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The Role of Emotional Expression on Person Identity Recognition

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THE ROLE OF EMOTIONAL EXPRESSION ON PERSON IDENTITY RECOGNITION

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ABSTRACT

Facial information concerning person identity and emotional expression is vital to human social interaction, and therefore, we find it beneficial to remember the faces we see. Little is known, however, about whether emotional expressions facilitate or inhibit recognition for person identity. The present studies examined the role of emotional expression on person identity recognition by manipulating whether such information was presented at encoding (i.e., initial perception of the actor) or at recognition (i.e., later memory for the actor). In Experiment 1, participants recognized more actors displaying an angry rather than a happy expression, when they initially saw actors display a neutral expression. Thus, angry rather than happy expressions facilitated recognition memory for person identity. Experiment 2 replicated and extended this finding. Participants recognized more actors displaying a surprised rather than a disgusted, a fearful, a happy or a sad expression, when they initially saw actors display a neutral expression. Furthermore, participants recognized actors displaying a neutral expression, when they initially saw actors display a surprised or a happy expression rather than a disgusted expression. Thus, surprised and angry expressions facilitated recognition memory for person identity, whereas surprised and happy expressions facilitated encoding of person identity. These results have implications not only for basic research concerning cognitive models of face perception (e.g., Bruce & Young, 1986) and evolutionary theories of emotion but also for refinement of methodologies used in the criminal justice system for eyewitness testimony.

DEDICATION

This dissertation is dedicated first and foremost to my advisor, Marilyn Mendolia, for the blood, sweat, and tears shed during the numerous hours she spent guiding me through times of stress and anxiety. Without her help and encouragement, this research would not have been possible. I also dedicate this dedicate this dissertation to my wonderful husband, Patton. He has been my constant strength and support, my rock. When I was ready to give up, he was always there to keep me motivated. I love you both and thank you for believing in me.

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TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

In order to successfully move about in the social world and respond to its many challenges, we have to rapidly make sense of our multifarious and fast-changing environment. Part of this demanding environment includes the multitude of faces we encounter each day. The human face—seen as we interact with others or as we encounter images of others in newspapers, in magazines, on computer screens, at the movies, or on television—is a highly significant social stimulus. In fact, from a simple glance at another's face or at the image of a face, we can glean, for example, information about one's sex, age, and even emotional state. As part of this information, person identity and emotional expression are possibly the most salient and essential aspects of nonverbal communication important for our success in communicating with and understanding others.

A facial expression, in the most parsimonious of explanations, is the result of one or more motions or positions of the muscles of the face. We all know, however, that facial expressions are much more informative than just that. Facial expressions convey emotion and serve as one of the most basic techniques human beings use to exchange social information. For example, by a simple inward and downward motion of the brow, a slight flaring of the nostrils, and a clinch of the jaw, a person will very clearly demonstrate to others that he or she is quite angry (Ekman & Friesen, 1975).

Consequently, because person identity and emotional expressions are so vital to human social interaction, we find it beneficial to remember the faces we see. Many times we see the

same individual again and again, going to work, shopping at the grocery store, or perhaps crossing the campus, but how well do we remember him or her? Do the facial expressions a person displays affect our memory for recognizing that person later? Do we happen to remember a person we saw smiling, for example, more so than we remember a person we saw frowning? The present research intends to investigate these issues and further explore the relationship between memory for a person's identity and his or her facial expressions.

Issues concerning factors that may influence our memory for a person's identity are relevant to the judicial system, especially with concern to eyewitness testimony. Eyewitnesses are critical in solving crimes and sometimes eyewitness testimony is the only evidence available for determining the identity of the culprit (Wells & Olson, 2003). In fact, it has been estimated that in 77,000 criminal trials each year in the United States, the primary or sole evidence against a defendant is eyewitness evidence, whether accurate or inaccurate (Wells, Small, Penrod, Malpass, Fulero, & Brimacombe, 1998). Unfortunately, research also indicates that eyewitness error is the leading cause of wrongful convictions. For example, in the first 200 DNA exoneration cases in the United States, eyewitness error occurred in 75% or more of the cases (Scheck et al., 2000; Wells, Memon, & Penrod, 2006).

The reliability of an identification is affected by two classes of variables—system variables and estimator variables (Wells, 1978). System variables are those under the control of the criminal justice system. These include instructions given to eyewitnesses before they consider a lineup or photospread or the method by which members of the lineup other than the suspect are chosen. Estimator variables are those beyond the control of the criminal justice system and whose effects can only be estimated. One particular variable that has lead to eyewitness identification error is a change in a culprit's physical appearance from the time of the

crime to the time of the recognition test. For example, after participants watched videotaped reenactments of armed robberies, simple disguises, even those as minor as covering the culprit's hair, impaired eyewitness identification (Cutler, Penrod, & Martens, 1987). Something even as seemingly insignificant as sunglasses can impair identification, however, the degree of impairment is reduced if the same culprit wears sunglasses at the time of the recognition test (Hockley, Hemsworth, & Consoli, 1999). These issues present a serious problem for the criminal justice system because often the photos of criminal suspects used in police lineups are several years old. Changes in appearance that occur naturally over time, as well as changes intentionally made by a culprit, can have quite strong effects on recognition rates. For example, Read, Vokey, and Hammersley (1990) found that participants made more recognition errors when viewing photos of the same individuals taken two years later when the individual's appearance had naturally changed (i.e., aging, changes in facial hair) than when their appearance remained largely the same.

Another important estimator variable that can influence eyewitness accuracy is the emotionality surrounding the event (Leinfelt, 2004). Witnessing a crime is typically a very frightening event. Although the influence of eyewitnesses' emotional stress on identification accuracy rates is inconclusive, several studies have suggested that this effect is likely to follow the Yerkes-Dodson Law, where by very high and very low levels of arousal will impair memory (Deffenbacher, 1983; Cutler et al., 1987).

