutes was spent interacting with the child before testing in order to establish a comfortable rapport. This was followed by the exact same procedure that was used with adults.

Neutral Posed Genuine

Figure 1. Rating/ranking model. The model is shown displaying each of the 3 expressions (neutral expression/ posed smile/ genuine smile) paired with one of the 6 colours of beach ball. The expression with which each ball was paired with was counterbalanced across participants.

Figure 2. Show/feel models shown (left to right) displaying neutral expressions, posed smiles, and genuine smiles. Two of the models have open smiles and two have closed smiles.

Next, all participants completed the visual screening tests (Lighthouse eye chart and Titmus test of stereoacuity) before beginning the tasks. For the Lighthouse test, participants stood 4 m away from the chart and named 5 letters of each row indicated by the experimenter. In order to pass (and be included in the experiment), participants had to receive a minimum score of 20/20-2. During the Titmus test, participants wore polarized glasses and were asked to indicate which images (made up of disparate lines to give a 3-dimensional effect) "jumped out" at them. In order to pass the Titmus test participants had to get 3/3 animals correct and 9/9 dots correct. This test was used as an indicator of early abnormal visual experience. It was important that participants had normal vision because facial expressions are carried by high spatial frequencies (i.e., crow's feet around the eyes distinguish posed versus genuine smiles). Suboptimal vision could have an impact on the participants' interpretation of the expressions. The visual criteria for children differed from adults only in that when a child made an error on a line, they were given another chance to read that line although errors on second attempts for each line were recorded and calculated into the total 20/20-2 requirement.

Adults and children received the same testing procedure on all of the tasks. However, before testing began, adults were told that the study was geared toward children and they were part of an adult study to assess the procedure.

Task 1- Rating. Participants were randomly assigned to 1 of 6 experimental orders. In each order participants saw each colour of beach ball paired with one of the 3 facial expressions (posed smile/ genuine smile/ neutral expression). Therefore, each participant saw each of the expressions twice.

This task was presented as a beach theme; participants were told to imagine that they were going to the beach to play catch with their friends and they wanted to look for a really "cool" beach ball to play with. They were told that they would see six different beach balls and that they would be asked how much they liked each one.

Before the actual test trials began, practice trials were administered to familiarize participants with a cup-rating system that was used to rate the beach balls. Five cups of increasing sizes were presented to the participants. The experimenter asked: i) "what is your *very* favorite food?" ii) "what is your *least* favorite food?" and iii) "what is a food you think is *so-so/ok*?' Next the experimenter demonstrated what the corresponding cup was for each food the participant named (the cups were labeled 1 to 5). This approach was taken to ensure that the participants understood that the largest cup meant, "I like something the most", the smallest meant, "I don't like it at all", and the middle cup meant, "I like it so-so". On the first set of practice trials, participants rated 3 suns that varied in attractiveness [an "ugly" sun (black), a "so-so" sun (plain) and an "awesome" sun (bright, with a playful smile)]. First the participant saw all three suns at once and then each sun was presented one at a time on the screen and remained visible until the participant rated it using the cups. On the second set of practice trials participants rated three beach umbrellas in the same manner. Participants were allowed to make one "error" (reversal) on the practice trials (i.e., rate the ugly sun as the most attractive). If they failed to meet this criterion they were excluded from the study unless they provided some indication for liking a certain object more (e.g., "Black is my favorite colour").

After 2 practice trials, test trials began with participants completing six ratings of the beach balls using the cup rating system. They saw the target stimulus (female model displaying either a posed, genuine, or neutral expression) paired with each of the 6 coloured balls. The target stimuli remained on the screen until the participant rated the beach ball. The experimenter recorded each participant's ratings of the balls. After 6 trials, participants had seen all six colours of beach balls and two examples of each expression. The order of the beach ball colours was held constant across participants, but the expressions that were paired with the coloured beach balls differed so that each colour was associated with each expression equally often across participants. The expressions were presented in 2 blocks, each of which consisted of 3 trails with all three expressions (posed, genuine, and neutral) so that 6 orders were presented across subjects within each block. The second block of trials was selected such that the same two expressions were not presented one after the other and the same order of expressions was not repeated (i.e., if the first 3 trials in the order were genuine, posed, neutral, the second 3 trials could not be in that same order or start with a neutral expression). Therefore each participant saw each of the 6 colours once and each of the 3 expressions twice.

Task 2- Ranking. Following the rating task, participants were presented with pictures of all six beach balls seen previously in the rating task. The pictures were mounted on a poster board with Velcro. They were asked to rank order the balls in their order of preference (most to least liked). The photo stimuli of the model with the beach balls were removed from the poster board one at a time as participants ranked each one. The stimuli photos were removed one at a time because corrections were not allowed in

the ranking task. It was also though that it would make the task more manageable for children. The experimenter recorded the participants' order of preference for the beach balls. The purpose of using both the rating and ranking tasks is the ranking task may be a more sensitive method of assessing children's awareness of authenticity of emotions because they are forced to differentiate among the six different beach balls.

Task 3- Scenarios. Following the rating and ranking tasks, the experimenter read 2 story-type scenarios to participants to assess their understanding of real and apparent emotions (Appendix A). The experimenter practiced making different emotional expressions with participants. For example, the experimenter asked the participants, "Can you show me what a sad face looks like?", "What does a happy face look like?" The participants were then asked to demonstrate what they thought the characters' faces from the stories looked like. In each scenario a child was described who received a gift. In one scenario the gift was desired and in the other case it was not; in both scenarios the character said that they liked the gift. The experimenter asked the participant: 1) if it was true what the child in the story said, 2) why the child said what he/she did, 3) what facial expression the child showed upon receiving the gift, and 4) whether the child in the story actually felt happy. If the participant had a cognitive understanding of felt versus displayed emotions they should have reported that only one child was happy but that both children would display smiles. The experimenter referred back to the characters from the scenarios when explaining the questions asked in the show/feel task.

Task 4- Show/Feel. This task was designed to assess discrimination of posed and genuine expressions in an explicit way. That is, participants were given specific verbal

instructions to attend to the emotional states of the models. Two male and two female models displaying each of three different facial expressions—genuine happy, posed happy, and neutral were presented in each of two blocks of trials (show and feel). One male and one female model displayed open mouth smiles and an additional male and female displayed closed mouth smiles. Each stimulus was presented for 1s then disappeared from the screen. In the *show* block of trials participants were asked to respond "yes" or "no" to the question: "Is this individual *showing* happy?" for each of the 12 stimuli. This is where the experimenter referred to the characters from the scenarios, (E.g., "Is the model showing happy like Liam and Helen from the stories we read?"). In the *feel* block of trials the exact same stimuli were repeated but the participant was asked to respond "yes" or "no" to the question: "Is this individual feeling happy?" Again the experimenter referred to the story characters (E.g., "Some of these models are feeling happy like Liam. Others aren't really feeling happy. They are more like Helen. I need you to tell me whether each person is feeling happy like Liam."). Participants' responses were entered on a keyboard by the experimenter and recorded by Cedrus Superlab. The order of the expressions was randomized for both the show and feel conditions. Every participant received the two blocks in the same order (show followed by feel).

Following 24 show/feel trials, participants completed 2 matching trials in which a male and a female were presented together for 5 seconds. One of the models was displaying a posed expression and one was displaying a genuine expression. The models' expressions were matched for open and closed mouths (i.e., a closed posed smile was paired with a closed genuine smile). Participants were asked, "Which of these individuals

is actually feeling happy?" Due to limitations in the number of stimuli available each of the two pairings involved a male and a female model. These were the same stimuli used in the show/feel trials. The model displaying the genuine emotion was counterbalanced across subjects. Each participant saw all of the 4 models (2 male, 2 female) across these two matched trials.

SECTION V – RESULTS

Scenario Task

The two stories in the scenario task were used to assess participants' understanding of real and apparent emotions. The first story assessed cognitive understanding of apparent emotions (i.e., that a character might verbalize something they don't feel and that a character might display a smile but not actually feel happy). The second story assessed understanding of a real emotion. There were 4 questions following each story, all of which participants had to answer correctly to be included in the study. This requirement was reasonable for 7-year-olds and adults because previous research has shown that by age 6, children do have an understanding of real and apparent emotions (Gosselin et al, 2002).

All participants included in the analyses scored 100% on all of the scenario questions. For the question that asked participants to show the experimenter what they thought the characters' faces looked like when they opened their gifts, all children showed variations of a smile. Only one 7-year-old (male) was excluded due to an error on this task; he said that Helen was feeling happy versus feeling disappointed but showing happy.

Based on participants' performance on the two storybook scenarios, I concluded that all participants included in the analyses of the remaining tasks understand that emotions felt and emotions displayed can be incongruent.

Ratings of Beach Balls

In the rating task, participants were asked to rate each beach ball (2 balls were paired with a posed smile, 2 with a genuine smile and 2 with a neutral expression). The ratings were measured using 5-point scale and participants were instructed to respond as quickly as possible. For each participant, ratings were recorded for each of the 6 beach balls and a mean rating for each of the three expressions (posed smile, genuine smile, and neutral expressions) was calculated.

Analysis by Participant. To assess whether participants' ratings of the beach balls were affected by expression type, a 3 (Expression: Posed smile/ genuine smile/ neutral expression) x 2 (Age: Adults/ 7-year-olds) ANOVA on the mean rating scores was conducted. Results from the ANOVA did not indicate an interaction between emotional expression and age. There was only a main effect of age, $F(1, 82) = 14.06$, $p < .01$. Figure 3 shows that 7-year-old's ratings were slightly higher than adult's ratings for all three of the expression types.

I looked at ratings separately for adults and children so that I could compare my task to previous work (Peace et al, 2006). I wanted to verify that replacing the T-shirts with beach balls had not eliminated the effects previously seen in adults. Results from the ANOVA for adults indicated a main effect of expression on ratings, $F(2, 82) = 2.99$, $p < .05$. Post hoc tests (Fisher's PLSD, $p < .05$) revealed that adults evaluated beach balls paired with the genuine smile ($M = 3.45$) more favorably than those paired with neutral expressions ($M = 3.01$, $p < .05$). Ratings for posed smiles ($M = 3.24$) did not differ from genuine ($M = 3.45$, $p > .2$) or neutral expressions ($M = 3.01$, $p > .2$). As shown in Figure

3, type of expression did not have an effect on 7-year-old's ratings of beach balls; the mean ratings for beach balls paired with posed, genuine and neutral expressions were comparable (*M*s = 3.63, 3.85, 3.74, $p > .2$).

To assess whether there were any sex differences on rating scores, a 3 (Expression: Posed smile, genuine smile, neutral expression) x 2 (Sex: Male/ female) ANOVA on the mean rating scores was conducted for the 7-year-olds only. Results indicated that there was not a significant interaction between type of facial expression and sex ($p>.2$) and there was no main effect of sex for ratings ($p>.2$). The same analysis was not performed for adults due to the uneven amount of males and females in the sample.

