Holistic and Featural Facial Processing in Children and Adults

by

Rayna House, B.A.

A thesis submitted to

the Faculty of Graduate Studies and Research

in partial fulfillment of

the requirements for the degree of

Master of Arts

Department of Psychology

Carleton University

Ottawa, Ontario, Canada

April 2004

© Copyright

2004, Rayna House

National Library
of Canada

Bibliothèque nationale
du Canada

Acquisitions and
Bibliographic Services

Acquisitons et
services bibliographiques

395 Wellington Street
Ottawa ON K1A 0N4
Canada

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

ISBN: 0-612-93904-9

Our file Notre référence

ISBN: 0-612-93904-9

The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of this thesis in microform, paper or electronic formats.

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de cette thèse sous la forme de microfiche/film, de reproduction sur papier ou sur format électronique.

The author retains ownership of the copyright in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

L'auteur conserve la propriété du droit d'auteur qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this dissertation.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de ce manuscrit.

While these forms may be included in the document page count, their removal does not represent any loss of content from the dissertation.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.

Canada

Abstract

Adults have been found to encode faces using a holistic approach. This type of encoding can be achieved by asking adults to make trait judgements (e.g., judging how friendly is the face). Making trait judgements results in higher recognition accuracy than featural judgements (e.g., judging how far apart are they eyes). It has been argued that children are unable to encode faces holistically (Carey & Diamond, 1977). The current study compared children's and adults' facial recognition and recall abilities (in an eyewitness context) when asked for either trait, featural, or no encoding judgements. Findings indicated that both adults and children demonstrated higher accuracy rates when asked to make trait judgements or no judgements, compared to feature judgements. Adults provided a greater number of facial descriptors than children regardless of encoding instructions, with both ages demonstrating similar proportions of correct descriptors. One possible explanation for comparable accuracy rates to adults is that children may be processing faces holistically.

Acknowledgements

First, I would like to thank my supervisor, Dr. Joanna Pozzulo, for her insight, encouragement, and guidance. Thank-you for your support at every step of this process.

I would like to express my gratitude toward Dr. Bennell, Dr. Coplan, Dr. Caputo, and Dr. Thorngate for their time and assistance. I also thank Dr. Leth-Steensen for his help with the statistical analyses, and Etelle Bourassa for her help and kindness.

Thank-you must also be extended to Dr. Ross Elliott for allowing me to conduct research at Elwood Elementary. I am also grateful to all the teachers at the school for their assistance and patience and to the students and their parents for their interest and participation.

A big thank-you goes to my mother, father, grandmother, and grandfather for their love and support. You were fantastic participant-finders!

Thanks to all my friends for their help and encouragement. Your patience and your ability to “calm me nerves” was and still is very much appreciated.

Finally, thank you to *Late Night with Conan O'Brien*, *American Idol*, and *Survivor* for providing me with entertaining, and much needed, distractions.

Table of Contents

Abstract.....	ii
Acknowledgements	iii
Table of Contents	iv
List of Tables	vii
List of Appendices.....	viii
Facial Encoding and Recognition: Definitional Issues	1
Face Recognition Task.....	4
Theories of Child Development	5
Face Encoding and Face Recognition in Children.....	6
Are Children Able to Process Faces Holistically?.....	11
Facial Recognition in Adults	11
Adult Encoding and Recognition.....	12
Differences Between Children and Adults in Facial Encoding and Facial Recognition.....	13
Eyewitness Identification Task	16
A Specific Form of Facial Recognition: The Lineup	17
Conclusions of Facial Recognition Studies	20
Predictions	22
Identification	22
Descriptions	22
Method	23
Participants.....	23

Measures	23
Exposure to the confederate's face	23
Facial Processing Task.....	23
Description Form	24
Lineup Task	25
Lineup Presentation	25
Lineup Instructions	25
Experimental Design.....	25
Procedure.....	25
Children.....	25
Adults	26
Results	26
Identification Accuracy.....	26
Single Feature Judgements versus Multiple Feature Judgements.....	29
Differences Among Adults	34
Target Descriptors.....	34
Total Number of Face Descriptors and Total Number of Body Descriptors as a Function of Age and Encoding Instructions	35
Proportions of Correct Face Descriptors and Proportion of Correct Body Descriptors as a Function of Age and Encoding Instructions.....	37
Total Number of Trait Descriptors and Total Number of Featural Descriptors as a Function of Age and Encoding Instructions	37
Age Descriptors	39

Race Descriptors	40
Gender Descriptors	40
Discussion.....	41
Identification Accuracy.....	41
Single Feature Judgements versus Multiple Feature Judgements.....	43
Target Descriptors: Total Number of Face and Body Descriptors Provided.....	45
Target Descriptors: Proportion of Correct Face and Body Descriptors Provided	46
Target Descriptors: Total Number of Trait and Featural Descriptors Provided	47
Target Descriptors: Race, Age, and Gender	47
Limitations and Future Research.....	49
References	51

List of Tables

Table 1.	Rates of identification accuracy (n = total number responding correctly out of 30 participants) as a function of age and encoding instructions.....	28
Table 2.	Rates of identification accuracy as a function of encoding instructions	28
Table 3.	Rates of identification accuracy as a function of age.....	29
Table 4.	Rates of identification accuracy (n = total number responding correctly out of 30 participants) as a function of the number of judgements made and age	32
Table 5.	Rates of identification accuracy as a function of encoding instructions (for single feature, single trait, and no encoding instructions).....	33
Table 6.	Rates of identification accuracy as a function of age (for single feature, single trait, and no encoding instructions)	33

List of Appendices

Appendix A. Face Judgements.....	55
Appendix B. Description Form.....	56
Appendix C. Lineup Response Form.....	57

Holistic and Featural Facial Processing in Children and Adults

The ability to recognize faces is an important aspect of an individual's life. Not only do individuals have to remember people they are familiar with, a situation may occur that requires an individual to recognize and remember someone whom he or she is unfamiliar with. Such may be the case of an eyewitness in a criminal context. The recognition capabilities of an individual (i.e., eyewitness) may be constrained by their encoding abilities (Wells, 1993). While it is generally accepted that adults are capable of encoding faces holistically, which encompasses facial features and the relations between those features (Mueller, Carlomusto, & Goldstein, 1978; Winograd, 1976); children's encoding abilities are unclear (Carey & Diamond, 1977). More specifically, some researchers believe children encode faces featurally and are unable to encode a face holistically (Carey & Diamond, 1977; Hay & Cox, 2000). The present study will examine whether children are able to encode faces holistically and how their abilities differ from adults by comparing facial recognition accuracy in the context of eyewitness identification.

Facial Encoding and Recognition: Definitional Issues

In describing the human face, Bradshaw and Wallace (1971, p. 443) noted that it contains "complex visual patterns," and this information is used for either communication or identification. The task of identifying a human face can be difficult. Humans tend to be better at recognizing faces that are familiar, than faces that are unfamiliar (Baddeley & Woodhead, 1982). The difficulty with this task can be accentuated by an individual's facial encoding abilities (or strategies) and their retrieval abilities (Baddeley & Woodhead, 1982; Wells & Hryciw, 1984).

It is important to identify what is meant by the terms “encoding” (or processing) and “retrieval.” When discussing encoding, this refers to “the dual process of forming a representation of a new face and storing that representation in memory” (Carey, Diamond, & Woods, 1980, p. 257). An individual’s retrieval abilities refers to their recognition abilities was defined by Carey, Diamond, and Woods (1980, p. 257) as, “matching a representation of a new instance with a representation already stored in memory.”

Generally, there are two types of facial processing that are mentioned in the literature: featural processing and holistic (or trait) processing. Schwarzer (2000) makes the important point that most researchers have a similar definition of featural processing; it involves focus on a single facial feature. However, there are two different definitions of holistic processing: holistic and configurational encoding. Holistic encoding refers to a face being represented by a template that takes into account the entire face; the face is not represented by its parts (Farah et al., 1998). This type of encoding may be done by asking an individual to make a judgement about an abstract trait of someone’s face, i.e., honesty. On the other hand, configurational encoding does take the specific features of the face into account, but their only use is to determine the spatial relationships with the different features (or second-order relational information), for example, the distance from the forehead to the eyes (Schwarzer, 2000). Diamond and Carey (1986) have suggested that as a person gains more experience, they are more able to distinguish between second-order relational features of faces.

Besides using featural and holistic principles to describe how faces are encoded, these two perspectives can be used as methods to assess the perception and recognition of

faces, particularly, unfamiliar faces (Baddeley & Woodhead, 1982). It is suggested that when encoding a face, holistic processing emphasizes a Gestalt approach to perception and emphasizes the characteristics of the person and their environment. Holistic processing may be seen as a good method for increasing recognition, whereas featural encoding does not appear to be as effective. Featural processing leads to poorer recognition than processing involving trait judgements, or holistic processing (Carey & Diamond, 1977).