Not only are the eyewitnesses in a heighted state of emotional arousal, but in many circumstances culprits are typically highly aroused as well, and tend to display intense emotional expressions. Does this intense facial expression make the culprit more memorable? Will seeing that same culprit at a later date with a different expression alter an eyewitness's ability to

recognize that individual? Or, for example, when an eyewitness viewed a crime in which the culprit predominantly displayed an intensely angry facial expression, will the eyewitness recognize that same culprit displaying a neutral expression in the police line-up? A major concern that will be addressed by the proposed research studies is the effect of an actor's emotional expression on an observer's ability to accurately identify that same actor at a later point in time.

Processing of Facial Information Associated with Person Identity and Emotional Expression: Two Competing Perspectives

There exists, among researchers, a debate about whether the processing of information specific to person identity and emotional expression influence each other and whether specific and separate brain areas are associated with each process. For example, Bruce and Young (1986) argued that while emotional expression may play a role in face perception, it plays a very minor role in face recognition. That is, the actor's expression may influence a person's ability to identify a stimulus as a face, but it may not necessarily help the person recall that face. In a review of neuropsychological studies of patients with cerebral damage to brain areas associated with face perception (i.e., lateral fusiform gyrus, superior temporal sulcus) as well as patients suffering from prosopagnosia, a rare disorder of face perception where the ability to recognize person identity is impaired, Bruce and Young argued that there is a dissociation in the cognitive and structural systems that the brain uses to encode and store information pertaining to person identity and emotional expression. In other words, they proposed a conceptual framework for face processing that consists of separate systems for the encoding (learning) and recognition of person identity and emotional expression. Evidence for their viewpoint comes from studying clinical cases in which patients with right cerebral hemisphere damage, who, depending on

where in the brain the damage occurred, could identify people but not their emotional expressions (Bruyer et al., 1983) or could identify emotional expressions but not people (Kurucz & Feldmar, 1979). The fact that person identity and facial expression identification were not both impaired from damage to a single area implies that the brain processes these two types of facial information separately. If these two types of facial information were processed by a mechanism associated with a single brain area, the authors argued that there should not be any dissociation between them.

As a functional account, the Bruce and Young (1986) model does not incorporate a neural topography of its separate components. More recently, however, Haxby, Hoffman, and Gobbini (2000) proposed a neurological account of face perception that emphasized a distinction between the representation of invariant and changeable aspects of faces. Specifically, the core system is comprised of occipitotemporal regions in the extrastriate visual cortex and contains two functionally and neurologically distinct pathways for the visual analysis of faces. One pathway codes changeable facial properties such as emotional expression, lipspeech, and eye gaze, and involves the inferior occipital gyri and superior temporal sulcus. The second pathway codes invariant facial properties, such as person identity, and involves the inferior occipital gyri and lateral fusiform gyrus. The degree of separation between the functional roles played by the different regions in this system, however, is unclear.

Several neuropsychological studies of patients with unilateral cerebral lesions have pointed to the same conclusion that perception of person identity and perception of facial expression proceeds independently. Researchers have used brief lateral stimulus presentations to investigate cerebral hemisphere differences in both normal subjects and in patients with lesions (e.g., Strauss & Moscovitch, 1981; Etcoff, 1984). Patients with unilateral cerebral lesions

demonstrated strong impairments that severely affected their identification of familiar faces or their interpretation of facial expressions of emotion, depending on the exact location of the cerebral damage. These studies have shown that although the right cerebral hemisphere makes an important contribution to analyses of both person identity and emotional expression, the region of the right hemisphere responsible for processing information relevant to a person's identity seems to be separate from the region that processes emotional expression information (see Etcoff, 1985, for a review).

Although the Bruce and Young (1986) model supports separate processing of person identity and emotional expression information, researchers have recently argued that while some separation exists, these processes may not operate completely independently of one another. Specifically, Calder and Young (2005) refuted the idea of completely different pathways by suggesting that conclusions drawn from clinical studies involving patients with disorders such as prosopagnosia or patients with some sort of cerebral damage, are over-simplifications. Calder and Young posited that in order to provide support for independent systems, patients would have to lose the ability to recognize people but not emotional expressions, or lose the ability to recognize emotional expressions but not people. For example, cases of prosopagnosia without impaired facial expression recognition would support the independence of identity processing, however, remarkably few prosopagnosics show well-preserved facial expression recognition. In fact, on formal testing, most such patients show impairments of facial expression recognition as well. Thus, it may be that there is an extensive arrangement of neural systems that communicate and cognitively process person identity and facial expression in a similar fashion.

Although neural topographical models of face perception with separate pathways for the processing of person identity and facial expression information have been proposed, empirical

support for these models is lacking. While Haxby and colleagues (2000) described wide distinctions between the systems that process person identity and changeable facial cues, relatively few functional imaging and cell-recording studies have investigated the processing of person identity and emotional expression in a single experiment (Calder & Young, 2005). Functional imaging investigations have consistently identified occipitotemporal regions as being activated by identity recognition, however, the results have been less consistent regarding the brain areas that are involved in expression recognition (Narumoto et al., 2001). Although fMRI techniques seem to support the idea that there is a degree of neural separation between the mechanisms involved in person identity and emotional expression recognition, such studies have contributed little to identifying how the person identity route separates from the emotional expression route.

Although some researchers point to evidence from a neural topographical perspective to describe the degree of separation between the processing of person identity information and emotional expression information, others prefer a more statistical approach. For example, Calder and Young (2005) used principle component analysis (PCA) to explore the relationship between the processing of person identity and facial expression information. PCA involves a mathematical procedure that transforms a number of possibly correlated variables into a smaller grouping of uncorrelated variables called principal components (Pearson, 1901). The first principal component accounts for as much variability in the data as possible, and each succeeding component accounts for unique portions of the remaining variability. Using this technique, the independent perception of person identity and facial expression arises from an image-based analysis of faces with no explicit mechanism for routing identity- or expression-relevant cues to different systems (Calder et al., 2001). PCA-based systems can reliably extract

and categorize facial cues to identity and expression. Recent work has shown that a PCA of emotional expressions posed by different actors generated distinct sets of principle components coding expression and identity, and others that coded both of these facial cues together. Moreover, this partial independence of the principle components was sufficient to model the independent perception of facial identity and expression. In addition, the partial overlap for facial identity and expression offers a potential explanation for the incidences where facial identity and expression produced interference effects (Calder & Young, 2005). In other words, independent perception does not need to rely on totally separate visual codes for these facial cues.