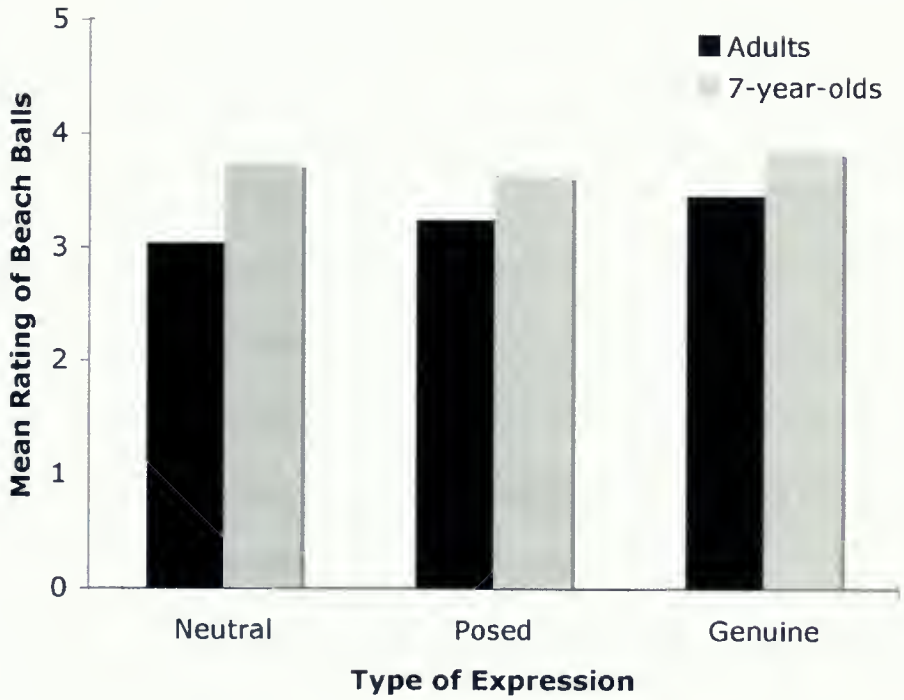

Figure 3. Mean ratings of beach balls for adults and children as a function of facial expression.

Analysis by Beach Ball. To assess whether the effect of expression varied across colours of beach balls, mean rating scores were calculated for each beach ball as a function of expression type. A 6 (Colour: red/ orange/ yellow/ blue/ green/ light green) x 3 (Expression: posed smile, genuine smile, neutral expression) ANOVA on the mean rating scores was conducted for adults and 7-year-olds separately. Although unorthodox, the 6 rating scores from each participant were treated independently to replicate the analyses done by Peace et al (2006) and because this is the only way to evaluate whether effect of expression was being carried or masked by specific colours.

As shown in Figure 4, the analysis of variance for adults revealed a significant interaction of beach ball colour and expression, $F(2, 5) = 2.17$, $p < .05$, which shows that the effect of expression varied with colour of beach ball. Adult ratings were higher for 4 of 6 beach balls when they were paired with genuine expressions. There was a main effect of beach ball colour, $F(2, 5) = 2.89$, $p < .01$; as shown in Figure 2, adults had higher ratings for the red, blue, yellow, and green beach balls than the orange and light green beach balls. There was no main effect of expression, $p > .05$.

The analysis of variance for 7-year-olds revealed that there was no significant interaction between expression and beach ball. The main effect of expression was not significant, but there was a main effect of beach ball colour, $F(2, 5) = 3.59$, $p < .01$. As shown in Figure 5, children rated the light green, blue and red balls most favorably, but their ratings were independent of facial expression.

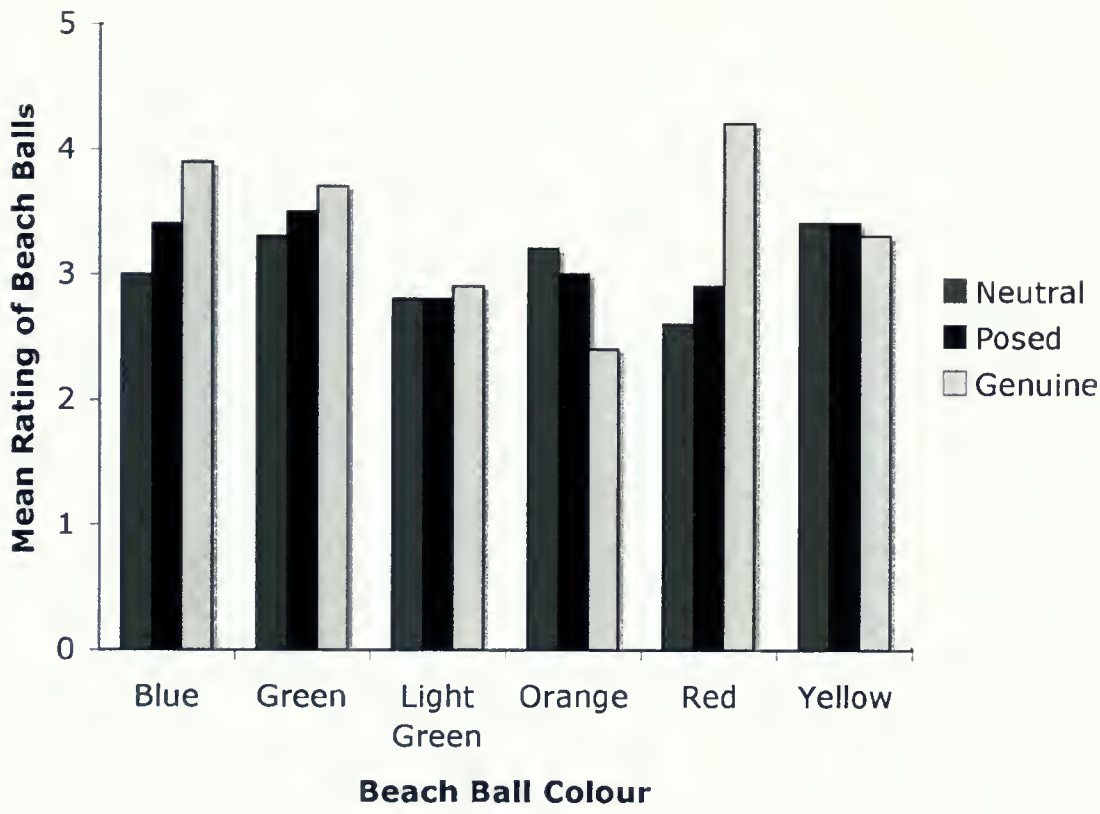

Figure 4. Adults' mean ratings as a function of beach ball colour.

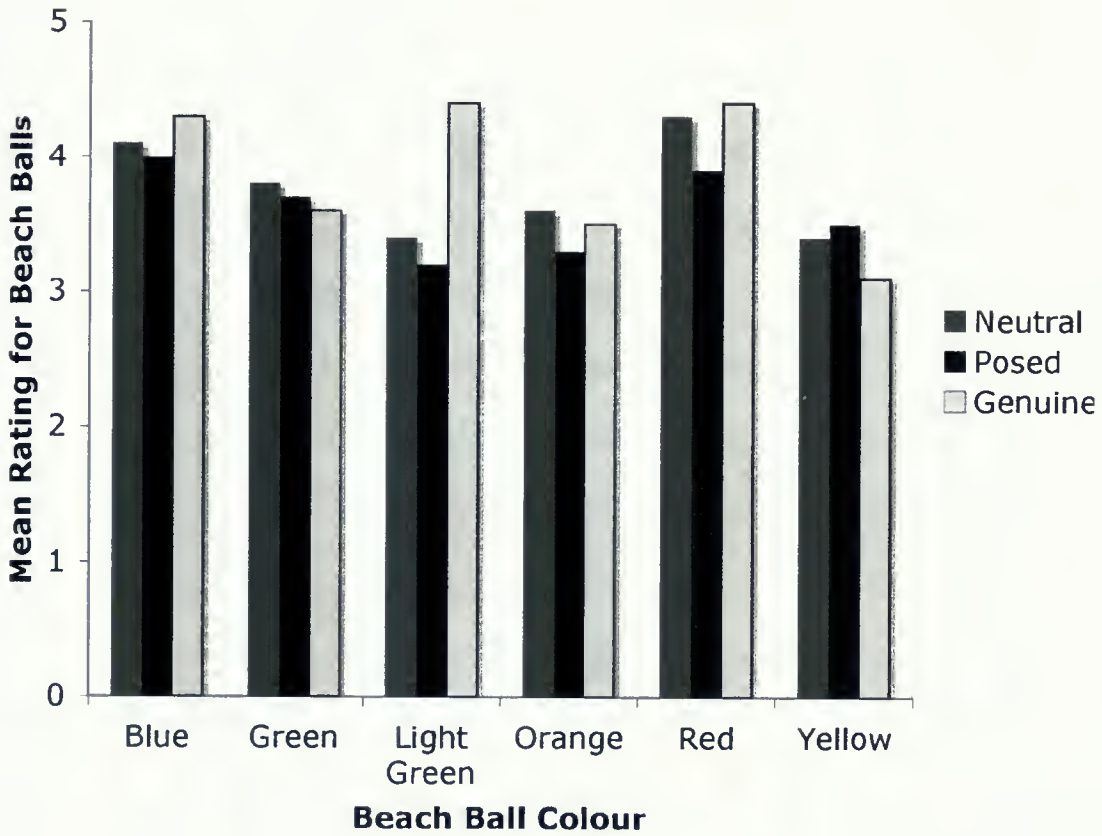

Figure 5. Seven-year-olds' mean ratings as a function of beach ball colour.

Ranking of Beach Balls

In the ranking task, participants were asked to rank the 6 beach balls in order of preference (most-least liked). High-ranking scores indicated a greater preference for the beach ball.

Analysis by Participant. To assess whether participants' rankings of beach balls were affected by expression type, mean rankings for each type of facial expression were calculated for adults and 7-year-olds. A 3 (Expression: Posed smile/ genuine smile/ neutral expression) x 2 (Age: Adults/ 7-year-olds) ANOVA on the mean ranking scores was conducted. Results from the ANOVA indicated an age by expression interaction, $F(2, 82) = 6.51$, $p < .001$. As shown in Figure 6, adults' rankings of beach balls varied as a function of expression; adults rated beach balls paired with genuine smiles more favorably than beach balls paired with posed smiles or neutral expressions. In contrast, children's rankings of beach balls did not vary as a function of expression type. There was no main effect of age and no main effect of expression. A 3 (Expression: Posed smiles, genuine smiles, neutral expression) x 2 (Sex: Male/ female) ANOVA on the mean ranking scores for 7-year-olds did not reveal an interaction between type of facial expression and sex ($p>.2$) or a main effect of sex for rankings ($p>.2$). Again, the same analysis was not performed for adults' mean rankings, as there were more females in the sample than males.