Information processing theory attempts to explain the superiority of holistic processing in terms of depth of processing faces; faces judged for abstract traits (i.e., honesty) are better recognized than faces judged for physical features (i.e., lip thickness) (Chung & Thomson, 1995). Holistic judgements and featural judgements can be explained in terms of “shallow” and “deep” encoding. Courtois and Mueller (1979) likened featural encoding to a shallow process and holistic encoding to a deep process. The process of encoding a face featurally involves examining one physical feature of the face, such as the nose. On the other hand, holistic encoding involves making a judgement about an abstract trait, such as shyness; and this encoding requires an individual to take into account all of the features of a face and the relation between them. Due to the fact that holistic encoding involves scanning the entire face and featural encoding involves only scanning one feature of the face, the superiority in recognition for holistic encoding could be caused by the number of features scanned and not a product of the encoding itself. Therefore, Courtois & Mueller (1979) compared holistic processing with single feature encoding and multiple feature encoding. Single feature encoding involved asking the participants to make a decision about a single facial feature (e.g., lip thickness); while

multiple feature encoding involved asking participants to decide the person's most distinctive facial feature. In contrast, participants asked to holistically encode a face by rating the face on its friendliness or honesty. They found that while facial processing with multiple features was superior to single feature processing, both featural conditions were inferior, albeit multiple featural encoding was only slightly inferior, to holistic encoding.

Face Recognition Task

The task of facial recognition typically falls within the domain of cognitive psychology using cognitive psychology terminology and methodology. The task is initiated with participants being presented with numerous slides (approximately 20) of faces for encoding, with each face being displayed for approximately 5 seconds. Participants may or may not be told they should try to remember the faces. For recognition, participants are shown slides of various faces that include those from the encoding stage and those that have never been seen before (an additional 20). A time delay may or may not be imposed between encoding and recognition. Participants are asked to identify previously seen faces. Accuracy is analyzed by examining the participant's hit rate (the proportion of correctly recognized faces) and true negative rate (the proportion of faces participants correctly classified as being unfamiliar), whereas inaccuracy is analyzed by examining the participant's false positive rate (the proportion of incorrectly recognized faces) and miss rate (the proportion of faces from the encoding stage that the participants did not recognize).

Theories of Child Development

Chung and Thomson (1995) noted that “it is now well established that children’s ability to recognize faces of unfamiliar people improves with increasing age” (p. 56). Researchers have observed a developmental curve with respect to face recognition in children, where the ability to recognize faces increases until the age of 10 years, and then seems to either approximate adult abilities, or slightly decrease in accuracy (around the ages of 12 and 14 years) before approximating adult abilities (Carey et al., 1980; Feinman & Entwisle, 1976; Flin, 1985). Thus, children seem to be following a continuous stage of development with respect to their facial processing abilities, as opposed to a discontinuous (or stage) theory of development. Through the observation of a developmental curve (and the slight decrease of accuracy at certain ages), it seems that their ability to process faces is an additive process that occurs gradually without sudden change, as opposed to a series of abrupt changes (Shaffer, Wood, & Willoughby, 2002).

In reference to the development of facial encoding and recognition abilities of children, two theories may offer explanations for why children may not perform as accurately as adults in facial recognition studies; neuropsychological (maturational factors) and information processing (cognitive aspects). While these two approaches may be presented as separate theories, in fact, they complement each other in explaining children’s facial encoding abilities (Chung & Thomson, 1995).

Shaffer, Wood, and Willoughby (2002) noted that during childhood, and even into adolescence, myelinization and cerebral lateralization occur. With myelinization, a myelin sheath forms around neurons, acting as an insulator to speed the conduction of neural impulses. Faster conduction results in more efficient communication with the

brain and the body. Cerebral lateralization involves the “specialization of brain functions in the left and right cerebral hemispheres” (Shaffer, Wood, & Willoughby, 2002; p. 155). While the hemispheres do divide the functions, each hemisphere is not independent of each other; they are connected by the corpus callosum, which incorporates their respective operations (Shaffer, Wood, & Willoughby, 2002).

Information processing theory views cognitive development as a continuous progression that involves small quantitative changes as a child ages (Shaffer, Wood, & Willoughby, 2002). Cognitive development involves changes in the brain and changes in the mental processes that occur with age, with biology playing a big role; biological maturation allows for faster processing of information. The result is that “developing persons become better at sustaining attention, recognizing and storing task-relevant information, and executing mental programs that allow them to operate on what they have stored so as to answer questions and solve problems” (Shaffer, Wood, & Willoughby, 2002; p. 56). Thus, as both the brain and the mental processes of a child mature and develop, their ability for facial recognition will continuously improve.

Face Encoding and Face Recognition in Children

Understanding the processing capabilities of children are both theoretically and practically important (Ellis & Flin, 1990). Theoretically, this type of research will aid in understanding the development of how children encode facial information and their memory and retrieval capabilities. Practically, such information may aid the criminal justice system, specifically, in their understanding of how a child eyewitness attempts to recognize an unfamiliar face from a lineup. Procedural modifications then may be developed to produce superior identification evidence from children.

Ellis and Flin (1990) examined whether children's face recognition abilities were affected by delay and its implication for facial processing; whether older children (10-years-old) were more accurate in recognizing faces than younger children (7-years-old). When older children were able to see the faces for a longer duration, their recognition increased. Delay between the presentation of the faces and the recognition task revealed that accuracy decreased for the older children when the recognition task was repeated one week after the initial recognition task (compared to when it occurred on the same day as the presentation of the faces). However, 7-year-old children were not affected by this delay, performing consistently worse compared to the older children. Explanations for this finding were offered by Ellis and Flin (1990). Perhaps, younger children forget information so quickly (i.e., in a manner of minutes) that delay in the recognition task does not affect them; or younger children may only code a few features to begin with making them less susceptible to forgetting. The authors dismiss the first explanation of forgetting and consider the second explanation as more reasonable. This later explanation is consistent with the idea that younger children process faces featurally.

In a follow-up study, Ellis and Flin (1990) found similar results. Again, 10-year-olds were more accurate in their identification than younger children. However, in this experiment, length of exposure to the facial stimuli did not increase recognition for the 7-year-olds; the 10-year-olds performed better as the exposure time increased from 2 seconds to 6 seconds. The authors suggested that the older children might have benefited from the extra exposure time because their encoding capabilities are more advanced. Thus, older children may be able to encode more information during a given time period, or they may have better strategies to help them integrate this newly encoded information

while still presented with the stimulus (Ellis & Flin, 1990). Similar to the first experiment, delay between the encoding and recognition task had no effect on the accuracy rates of the 7-year-olds, but it did effect the older children, in that they performed significantly poorer in the recognition task as the delay increased.

Consequently, children are thought to process faces featurally; they may be inclined to recognize only the features of an individual's face. To further explore this notion, Baenninger (1994) found that having a target face wear paraphernalia at both the encoding stage and the recognition stage aided the children in their recognition. However, children believed that the target was absent when the target was actually present, due to the lack of paraphernalia at the recognition stage.

Consistent with previous research, Diamond and Carey (1986) found that younger children tended to make facial recognition judgements based on isolated features, such as paraphernalia. From this, the authors concluded that children 6-to 8-years-old tend to encode unfamiliar faces using the features of the face. However, during the age range of 10-to 12-years, the capability of holistic processing of faces seems to be attained. The authors hypothesize that this important encoding tool for faces could emerge so late in childhood because of a necessity to encounter as many different faces as possible in order to develop a face schema, or it could be due to a biological aspect of the brain that matures around 10 years of age.

Generally, between the ages of 6/7 and 10, the ability to recognize unfamiliar faces vastly improves (Schwarzer, 2000). Specifically, information on this developmental change comes from research conducted using inverted faces. In particular, Carey et al. (1980) found that the ability to recognize upright and inverted

unfamiliar faces did not differ for 6-year-olds compared to 10-year-olds. Also, ten-year-olds were significantly worse at recognizing inverted faces compared to upright faces. A further result observed by the authors was that overall performance in facial encoding declined slightly after the age of 10 and improved again until the age of 16.

Within the facial encoding/recognition research with children, there is a tendency for some of the developmental increases in facial identification to decrease or plateau around the ages of 10, 12, and 14. One study demonstrated an inferior performance in facial recognition with 12-to 14-year-olds compared to the 6, 8, 10, and 16-years-olds (Chung & Thomson, 1995). Carey et al. (1980) observed that an increase in recognition performance remained steady through the ages of 10 and 12. On the other hand, other studies reported that at the age of 10 and until the age of 16, accuracy in recognition tends to remain constant rather than decline (i.e., Diamond & Carey, 1977). Due to all of the inconsistency in the research, the actual encoding and recognition abilities of each age group of children is debatable.

One possible explanation for a developmental “dip” in face recognition accuracy could be due to maturational changes that occur at the start of puberty (Carey & Diamond, 1980). It has also been suggested that this decline may not be related to maturational status, but rather it can be explained by information processing theory; when children are moved from elementary schools to larger junior high schools this creates the need to encode numerous new faces (Chung & Thomson, 1995). Another explanation for this occurrence is that perhaps children are demonstrating a developmental dip because they have attained a new encoding strategy that they are not yet competent to use.

Further research on inverted faces continues to support the notion that children are unable to encode faces using holistic encoding. Carey and Diamond (1977) found that while children's accuracy rate on upright faces increases from age 6 to 10, their accuracy in recognizing inverted faces remains uniform. From this, the authors concluded that, the difference must be due to children developing an efficient method of encoding upright faces and they suggest that this method involves configural information of the face (or holistic encoding). Further support for their premise was provided in a subsequent study that specifically examined if 6-to 8-year-olds, unlike 10-year-olds, used isolated features for face recognition. In this experiment, the authors manipulated the facial expressions and paraphernalia of the photographs. The recognition accuracy of 6-to 8-year-olds' was affected (negatively) by paraphernalia cues (e.g., scarves, or hats); the same effect did not occur with 10-year-olds. Considering the results of both experiments together, Carey and Diamond (1977, p. 313) proposed that, "the properties that replace paraphernalia by age 10 are configurational aspects of faces, aspects that can be encoded best from upright faces."