Emotional Expression Influences Perception of Person Identity

Several studies have been designed to explore the role that emotional expression plays in our perception of familiarity for others. Ganel and Goshen-Gottstein (2004) used a speeded-classification task to demonstrate that familiarity—knowing who a person is—increased the perceptual interconnectedness of identity and expression information. Specifically, participants viewed a series of familiar and unfamiliar actors displaying happy and angry emotional expressions and classified emotional expressions as being positive or negative while ignoring identity information (whether the face was familiar or unfamiliar), or classified faces as familiar or unfamiliar while ignoring expression information. Participants were quicker and made fewer classification errors for familiar faces than for unfamiliar faces for both identity and expression judgments. These findings are particularly interesting because the dimensions of identity and expression were equally discriminable, thus implying that this interference can only be attributed to participants' ability to classify person identity given a unique expression and cannot be easily dismissed as an artifact of a fast dimension interfering with the processing of a slower one.

Other researchers exploring this link between emotional expressions and how quickly and efficiently we process a person's identity explain that the amount of exposure we have to a person displaying a specific emotion may have a direct effect on ratings of familiarity. For example, Endo, Endo, Kirita, and Maruyama (1992) demonstrated that celebrities were more recognizable when seen displaying a positive expression rather than a negative one. The researchers suggested that this positive advantage may be due to the amount and type of exposure we have to such faces. In other words, most of the time we see celebrities smiling, whether on television or in magazines, and therefore they are more familiar to us when they display a positive expression than when they display a negative one.

Similarly, other researchers have observed that a smile increased feelings of familiarity for both unknown and famous faces (Baudouin, Gilbert, Sansone and Tiberghien, 2000). Across two studies, participants observed famous and unknown persons with smiling and neutral expressions, and categorized these faces as being famous or unknown and indicated how familiar they found each face to be. Results from these studies suggest a direct association between familiarity and expression processing such that a positive expression bias was found for both familiar and unfamiliar faces. In other words, the smile increased feelings of familiarity for both unfamiliar and familiar faces. Because unfamiliar faces do not hold a retrievable memory trace in long-term memory, the smiling bias cannot be attributed to a structural effect at the matching level between the visual input and the representation of faces in long-term memory. Instead, the smiling bias most likely occurred at the decision-making stage. Even if we can successfully identify faces without interference from emotional expressions, some information about emotional expression can, in some conditions, influence a decision about familiarity.

In addition to the familiarity that positive faces may contribute to face perception, there is also the possibility that positive faces may somehow provide an advantage in the identification and categorization of emotional expressions. Leppanen and Hietanen (2004) explored this possibility by having participants compare pictures of actual faces with schematic drawings of faces with a single feature such as an upturned mouth line. Across both studies and regardless of stimulus type (actual photographs or schematic drawings), participants reliably recognized happy expressions faster than they recognized angry ones. In order to investigate whether low-level processing of one particular feature of the face (e.g., the upturned curve of the mouth) contributed to the happy face advantage, participants in a third study categorized only the mouths used in the schematic drawings as being upturned, straight, or downturned. Participants were no quicker at classifying upturned lines rather than downturned lines, thus suggesting that the positive face advantage reflects a higher-level asymmetry in the recognition and categorization of emotionally positive and negative signals.

Though there is an advantage for happy faces in recognition tasks, angry or fearful expressions are often more easily detected. For example, angry faces are better noticed in a crowd, which could have an evolutionary survival basis (Vuilleumier et al., 2001). In a series of experiments, Hansen and Hansen (1988) documented an asymmetry in the processing of emotional expressions embedded in crowds. In these studies, participants were given the task of surveying crowds for the presence of a discrepant face. Across three studies, participants were faster at detecting an angry face from among happy crowds than they were at detecting a happy face among an angry crowd. Threatening faces pop out of crowds, perhaps as a result of a preattentive search for signals of direct threat.

Emotional Expression Influences Memory for Person Identity

Although there has been considerable work done in order to determine the effect of emotional expression on how recognizable or familiar we find others, very few studies have been directly aimed at investigating the influence emotional expression has on memory for new faces. Memory can be measured in one of several ways including, for example, recall tests, reconstruction tests, and recognition tests (Danziger, 2008), although not all measures of memory are applicable to facial stimuli. In recall tests, individuals rehearse a list of items and then reproduce that list as best as they can remember. The order that the individual recalls the list of items is not important. In reconstruction tasks, on the other hand, order is vital. Individuals are given a list of items to remember in the specific order in which they were presented. At test, individuals are presented with the studied items and are required to arrange those items in the order they were originally presented. Recognition tasks, however, are somewhat different from reconstruction and recall tasks. In recognition tasks, individuals are asked to remember a list of words or pictures, for example, and then identify the previously studied words or pictures from among a list of alternatives, or distracters, that were not present in the original list.

While each of these memory measures has its own unique benefit, only one is applicable to the study of memory for person identity and emotional expression. Because of the intricate nature of facial stimuli, recall memory tasks using this variety of stimuli are too difficult and, for this reason, inappropriate. Although images of actors displaying various facial expressions could be used as stimuli in a reconstructive memory task, a study employing a task of this nature could be said to be lacking in real-world applicability. The proposed studies, therefore, will employ recognition memory tasks to explore the influence of emotional expression on memory for person identity. Recognition memory tasks using facial stimuli best match real life experiences

(e.g., see Wells & Olsen, 2003, for a review of memory strategies used in eye-witness testimony literature).