Due to the significant age x expressions interaction, I conducted two separate single-factor (Expression: Posed smile/ genuine smile/ neutral expression) within-subjects analyses of variance. Results from adults revealed a main effect, $F(2, 82) = 7.21$,

$p < .001$ of expression. Post hoc tests (Fisher's PLSD, $p < .05$) revealed that the beach balls paired with the genuine expressions were preferred over those beach balls paired with either the posed smile (Ms = 4.22 vs. 3.14, $p < .05$) or neutral expression (Ms = 4.22 vs. 3.14, $p < .05$). There was no difference between rankings of posed and neutral expressions, $p > .2$ (see Figure 6). The analysis of variance for 7-year-old's ranking revealed that expression type did not have an effect on their rankings of beach balls, $p > .2$. As shown in Figure 6, 7-year-olds did not even rate those beach balls paired with genuine smiles more favorably that beach balls paired with neutral expressions.

Another way I assessed the effect of expression on rankings was by analysing distributions of participants' first choice rankings of the beach balls. The beach balls that were ranked after the first choice was made were eliminated as the later choices made may have been influenced by boredom, fatigue, etc. A chi-square goodness of fit test revealed that adults' distributions of first-choices for posed smiles, genuine smiles and neutral expressions were significantly different from the expected distribution, $\chi^2_{(2)} = 8.18$, $p < .05$, whereas, 7-year-olds' distributions of first-choices for posed smiles, genuine smiles and neutral expressions were not significantly different, $\chi^2_{(2)} = 0.28$, $p > .05$, from the expected distribution. Adults' first-choice beach balls were most often beach balls that were paired with genuine smiles compared to beach balls that were paired with posed smiles or neutral expressions. The pattern that was observed in the adult group was not observed in children.

To assess whether the presence of any type of smile (posed or genuine) had an effect on children's first choice of beach balls, I collapsed genuine and posed smiles and

compared the distribution of first choice beach balls paired with smiles versus non-smiles to the expected distribution. The chi-square goodness of fit test revealed that 7-year-olds' observed first-choice rankings did not differ significantly from the expected distribution, $\chi^2_{(1)} = 0.22$, $p > .05$; 7-year-olds were no more likely to choose beach balls paired with any type of smile than beach balls paired with non-smiles.

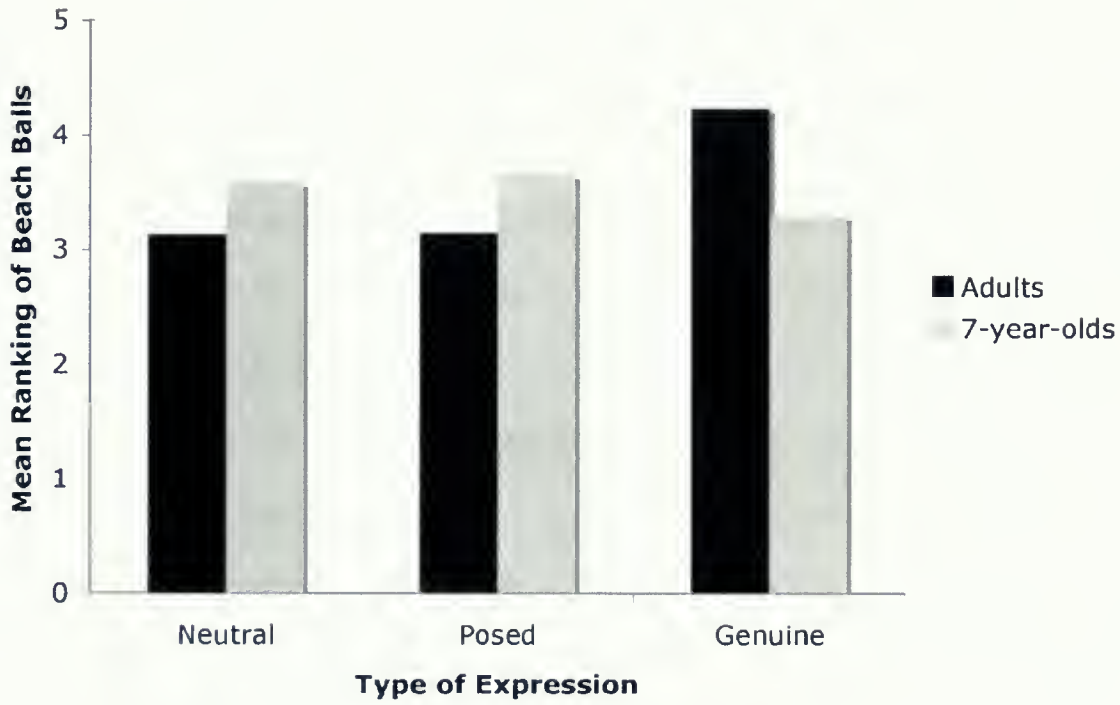

Figure 6. Mean rankings of beach balls for adults and children as a function of expression type.

Analysis by Beach Ball. To assess whether the effect of expression varied across colours of beach balls for rankings, mean ranking scores were calculated for each beach ball as a function of expression type. A 6 (red/ orange/ yellow/ blue/ green/ light green) x 3 (Expression: posed smile, genuine smile, neutral expression) ANOVA on the mean ranking scores was conducted for adults and 7-year-olds separately.

The analysis of variance for adults did not show an interaction but did reveal main effects of colour, $F(2, 5) = 3.95$, $p < .001$ and expression, $F(2, 5) = 15.4$, $p < .001$. As shown in Figure 7, every beach ball showed the same pattern of results: adults' rankings of every colour of beach ball was higher when the beach ball colour was paired with genuine smiles than when it was paired with posed smiles or neutral expressions.

The analysis of variance for 7-year-olds revealed an interaction of colour of beach ball and expression, $F(2, 10) = 4.63$, $p < .05$. Figure 8 shows that 7-year-olds ranked beach balls that were paired with genuine smiles higher for 3 of the 6 colours, but also ranked beach balls paired with genuine smiles the lowest for 2 of the 6 colours. There was a main effect of beach ball colour, $F(2, 5) = 10.66$, $p < .001$; children rated red and blue beach balls more favorably than other colours of beach balls). There was no amin effect of expression ($p>.2$).

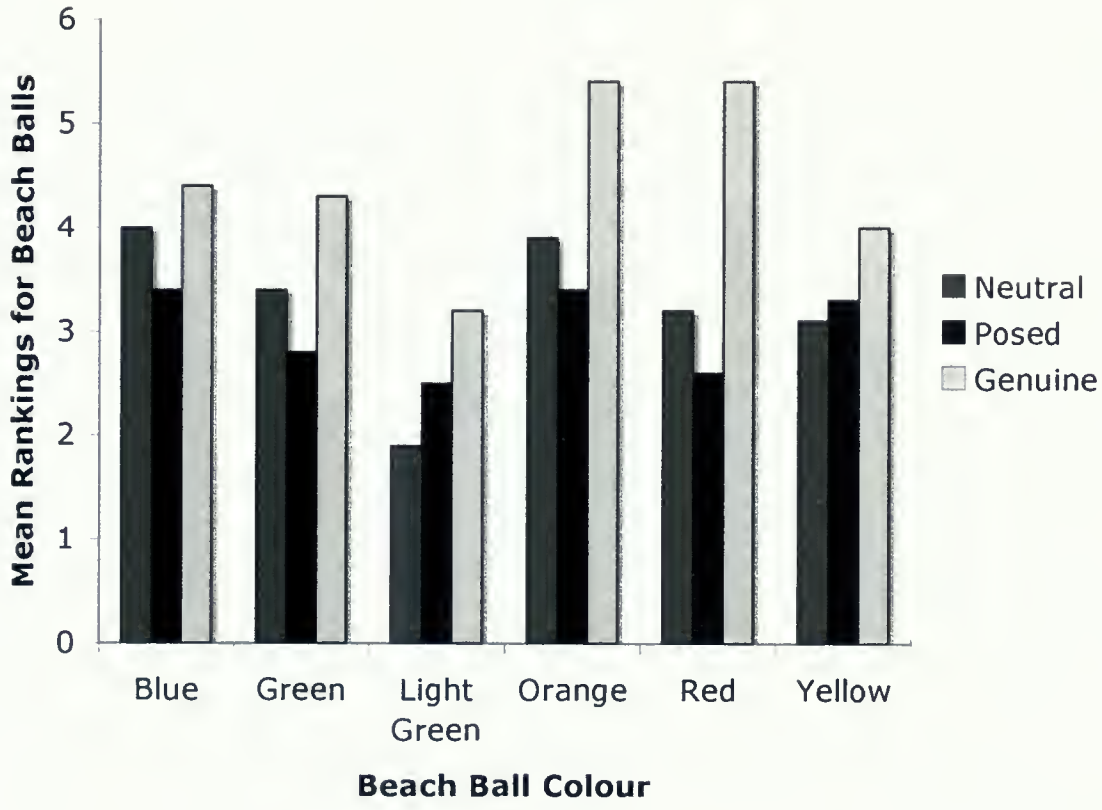

Figure 7. Adults' mean rankings as a function of beach ball colour.

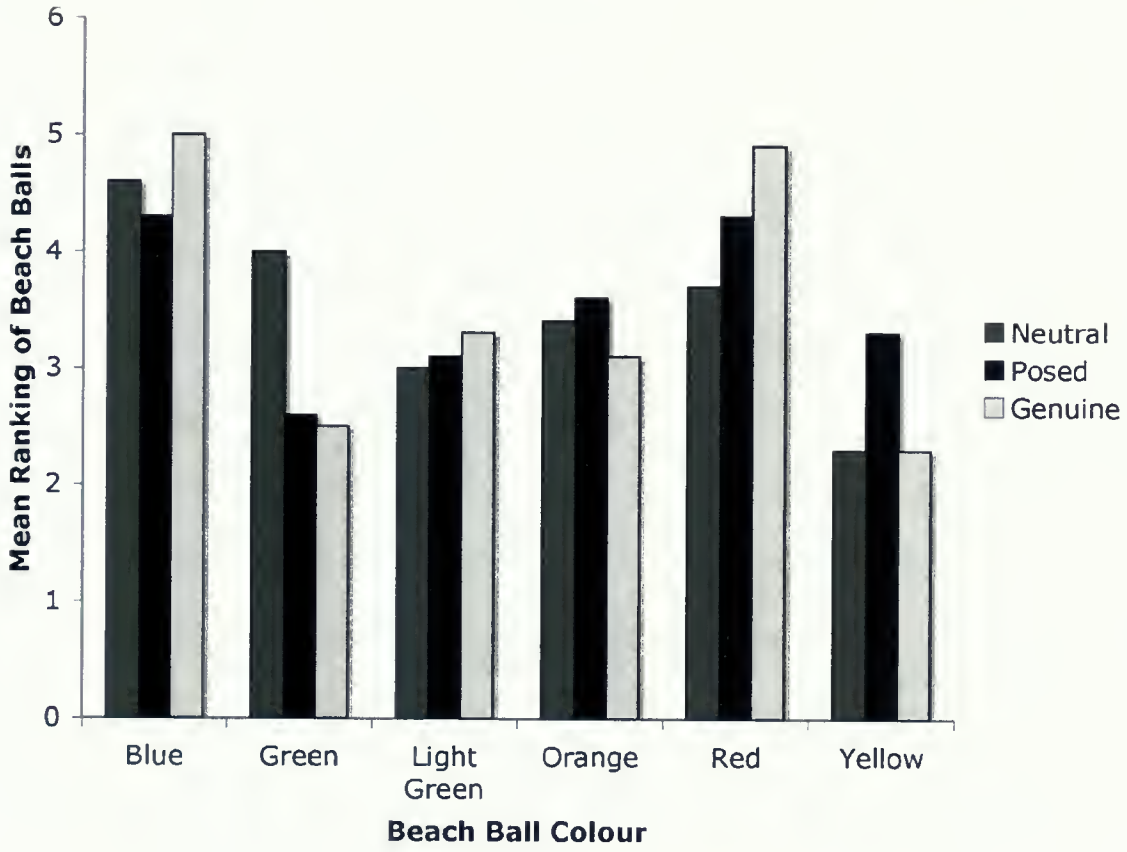

Figure 8. Seven-year-olds' mean rankings as a function of beach ball colour.