The switch from featural to holistic processing in children has been demonstrated by Hay and Cox (2000). One particular result they observed was that 9-to 10-year-old children were better at recognizing whole faces than 6-to 7-year-old children. Also, consistent with other research, the recognition abilities of older children (9-to 10-year-olds) were superior to those of the younger children (6-to 7-year olds) with respect to inverted, whole face recognition. Still consistent with the featural processing abilities of younger children, the 6-to 7-year-olds were better able to identify individual features of faces, specifically the eyes, than older children.

Are Children Able to Process Faces Holistically?

The majority of the research on children's facial recognition abilities illustrates that younger children are more likely to pay attention to (and, thus, encode) specific features of the face. In fact, 6- to 7-year-old children are better at identifying individual features of a face (especially the eyes) than 9- to 10-year-old children (Hay & Cox, 2000). With regard to children's holistic processing abilities, researchers supporting the notion that younger children are *not* capable of this type of encoding illustrate this claim with empirical evidence showing the effects of delay (of recognition task), paraphernalia, and upright/inverted faces on children's recognition (Baenninger, 1994; Carey et al., 1980; Carey & Diamond, 1977; Diamond & Carey, 1986; Ellis & Flin, 1990; Hay & Cox, 2000). Generally, younger children (6- to 8-years-old) are not affected by delay in the recognition task, seem to pay more attention to paraphernalia, and do not differ in their recognition accuracy of upright and inverted faces. These findings support the idea that younger children pay attention to the features of the face, more so than older children; thus, they seem to be encoding faces featurally.

With research that directly examines children's holistic encoding abilities (i.e., by providing them with holistic or trait encoding instructions at the encoding stage) being very limited, and a vast body of research suggesting that children are, in fact, more likely to attend to, thus encode, features of a face, the exact encoding capabilities of children are still unknown. Thus, the debate continues.

Facial Recognition in Adults

Early facial recognition work by Hochberg and Galper (1967) found that adults were able to accurately recognize upright photographs at a significantly higher rate than

inverted photographs. They used this finding to conclude that adults do not merely use pattern storage and pattern recognition when trying to recognize faces, because simply inverting a face does not change the pattern. However, they fail to provide a theory for how adults recognize faces; they only infer from the results that information stored from inverted viewing is not tied to orientation. Currently, it is generally accepted that adults can recognize a large number of individual faces even if the faces are physically similar, or facial characteristics change, and the angle of the view is different from encoding and recognition (Carey & Diamond, 1977). Carey, Diamond, and Woods (1980) noted that adults are very capable of recognizing previously unfamiliar faces.

Adult Encoding and Recognition

The holistic encoding of faces has been compared to shallow processing, such as the identification of the sex of a face. Strnad and Mueller (1977) argued that because trait processing involved the encoding of more semantic features (or deep processing, e.g., judgements of honesty) of the face, it should be superior to judgements of the sex of someone's face because this type of processing involved sensory features (or shallow processing, e.g., determining gender). As predicted, the holistic encoding of a face led to more accurate face recognition among adults than the shallow judgement.

Winograd (1976) examined how three different types of judgements concerning a male face affected the subsequent recognition of that face. Participants were instructed to make three judgements of a male face; making judgements based on physical characteristics (e.g., straight hair, big nose, and looking heavy or weight), versus trait characteristics (e.g., intelligent, anxious, and friendly), versus occupational status (e.g., teacher, businessman, and actor). When judgements were made concerning physical

characteristics, recognition of the face was worse than with the trait or occupational judgements. However, there was one particular featural judgment that participants were asked to make, that resulted in no recognition differences between this judgement and the trait and occupational judgements, specifically the rating of the face with respect to its “heaviness” (i.e., the weight of the male). This result can be explained in that, heaviness may involve participants using all of the facial information to assess this characteristic. Therefore, the “heaviness” judgement may involve the encoding of more features than a judgement of a particular facial characteristic only, and the more features that are encoded, the better the recognition.

Similar to the previous studies, Mueller et al. (1978) compared three different types of facial processing judgements; holistic (or trait) judgement versus featural judgement involving only facial features versus a featural judgement that involved rating an aspect of the body. Results indicated that the featural judgement of the face led to poorer recognition than the trait judgement. One interesting finding was that there was no significant difference in recognition between the trait judgement (or holistic processing) and the judgement involving aspects of the entire body.

Differences Between Children and Adults in Facial Encoding and Facial Recognition

Based on their finding that 6-to 8-year-olds are highly susceptible to paraphernalia cues, with this effect decreasing by the age of 10, Carey and Diamond (1977) offered a maturational explanation of facial encoding. They suggested that children rely on a more featural encoding approach with unfamiliar faces, while from the age of 10 onward the ability to encode faces with configurational information emerges. Similar to this finding, Chung and Thomson (1995) proposed that facial recognition

improves as people age because adults encode more information; this is due to the improvement in both featural and holistic encoding over time.

With research examining animal recognition, the work of Davidoff and Robertson (2002) illustrates important differences between children's and adult's recognition capabilities. The authors contrasted children's and adults' abilities to recognize animals by their parts (features) or by the whole. They found that with respect to the whole recognition of animals, children only begin to approximate the performance of adults (for whole, rather than for featural stimuli) at the ages of 15- to 16-years-old. There is an emphasis on the parts of an animal for recognition in early childhood, with the ability to recognize the whole shape of the animal occurring sometime during the teen years (Davidoff & Robertson, 2002).

In an effort to understand the holistic processing capabilities of young children, older children, and adults, Baenninger (1994) manipulated facial configuration without changing the featural information. Recognition accuracy was examined by altering the location of facial features using three conditions: one feature remained in its normal position on the face (i.e., the eyes) while no facial features remained in a normal relation with each other (i.e., the nose was not located below the eyes), features remained in their normal facial positions while two features (the eyes and nose) remained in normal relation to each other (i.e., the nose was located below the eyes), and all facial features were located in their proper positions on the face. When two facial features remained in the same position relative to each other, but not in their rightful position on the face, participants of all ages produced more recognition errors than the other two groups of one feature in rightful position and all features in rightful position. Adults were significantly

more accurate in their recognition than the younger children (8-year-olds); older children (11-year-olds) did not differ from the other two groups in their recognition. Thus, it was suggested that all age groups relied on holistic encoding because the proper location of a feature appeared to be more important than its correct position relative to the other features (Baenninger, 1994).

In a subsequent experiment, single facial features were removed from the face while the facial configuration (i.e., the arrangement of the face and its features) remained consistent (Baenninger, 1994). Adults demonstrated significantly more accurate recognition than both the 8-year-olds and the 11-year-olds. In one surprising finding, when the facial features were removed from the face at the recognition stage (i.e., the eyes, nose, and mouth of the target face), it was found that removing all of the facial features did not impact the performance of any age group. Again, this suggests that holistic encoding may be present even among children as young as 8-years-old.

According to Schwarzer (2000), current research does not provide a clear indication as to the differences between adults and children's facial processing abilities. It had been observed that there is a movement from featural to holistic facial processing from childhood (around 7-years-old) to adulthood (Schwarzer, 2000). This conclusion was based on the finding that for 7-year-old children, inverting the face did not affect how they classified faces into groups based on a featural aspect of the face or a holistic aspect. In contrast, this inversion did effect the classification of 10-year-old children, but to a lesser degree, and the inversion had a strong effect on the adults. One problem with this study, however, is that schematically drawn faces as stimuli were used and it could be argued that these faces would not be as realistic as photographed faces.

Hay and Cox (2000) mentioned a relevant problem with the research that had been conducted on the facial recognition abilities of adults and children. Generally, different researchers have employed different age groups of children, and used different methods and stimuli, resulting in problems in trying to compare the divergent findings in this area of research.

Eyewitness Identification Task

In contrast to face recognition studies, eyewitness identification studies typically fall within the domain of social psychology using social psychology terminology and methodology. Participants are presented with one target, a culprit, in a mock event or crime. This culprit may be shown in a series of slides or in a live-staging (of the mock-crime), but the culprit is usually presented in a video-tape format. Participants are unaware that they will be asked to identify the culprit at a later time. In the identification phase participants are given a lineup task that will test their ability to identify the culprit. With the lineup task, the culprit may or may not be present among the photographs that are shown. In a target-present lineup, the culprit is placed among a small number of distractor photographs (usually 5), and in a target-absent lineup, the eyewitness is not shown the culprit's photograph; rather he/she is shown six distractor photographs. Accuracy, in target-present lineups, is measured in terms of correct identification (the participant correctly identifies the culprit in the lineup), and inaccuracy is measured in terms of foil identification (the participants incorrectly selects one of the distractors as the culprit), and in terms of false rejection (the participant incorrectly states that the culprit is not in the lineup). With target-absent lineups, accuracy is measured in terms of correct rejection (the participant correctly identifies the culprit is *not* in the lineup), and

inaccuracy is measured in terms of foil identification or false identification if a foil was deemed to be the innocent suspect a priori. Recently, researchers in the field are combining false identifications and foil identifications and referring to these as the false positive rate (Lindsay, Pozzulo, Craig, Lee, & Corber, 1997).