Several of the earliest studies exploring the influence of emotional expressions on memory for person identity have demonstrated that positive expressions significantly increase person identity recognition. Kottoor (1989), one of the earliest researchers on the topic, designed a recognition memory study in which participants studied a set of photographs of actors displaying either happy, neutral, or pouting facial expressions. Participants then identified these same photographs from a set of photographs containing the previously seen photographs as well as photographs of new actors. Participants were better at recognizing photographs of actors displaying smiling expressions as compared to actors displaying neutral expressions or pouting expressions, thus providing direct evidence of a relationship between emotional expression and person identity recognition. In a similar study, Cohen-Pager and Brosgole (1992) had participants study photographs of actors displaying happy and neutral expressions. At recognition, participants chose between two photographs—the photograph they saw at inspection along with a photograph of a different individual (two-person condition), or the photograph they saw at inspection along with a photograph of the same individual displaying a different expression (two-expression condition). Participants made significantly more recognition errors in the two-expression condition than in the two-person condition, and their memory for smiling expressions was better than that for neutral expressions in both the two-person and two-expression conditions. These studies are important in the fact that they provide preliminary evidence for the role of emotional expression in memory for person identity. Specifically, both studies suggest that a recognition memory advantage exists for faces previously seen displaying a positive emotional expression.

Each of these studies, however, has included a fairly obvious weakness that poses a problem for proper interpretation. With regard to identity memory, the use of the same stimulus (e.g., photograph) at both inspection and test poses a problem. The recognition of an identical photograph and the recognition of a person are two quite different tasks. Bruce (1982) explained that when we see a photograph of a face we generate a pictorial code which includes elements such as lighting, grain, and perhaps even flaws that the photograph might possess. When the same photograph is presented at test, it is difficult to distinguish memory for person identity from memory for the pictorial code generated at inspection. Another major drawback to using the same picture at inspection and at test is that memory for facial expression cannot be assessed independently of identity because the same expression for a particular face would be seen at inspection and at test.

In an effort to test memory for emotional expression and person identity separately, D'Argembeau, Van der Linden, Comblain, & Etienne (2003a) conducted a study in which participants saw different photographs of the same actor at inspection and at test—each actor displayed a positive or a negative expression at inspection and a neutral expression at test. Thus, participants never saw the same photograph more than once, ensuring that participants were recognizing individuals, not photographs. By utilizing this research paradigm, D'Argembeau and his colleagues were better able to determine whether participants recognized the actors and whether participants remembered which emotional expression the actor displayed at inspection. Participants indicated first whether they recognized the actor in the photograph. If the actor was recognized, the participant then indicated which facial expression that actor previously displayed. D'Argembeau et al. discovered that participants recognized significantly more actors previously seen with a positive expression than with a negative expression. To explain this

happy face advantage, it was suggested that people more readily encode positive information rather than negative information when it provides some type of self-relevance (e.g., an increase in positive affect after viewing a photograph of a happy actor). Memory for emotional expressions, however, was similar for happy or angry faces.

Using this very same paradigm, reliable results have been found for person identity recognition such that recognition accuracy was significantly higher for actors who were seen with a happy rather than an angry expression at inspection (D'Argembeau & Van der Linden, 2004; D'Argembeau et al., 2003a; D'Argembeau, Van der Linden, Etienne, & Comblain, 2003b). Results for memory for facial expression, however, are inconclusive in that several studies have found better memory for positive rather than negative expressions (D'Argembeau et al., 2003b; Shimamura, Ross, & Bennett, 2006), while other studies have found no differences whatsoever (D'Argembeau et al., 2003a; D'Argembeau & Van der Linden, 2004).

The happy expression advantage for person identity recognition holds even when direct attention is not paid to the emotional expression being displayed. To demonstrate this, D'Argembeau and Van der Linden (2007) designed a study in which participants, during a initial task, attended to the actor's physical characteristics (i.e., nose size), trait information (i.e., intelligence), or the emotional expression. Participants recognized more actors after attending to the actor's personality or emotional expression than physical characteristics. These findings suggest that, when participants view a face as a whole (i.e., to make a decision about whether the actor is intelligent or to determine the affect displayed in an emotional expression), emotional expressions influence person recognition automatically, regardless of whether specific attention is being paid to the expression or its possible meaning. Participants' memory for emotional expressions, however, was best after participants attended to the actor's expression displayed by

actors, suggesting that emotional expression information is not automatically stored in our memory and must be paid specific attention in order to be properly stored. Again, memory for expression was not different for happy or angry faces, regardless of the type of information that participants attended to when viewing the actors.

Although the above-mentioned studies have reinforced the idea that positive expressions significantly increase person identity recognition, there seems to be an important piece missing in this literature concerning the memory processes involved in this relationship between emotional expressions and person identity recognition. Memory processing is divided into three stages: encoding, storage, and retrieval (Tulving, 1972). Encoding allows information that is from the outside world to reach our senses in the forms of chemical and physical stimuli. Encoding also requires that the perceived item of use or interest be converted into a construct that can be stored within the brain and recalled later from short term or long-term memory. Storage is the second process and involves the creation of a permanent record of the encoded information. Finally, retrieval includes calling back the stored information in response to a cue in the environment for use in a process or activity (Tulving, 1972, 1983). In previous studies, participants viewed happy and angry faces at inspection (encoding), and only neutral faces at test (retrieval) (D'Argembeau et al., 2003a; D'Argembeau et al., 2003b; D'Argembeau & Van der Linden, 2004; D'Argembeau & Van der Linden, 2007). This presents a problem for the interpretation of previous findings because it is unclear at which stage of processing that emotional expressions exert their influence on person identity recognition. In other words, we only know about the relationship between emotional expression and memory for a person's identity for situations in which emotional expression information is available when participants encode actor's faces. Experiment 1 was designed to explore whether emotional expression

information enhances person identity recognition only when such information is presented at inspection (the expression may help us to process or learn the face in a special way), or whether emotional expression information enhances person identity recognition even when such information is presented at test (the expression may help us to retrieve the memory trace). Specifically, participants saw either happy and angry expressions or neutral expressions at inspection. Those participants who viewed happy and angry faces at inspection then saw neutral faces at test while those who viewed neutral faces at inspection then saw happy and angry faces at test. Because stimuli have to be converted into meaningful bits of information to be successfully stored in memory (Tulving, 1972), it was hypothesized that emotional expressions would influence person identity recognition when emotional expression information was present only when facial information was encoded.