Show/Feel Task

The show/feel task was used to measure explicit sensitivity to the difference between posed and genuine facial expressions. In the show condition, participants were asked to indicate whether a model was "showing happy" or not. In the feel condition, the participants were asked to indicate whether a model was "feeling happy" or not. The correct response to genuine smiles was "yes" in both the show and feel tasks, whereas the correct response to neutral expressions was "no" in both tasks. In contrast, the correct response to posed smiles was "yes" in the show condition and "no" in the feel condition.

I analysed accuracy on show and feel trials together and included both groups of participants (adults and 7-year-olds). I also collapsed across the two mouth conditions (open vs. closed) so I could include neutral expressions in the analyses. All 4 of the neutral expressions had closed mouths. The 3 (Expression: Posed smile/ genuine smile/ neutral expression) x 2 (Age: adults/ 7-year-olds) x 2 (Condition: Show/ feel) ANOVA on accuracy produced a 3-way interaction, $F(2, 82) = 3.93$, $p < .05$. The analysis of variance also revealed two 2-way interactions: Condition x expression, $F(1, 2) = 43.51$, $p < .001$ and expression x age, $F(1, 2) = 6.57$, $p < .001$. There were two main effects: condition, $F(1, 82) = 55.59$, $p < .001$ and expression, $F(2,82) = 198.36$, $p < .001$. As shown in Figure 9, both adults and children were at ceiling for neutral expressions in both the show and feel conditions. Both age groups were also very accurate (> 80%) for genuine smiles in both the show and feel conditions and for posed smiles in the show condition (~80%). The most interesting results come from judgments of posed smiles,

where both adults' and children's accuracy dropped, especially in the feel condition. That is, adults only accurately indicated posed smiles as not feeling happy about 57% of the time and children were accurate 40% of the time.

To assess whether there were any gender effects in the show/feel task, a 3 (Expression: Posed smile, genuine smile, neutral expression) x 2 (Sex: Male/ female) x 2 (Condition: Show/ feel) ANOVA was conducted. Results indicated there were no significant interactions (p>.2) and no main effect of gender for 7-year-olds (p>.2). The same analysis was not conducted for adults due to the uneven number of males and females in the sample.

Accuracy on Show Trials. Due to the 3-way interaction (Figure 9), I analysed show and feel trials separately. Neutral expressions were not included in these analyses so that any effect of open and closed mouths on accuracy could be assessed and because the critical comparison was between genuine and posed expressions. I first looked at show trials using a 2 (Age: Adults/ 7-year-olds) x 2 (Expression: Posed smile/ genuine smile) x 2 (Mouth: Open/ closed) ANOVA. As shown in Figure 10, there was only one main effect of expression, $F(2, 82) = 40.65$, $p < .001$. Adults and children were more accurate in saying that genuine smiles were showing happy than posed smiles. However, adults and children had overall high accuracy on show trials; both groups were above 80% accurate in all conditions. There was no difference in accuracy as a function of age (p>.2) and accuracy did not vary as a function of whether the mouth was open or closed (p>.2), which differs from the results found by Miles (2003) (Figure 10).

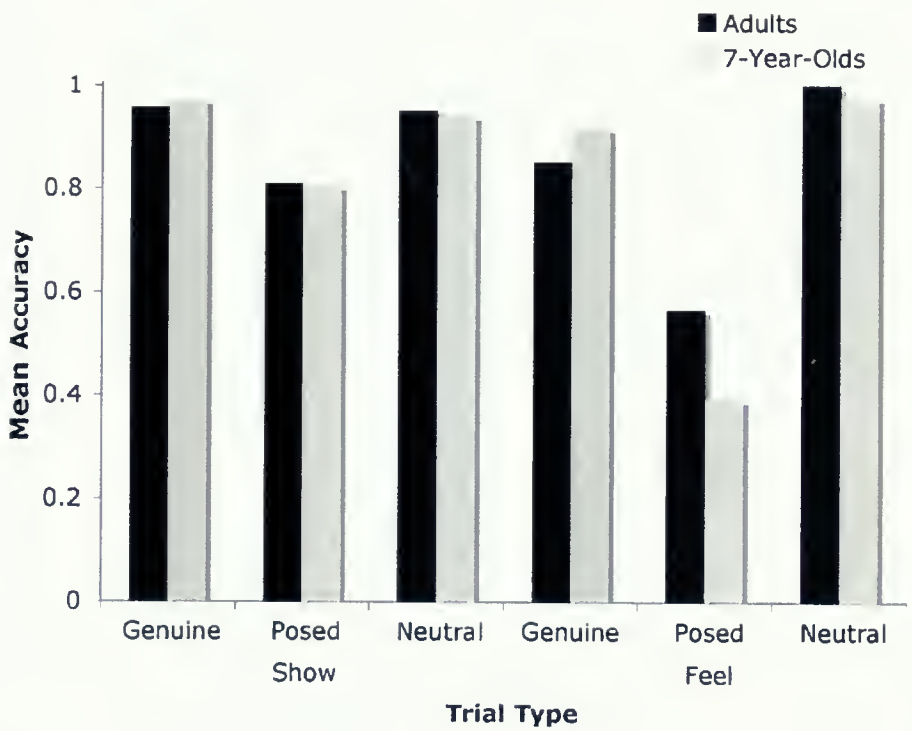

Figure 9. Participants' accuracy on show/feel task including neutral expressions, with open and closed mouth collapsed.

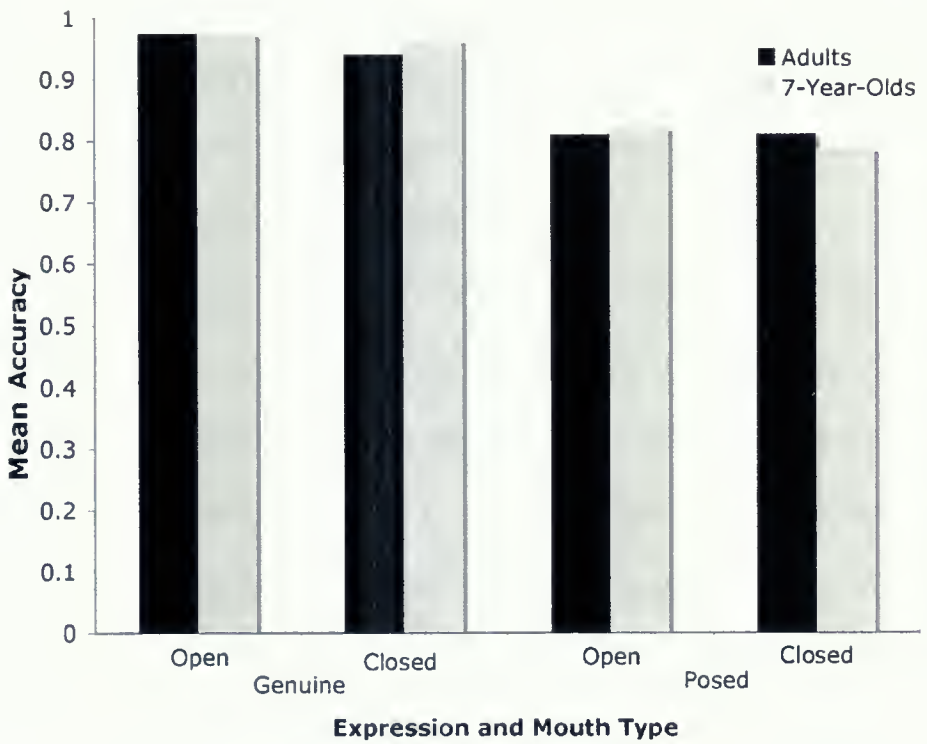

Figure 10. Participants' accuracy on show task with open and closed mouth shown separately.

Analysis of Feel Trials. Feel trials were analysed using a 2 (Age: Adults/ 7-year-olds) x 2 (Expression: Posed smile, genuine smile) x 2 (Mouth: Open/ closed) ANOVA. The analysis of variance revealed a 3-way interaction, $F(2, 82) = 5.29$, $p < .05$. There also were two 2-way interactions: Expression and mouth type, $F(1, 2) = 30.47$, $p < .001$ and expression and age, $F(1, 2) = 9.83$, $p < .05$. Results also indicated two main effects: expression, $F(1, 82) = 113.73$, $p < .001$ and mouth type $F(1, 82) = 9.44$, $p < .05$. As shown in Figure 11, adults and children were significantly more accurate when judging genuine than posed smiles and for closed versus open mouths, although as seen in Figure 11, the latter effect was limited to posed smiles. Given the 3-way interaction for feel trials, genuine and posed smiles were analysed separately.

Analysis of Genuine Feel Trials. A 2 (Age: Adults/ 7-year-olds) x 2 (Mouth type: Closed/ open) ANOVA revealed an interaction of age and mouth type, $F(1, 82) = 5.34$, $p < .05$. There was a main effect of mouth type, $F(1, 82) = 5.34$, $p = .05$, and a trend for effect of age, $p = .07$. As seen in Figure 11, adults were less likely to say that a genuine closed mouth was feeling happy than were 7-year-olds. Both groups were highly accurate (>80%) for genuine smiles in the feel condition.