Many differences exist between the facial recognition and the eyewitness identification research paradigms. First, the presentation of the target(s) differs. Facial recognition research presents a participant with numerous faces to encode (e.g., 20), mainly in photographed form, while eyewitness identification research presents the participant with one target, usually in a videotaped mock-crime. Second, in facial recognition studies participants are presented with the same stimuli at the encoding stage and the recognition stage (i.e., the same slide is used from encoding for recognition). Eyewitness identification uses two different stimuli; video, live, or slide for encoding and photographs for recognition. Also, the target (culprit) is viewed from different angles (e.g., profile/side view) than s/he will be seen for recognition (full frontal face). Finally, with facial recognition research, the participant is always presented with the target during the recognition task. In other words, a target-present arrangement is used at all times. While, a target-present lineup task may be used in eyewitness identification research, a target-absent lineup is also necessary to assess the likelihood of false identifications in an eyewitness context.

A Specific Form of Facial Recognition: The Lineup

Bradshaw and Wallace (1971) raise an important point concerning an individual's everyday usage of facial recognition; normally, people attempt to locate a familiar person who is among unfamiliar faces. It is unusual for a person to have to locate an unfamiliar

face among other unfamiliar faces that are similar in appearance. This later situation may occur with an eyewitness who has seen a crime and needs to make an identification from a lineup. While, it is important to understand how children process familiar faces, it is equally important to understand how children encode and recognize unfamiliar faces, especially in the context of being a witness to a crime.

In an overview of the empirical research on eyewitness identification, Wells (1993) reiterates that eyewitness identification is a holistic process, and poorer identification accuracy with lineups can be seen with *adults* who attempt to process faces featurally. A conclusion on how children's processing abilities effect eyewitness identification has yet to be developed. Wells (1993) however has suggested that based on the work of Carey and Diamond (1977) the process of facial recognition may be different for children because, unlike adults, they appear to process faces featurally. Wells (1993) argued that eyewitness lineup identification represents a different task from what most participants experience in facial recognition experiments.

It is important to illustrate the different identification tasks that may be used to test an eyewitness's memory. Generally, there are two lineup procedures that may be used: simultaneous lineup and sequential lineup (Pozzulo & Lindsay, 1998). The simultaneous lineup involves presenting the witness with all the photographs of the lineup members at the same time (Wells, 1993). In contrast, the sequential lineup involves presenting photographs to the witness one at a time, with the witness being unable to re-examine previous photographs after they have decided whether the individual in the photograph was the culprit (Lindsay & Wells, 1985).

Generally, the standard police procedure for a lineup involves presenting the witness with a simultaneous lineup (Wells et al., 2000). As Wells et al. (2000) noted, the simultaneous lineup may afford the witness the opportunity of comparing across lineup members and choosing the person that looks most like the culprit, thus making a relative judgement. The person selected may or may not be the culprit. While making a relative judgement in a target-present lineup (i.e., the culprit is among the lineup members presented) is a good strategy; this is not an effective identification procedure for a target-absent lineup (Pozzulo & Lindsay, 1999). Consider that in a target-present lineup, the culprit is present and most likely will look more like himself/herself than the other lineup members (Wells, 1993). However, with a target-absent lineup the culprit is not present; the most similar-looking lineup member is therefore innocent.

With respect to the simultaneous lineup, children's (over 5 years of age) correct identification rates in a target-present lineup have been found to be comparable to those of adults; however, when the culprit is absent from the lineup, children make more false positives, that is, children are more likely to identify an innocent person than adults (Clifford, 1998; Pozzulo & Lindsay, 1998). More specifically, it has been demonstrated that children aged 9- to 10-years-old and adolescents (aged 12- to 13-years-old) were significantly less likely than adults to correctly reject a target-absent lineup (Pozzulo & Lindsay, 1998).

Clearly, a different conclusion regarding children's abilities emerges whether they are looking at a target present or absent lineup. The need for target-absent lineups is well described by Wells and Turtle (1986). Real-life cases have occurred in which the real culprit was not present in the lineup (Wells et al., 2000), and a wrongful conviction has

resulted. Target-absent lineups also are important in assessing a witness's response bias (to select anyone from the lineup) versus the strength of his or her memory. Since there is the option to select no one from the lineup (i.e., a person believes the culprit is not present), using a target-absent lineup is the only way to determine response bias; thus distinguishing it from the strength (i.e., how well they remember the culprit) of an individual's memory (Wells & Turtle, 1986).

Not only may an eyewitness view a lineup, in an effort to recognize the culprit, the eyewitness may be asked to recall everything they can remember about the crime and the culprit. Few studies have examined the descriptions (of a target/culprit) given by the eyewitness (Pozzulo & Warren, 2003). When Pozzulo and Warren (2003) examined the descriptors of the target (i.e., brown hair, tall, etc.), children (aged 10- to 14-years-old) reported fewer descriptors, however their accuracy rate varied as a function of description category. More specifically, children provided significantly fewer exterior face items than adults (e.g., hair color, style), and were as accurate as adults in reporting these items. With interior face items, such as nose, and eyes, children provided significantly fewer items than adults, and the children were less accurate than adults with these features. The purpose of examining descriptors in the present study is to further examine the information encoded by children and adults and also whether the information is stored as featural or holistic.

Conclusions of Facial Recognition Studies

Despite the numerous studies that have examined the encoding and recognition capabilities of children, it is difficult to reconcile the findings. As suggested by Hay and Cox (2000), the differences in the methodologies of the research, specifically, the age

groups and stimuli used, make it hard to compare the findings. Different types of target faces (i.e., composite faces, photographs of faces), and different types of recognition tasks are used (i.e., forced choice recognition, lineups ranging from two to six people). As well, the dissimilar age groups used in each study make it difficult to reach uniform conclusions. While most researchers seem to agree that children's recognition abilities improve as they age, it is still difficult to determine whether children are capable of holistic encoding. The effects of using different stimuli and methodologies should be examined. Without such information it would be difficult to arrive at a definitive conclusion concerning children's encoding abilities, especially when examining divergent methodologies.

The present study will attempt to cross methodologies from eyewitness identification research and face recognition paradigms in order to further understand children's encoding capabilities. One reason for merging the two methodologies is to avoid the problem of portrait recognition. Wells (1993) points out that with portrait recognition, the participant is presented with the same photograph at both the encoding and recognition stages of the experiment. Consequently, they may be recognizing the portrait (i.e., a property of the photograph itself) rather than the person. Thus, the target face will be presented in video-tape format, while the identification task will be presented in photograph format. The presentation of a target-absent lineup will be used. The target-absent lineup is a better test of memory than the face recognition task.

The present study will be conducted to determine whether children use a single feature process to encode faces.

*Predictions**Identification*

- (1) Adults will produce a higher rate of correct rejections when presented with holistic encoding instructions than when presented with featural encoding instructions.
- (2) For adults, the rate of correct rejections with holistic encoding instructions will not differ compared to the rate of correct rejections with no encoding instructions.
- (3) Children's (aged 6- to 9-years-old) correct rejection rates will not differ across the holistic encoding, featural encoding, and no encoding instructions. (This prediction tests whether children use a single feature encoding strategy.)
- (4) The correct rejection rates of children and adults will be comparable when given featural encoding instructions. However, the adults' correct rejection rates will be higher than the children's correct rejection rates in the holistic encoding instructions and in the no encoding instructions.

Descriptions

- (1) Adults will provide a greater number of total descriptors than children.
- (2) Adults will be as accurate as children in the proportion of correct descriptors provided.
- (3) Adults will provide a higher proportion of holistic-type descriptors (i.e., friendly, angry) than children.

Method

Participants

Ninety elementary school children, ($M_{\text{age}} = 7.66$, $SD = 1.03$, age range = 6- to 9-years-old) selected from grades one, two, and three, were recruited from an elementary school in Central Newfoundland. Only those children who had parental/guardian consent participated in the study. Children were told they could withdraw from the study at any time, as their participation was strictly voluntary.

Also, 90 adults ($M_{\text{age}} = 36.07$, $SD = 12.77$, age range = 18- to 64-years-old) were recruited from the first year psychology participant pool at Carleton University and from volunteer participants in Newfoundland. The Psychology students received course credit for their participation.

Measures

Exposure to the confederate's face: Participants were shown a 5-second video clip of a male confederate's (i.e., target) face, while he was looking directly into the camera for the length of exposure. Exposure time for the confederate's face was kept to 5 seconds in order to keep methodology comparable to previous research examining holistic and featural encoding abilities (i.e., Courtois & Mueller, 1979), and to prevent participants from over-exposure of the target-face and the possibility of them encoding the face using their own "natural" encoding abilities.

Facial Processing Task: Participants made yes/no judgements, concerning the target's face as it was displayed on screen. Participants were asked to make trait or feature judgements (Appendix A). For example, a trait judgement involved asking the participant if s/he thought the person on the video was fun. A featural judgement

involved asking the participant if s/he thought the person's eyes were small. A third group of participants were asked to watch the video and were not asked to make any judgements. The trait and feature judgements were adapted from Blaney and Winograd (1978). In addition, the judgements were pre-tested with 6-year-old children to ensure that the children understood the questions asked.

All participants were provided with the same trait encoding and featural encoding judgements. This was due to the fact that some facial features are better recognized than other features. The use of different facial features (and, thus, different questions) would have resulted in the inability to decipher whether a significant finding was due to the observed effect or due to the fact that one particular feature resulted in a lower rate of recognition than the others. In the current study, the featural encoding questions focused on the eyes. Generally, it has been found that the eye region is best recognized by children (Hay & Cox, 2000). Thus, by using an eye feature encoding question, children's featural abilities were maximized, reducing the likelihood of finding the predicted difference.

In order to equate the viewing time of the video across all participants, participants were asked encoding judgements until the video stopped. Therefore, while most participants heard only one (trait or featural) encoding judgement, some participants heard two encoding judgements, with the maximum number of encoding judgements heard by any participant being two.