Along with exploring whether emotional expression information enhances person identity recognition when emotional expressions are seen at inspection or at test, Experiment 1 is unique because of its inclusion of a simple, yet direct measure of judgment confidence. Confidence ratings have been measured in past studies using the Remember/Know/Guess option format (D'Argembeau et al., 2003b; D'Argembeau & Van der Linden, 2007). Adapted from Gardiner, Ramponi, and Richardson-Klavehn (1998), participants were instructed to give a "Remember" response to any face that brought back to mind something they had consciously experienced, a "Know" response to faces that felt familiar, and "Guess" responses if they were unsure whether or not the face had been presented at inspection. This particular methodology is problematic because of the somewhat confusing nature of the response categories. Also, the Remember/Know paradigm, which was adapted into the Remember/Know/Guess paradigm, was originally designed to explore the different states of consciousness associated with memory

retrieval (Tulving, 1985). Because confidence in memory retrieval is considerably different than a state of consciousness associated with memory retrieval, using the Remember/Know/Guess paradigm we miss information pertaining to a direct reflection of participants' confidence. Experiment 1 measured participants' confidence of the decisions they made using a 7-point scale with anchors of 0 (*not at all*) and 6 (*very much*). It was expected that by choosing a simple, yet direct, measure of judgment confidence, we could enhance our understanding of the judgment process.

Another possible drawback to the current literature is that the influence of emotional expressions on identity recognition has been limited to only happy and angry expressions. In order to replicate and extend previous findings, Experiment 2 was designed to include a variety of facial expressions at inspection. In order to further explore the complexity of the facial decoding processes underlying the recognition of particular emotions, Experiment 2 not only included happy and angry faces at inspection, but also included expressions of sadness, disgust, fear, and surprise.[1]

In order to fully understand the nature of the relationship between emotional expression and memory for a person's identity, it is necessary to investigate the different decoding strategies associated with recognizing various emotional expressions. Research has demonstrated that we infer what others are feeling by a quick, automatic processing of their facial expression information. However, there exists a debate in the literature about the cognitive mechanisms associated with this automatic processing. Theorists supporting a categorical processing of facial expression information have postulated a set of basic emotion categories, each including a set of emotion words for each emotion category (e.g., Ekman, Friesen, & Ellsworth, 1982; Izard,

[1] A study by Shimamura et al. (2006) included multiple emotional expressions; however, this study will not be discussed in detail because its methodology is not informative or relevant to that of Experiment 2.

1971). Although the emotion words in each category as well as the associated emotional expressions may differ in intensity, different facial behaviors are associated with each of the separate overlying emotional categories. According to this theory, the diversity of human facial expressivity is systemized using prototype expressions that correspond to these categories. These prototypes are configurations of facial-feature movements, produced by well-defined combinations of muscle contractions (Ekman, 1982). For example, a person who is ecstatic about winning the lottery is experiencing a much more intense emotion than a person feeling a slight sense of accomplishment after completing a difficult school assignment. Categorical perception theorists would argue that both of these affective states fall within the "happy" category, and although they differ in intensity, the configuration of the facial features as well as the action patterns of facial muscle movements would be similar.

Dimensional theorists, in contrast, suggest that facial expressions of emotion are recognized based on their association with dimensions underlying the structure of emotion (Katsikitis, 1997; Russell, 1997). Based on factor analysis and multidimensional scaling techniques, the recognition of facially expressed emotion has commonly been represented by two dimensions (e.g., valence and facial dominance, Katsikitis, 1997; valence and arousal, Russell, 1997). The dimensions are said to represent two independent factors that are common to all emotions and emotional expressions and can be arranged to form a two-dimensional emotion space such that any single emotion judgment reflects the individual's simultaneous assessment of both dimensions. Although researchers on the topic often disagree about the dimensions that make up this emotion space, researchers generally agree that variations among expressions is a function of each expression's alignment in the emotion space created by the dimensions that constitute it, rather than its membership in a discrete emotion category.

Very little research has directly compared the conscious use of categorical or dimensional decoding strategies when recognizing facial expressions of emotion. Only one such piece has begun to explore these effects by testing whether the type or completeness of an emotional expression contributes to the ease at which participants use either a categorical or dimensional judgment strategy to recognize a facially expressed emotion (Mendolia, 2007). Specifically, participants viewed actors displaying each of the basic emotions, which varied in intensity. The images included either complete expressions (expressions that were not altered in any way) or partial expressions. Partial expressions were made from the composite of either an upper blend of an emotion and a neutral image or a lower blend of an emotion and neutral image. In other words, participants saw complete expressions, partial expressions where the upper half of the face displayed an emotional expression while the bottom half was displaying a neutral expression, or the opposite of this. After viewing each face, participants identified the emotional expression using either an affect grid style format (dimensional approach) or a list of emotion discrete categories (categorical approach). Results demonstrated that participants could consciously employ both strategies quite well. Participants, however, judged the complete expressions more accurately using the categorical approach especially when viewing fearful, disgusted, and surprised expressions. These findings seem to suggest that individuals are more effective at consciously using the categorical approach rather than the dimensional approach to decoding facial expressions when all features fit an emotion prototype. Participants, however, were more effective at employing a dimensional decoding strategy rather than a categorical decoding strategy for partial expressions, or when facial expressions were ambiguous. Therefore, it could be concluded from the evidence described here that individuals are quite able at using both categorical and dimensional strategies when recognizing facial expressions,

however, individuals choose the strategy that best fits the stimulus presented to them. Because of this evidence that participants use dimensional and categorical strategies differentially, it was necessary for Experiment 2 to include emotional expressions that represent both of this strategies.

The classification of emotional expressions is also influenced by the location and distinctiveness of expression-consistent features (Calder, Young, Keane, & Dean, 2000; Wallbott & Ricci-Bitti, 1993), as well as the extent to which those expression-consistent features are characteristic for more than one emotion category (Ekman et al., 1982). For example, lower face cues, including movement in the mouth area, influenced raters' judgments of emotions such as anger, disgust, and happiness, whereas upper face cues, predominantly associated with eyebrow movement, influenced judgments of surprise, fear, and sadness (Katsikitis, 1997). Experiment 2 included this extensive list of emotions associated with unique decoding strategies to examine whether each emotional expression has unique influences on person identity recognition accuracy.