Analysis of Posed Feel Trials. Both adults' and children's accuracy was very low for posed feel trials. The 2 (Age: Adults/ 7-year-olds) x 2 (Mouth type: Closed/ open) ANOVA did not reveal an interaction between age and mouth type, but did show main effects of age, $F(1, 82) = 9.28$, $p < .05$ and mouth type, $F(1, 82) = 26.86$, $p < .001$. Adults were more accurate than 7-year-olds for both closed and open smiles in the posed feel condition. Both groups were more accurate when the posed smile mouths were closed. In

other words, 7-year-olds and adults were less likely to say that a model posing happy was feeling happy when his/her mouth was closed than when it was open (Figure 11).

Alternative Analysis of Feel Data. As an alternative to looking at accuracy, I analysed the proportion of trials in which participants reported the model was feeling happy. I did this because the accuracy data may be misinterpreted easily. Adults' accuracy was at about 50%, which can be interpreted as adults simply performing at chance level and not being sensitive to the difference between posed and genuine expressions. In this analysis, proportions of trials in which participants report the model was feeling happy should be higher for genuine than posed smiles if perceivers are sensitive to the differences between the two types of expressions. A 2 (Age: Adults/ 7-year-olds) x 2 (Expression: Posed smile/ genuine smile) x 2 (Mouth type: Open/ closed) ANOVA revealed two significant 2-way interactions between expression and mouth type, $F(1, 82) = 9.44$, $p < .05$ and age and mouth type, $F(1, 82) = 5.29$, $p < .05$. All three main effects were significant: Age, $F(1, 82) = 9.83$, $p < .05$, expression, $F(1, 82) = 156.31$, $p < .001$, and mouth type, $F(1, 82) = 30.47$, $p < .001$. As shown in Figure 12, both adults and 7-year-olds reported the model to be feeling happy at a higher rate for genuine smiles than posed smiles, as expected. Both adults and children were more likely to be duped by open mouth posed smiles than closed mouth posed smiles (i.e., they were more likely to say that the model was feeling happy).

Given the significant interactions, I analysed the proportion of trials in which participants reported the model was feeling happy for posed smiles only. The 2 (Age: Adults/ 7-year-olds) x 2 (Mouth type: Open/ Closed) ANOVA revealed significant main

effects of age, $F(1, 82) = 9.28$, $p < .05$ and mouth type, $F(1, 82) = 26.89$, $p < .001$. Seven-year-olds reported that posed smiles were feeling happy more often than adults. As shown in Figure 12, both groups reported that the model was feeling happy more often when the mouth was open compared to when the mouth was closed.

I also looked at whether participants' accuracy was significantly different from chance on feel trials. All t-tests used were two-tailed. Adults, $t(41) = 13.69$, $p < .001$, and children, $t(41) = 15.72$, $p < .001$, were significantly above chance for genuine smiles. For neutral expressions adults were at 100% accuracy and children were significantly above chance, $t(41) = 33.34$, $p < .001$. Adults' accuracy ($M = .57$, $SD = .34$) did not differ significantly from chance level (50%) for posed smiles and children's accuracy ($M = .39$, $SD = .31$) was significantly different from chance, $t(41) = 2.62$, $p < .05$. That is, children said that a model that was posing happy, was not really feeling happy only 39% of the time (i.e., children's performance was below chance).

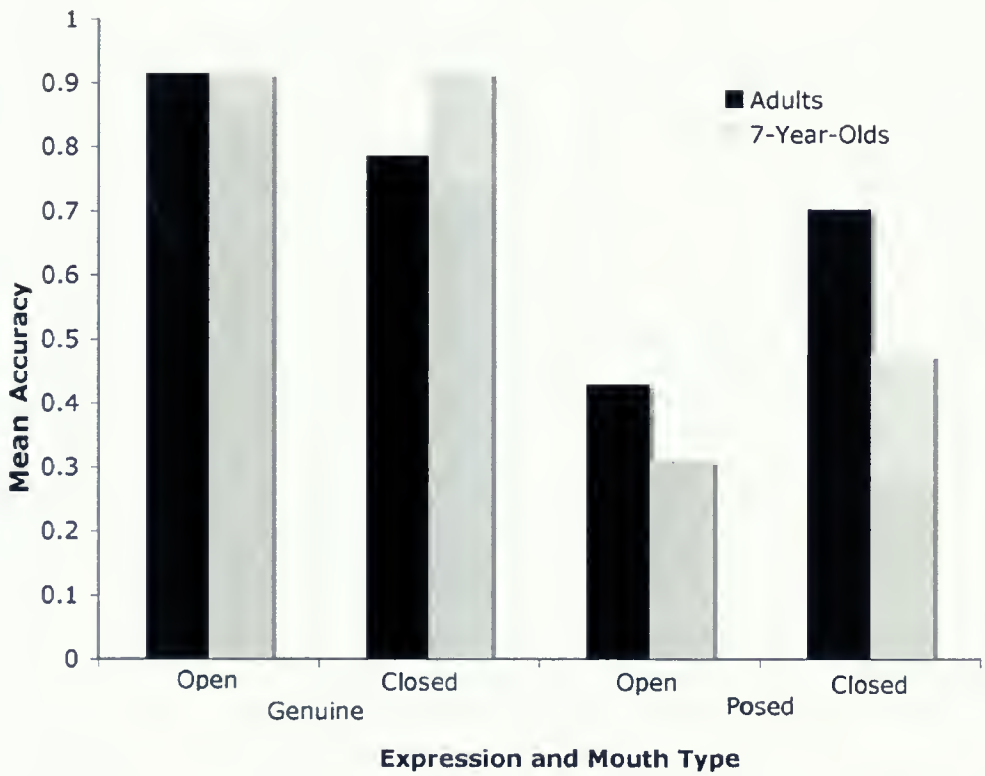

Figure 11. Adults' and 7-year-olds' accuracy on feel task as a function of expression type and mouth type.

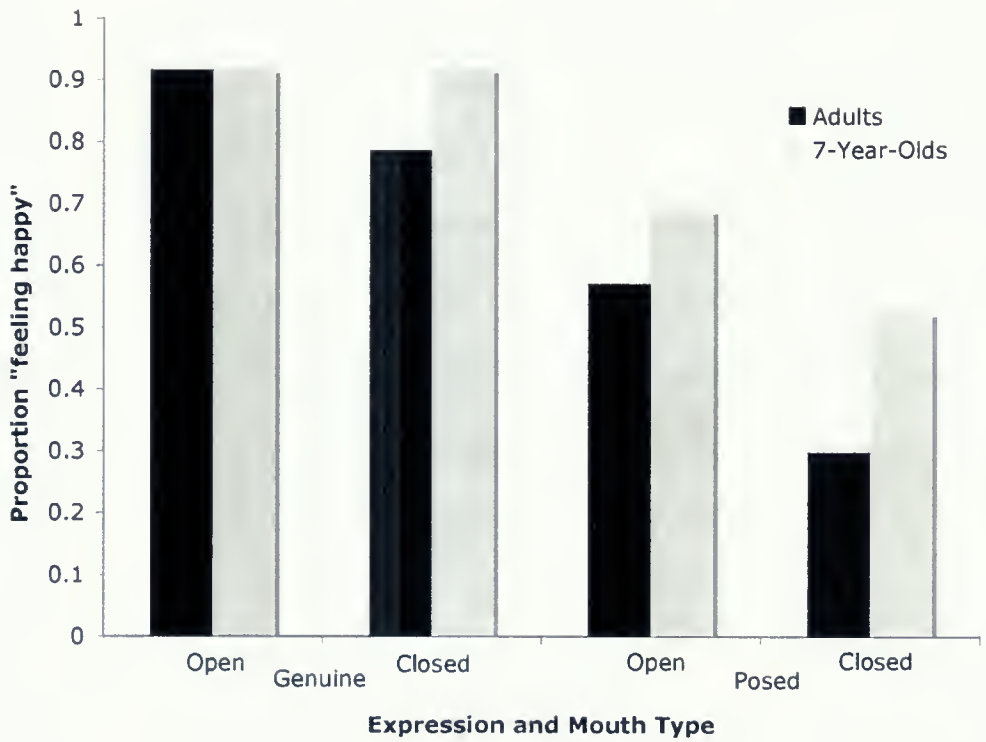

Figure 12. Adults' and 7-year-olds' proportion of "feeling happy" reported on feel trials as a function of expression type and mouth type.

Analysis of Matching Trials

Two matching trials followed the show/feel task; participants were asked to indicate which of the models was "actually feeling happy". One model was displaying a genuine happy smile and one was displaying a posed happy smile. An accurate response on matching trials was pointing to the model displaying the genuine happy smile.

As shown in Figure 13, adults were more accurate than children on both open and closed mouth matching trials. Two chi-square tests of independence revealed that there were no significant differences between adults and children on either open mouth matching trials, $\chi^2_{(1)} = 2.54$, $p > .05$, or closed mouth matching trials, $\chi^2_{(1)} = 1.37$, $p > .05$.

For open mouth smiles, 30 children and 36 adults accurately identified the individual who was feeling happy. Binomial tests revealed that both children ($p < .01$) and adults ($p < .001$) performed significantly better than chance. For closed mouth smiles, 33 children and 37 adults were accurate. Binomial tests indicated that both children ($p < .001$) and adults ($p < .001$) performed significantly above chance.

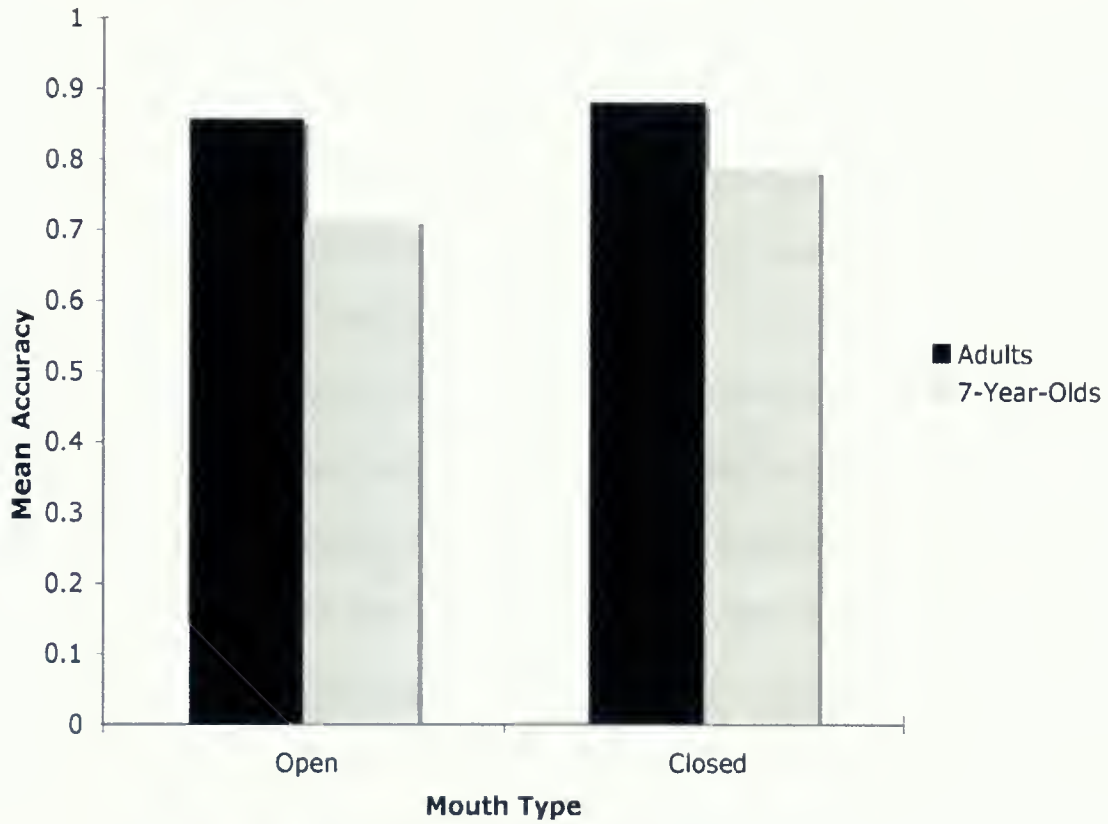

Figure 13. Adults' and 7-year-olds' mean accuracy on matching trials.