Description Form. Participants were asked to describe the target using a free recall format (Appendix B). All responses were recorded using an audio cassette recorder. Audiotapes were then transcribed for coding.

Lineup Task: Head and upper body photographs were taken of male undergraduate students who resembled the confederate. From this pool of photographs, one, six-person, target-absent (i.e., the target's photo was not used) lineup was constructed.

Lineup presentation. A simultaneous lineup was used to display the photographs, that is, all lineup photos were displayed at the same time in a two row by three-column arrangement.

Lineup Instructions. When shown the lineup, participants were informed that the person seen in the video may or may not be present. Participants were asked to examine the photographs and indicate whether one of the photographs was of the target (Appendix C).

Experimental Design.

A 3 x 2 between-subjects factorial design was employed. Three facial processing instruction conditions were examined; holistic/trait vs. feature vs. control. Two age conditions were included; child vs. adult. All participants in both the holistic and featural encoding conditions were told that they would watch a short videotape of a person and would be asked questions about the person while they were watching the videotape. Participants in the control encoding condition were told that they were going to watch a short videotape. Participants were divided equally across conditions.

Procedure

Children

Children who had parental/guardian consent were asked if they would like to help the researcher with her project. Agreeable children were introduced to the researcher and

were shown the videotape of the target for 5 seconds. Prior to the start of the video, participants in the trait and featural encoding conditions were given the appropriate encoding instructions for their particular encoding condition (Appendix A). With the target's image on screen, these participants completed their judgement(s) (either trait or featural). Participants were asked to complete trait or featural judgements until the video had ended, resulting in participants hearing either one or two trait or feature judgments. Participants in the control encoding condition were asked to watch the video. Upon completing the encoding task, all participants were asked to describe the target. Their descriptions were recorded on an audio cassette recorder. Lastly, participants were asked to examine a six-person lineup. They were told that the person from the video may or may not be present, and were told to indicate whether one of the pictures was that of the confederate or if the confederate was not pictured. Once participation was complete, participants were debriefed.

Adults

The procedure as described with children was used with adults.

Results

Identification Accuracy

The goal of the following analysis was to explore the effects of age (child vs. adult) and encoding instruction (holistic vs. featural vs. control) on identification accuracy. For the purpose of examining this relationship a subtype of loglinear analysis, hierarchical analysis, was used.

The 3-way association between age, encoding instructions, and lineup identification accuracy was not significant, indicating that if lineup identification

accuracy was regarded as the dependent variable, the interaction of age and encoding instructions on lineup identification was not reliable, partial $\chi^2(2) = 3.52$, *n.s.* (see Table 1). However, the two-way association between encoding instructions and identification accuracy was significant, partial $\chi^2(2) = 8.42$, $p = .01$ (see Table 2). Thus, there was a main effect for encoding instructions on lineup identification accuracy. The 2-way association between age and lineup identification accuracy was nonsignificant, partial $\chi^2(1) = 2.36$, *n.s.* (see Table 3).

In order to determine where differences existed in the variable of encoding instructions, post hoc analyses were conducted. All three types of encoding instructions (trait, featural, and control) were compared using three chi square tests using an alpha of .016 (.05/3). Significant differences were observed between the correct rejection rates of participants receiving feature encoding instructions ($M = .30$) and participants receiving no encoding instructions ($M = .55$), $\chi^2 = 7.673$, $p = .01$. Correct rejection rates of featural and trait encoding instructions ($M = .48$), approached significance, $\chi^2 = 4.232$, $p = .06$. Trait and control encoding instructions were nonsignificant, $\chi^2 = .534$, *n.s.* Thus, receiving no encoding instructions leads to better recognition than receiving featural encoding instructions.

Table 1

Rates of identification accuracy (n = total number responding correctly out of 30 participants) as a function of age and encoding instructions.

Age	Type of Encoding Instructions		
	Trait	Featural	Control
Child			
Correct Rejection	.43(13)	.17(5)	.57(17)
Adult			
Correct Rejection	.53(16)	.43(13)	.53(16)

Table 2

Rates of identification accuracy as a function of encoding instructions.

	Type of Encoding Instructions		
	Trait	Featural	Control
Correct Rejection	.48	.30	.55

Table 3

Rates of identification accuracy as a function of age.

	Age	
	Child	Adult
Correct Rejection	.39	.50

Single Feature Judgements versus Multiple Feature Judgements

Upon examination of the results from the hierarchical loglinear analysis, identification accuracy does not differ across age. Thus, both children and adults have similar correct rejection rates regardless of the encoding instructions received. As predicted, there was a significant difference between the correct rejection rate of the feature encoding and the control encoding condition; thus demonstrating that both adults and children do not appear to “naturally” encode faces featurally. Unexpectedly, there was no significant (although the chi square test approached significance) difference in the correct rejection rates of the feature and trait encoding conditions.

Upon examining the correct rejection rates across encoding conditions and ages, children demonstrated higher recognition accuracy rates with holistic (trait) encoding than featural encoding (see Table 1). Conversely, when examining the correct rejection rates of adults, their accuracy rates did not differ regardless of encoding instructions.

This finding is not consistent with previous research. However, Courtois and Mueller (1979) had found that multiple feature encoding was superior to single feature encoding, and only slightly inferior to holistic encoding. Therefore, asking a person to encode more than one feature may result in a higher accuracy rate than simply asking them to encode only one feature; although it is unclear exactly how many features one would have to encode in order to approximate the accuracy rate of holistic encoding, with the number of features ranging anywhere from two or greater. One explanation for adult's higher accuracy rates within the featural encoding condition is that 57% of participants heard two judgements for encoding. Thus, it is important to examine accuracy rates in terms of single feature encoding and single trait encoding.

Table 4 illustrates a breakdown of the accuracy rates (and total count) across age and the number of encoding judgements made. Due to previous research suggesting that multiple feature encoding leads to better recognition than single feature encoding, a second hierarchical log linear analysis was conducted using participants who had heard only one trait encoding judgement, only one feature encoding judgement, or had received no encoding instructions. In the following hierarchical log linear analysis, 17 adults hearing two feature encoding judgements, 7 adults hearing two trait encoding judgements, 4 children hearing two feature encoding judgements, and 8 children hearing two trait encoding judgements were excluded from the analysis.

The 3-way association between age, encoding instructions, and lineup identification accuracy was nonsignificant, indicating that if lineup identification accuracy was regarded as the dependent variable, the interaction of age and encoding instructions on lineup identification was not reliable, partial $\chi^2(2) = 1.41$, *n.s.* (See Table

4). However, the two-way association between encoding instructions and identification accuracy was significant, partial $\chi^2(2) = 20.15, p < .001$ (see Table 5). Thus, there was a main effect of encoding instructions on lineup identification accuracy. The 2-way association between age and lineup identification accuracy was nonsignificant, partial $\chi^2(1) = .58, n.s.$ (see Table 6). Results of the hierarchical log linear analysis with only one feature and one trait judgement are similar to the findings of the original analysis; encoding instruction is the only factor that impacts recognition accuracy.

In order to determine where differences existed in the variable of encoding instructions, post hoc analyses were conducted. All three types of encoding instructions (trait, featural, and control) were compared using three chi square tests using an alpha of .016 (.05/3), in order to control for type I error. Significant chi square tests were observed for the comparison between the correct rejection rates of feature encoding instructions ($M = .13$) and no encoding instructions ($M = .55$), $\chi^2 = 17.70, p < .001$, and between the correct rejection rates of feature encoding instructions and trait encoding instructions ($M = .51$), $\chi^2 = 13.79, p < .001$. The comparison between the correct rejection rates of trait and control encoding instructions were nonsignificant, $\chi^2 = .16, n.s.$ Thus, receiving trait encoding instructions or no encoding instructions lead to better recognition than receiving featural encoding instructions. These findings are consistent with previous research on the superior recognition with trait encoding.

Table 4

Rates of identification accuracy (n = total number responding correctly out of 30 participants) as a function of the number of judgements made and age.

	Identification (ID) Accuracy	
	Correct Rejection	Incorrect ID
Adults		
One Feature Judgement	.15(2)	.85(11)
Two Feature Judgements	.65(11)	.35(6)
One Trait Judgement	.61(14)	.39(9)
Two Trait Judgements	.29(2)	.71(5)
No Encoding Instructions	.53(16)	.47(14)
Children		
One Feature Judgement	.12(3)	.88(23)
Two Feature Judgements	.50(2)	.50(2)
One Trait Judgement	.41(9)	.59(13)
Two Trait Judgements	.50(4)	.50(4)
No Encoding Instructions	.57(17)	.43(13)

Table 5

Rates of identification accuracy as a function of encoding instructions (for single feature, single trait, and no encoding judgements).

	Type of Encoding Instructions		
	Trait	Featural	Control
Correct Rejection	.51	.13	.55

Table 6

Rates of identification accuracy as a function of age (for single feature, single trait, and no encoding instructions).

	Age	
	Child	Adult
Correct Rejection	.37	.48

Differences Among Adults

Adult participants ranged in age from 18-years-old to 64-years-old, with a mean age of 36 years. In fact, many of the participants were above the age of 40. A closer examination of adults aged 30 and below and adults over the age of 30 revealed differences in accuracy rates. Adults' aged 30 and below ($n = 24$) averaged a correct rejection rate of .17 in the feature encoding condition, a correct rejection rate of .71 in the trait encoding condition, and a correct rejection rate of .73 in the control encoding condition. On the other hand, adults over the age of 30 ($n = 42$) averaged a correct rejection rate of .14 for the feature encoding condition, a correct rejection rate of .56 for the trait encoding condition, and a correct rejection rate of .42 in the control encoding condition.