In order to simulate real life events (e.g., seeing someone for the first time), an incidental learning condition was chosen for both Experiments 1 and 2. Using an incidental learning procedure, participants were presented with photographs of actors on a computer screen and were asked to make decisions about the possible interests or preferences of the actors depicted in the photographs. Following a brief distraction task, participants' memory for recognizing the actors was tested.

EXPERIMENT 1

The purpose of Experiment 1 was to explore whether emotional expressions have to be encoded in order to influence memory for person identity. Specifically, participants were assigned to one of two encoding conditions—emotional expressions at inspection or neutral faces at inspection. Those participants who viewed emotional expressions at inspection viewed neutral expressions at test, whereas participants who viewed neutral expressions at inspection viewed emotional expressions at test. It was hypothesized that in order for emotional expressions to affect person identity recognition then facial expressions must be encoded at inspection. In other words, actors initially seen displaying a positive expression should be better recognized than actors seen with a negative expression. Actors initially seen displaying a neutral expression should be recognized equally as well when later seen with a positive or a negative expression.

Method

Participants and design. Participants included 227 undergraduate students enrolled in psychology courses at the University of Mississippi (71.1% women, mean age of 20.1 yr.), who received partial course credit in exchange for their participation. Participants who volunteered to participate were randomly assigned to condition. The experiment consisted of a 2 (encoding condition: emotional expressions and neutral expressions at inspection) × 2 (facial expression: happy and angry) mixed-model design with encoding condition as a between-participants factor and facial expression as a within-participants factor.

Materials. All aspects of the present study were presented using SuperLab software on standard Dell computer systems. Participant responses were made on a standard Cedrus 7-button

response pad. Stimuli were selected from the Karolinska Directed Emotional Faces (KDEF; Lundqvist, Flykt, &Öhman, 1998). This carefully controlled database includes faces that have been photographed from the same distance, with the background of the photographs, the lighting conditions, and the clothes worn by the actors portrayed being identical across all images. Photographs of 54 actors (27 males and 27 females) were selected, with each individual being portrayed with three different expressions (neutral, happy, and angry). In all pictures, face orientation was directed (facing forward). To control for peripheral facial cue influences on recognition accuracy rates, photographs of actors were cropped in such a way that only internal facial features were visible. Thirty-six faces were presented at inspection (18 happy expressions and 18 angry expressions in the emotional expressions at inspection condition, 36 neutral faces in the neutral expressions at inspection condition), and the remaining 18 faces were used as distracters for the recognition test (faces used as studied or nonstudied items were counterbalanced across participants). Sex of the actors presented at both inspection and test was balanced across conditions. In the emotional expressions at inspection condition, each studied face was seen with a happy expression by half the participants and with an angry expression by the other half, to control for the possibility of differences in the memorability of particular actors. Similarly, in the neutral expressions at inspection condition, each test face was seen with a happy expression by half the participants and with an angry expression by the other half. Faces were presented in a random order as to control for possible order effects within conditions.

Procedure. After arriving at the lab and providing informed consent, the participant sat in a chair 24 inches in front of a 17-inch computer monitor. The experimenter stated in a cover story that the objective of the study was to investigate social perception skill. The experimenter told the participant that by studying social perception skill, researchers can better understand

how people relate to one another. The experimenter explained to the participant that he or she would see a number of photographed faces displayed on the screen, and that each person's expression was in response to an event. The experimenter instructed the participant to indicate whether the person exhibited various personality traits, based on his or her impressions of the person depicted in the photograph. The actual purpose of this task was to expose the participant to photographs of actors displaying either emotional expressions or neutral expressions, depending on condition, without instructing the participant to intentionally remember the actors.

After completing two practice trials, the experimenter left the room and the participant began the face-perception task. A red fixation cross appeared on the screen for approximately 1 s in order to draw the participant's attention to the center of the computer monitor. Once the cross disappeared, the participant saw a photograph of an actor for 5 s. Once the photograph left the screen, the participant saw a personality descriptor (e.g. organized, intelligent, logical*)* displayed on the screen for 3 s along with a 7-point scale ranging from 0 (*not at all*) to 6 (*very much*). Participants selected the rating on the scale that best represented his or her perception of the person in the photograph and pressed the corresponding button on the response pad. After 3 s the computer automatically advanced to the next trial, even if the participant did not make a response, ensuring that the time between each trial was uniform for all participants. The participant completed 36 trials in this task. Personality traits were randomized to ensure that an actor was not associated with any one specific personality trait. No actual measurements were recorded during this task because its sole purpose was to expose participants to images of the actors.

After the participant completed the face-perception task, the experimenter returned to the room and stated that the next task served as another assessment of visual perceptual processes,

specifically, the perception of color. The experimenter stated that the purpose of the task was to examine whether strategies a person uses to read people are similar to those that a person might use to perceive other stimuli, for example, colors.

While alone, the participant saw a color patch displayed on the screen for 5 s, followed by a color wheel displayed for 4 s. The color wheel was divided into six equal sections. Each section was labeled from 1 to 6 and represented one of the major colors of the color wheel. In the allotted 4 s, the participant used the response pad to select the corresponding section of the color wheel that best matched the previously displayed color patch. After making this first judgment, the participant had 4 s to indicate how confident he or she was of the decision by using the response pad to select the corresponding rating on a 7-point scale ranging from 0 (*not at all*) to 6 (*very much*). This particular confidence rating was included in order to familiarize the participant with the confidence scale to be used in the following recognition-memory task. In order to control for time, each screen in the distraction task was programmed to advance automatically after the allotted time for each trial, regardless of the participants' response. The participant completed 12 color trials, thus making the distraction task approximately 2.5 min. Again, no actual measurements were recorded in this task. In actuality, this task served as a distraction task designed to provide a controlled delay between the initial exposure to the photographs of the actors in the face-perception task and the recognition-memory task to follow.