SECTION VI –DISCUSSION

The results of this study are consistent with those of previous studies. They indicate that adults and 7-year-olds understand the fundamental concept of posing facial expressions; they realize that emotions displayed are not always congruent with emotions felt (*scenario task*). The two main questions examined were whether 1) adults and children show implicit sensitivity to posed and genuine facial expressions (*rating and ranking tasks*); and 2) whether adults and children show explicit sensitivity to posed and genuine facial expressions (*show/feel task*). Findings from this thesis support previous research concerning adults' sensitivity to posed and genuine facial expressions of emotion (Miles and Johnston, in press; Peace et al., 2006) and contribute additional information to an emerging body of research concerning the development of children's sensitivity to the authenticity of emotional expressions.

Confirmation that adults and children realize that expressions can be posed

Adults and 7-year-olds were able to decipher the difference between emotions felt and emotions displayed in the scenario task (*Task 3*). This was expected as previous work has shown that children as young as 3 years demonstrate a realization that there is not always a one-to-one correspondence between feelings and facial expressions (Banerjee, 1997). It has also been shown that this distinction becomes verbally articulated around ages 5 to 6 years (Gross & Harris, 1988). Between the ages of 6 and 10 years, children become increasingly proficient at explaining display rules such as how people should act in certain situations and what facial expressions they should display (Gnepp & Hess, 1986; see also Saarni, 1979). However, Gnepp and Hess (1986) found that children are

more able to report display rules accurately in verbal situations than when merely relying on cues of facial expression. The authors suggested that socialization might be a possible explanation for children's divergent abilities in understanding verbal and facial display rules. Adults may teach children how to control their verbal displays more often than how to control their facial displays (e.g., parents may be more likely to encourage their child to say "thank you" for a gift that they do not like versus ensuring that their child displays an appropriate facial expression after receiving the gift).

Gnepp and Hess (1986) also found that children were more likely to accurately report display rules to stories in which the motivation was pro-social versus stories in which the motivation was self-protective. Children's ability to report display rules increased with age (between ages 6 and 10 years) and also when they were given a prompt that indicated that the character in the story was motivated to hide his/her true emotions. The authors suggest that pro-social display rules may be more overtly socialized than self-protective display rules that are often left to be learned on one's own. In contrast, Gosselin et al. (2002) found that by age 6, children understand the distinction between real and apparent emotions very well, whether the motivation was self-protective or pro-social. One of the scenarios in our task involved a pro-social display rule; the character (Helen, who received an undesired gift) masked her true emotion to protect another individual. Findings from both Gosselin et al. (2002) and Gnepp and Hess (1986), predict that children would be successful on the pro-social scenario. The other scenario represented an actual felt emotion.

Based on this previous research (Gnepp and Hess, 1986, Gosselin et al., 2002), I was confident that 7-year-olds and adults would be very accurate on this task. This hypothesis was confirmed. Overall, casual observations suggest the children in the study responded to the questions following the stories with slightly more hesitation than adults. This was especially true in the scenario where there was a conflict (i.e., Helen hid her true feelings about a gift she received in order to protect her parents' feelings). Although this observation suggests that children may have found the task more difficult than adults, this pattern of results may generalize to any complex task rather than being specific to their understanding of emotional expressions.

Adults' and 7-year-olds' explicit sensitivity to posed and genuine facial expressions

Results from the show/ feel task (*Task 4*) indicated that adults and children are about equally sensitive when classifying genuine smiles and posed smiles as *showing happy*; both groups made very few errors. Both groups made more errors when judging posed smiles than genuine smiles (i.e., they said that the posed happy smiles were not showing happy more than they said the genuine smiles were not showing happy). It is interesting that this occurred in the show circumstance where participants were only asked to classify the person as showing happy or not and were not asked to attend to the underlying emotion. More errors on the posed smiles than genuine smiles may indicate participants' sensitivity to the authenticity of the smiles. To make errors on the posed smiles in the show condition (i.e., saying that they were not showing happy), participants must have noticed some subtle differences between the genuine and posed smiles. For the majority of instances when participants accurately classified posed smiles as showing

happy, this could be because participants have an idea of a stereotypical smile (e.g., an idea of what constitutes a smile without factoring in a corresponding emotion) and use this to classify smiles. Although the posed smiles may have seemed ambiguous to perceivers, they may have still classified them in a broad smile category.

In the *feel* condition, participants were asked to attend to the underlying emotional state of the targets and make an explicit judgment about whether the model was feeling happy or not. In this case, both adults and children made many errors, especially for the posed smiles. That is, both adults and children were likely to erroneously say that models displaying posed smiles were feeling happy rather than saying that models displaying posed smiles were not actually feeling happy. Adults were fooled by nearly half of the posed smiles they were shown, and children were fooled by even more. Adults performed at about 57% accuracy and children at 39% accuracy on posed smiles in the feel condition. Although children's accuracy was below chance when asked to judge whether models posing a happy expression were feeling happy, there is some evidence of their being sensitive to the difference.

Analysing the proportion of trials in which participants reported "yes" in the feeling happy condition indicated that adults reported "yes" to more genuine than posed smiles and more open mouth than closed mouth smiles: Genuine: 92% (open), 79% (closed) versus posed: 43% (open), 70% (closed). Children showed the same pattern as adults in that they reported "yes" in the feeling happy condition to more genuine than posed smiles and more open mouth than closed mouth smiles: Genuine: 92% (open), 92% (closed) versus posed smiles: 31% (open) and 48% (closed). The results from adults are

fairly consistent with previous findings that showed adults to be 46% accurate on posed feel trials (Miles & Johnston, in press). An additional finding that was consistent with the previous study was that mouth type (closed versus open) affected adults' and children's accuracy. Like adults and children in the present study, adults in the Miles and Johnston (in press) study were more likely to make the mistake of perceiving open mouth posed smiles as true indications of happiness than they were closed mouth posed smiles.

Limitations of the Present Study

The static nature of the stimuli in the present study may have affected participants' ability to judge authenticity. In everyday interactions we are exposed to the temporal sequences, asymmetry, and duration of expressions, all of which differ for posed versus genuine expressions. Gosselin, Perron, Legault & Campanella (2002) showed that 9-year-olds and adults were sensitive to the veracity of enjoyment and non-enjoyment smiles when they viewed video excerpts showing all temporal stages of a smile from onset to apex, but were not as sensitive when they viewed only the apex or the combination of the apex and onset of the smile both as static images. Adults' ability to decipher enjoyment smiles increased as a function of the activation of the obicularis oculi muscle in the dynamic condition, which raises the cheeks and cause changes in appearance around the eye region (crow's feet). Children 9 years of age were only sensitive to this difference in smiles when they viewed all temporal stages of a smile in dynamic displays. In contrast, increased activation of the obicularis oculi muscle had no effect on 6- to 7-year-olds' ability to discriminate the smile types in any presentation condition, even when they viewed all the temporal stages of the smile in a dynamic

display. Miles and Johnston (in press) also found that the nature of the presentation condition affected adults' accuracy. Adults' accuracy on posed feel trials was greater (61%) in a dynamic presentation condition than in the static presentation condition (46%). Although dynamic expression stimuli may have enhanced children's explicit sensitivity to the difference between posed and genuine facial expressions in the present study, it was important to use the same type of expression display in all of the tasks in order to be able to compare results across task conditions.

Another potential concern involving the stimuli is intensity. Models' "smiles" (contraction of the zygomatic major action units (AU12)) were deemed matched in intensity across posed and genuine smiles within each model according to the FACS criteria. However, it may be difficult to match posed and genuine smiles on intensity; posed smiles are more asymmetrical than genuine smiles so one side of the posed smile may match the genuine smile and the other side may not. Also, genuine smiles involve contraction of the obicularis oculi action unit (AU6), which causes crows' feet around the eyes in addition to contraction of the AU12. By definition genuine and posed smiles cannot be matched on this dimension because posed smiles do not involve contraction of AU6, which may cause the genuine smiles to appear more intense. It is also important to keep in mind that the genuine smiles are indications of actual happiness, whereas the posed smiles are not.

Although, to the perceiver, the model's genuine smiles may have appeared more intense, this was not the sole impact on participants' rating or ranking of beach balls. If participants were evaluating the beach balls based only on intensity of the smiles then

those balls paired with posed expressions should have evaluated more favourably than beach balls paired with neutral, which was not the case in the present study or the previous study (Peace, et al., 2006).

A second potential limitation is that children's performance may have been underestimated by not providing sufficient situational cues. For example, Hoffner & Badzinski (1989) showed 5-to 10-year-olds pictures of characters with happy or sad expressions in the context of either congruent or conflicting situations. An example of a congruent expression situation was when participants were shown a character smiling at a birthday party whereas an incongruent expression situation was a child frowning while opening a gift. Children were asked to indicate the emotion felt (happy/sad) and the intensity of expressions of a picture of an emotional display. Hoffner and Badzinski (1989) found that reliance on situation cues increased with age and reliance on facial expression cues decreased (i.e., that older children were more likely to report an emotion that was congruent with the situational cue than an emotion that was incongruent with the situational cue). These findings suggest that as children begin to integrate the facial and situation cues their accuracy for decoding emotional expressions increases; they no longer merely look at facial expressions but think about the potential that the expression may be false.

In the show/feel task of the current study participants were reminded of the characters in the scenarios, specifically, that one character (Helen) did not want others to know her true feelings. It is likely that providing participants with a reminder of this situational cue was an advantage, although it is conceivable that children may have

forgotten the prompt as the task unfolded. Children's mean accuracy on the first 6 of 12 feel trials was slightly higher on the first 6 feel trials (M = 1.3 errors) than on the last 6 feel trials (M = 1.5 errors). However, because the difference in accuracy between the first and last 6 feel trials is so small, it seems unlikely that memory demands of situational cues serves as a possible explanation for children's performance on the show/feel trials.