Target Descriptors

Participants were asked to describe the target using a free recall format. In order to code the responses, a coding scheme was devised in order to categorize the descriptors. Categories included face (e.g., hair items, nose shape), body (e.g., weight, build, clothing items), featural descriptors (e.g., big nose, small eyes), and holistic descriptors (e.g., fun, nice, mean). (The categories of featural and holistic descriptors were used for experimental analyses in the current study in order to compare the type of descriptors provided by adults and children based on encoding instructions received. Featural descriptors were coded differently from face descriptors; featural descriptors only involved descriptions about such specific features of the face as nose and eyes, and not such facial descriptors as hair or face shape.) Age, race, and gender were coded separately. These descriptors could be seen as holistic-type descriptors, more so than

feature-type descriptors, in that, determining an individual's age, race, or gender would involve examining the entire face and not a single feature. An acceptable range was given for age, weight, and height descriptors (age ± 3 years; height ± 2 inches; weight ± 10 pounds). If a descriptor exceeded an expectable range (e.g., weight between 170lbs and 190lbs), it was considered an error and coded as incorrect. When two or more adjectives were provided for a descriptor (e.g., long, black hair) each adjective was scored separately. After 20 descriptions were scored an independent rater randomly scored these descriptions. Discrepancies between raters were discussed and a decision was reached on how to code the item, which continued until the reliability coefficients for each category reached .8 or higher.

Total Number of Face Descriptors and Total Number of Body Descriptors as a Function of Age and Encoding Instructions.

A Multivariate Analysis of Variance was conducted using age and encoding instructions as the independent variables and the total number of face descriptors and the total number of body descriptors as the dependent variables, in order to examine the relationship between age and encoding instructions and the number of descriptors provided by a participant. Multivariate tests revealed a significant main effect for age, $F(2, 173) = 39.04, p < .0001$, and a significant main effect of encoding instructions, $F(4, 346) = 5.15, p < .0001$. The interaction between age and encoding instructions was nonsignificant, $F(4, 346) = .12, n.s.$

Further tests were conducted to determine if the main effects of age and encoding instructions were significant for each dependent variable. A test of between-subjects effects revealed a significant main effect of age for both dependent variables of total

number of face descriptors, $F(1, 174) = 72.94, p < .0001$, and total number of body descriptors, $F(1, 174) = 25.23, p < .0001$. Adults provided significantly more total face descriptors ($M = 3.56$) and significantly more body descriptors ($M = 1.58$) than children ($M = 1.10$ and $M = .52$, respectively).

For the main effect of encoding instructions, only the dependent variable of total number of face descriptors was significant, $F(2, 174) = 10.62, p < .0001$. Results for the dependent variable of total number of body descriptors was nonsignificant, $F(2, 174) = 1.44$, n.s. Therefore, the total number of face descriptors provided by a participant was dependent on the encoding instructions received.

In order to determine where differences were among the three encoding conditions (trait, featural, and control), with respect to the dependent variable of total number of face descriptors provided, post hoc tests were conducted using Tukey's procedure to control for error. Significant differences were observed between the featural encoding condition and the trait encoding condition, mean difference = 1.57, $p < .0001$, and the featural encoding condition and the control condition, mean difference = 1.15, $p = .003$. A comparison between trait encoding condition and control condition yielded nonsignificant results, mean difference = -.42, n.s. Participants in the featural encoding condition ($M = 3.23$) provided a greater number of face descriptors than participants in both the trait encoding condition ($M = 2.08$) and control condition ($M = 1.67$), with no significant difference observed between participants in the trait and control conditions.

Proportions of Correct Face Descriptors and Proportion of Correct Body Descriptors as a Function of Age and Encoding Instructions.

A Multivariate Analysis of Variance was conducted using age and encoding instructions as the independent variables and the proportion of correct face descriptors and the proportion of correct body descriptors as the dependent variables, in order to examine the relation between age and encoding instructions and the number of accurate descriptors provided by a participant. Multivariate tests revealed a nonsignificant main effect of age, $F(2, 67) = .05$, n.s., a nonsignificant main effect of encoding instructions, $F(4, 134) = 1.39$, n.s., and a nonsignificant interaction between age and encoding instructions, $F(4, 134) = .15$, n.s. Thus, with respect to the proportion of correct face and body descriptors, children and adults demonstrated similar accuracy regardless of encoding instructions.

Total Number of Trait Descriptors and Total Number of Featural Descriptors as a Function of Age and Encoding Instructions.

A Multivariate Analysis of Variance was conducted using age and encoding instructions as the independent variables and the total number of trait descriptors and the total number of featural descriptors as the dependent variables, in order to examine the relationship between age and encoding instructions and the number of holistic and featural descriptors provided by a participant. Multivariate tests revealed a significant main effect of age, $F(2, 173) = 13.50$, $p < .0001$, and a significant main effect of encoding instructions, $F(4, 346) = 11.61$, $p < .0001$. The interaction between age and encoding instructions was nonsignificant, $F(4, 346) = .09$, n.s.

Further tests were conducted to determine if the main effects of age and encoding instructions were significant for each dependent variable. A test of between-subjects effects revealed a significant main effect of age for both dependent variables of total number of trait descriptors, $F(1, 174) = 6.19, p = .01$, and total number of featural descriptors, $F(1, 174) = 21.36, p < .0001$. Adults provided significantly more total trait descriptors ($M = .42$) and significantly more featural descriptors ($M = 1.33$) than children ($M = .22$ and $M = .54$, respectively).

For the main effect of encoding instructions, both dependent variables of total number of trait descriptors, $F(2, 174) = 8.27, p < .0001$, and total number of featural descriptors, $F(2, 174) = 16.09, p < .0001$, were significant. Thus, both the total number of trait and featural descriptors provided by a participant were dependent on the encoding instructions received.

In order to determine where differences were among the three encoding conditions (trait, featural, and control), with respect to the dependent variable of total number of trait descriptors provided, post hoc tests were conducted using Tukey's procedure to control for error. Significant results were observed for the comparison between the featural encoding condition and the trait encoding condition, mean difference = $-.40, p < .0001$. The comparison between featural encoding and control condition, mean difference = $-.22, p = .071$, and the comparison between trait encoding and control condition, mean difference = $.18, p = .15$, were nonsignificant. Therefore, participants in the trait encoding condition ($M = .52$) provided significantly more trait descriptors than participants in the featural encoding condition ($M = .12$). No significant differences were

observed in the total number of trait descriptors provided by participants in the control condition ($M = .33$) and participants in the two other encoding conditions.

Post hoc tests also were conducted with respect to the dependent variable of total number of featural descriptors provided among the encoding instructions condition. Significant results were observed for the comparisons between the featural encoding condition and the trait encoding condition, mean difference = 1.10, $p < .0001$, and the comparison between the featural encoding condition and the control condition, mean difference = .93, $p < .0001$. The comparison between the trait encoding condition and the control condition was nonsignificant, mean difference = .17, $p = .71$. Therefore, participants in the feature encoding condition ($M = 1.62$) provided significantly more featural descriptors than participants in both the trait encoding condition ($M = .52$), and the control condition ($M = .68$).

Age Descriptors

The dependent variable of age descriptors was coded as a categorical variable (age descriptor provided versus age descriptor not provided). Therefore, two chi square tests were conducted to examine whether the rates of providing age descriptors differed as a function of age and encoding instructions.

Adult participants showed a higher rate of providing age descriptors ($M = .13$, $n = 12$) than children ($M = .03$, $n = 3$), $\chi^2 = 5.98$, $p = .02$. As well, the rates of age descriptors provided among the featural encoding condition ($M = .08$, $n = 5$), the trait encoding condition ($M = .05$, $n = 3$), and the control condition ($M = .12$, $n = 7$) did not differ significantly, $\chi^2 = 1.75$, n.s.

Race Descriptors

The dependent variable of race as a descriptor also was coded as a categorical variable (race descriptor provided versus race descriptor not provided). Two chi square tests were conducted to examine whether the rates of providing race descriptors were different across the variables of age and encoding instructions.

A chi square test was conducted to examine the rates of providing race descriptors among the independent variable of age. Adult participants demonstrated a higher rate of providing race descriptors ($M = .18, n = 16$) than child participants ($M = .03, n = 3$), $\chi^2 = 9.94, p = .002$.

A chi square test also was conducted to examine the rates of providing race descriptors among the independent variable of encoding instructions. Results were nonsignificant. The rates of providing race descriptors were similar among the feature encoding condition ($M = .13, n = 8$), the trait encoding condition ($M = .03, n = 2$), and the control condition ($M = .15, n = 9$), $\chi^2 = 5.06, p = .08$.

Gender Descriptors

The dependent variable of gender was coded as a categorical variable (gender descriptor provided versus gender descriptor not provided). Two chi square tests were conducted to examine whether the rates of providing gender as a descriptor differed across the independent variables of age and encoding instructions.

A non significant chi square test was observed among the rates of providing gender with respect to the independent variable of age. Both adult participants ($M = .96, n = 86$) and child participants ($M = .92, n = 83$) demonstrated similar rates of providing gender, $\chi^2 = .87, n.s.$ A chi square test also was conducted to examine the rates of

providing gender descriptors among the independent variable of encoding instructions. The rates of providing gender were similar among the feature encoding condition ($M = .97, n = 58$), the trait encoding condition ($M = .92, n = 55$), and the control condition ($M = .93, n = 56$), $\chi^2 = 1.36$, n.s.