Immediately following the distraction task, the participant completed a surprise recognition-memory task. For each trial the participant saw a photograph displayed on the computer screen. As quickly as possible, the participant indicated by clicking a "yes" or "no" button designated on the response box whether he or she recognized the actor from the face-perception task. Participants in the emotional expressions at inspection condition saw 54

photographs of actors displaying neutral expressions—the 36 actors from the face-perception task as well as 18 distracter photographs of actors they had not previously seen. Participants in the neutral expressions at inspection condition saw 54 photographs of actors displaying happy or angry facial expressions—the 36 actors from the face-perception task (half of which displayed a happy expression, half an angry expression) and 18 distracter photographs of actors they had not previously seen (again, half of which displayed a happy expression, half an angry expression). For each of these judgments, reaction times were measured and the participant indicated how confident he or she was about each judgment by using the response pad to select the corresponding rating on a 7-point scale ranging from 0 (*not at all*) to 6 (*very much*).

The recognition-memory task was self-paced. Computer software measured responses for participants' accuracy, reaction times, and confidence levels for person identity recognition. After completing the recognition-memory task, participants were fully debriefed and dismissed.

Results and Discussion

Experiment 1 was designed to explore whether emotional expression information enhances person identity recognition when such information is presented at inspection (i.e., the expression helps us to process or learn the face in a special way) or at test (i.e., the new expression information helps us to retrieve the memory trace). It was hypothesized that emotional expressions would influence person identity recognition when they were presented at encoding (emotional expressions at inspection condition) rather than recognition (neutral expressions at encoding condition). In other words, actors seen with a positive expression at inspection should be better recognized when displaying a neutral face at test than actors who were seen displaying a negative expression at inspection. Actors displaying neutral expressions

at inspection should be recognized equally as well when seen with either a positive expression or a negative expression at test.

Participants' recognition accuracy was assessed using Wagner's (1993) method for calculating unbiased hit rates and chance values. Wagner's unbiased hit rate is posited to more accurately reflect participants' performance than simple hit rates alone because it takes into account the number of times a participant correctly identified an actor that was present in the previous face-perception task (simple hit rate) in conjunction with how often the participant used a response category (i.e. "*yes*" or "*no*"). Simple hit rates provide misleading information by not taking into consideration the number of times a participant incorrectly used a particular response category (false alarms). For example, if a participant selects "yes" for every trial in a recognition memory task, a simple hit rate would indicate that the participant performed at 100% accuracy. This is not correct, however, because even though this participant recognized all the actors from the previous task he also incorrectly identified all the foils. Based on Wagner's method, unbiased hit rates were calculated for each participant using the following formula:

$$H_u = \frac{Hits^2}{(Number\ of\ Old\ Faces\ x\ Number\ of\ Times\ You\ Said\ Yes)}$$

For Wagner's method, an unbiased hit rate of "1", for example, indicates that a participant correctly identified each previously seen actor and only used the response category "yes" when it was appropriate to do so. Chance values, on the other hand, were calculated by taking into account the likelihood that a certain stimulus and response category will co-occur by chance given the participant's response pattern. In other words, chance values were calculated as follows:

$$p_c = \frac{(Number\ of\ Old\ Faces\ x\ Number\ of\ Times\ You\ Said\ Yes)}{N^2}$$

Each participant's unbiased hit rate was compared to his or her chance value rather than to a standard chance value of .5 based on the 2-option response format of the recognition judgment. Using Wagner's chance values are more appropriate because participants may have been biased in their use of one response type over the other, and Wagner's method takes into consideration each participant's response pattern when considering chance value.

Paired t-tests were performed to compare unbiased hit rates and chance values in order to explore whether participants were performing at or above chance (see Table 1). In all cases participants performed at a level exceeding their own chance values, thus suggesting that participants were not responding in a random fashion (all $p_s < .001$). Finally, in order to quantify each participant's performance above his or her chance level, difference scores were calculated for each participant by subtracting chance values from unbiased hit rates.

A 2 (encoding condition: emotion expressions at inspection, neutral expressions at inspection) × 2 (facial expression: happy, angry) analysis of variance performed on difference scores (unbiased hit rates − chances rates) to explore the influence of encoding condition and emotional expression on participants' ability to recognize the actors revealed a main effect of emotional expression, which was qualified by a significant interaction of emotional expression and encoding condition. Whether participants initially saw actors displaying an emotional or a neutral expression in combination with whether they were happy or angry altered their ability to recognize the actor, $F(1, 225) = 7.5$, $p < .01$, and their quickness to make, $F(1, 225) = 6.7$, $p < .01$, and confidence in the judgment, $F(1, 225) = 4.6$, $p < .05$ (see Figures 1, 2, and 3). Pairwise comparisons using Bonferroni adjustments revealed that, contrary to predictions, after initially seeing actors displaying neutral expressions, participants recognized more actors and were quicker to make and more confident about their judgments when actors were displaying an angry

rather than a happy expression. Participants who viewed actors displaying happy and angry expressions at inspection recognized those same actors equally as well when seen displaying neutral expressions (p = .55). Likewise, participants in the emotional expressions at encoding condition made recognition judgments for actors previously seen displaying happy expressions no quicker (p = .94) or more confidently (p = .26) than judgments for actors previously seen displaying angry expressions.

The results from the present study suggest that emotional expressions influence memory for a person's identity, but only when the expression information is available at the time of recognition. In other words, when emotional expressions were present during the recognition test, participants' accuracy rates were higher for actors displaying angry expressions as compared to happy expressions. When emotional expression information was available at inspection, however, this added piece of information encoded for each actor did not seem to influence participants' memory for those actors. Participants in this condition remembered equally as many actors displaying neutral expressions who were previously seen with a happy expression as they did actors displaying angry expressions.