Possible reasons why children and adults are not sensitive to the differences between posed and genuine expressions

At first glance it may be surprising that both adults and children are easily fooled by posed expressions. It may have been assumed that adults' sensitivity to posed expressions would be much more developed than children's in order to deal with more complicated and manipulative situations than children face. The ability to spot another individual faking an emotion would conceivably help adults to avoid compromising social or work situations. Together, the findings from the explicit show/ feel task indicates the value of posed smiles in that posing expressions works (even with adults). If adults had not been at all fooled by the posed smiles, this would suggest that posed smiles are really not functional.

Children may be less sensitive to posed versus genuine expressions because they attend to different areas in facial stimuli than adults. A recent study used an explicit method to assess what specific face muscle action units (AU's) 8-year-olds and adults rely on to determine the authenticity of smiles (Del Giudice & Colle, in press). Participants were shown pictures of smiling models and asked whether they were "actually happy or just pretending to be happy." Results indicated that children do not

discriminate between the involuntary AU 6 and the voluntary AU 7 as much as adults do. The involuntary AU 6 raises the cheeks and causes crow's feet around the eyes, the marker of a genuine smile. The voluntary AU 7 only narrows the eyes without raising the cheeks or causing crow's feet around the eyes like the AU 6.

Gosselin and colleagues (2002) found that 6-year-olds were unable to distinguish posed from genuine smiles unless their attention was drawn to specific facial regions. When their attention was drawn to specific regions, they were able to identify basic featural differences between posed and genuine smiles at a level comparable to adults. Results from the matching task may provide support for the idea that drawing children's attention to relevant cues helps facilitate children's ability to discriminate authenticity of expressions. In the matching task, participants' attention was drawn to two faces enabling them to make a comparison. Children were able to identify "the person who is actually feeling happy" (genuine smiles) significantly greater than chance on this task.

It may be adaptive for young children to be even less sensitive than older children and adults to the difference between posed and genuine expressions. Adults and maybe older children may benefit from the ability to realize when individuals' expressions are not genuine in order to avoid being duped or manipulated. The opposite may be true for 7-year-olds; it may be more adaptive for them to not be as sensitive to the difference because they may be exposed to more posed expressions on a day-to-day basis by people who are posing expressions with the child's best interests in mind (pro-social). For example, teachers and parents may pose happy smiles to put children at ease, encourage them, etc., so it may be more adaptive for children not to pick up on the nuances between

posed and genuine smiles. Further research is needed with older age groups of children to determine when this sensitivity becomes adult-like. Presumably at some point the cost of not seeing the difference exceeds the benefit. If individuals do not develop the ability to decipher posed expressions by the time their peers begin posing expressions with the goal of manipulating others for personal benefit this could have great social implications. For example, a child who is not aware of a posed expression may be manipulated by others, deceived, or even become a victim of bullying.

Adults' and 7-year-olds' implicit sensitivity to posed and genuine expressions

Despite being duped by posed expressions in the explicit task, I predicted based on previous findings (Peace et al., 2006) that adults would show implicit sensitivity to the difference between posed and genuine expression (i.e., their evaluations of beach balls paired with genuine smiles would be higher than for beach balls paired with posed smiles or neutral expressions). I questioned whether or not children would show adult-like sensitivity at age 7. Findings revealed that type of expression did have an effect on adults' ratings of beach balls (*Task 1*). That is, they rated the beach balls that were paired with the genuine smiles more favourably than those beach balls paired with neutral expressions. However there was no significant difference in adults' ratings of beach balls that were paired with genuine and posed smiles and no difference between posed smiles and neutral expressions. The ranking task was a more sensitive measure of implicit sensitivity to posed and genuine smiles than the rating task. Adults' rankings of beach balls (*Task 2*) were significantly higher for beach balls that were paired with genuine smiles versus beach balls that were paired with posed smiles or neutral expressions.

There was no significant difference between evaluations of beach balls paired with posed and neutral expressions.

Our findings also are consistent with previous research that has shown that adults evaluate items more positively when the items are paired with positive affective stimuli versus negative stimuli. For example a perceiver's evaluation of products increases as a function of their affective reaction to the product (Batra & Ray, 1986). Priming research on adults' implicit sensitivity to expressions has shown that objects are evaluated more favourably when preceded by happy facial primes than when preceded by negative facial expression primes (Channouf, 2000; Winkielman et al., 1997). The present method (Peace et al., 2006) of having the evaluation item in the same display as the model's expression may be more realistic than the priming method. Displaying an item and a facial expression in the same visual display resembles everyday situations; we view advertisements in which a product item is paired with a model displaying a smile.

Adults were sensitive to the differences between posed and genuine expressions when asked to evaluate an item and expressions are embedded within the display of that evaluation item in our ranking but not our rating task. In addition to replicating the ranking data from Peace and colleagues (2006) I found that the effect generalizes from item-to-item. That is, I found the same effect with our beach ball stimuli as Peace and colleagues found with their T-shirt stimuli using the same face stimuli. Adults may have demonstrated more implicit sensitivity in the ranking task than the rating task due to the simultaneous presentation the face stimuli. This presentation method is much like the

matching task, which also allowed participants to compare the expressions. Both adults' and children's accuracy was quite high on the matching task.

Findings from 7-year-olds on the rating and ranking task did not reveal the same effect as adults. Children's evaluations of the beach balls did not vary as a function of facial expression. Not only were 7-year-olds' ratings and rankings the same for posed and genuine smiles, children did not even rate or rank the beach balls paired with genuine expressions higher than those paired with neutral expressions and, given this result, it is impossible to interpret the lack of any differences between their ratings of beach balls paired with genuine versus posed smiles. From the show/feel task we know that children do know the difference between a neutral and happy expression. In addition, Mondloch and colleagues (2003; see also Bruce et al., 2000) showed that 6-year-olds were able to match a model's facial expressions to one of three faces in a test array. These findings offer support that children do understand the fundamental differences between facial expressions. However, unlike adults, genuine smiles did not have a positive effect on children's evaluations in the implicit rating task.

A conceivable idea about why children did not demonstrate the same effect as adults on the ranking task is that adults may have been more likely to construct their own ideas about what the task was about or were more affected by demand characteristics than children. In the current study informal conversations with adults upon debriefing did not reveal any adults who guessed the nature of the task. Further, Peace and colleagues (2006) administered funnel debriefing questionnaires to participants following their task which indicated that no participants guessed the true nature of the study.

Why did 7-year-olds not show a preference for beach balls paired with genuine happy expressions versus beach balls paired with neutral expressions?

The lack of significant findings in 7-year-olds was not due to the fact that they misunderstood the tasks. Children's performance on the pre-test items indicated that they understood how to use the cup-rating system; they demonstrated clear preference hierarchies. In order to compare children's use of the cup-rating system to that of adults during the beach ball portion of task, I took the highest and lowest cups that each participant used in the rating task. I then subtracted the lowest cup used from the highest cup used to get the range for each participant. Finally, I calculated a mean range score for children ($M = 2.9$, $SD = .93$) and adults ($M = 2.4$, $SD = 1.0$). Results from a two-tailed t-test indicated that children actually used a wider range of the cups in the rating task than adults, $t(82) = 2.14$, $p < .05$. These results suggest that expression did not have an effect on children's beach ball ratings because they were only using a limited range of the scale (e.g., selecting the same cup for each beach ball).

There are three possible explanations for why children did not evaluate the beach balls paired with either type of smile (posed or genuine) more favourably than beach balls paired with neutral expressions. One conceivable reason why children did not demonstrate the same sensitivity to the facial expressions as adults is that children's evaluations of items may not be affected by facial expressions the same way that adults are. Another possible reason might be that children's interest in the beach balls masked any influence of the facial expressions. Finally, it is plausible that children's choices near the end of the ranking task may have been affected by fatigue or boredom. The latter two

alternative hypotheses must be eliminated before we can conclude that facial expressions do not influence children's evaluations of objects.

One previous study suggests that 7-year-old children may distinguish posed from genuine expressions if their attention is focused on the face. Bugental, Kopelkin, & Lazowski (1991) looked at 6- to 10-year-olds' visual responses to polite (posed) and enjoyment smiles when interacting with adults. They found that children under 7 years avoided the polite smiles by averting eye gaze; however this effect was not present in 10-year-olds. The authors suggest that younger children may withdraw from polite smiles as they consider them to be sources of discrepancy whereas older children view the polite smiles as only minor deceptive stimuli. The results may suggest that children 6-years old have an implicit understanding of the difference between posed and genuine expressions when the face is the focus of attention. In contrast to Bugental et al., however, in the current study the beach balls, rather than the faces, were the focus of attention. Findings by Bugental and colleagues (1991) should be interpreted with caution with respect to posed versus genuine expressions because the physical aspects such as speed and duration of the muscle actions of the facial displays were not controlled for therefore there may have been variations in intensity among the categories of smiles (e.g., posed and genuine). Nonetheless, participants in the present study may have been captivated by the beach balls narrowing their focus of attention masking any effect of expression. Future studies should be modified so as to enhance children's attention to the faces (see below).

It is also possible that, like adults', children's ranking of the beach balls was influenced by facial expression but that they became bored with the task, eliminating any apparent effect. In order to assess whether or not boredom or fatigue may have nullified any effect, I analysed the distribution of children's first choices in the ranking task. Results indicated that there was no effect of expression, even when the posed and genuine smiles were collapsed (i.e., children were no more likely to pick a beach ball with a smile than a non-smile as their first choice). This was in contrast to the adults' distribution of first choice rankings. Adults' first choices were most often the beach balls that were paired with genuine smiles.

At least at the neural level, even adults' response to emotional expressions varies as a function of whether the face is the focus of attention versus not. Eimer, Holmes, and McGlone (2003) showed adults stimulus sets that contained 2 faces (fearful or neutral expressions) and 2 houses per trial. Each trial was preceded by a cue in order to direct attention to either the face or house stimulus pair. Adults had to make same/different judgments about the cued stimulus set. When adults' attended to the emotional expression stimuli (faces), ERP measures show enhanced neural activity for fearful faces relative to neutral faces. Alternately, when adults' attention was directed away from emotional expressions (i.e., directed to houses), the effect of emotional expression disappeared (Eimer, Holmes, & McGlone, 2003). Given that attention affects adults' processing of emotional expressions it is likely that if children attended less to the faces than adults that they would show less influence of the expressions. If in the present study,

children looked only at the beach balls, then their processing of the emotional expressions may have been affected.