Discussion

The purpose of the present study was to examine children's facial recognition abilities, compared to the abilities of adults. It had been hypothesized that children process faces featurally; thus, children should have demonstrated similar rates of correct rejection across the three encoding conditions examined, featural, trait, and no instructions. It was hypothesized that adults would demonstrate higher rates of correct rejection with the trait and control encoding instructions compared to feature encoding instructions. Free recall capabilities of children and adults also were examined to further observe any similarities and differences between the two age groups. It was hypothesized that adults would recall a greater number of descriptors and a greater number of holistic-type features (due to their unique ability to process faces holistically) compared to children.

Identification Accuracy

Upon examining the correct rejection rates of the three encoding conditions, no instructions or trait instructions led to better recognition than hearing a featural encoding judgment. This finding is consistent with previous research suggesting that trait encoding leads to better recognition than featural encoding (Carey & Diamond, 1977; Courtois & Mueller, 1979). With the similar correct rejection rates in the control and trait encoding conditions, all participants may have been utilizing an encoding style consistent with trait

encoding. An alternative interpretation is that participants were utilizing multiple feature encoding.

As suggested by some researchers, such as Carey and Diamond (1980), and Hay and Cox (2000), children are thought to process faces featurally, switching to holistic encoding between the ages of 10 and 12. Thus, children should have demonstrated comparable correct rejection rates across all three encoding conditions. In the present study, the result was not found.

One possible explanation for the current finding, as suggested by Blaney and Winograd (1978) and Tanaka, Kay, Grinnell, Stansfield, and Szechter (1998), is that children are indeed capable of holistic encoding. Blaney and Winograd (1978) had observed that asking children to process faces holistically did, in fact, lead to better recognition, than if they were asked to encode featurally or simply asked to remember the face. From these results, the authors concluded that facial memory improves with the greater amount of features you encode.

However, it is difficult to know whether children are indeed encoding faces holistically or using multiple features. It has been demonstrated that multiple feature encoding leads to better recognition than single feature encoding, while only leading to slightly inferior recognition rates than that of trait (or holistic) encoding (Courtois & Mueller, 1979).

Previous research has indicated that while children's identification accuracy rates with a target-present lineup are comparable to adults, children's accuracy rates are lower than those of adults when presented with a target-absent lineup, such as the one utilized in the present study (Pozzulo & Lindsay, 1998). An examination of the correct rejection

rates of adults and children demonstrates that children's identification accuracy is comparable to adult's.

One possible explanation for this finding is the extreme age range of adults employed in the present study. The older adult participants seem to have lowered the identification accuracy rate of the adult group overall. As suggested by Adams-Price (1992), there is a moderate negative relationship between age and identification accuracy; however, this difference may be negligible if level of education is taken into account. Older adult participants may have a low level of education; whereas, younger adult participants are usually obtained from a university setting. The complete educational background of the adults in the current study is not known; however, some of the participants were teachers (thus, having a high level of education), whereas other participants were from rural Newfoundland and possibly having a significantly lower level of education (i.e., high school dropout). Thus, the accuracy rate of the adults in the current research study could be lower than that of younger adult participants in comparable studies. Moreover, the absolute level of correct rejection (53%) in the present study is lower than that found in other eyewitness studies (e.g., 66%, Lindsay et al., 1997).

Single Feature Judgements versus Multiple Feature Judgements

In the present study, in order to equate the viewing time (and encoding time) of the video for each participant, participants in the featural and holistic encoding conditions were asked to make the appropriate encoding judgements until the 5 second video had concluded. For the child participants, 27% of children heard two trait judgements and 13% of children heard two feature judgements; but the breakdown of the adult

participants was somewhat different. Comparable to the child participants, only 23% of adults heard two trait judgements; however, 57% of adults heard two feature judgements. With a much higher proportion of adults hearing two feature judgements than children, it was important to examine the possibility that hearing more than one feature encoding judgement had resulted in superior recognition rates for the adults in the featural encoding condition.

A comparison of the results between the initial hierarchical log linear analysis and the subsequent hierarchical log linear analysis yielded similar results. Both analyses demonstrated that only the variable of encoding instructions impacted participants' correct rejection rates; whereas age did not have an effect and there was no age and encoding instruction interaction. Regardless of single or multiple feature (or trait) encoding, both children and adults were similarly effected by encoding instructions.

When post hoc tests were conducted on encoding instructions, results differed for each log linear analysis. This difference was due to the inclusion of the data from those participants who had heard two feature encoding judgements in the first analysis. While it has been demonstrated by Courtois and Mueller (1979) that multiple feature encoding led to better recognition than single feature encoding, with multiple feature encoding resulting in only slightly inferior recognition than holistic encoding, it is difficult to know if that is indeed the case in the current study. The maximum number of feature encoding judgements heard by any participant was two. Since few studies have examined the issue of single feature encoding versus multiple feature encoding, it is difficult to know how many features have to be encoded in order for accuracy rates to begin to approximate those of holistic encoding. As shown by the accuracy rates of the adults in the two

feature encoding judgement condition, multiple feature encoding may begin to approximate that of holistic encoding anywhere from only two feature judgements or greater.

When the multiple feature encoding data were excluded from the subsequent analysis, the correct rejection rate of the featural encoding dramatically decreased. As a result, post hoc tests demonstrated that completing a feature encoding judgement lead to significantly poorer recognition than completing either a trait encoding judgement or completing no encoding judgements. Thus, trait encoding leads to superior recognition for both adults and children, and, with the comparable recognition rates with no encoding instructions. One possible explanation is that both age groups appear to be encoding faces holistically. However, as demonstrated with the data on two feature judgement encoding, participants could be using a strategy similar to that of multiple feature encoding; thus approximating the accuracy rates of holistic encoding even though they may not be using a holistic encoding strategy.

Target Descriptors: Total Number of Face and Body Descriptors Provided

Another method to assess the accuracy of eyewitnesses is through a free recall format that allows them to explain all they can remember about the target face. With respect to the total number of facial descriptors that were provided by the participants, results were consistent with previous research (Pozzulo & Warren, 2003). Adults reported a greater number of facial descriptors than children. Also, children reported a fewer number of body descriptors than adults. It is important to note that participants were only able to see the upper shoulders and head of the target in the video. While most participants provided body descriptors that were visible (i.e., type and color of shirt),

some participants provided information about descriptors that were not visible (i.e., color of pants), suggesting that a few of the participants provided completely fabricated descriptors of the target.

Encoding instructions also impacted the total number of face descriptors that were reported; with participants in the featural encoding condition providing more facial descriptors. While it would be difficult to compare this finding with previous research, due to the fact that this type of analysis has never been done within the context of facial encoding research, this result makes sense from a theoretical perspective. Featural encoding requires the participant to look at the features of the face; thus, this is where their concentration of the target would be directed. Participants in the trait (and also the control) encoding condition could be focusing on the entire template of the face during encoding. This would lead to a more general description of the face (i.e., plain-looking man, friendly-looking man) that does not involve providing or producing specific featural descriptors of the face.

Results also indicated that the encoding instructions did not impact the number of body descriptors provided. Featural, trait, and control encoding conditions provided similar counts of body descriptors. This finding would indicate that when presented with a specific encoding instruction, participants do examine the target face in the manner intended by the questions posed.

Target Descriptors: Proportion of Correct Face and Body Descriptors Provided

Besides examining the number of face and body descriptors provided by a witness, it is also important to assess their accuracy with this task. Therefore, participants' proportion of correct descriptors was examined. There was no effect of

proportion of accurate face and body descriptors for age. Children, despite providing fewer total face and body descriptors, were just as accurate as adults, which is a common finding in the research (Pozzulo & Warren, 2003).

Target Descriptors: Total Number of Trait and Featural Descriptors Provided

Descriptors of the target in the video also were coded in the categories of total number of trait descriptors and total number of featural descriptors. This was done to assess whether participants would provide a more featural- or a more holistic-type description of a target face; to determine how participants encode faces. Not surprising, adult participants were more likely than child participants to provide both more feature-type descriptors, and more trait-type descriptors. These two types of descriptors are sub-categories of face descriptors in general; thus, adults provide a greater number of descriptors than children.

The important finding is that encoding instructions did impact the total number of trait and featural descriptors that were provided. Participants receiving featural encoding instructions provided more feature-type descriptors than participants receiving trait encoding instructions and participants receiving no encoding instructions. It is also important to note that participants receiving trait-encoding instructions provided more trait-type descriptors than only those participants receiving featural encoding instructions. These results suggest that participants in the control condition (no encoding judgements) are providing similar-type descriptors as participants in the trait encoding condition.

Target Descriptors: Age, Race, and Gender Descriptors

Adults were more likely to report age than children. Previous research demonstrated that children and adults report age at a similar rate (Pozzulo & Warren,

2003). Perhaps this study's higher rate for adults is influenced by the overall greater number of descriptors provided by the adults. Note, both adults and children reported the age of the target at a very low rate overall ($M = .13$, and $M = .03$, respectively). The rate of reporting the target's age did not differ as a function of the type of encoding instructions received. With age being difficult to describe as either a featural-type descriptor or a trait-type descriptor, it would be expected that the reporting rate of age would not differ as a function of encoding instructions.