Implications

The results of this study may have implications for day-to-day interactions with others, but also in the realm of product advertising and politics. For example, advertising companies may be more inclined to pair their products with genuine smiles rather than posed smiles when targeting adults. However, this strategy may be less relevant if the target audience is children under 7-years-old. Political candidates may work on controlling the activation of their obicularis oculi muscles in order to produce the crow's feet lines around the eyes in order to capture the trademark of genuine smiles or advertisement companies may add lines around the eyes of individuals on bill boards.

Future Directions

Future research needs to address the surprising finding that children did not show a difference between genuine and neutral on the rating and ranking tasks. Three modifications to the current protocol may enhance the influence of children's ratings of the beach balls: presenting the faces prior to the beach balls, measuring the influence of negative rather than or in addition to positive expressions on ratings, and using familiar faces. Presenting the faces prior to the beach balls would ensure that children attend to the faces. I am currently testing 7- and 9-year-olds using a modification to the present ranking method. To ensure that children attend to the facial expressions in the ranking task, I cover the balls so that only the faces are visible. Next, I ask participants to attend to the faces and after the participants have had sufficient time to view all of the faces, I

remove the papers covering the beach balls and participants complete the ranking task. Results from this method will guide the next step in testing. If children's evaluations remain unaffected by the facial expressions with this method, a potential next step could include replacing the posed expressions in the tasks with sad expressions in order to assess whether or not children's evaluations are at all affected by emotional expressions.

Although presenting a face prior to presenting a beach ball may be necessary for children to be influenced by happy expressions, it is possible that negative expressions such as fear would elicit their attention automatically, as appears to be true for adults. Adults' attention can be guided based on the valence of the expressions; when participants search displays of neutral distracter faces for a unique face, negative faces are detected more efficiently than positive faces (Eastwood, Smilek, & Merickle, 2001). Since negative expressions are more effective than positive expressions at guiding focal attention in adults it is possible that negative expressions would elicit children's attention automatically and thus would influence their ratings of beach balls in a study like the present one. For example, children may be more likely to rate/ rank a beach ball paired with positive expressions more favourably than negative expressions such as sad. If so, then it would be interesting to assess whether children are able to decipher authenticity of negative expressions. However, in these visual search paradigms the focus of attention is the face; in the present rating/ranking tasks the focus of attention is the beach ball. This is important because, whenever the beach ball is the focus of attention, even when paired with a negative expression, children may not attend to the face at all. Thus it would be important to combine the two modifications (i.e., to present faces prior to the beach balls

and include negative expressions). Further it has also been shown that even adults have trouble deciphering pretended negative emotions (Soppe, 1988). Given adults' sensitivity to the veracity of negative expressions it is very likely that children would demonstrate even less sensitivity.

Although some models of face perception (e.g., Bruce & Young, 1986) suggest that facial identity and emotions are processed separately and independently one study has shown that emotional expression influences adults' ability to recognize familiar, but not unfamiliar faces (Kaufmann & Schweinberger, 2004). Participants were shown familiar and unfamiliar faces with either angry or happy facial expressions and participants made a forced 2-choice decision about whether the face was familiar or not. Happy facial expressions were shown to facilitate recognition of faces more than angry faces in that participants' reaction times were shorter for happy expressions than angry expressions. However, this effect was only true for familiar faces, not for unfamiliar faces. Given that facial identity is influenced by emotional expressions, it is possible that the reverse also is true – that familiar faces would facilitate children's ability to decipher veracity of emotional expressions relative to unfamiliar faces.

Future research will assess at what age the sensitivity to posed and genuine expressions in implicit and explicit contexts becomes adult-like. I am currently testing a group of 9-years old children on the current paradigm and comparing their performance to 7-year-olds and adults. There are several indications that 9-year-olds are the next logical step. Harris and colleagues (1986) showed that there is a developmental increase in the ability to distinguish between real and apparent emotions between the ages of 6 and

10 years. Children listened to stories that provided reasons for the following actions: 1) why a protagonist would legitimately feel a positive or negative emotion and 2) why a protagonist would be motivated to hide his/her emotion. Children then were asked how the protagonist actually felt and how the protagonist looked. Children were also asked to provide justification for their thoughts. Children 6 and 10 years old were comparably sensitive to the fact that the protagonists' actual felt emotion would not correspond to the protagonists' emotion shown. The only age difference was that 10-year-olds were more able than 6-year-olds to accurately justify their claims.

Results from studies looking at children's sensitivity to posed and genuine facial expressions in a truth/ lie scenario also indicated that 9-year-olds are an appropriate age group on which to focus. Children understand the difference between lying and telling the truth as young as age 3. Talwar, Lee, Bala, and Lindsay (2002) assessed 3- to 7-year-olds' understanding and lying behavior using a paradigm that tempted participants to cheat. The 3-year-olds were more likely to admit to cheating than the older children, suggesting that with age children begin to understand the concept of being able to hide their true feelings. It also has also been shown that when children are asked to judge whether an individual is telling a lie or telling the truth they rely increasingly on the consistency of the truth/lie tellers' verbal statement and facial expression cues with age (Rotenberg, Simourd, & Moore, 1989). For example a consistent nonverbal/ facial expression display was an actor smiling while saying a positive valence statement, "I like this shirt", whereas an inconsistent nonverbal/ facial expression was an actor frowning while saying "I like this shirt". Rotenberg an colleagues (1989) found that by age 9,

children classify someone as telling the truth accurately by relying on the consistency between valence of communication and valence of nonverbal stimuli (facial expressions). Given that 9-year-olds are able to integrate the knowledge of facial display and verbal cues to infer truth/lies, it may be that they are also more sensitive than 7-year-olds in deciphering subtle cues of expression veracity.

Cole (1986) has shown that children as young as 3- to- 4-years can produce spontaneous happy expressions in a mildly disappointing situation with another individual present. In other words, children are able to pose expressions before they can articulate their motivation for doing so. By age 9, children may be quite successful at posing expressions as they have more opportunity to do so in interactions with peers, etc. The type of posed expressions that children are exposed to may differ with age. Younger children are most often exposed to parents and teachers posing expressions for pro-social reasons. However, it is conceivable that by age 9, children have more exposure to people posing expressions for self-protective reasons, therefore it may be of functional value to be able to distinguish posed versus genuine expressions. Collectively these findings suggest that 9-year-olds are a logical age group of children to test on the current protocol.

Conclusion

In conclusion, this thesis provides support for previous research findings: 1) That adults are implicitly sensitive to the differences between posed and genuine facial expressions in an item evaluation task (Peace, et al., 2006), and 2) that adults show explicit sensitivity to the veracity of expression when making show/feel judgments (Miles & Johnston, in press). However, even adults are fooled by posed smiles, indicating

the functionality of the posed expression. Using the same testing procedures I showed that by age 7: children not only fail to show implicit sensitivity to the differences between posed and genuine facial expressions, they also do not show sensitivity to happy versus neutral expressions. The latter finding means that we cannot interpret their sensitivity to posed versus genuine smiles. In addition I found that, although not adult-like, children show some explicit sensitivity in the show/feel task, especially when they are able to compare directly two faces in the matching task. This was also true of adults in the ranking task, where they demonstrated increased implicit sensitivity to posed and genuine facial expressions. Future research should assess at what age children become adult-like in their ability to decipher posed and genuine smiles under various task conditions.

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Appendix A

Scenarios

1. Story Type: Posed happy

Helen waited all year for her birthday, because she knew at her birthday she could ask her parents for a rabbit. Helen wanted a rabbit more than anything in the world. At last her birthday arrived, and Helen ran to unwrap the big box her parents had given her. She felt sure it would contain a little rabbit in a cage. But when she opened it, with all the family standing round, she found her present was just a boring old set of books, which Helen did not want at all! Still, when Helen's parents asked her how she liked her birthday present, she said, "It's lovely, thank you. It's just what I wanted." (Happe, 1994)

Test Questions:

a) Is it true, what Helen said?

b) Why did she say that to her parents?

c) What do you think Helen's face looked like when she told her parents that she liked her gift?

d) Do you think that Helen was **feeling** happy?

2. Story Type: Genuine Happy

Liam loved to play with Lego blocks. Every time Liam was in the store with his parents, he always went straight to look at the Lego. Every time Liam saw a new Lego set, he begged his parents to buy it for him for his birthday. Liam was disappointed when his parents told him, "Liam you already have too much Lego. Try to think of something else that you want for your birthday." Liam thought really hard about what else he could ask for, but all he could think of was Lego! He loved Lego more than anything else in the store. Finally, Liam's birthday arrived and he still hadn't thought of anything to ask for from his parents. When Liam's parents handed him a big present, Liam was not expecting it to be

Lego blocks. Liam unwrapped his present and to his surprise, it was the new Lego set from the store that he wanted so badly! Liam squealed, "Thank you so much! This is just what I wanted!'

Test Questions:

(a) Is it really true that Liam wanted the Lego?

(b) Why did Liam act the way he did when he opened the present?

c) What do you think Liam's face looked like when he opened the present?

d) Do you think that Liam was **feeling** happy?

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DATE: **October 04, 2004**

FROM: Linda Rose-Krasnor, Chair
Research Ethics Board (REB)

TO: Cathy MONDLOCH, Psychology
Daphne MAURER, McMaster University

FILE: **04-035 - MONDLOCH**

TITLE: **Development of Visual Processing**

The Brock University Research Ethics Board has reviewed the above research proposal.

DECISION: **Accepted as Clarified**

This project has been approved for the period of **October 04, 2004** to **September 15, 2005** subject to full REB ratification at the Research Ethics Board's next scheduled meeting. The approval may be extended upon request. ***The study may now proceed.***

Please note that the Research Ethics Board (REB) requires that you adhere to the protocol as last reviewed and approved by the REB. The Board must approve any modifications before they can be implemented. If you wish to modify your research project, please refer to www.BrockU.CA/researchservices/forms.html to complete the appropriate form ***REB-03 (2001) Request for Clearance of a Revision or Modification to an Ongoing Application.***

Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Principal Investigator, the safety of the participants and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-Council. Policy Statement requires that ongoing research be monitored. A Final Report is required for all projects, with the exception of undergraduate projects, upon completion of the project. Researchers with projects lasting more than one year are required to submit a Continuing Review Report annually. The Office of Research Services will contact you when this form ***REB-02 (2001) Continuing Review/Final Report*** is required.

Please quote your REB file number on all future

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FROM: Linda Rose-Krasnor, Chair
Research Ethics Board (REB)

TO: Cathy Mondloch, Psychology
Daphne Maurer

RE: Continuing Review

FILE: 04-035 - MONDLOCH
Original clearance date: October 4, 2004
Date of completion: October 31, 2007

DATE: November 23, 2006

Thank you for completing the ***Continuing Review*** form. The Brock University Research Ethics Board has reviewed this report for:

Development of Visual Processing

The Committee finds that your original proposal and ongoing research conforms to the Brock University guidelines set out for ethical research.

*** Continuing Review Accepted.**

LRK/bb