The rate of reporting race descriptors was higher for adult participants than children. This finding is consistent with research by Pozzulo and Warren (2003), where a smaller proportion of children reported race. Also noted in their study is an explanation of why children seemed to report race at a lower rate; the sample children in their study, as in the current study, were mainly Caucasian, as was the target. Thus, children may not feel the need to report the target's race because they feel this information may be self-evident.

As for encoding instructions, rates of reporting race did not differ among encoding conditions. Race is possibly a descriptor of a target that is evident regardless of whether you are examining only their features or their entire face.

The rate of reporting the gender of the target did not differ as a function of either age or encoding instructions. Generally, the vast majority of participants reported (either directly, i.e., "it was a male," or indirectly, i.e., "he was tall") the gender of the target. A few participants failed to provide any gender descriptors. This could possibly be due to some participants feeling that the gender of the person in the video was obvious; thus, not providing the descriptor.

Limitations and Future Research

The purpose of this study was to extend the knowledge of children's facial encoding and recognition abilities, and to merge the methodology of both the facial recognition literature and the eyewitness identification literature. However, some limitations need to be addressed. First, while few children were able to answer either two trait or two featural encoding judgements, a higher proportion of adult participants were able to complete two (trait or featural) encoding judgements. Equating the amount of time a participant spends exposed to a target face may not lead to equal encoding processes of the face. The smaller numbers of children able to answer two encoding judgements did not allow for an analysis of children's multiple feature encoding capabilities. As well, few adult and child participants were able to get through two trait judgements; thus, this information could not be used to examine any possible differences that may exist between multiple trait encoding and the other types of facial encoding. Future research should examine multiple features encoding in children, and the possible effects of multiple feature encoding.

It is also difficult to determine how many facial features have to be encoded for multiple feature encoding to approximate that of holistic encoding. Few researchers have examined differences, if any, in the accuracy rates of multiple feature encoding depending on the number of features heard (i.e., two features or greater than two features). Future research should examine exactly how many features have to be encoded before the accuracy rates begin to approach those of holistic encoding.

Interviewing children in a school setting was beneficial in obtaining a sufficient number of participants for the study. However, the research had to be as undistruptive to

the children's time as possible. Thus, the researcher was not able to allow a generous amount of time to pass between the encoding task, the recall task, and the recognition task. As well, the same time arrangement had to be used with the adult participants to ensure comparable findings. This procedure may have resulted in findings different from other identification/recognition studies where a greater time delay occurred. As well, a greater delay time may elicit responses from participants more resembling real world recall and recognition.

As indicated by findings in the present study, children ages 6- to 9-years-old are capable of holistic encoding and seem to be encoding faces in this manner (as indicative of their correct rejection rate when viewing a video of a person's face without encoding instructions). Future research could examine the encoding abilities of younger children (children aged 4- to 5-years-old) to determine if they are capable of holistic encoding and/or multiple feature encoding.

The present study used a videotape presentation of a person's face for encoding purposes, with the intention of avoiding a possible portrait recognition scenario. Generally, many studies in the area of facial encoding and facial recognition use still photographs at both the encoding and recognition stage. Perhaps future research could use a more tangible stimulus during the encoding task to mimic the "everyday" presentation of faces to individuals. Target-present as well as target-absent lineups should be examined.

References

- Adams-Price, C. (1992). Eyewitness memory and aging: Predictors of accuracy in recall and person recognition. *Psychology and Aging*, 7, 602-608.
- Baddeley, A., & Woodhead, M. (1982). Depth of processing, context, and face recognition. *Canadian Journal of Psychology*, 36, 148-164.
- Baenninger, M. (1994). The development of face recognition: Featural or configurational processing? *Journal of Experimental Child Psychology*, 57, 377-396.
- Blaney, R. L., & Winograd, E. (1978). Developmental differences in children's recognition memory for faces. *Developmental Psychology*, 14, 441-442.
- Bradshaw, J. L., & Wallace, G. (1971). Models for the processing and identification of faces. *Perception & Psychophysics*, 9, 443-448.
- Carey, S., & Diamond, R. (1977). From piecemeal to configurational representation of faces. *Science*, 195, 312-314.
- Carey, S., & Diamond, R. (1980). Maturational determination of the developmental course of face encoding. In D. Caplan (Ed.), *Biological studies of mental processes* (pp. 60-93). Cambridge, MA: MIT Press.
- Carey, S., Diamond, R., & Woods, B. (1980). Development of face recognition: A maturational component? *Developmental Psychology*, 16, 257-269.
- Chung, M., & Thomson, D. M. (1995). Development of face recognition. *British Journal of Psychology*, 86, 55-87.
- Clifford, B. R. (1998). Children vs. adults: Showups vs. lineups. *Expert Evidence*, 6, 145-150.

- Courtois, M. R., & Mueller, J. H. (1979). Processing multiple physical features in facial recognition. *Bulletin of the Psychonomic Society*, 14, 74-76.
- Davidoff, J., & Robertson, D. (2002). Development of animal recognition: A difference between parts and wholes. *Journal of Experimental Child Psychology*, 81, 217-234.
- Diamond, R., & Carey, S. (1977). Developmental changes in the recognition of faces. *Journal of Experimental Child Psychology*, 23, 1-22.
- Diamond, R., & Carey, S. (1986). Why faces are and are not special: An effect of expertise. *Journal of Experimental Psychology: General*, 113, 107-117.
- Ellis, H. D., & Flin, R. H. (1990). Encoding and storage effects in 7-year-olds' and 10-year-olds' memory for faces. *British Journal of Developmental Psychology*, 8, 77-92.
- Farah, M. J., Wilson, K. D., Drain, M., & Tanaka, J. N. (1998). What is "special" about face perception? *Psychological Review*, 105, 482-498.
- Feinman, S., & Entwisle, D. R. (1976). Children's ability to recognize other children's faces. *Child Development*, 47, 506-510.
- Flin, R. (1985). Development of face recognition: An encoding switch? *British Journal of Psychology*, 76, 123-134.
- Hay, D. C., & Cox, R. (2000). Developmental changes in the recognition of faces and facial features. *Infant and Child Development*, 9, 199-212.
- Hochberg, J., & Galper, E. (1967). Recognition of faces: 1. An exploratory study. *Psychonomic Society*, 9, 619-620.

- Lindsay, R. C. L., Pozzulo, J. D., Craig, W., Lee, K., & Corber, S. (1997). Simultaneous lineups, sequential lineups, and showups: Eyewitness identification decisions of adults and children. *Law and Human Behavior, 21*, 391-404.
- Lindsay, R. C. L., & Wells, G. L. (1985). Improving eyewitness identification from lineups: Simultaneous versus sequential lineup presentation. *Journal of Applied Psychology, 70*, 556-564.
- Mueller, J. H., Carlomusto, M., & Goldstein, A. G. (1978). Orienting task and study time in facial recognition. *Bulletin of the Psychonomic Society, 11*, 313-316.
- Pozzulo, J. D., & Lindsay, R. C. L. (1998). Identification accuracy of children versus adults: A meta-analysis. *Law and Human Behavior, 22*, 549-570.
- Pozzulo, J. D., & Lindsay, R. C. L. (1999). Elimination lineups: An improved identification procedure for child eyewitnesses. *Journal of Applied Psychology, 84*, 167-176.
- Pozzulo, J. D., & Warren, K. L. (2003). Descriptions and identifications of strangers by youth and adult witnesses. *Journal of Applied Psychology*.
- Schwarzer, G. (2000). Development of face processing: The effect of face inversion. *Child Development, 71*, 391-401.
- Shaffer, D. R., Wood, E., & Willoughby, T. (2002). *Developmental Psychology: Childhood and Adolescence*. (1st ed.). Scarborough, ON: Thomson Canada Ltd.
- Strnad, B. N., & Mueller, J. H. (1977). Levels of processing in facial recognition memory. *Bulletin of the Psychonomic Society, 9*, 17-18.
- Tanaka, J. W., Kay, J. B., Grinnell, E., Stansfield, B., & Szechter, L. (1998). Face

recognition in young children: When the whole is greater than the sum of its parts. *Visual Cognition*, 5, 479-496.

Wells, G. L. (1993). What do we know about eyewitness identification? *American Psychologist*, 48, 553-571.

Wells, G. L., & Hryciw, B. (1984). Memory for faces: Encoding and retrieval operations. *Memory & Cognition*, 12, 338-344.

Wells, G. L., Malpass, R. S., Lindsay, R. C. L., Fisher, R. P., Turtle, J. W., & Fulero, S. M. (2000). From the lab to the police station: A successful application of eyewitness research. *American Psychologist*, 55, 581-598.

Wells, G. L., & Turtle, J. W. (1986). Eyewitness identification: The importance of lineup models. *Psychological Bulletin*, 99, 320-329.

Winograd, E. (1976). Recognition memory for faces following nine different judgements. *Bulletin of the Psychonomic Society*, 8, 419-421.

Appendix A – Face Judgments

Trait Judgments

1. Is this person fun?	YES	NO
2. Is this person mean?	YES	NO

Feature Judgments

1. Are this person's eyes small?	YES	NO
2. Is this person's nose big?	YES	NO

Appendix B - Description Form

female? _____

in? _____

How old are you? _____

Are you male or

What grade are you

Please tell me everything you can remember about the person in the video?

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Appendix C - Lineup Response Form

Please look at these photographs. The person from the video may or may not be present. If you see the person from the video place a check mark in the box with the same number as the person's photo. If you do not see the person from the video place a check mark in the not here box.

1 **2** **3** **4** **5** **6** **Not Here**