One possible explanation for participants' increased recognition accuracy rates for actors displaying negative expressions could be that participants viewed the actors' neutral expressions during inspection as being more negative rather than neutral. Functional neuroimaging studies on emotion as well as emotion categorization studies have demonstrated that prototypical "neutral" faces are often evaluated as being negative (i.e., Lee et al., 2008; Baggott, Palermo, & Fox, 2011). If it is the case that participants in the present study viewed the neutral faces as being negative, state dependent learning theory would suggest that actors seen displaying a negative expression at test would be more readily recognized than actors displaying a positive

expression (Godden & Baddeley, 1975; Godden & Baddeley, 1980). In other words, the negative emotion participants associated with the neutral expressions of the actors seen at inspection may have made those same actors seem more familiar when displaying angry expressions at test because of the consistency of emotion state associated with each expression. To explore this hypothesis, Experiment 2 was designed to include a measure of perceived emotionality for each face seen at inspection. If it is the case that participants are viewing the neutral expressions as being more negative than neutral, and this negative emotion associated with the neutral expressions seen at inspection is boosting recognition rates for actors seen with a negative expression at test, then participants in the neutral expression at encoding condition in Experiment 2 should show higher recognition rates not only for angry faces, but also for other negative expressions as well.

Another purpose for including this second judgment in Experiment 2 was to double the exposure time for faces seen during inspection. Although participants in Experiment 1 were performing at a level significantly higher than chance, recognition rates were low across all expressions (unbiased hit rates ranged from 4% to 8% above chance rates, see Table 1). Allowing participants to view each of the faces during the face-perception task for 10 s instead of 5 s was intended to increase recognition accuracy in Experiment 2.

Finally, to further investigate the role of emotion in the encoding and recognition of person identity, Experiment 2 maintained the two encoding conditions of Experiment 1. In an attempt to replicate and extend the findings of Experiment 1, Experiment 2 included a more comprehensive list of emotions in order to examine whether emotional expressions with different decoding strategies have unique influences on person identity recognition rates. While

Experiment 1 only included the emotions of happiness and anger, Experiment 2 was designed to include the emotions of happiness, anger, fear, sadness, surprise and disgust.

EXPERIMENT 2

The purpose of Experiment 2 was to replicate and extend Experiment 1 by including a more extensive list of emotions, a list which included six basic emotions. Experiment 2 included a more comprehensive list of emotions in order to examine whether emotional expressions with different decoding strategies have unique influences on person identity recognition rates. In order to further investigate whether emotional expression information enhances person identity recognition when presented at inspection or when presented at test, participants in an emotional expressions at encoding condition saw a series of actors displaying happy, sad, angry, scared, surprised and disgusted facial expressions at inspection, and saw those same actors, along with actors they have never seen before, displaying neutral expressions at test. Participants in the neutral expressions at encoding condition saw a series of actors displaying neutral expressions at inspection, and saw those same actors, along with actors they have never seen before, displaying happy, sad, angry, scared, surprised and disgusted facial expressions at test. Based on previous findings that actors previously seen displaying a positive rather than negative expression are better recognized when later seen displaying a neutral expression (i.e., D'Argembeau et al., 2003a; D'Argembeau et al., 2003b; D'Argembeau & Van der Linden, 2004; D'Argembeau & Van der Linden, 2007), and because classification accuracy rates are highest for happy expressions (Calder, Young, Keane, & Dean, 2000; Wallbott & Ricci-Bitti, 1993), it was hypothesized that participants' person identity accuracy rates will be highest for actors previously seen displaying a happy expression. Lastly, the further investigate participants' higher recognition accuracy rates for actors displaying negative expressions in the neutral

expressions at encoding condition of Experiment 1 and in an attempt to boost recognition accuracy ratings, Experiment 2 included a measure of perceived emotion displayed by each of the actors. Specifically, participants were exposed to actors in the face-perception task a second time, and asked to rate the emotion displayed by each of the actors. If it is the case that participants are viewing the neutral expressions as being negative, and this negative emotion associated with the neutral expressions seen at inspection is boosting recognition rates for actors seen with a negative expression at test, then participants in the neutral expression at encoding condition should show higher recognition rates not only for angry faces, but also for sad and disgusted faces as well.

Method

Participants and design. Participants included 174 undergraduate students enrolled in psychology courses at the University of Mississippi (78.7% women, mean age of 19.9 yr.), who received partial course credit in exchange for their participation. Participants who volunteered to participate were randomly assigned to condition. The experiment consisted of a 2 (encoding condition: emotional expressions and neutral expressions at inspection) × 6 (facial expression: happy, angry, sad, scared, surprised, and disgusted) mixed-model design with encoding condition as a between-participants factor and facial expression as a within-participants factor.

Materials. Again, stimuli were selected from the Karolinska Directed Emotional Faces (Lundqvist et al., 1998). While Experiment 1 used 54 actors, photographs of 36 actors (18 males and 18 females) were selected for Experiment 2, with each individual being portrayed with seven different expressions (neutral, happy, angry, sad, scared, surprised, and disgusted). Twenty-four faces were presented at study (four of each emotional expression), and the remaining twelve faces were used as distracters for the recognition test (faces used as studied or nonstudied items

were counterbalanced across participants). Each studied face was seen with a randomly selected expression, thus ensuring that the effect of facial expression was not confounded by differences in the memorability of particular facial identities.

Procedure. The procedure for Experiment 2 was identical to that of Experiment 1 with the exception that all participants made two judgments of each actor during the face-perception task. First, participants completed the same personality trait judgment as in Experiment 1. The second judgment was a rating of perceived emotion for each actor's expression. For each trial, a red fixation cross appeared on the screen for approximately 1 s in order to draw the participant's attention to the center of the computer monitor. Once the cross disappeared, the participant saw a photograph of an actor for 5 s. Once the photograph left the screen, the participant saw a 7-point scale with anchors of 0 (*negative*) and 6 (*positive*) for 3 s. Each participant indicated the degree to which he or she perceived the individual's facial expression to be either positive or negative by selecting the appropriate rating on the scale provided. Again, after 3 s the computer automatically advanced to the next trial, even if the participant did not make a response, ensuring that the time between each trial was uniform for all participants. Participants completed the first judgment for all actors in the face-perception task and then saw each face a second time in order to complete the second judgment. The order in which participants completed these two judgments of the face-perception task was counterbalanced across participants to control for order effects. All other aspects of Experiment 2 were the same as Experiment 1.

Results and Discussion

Experiment 2 was designed to replicate and extend Experiment 1 by examining whether certain emotional expression with different decoding strategies have unique influences on the encoding and recognition of person identity. Participants saw actors displaying happy and angry

expressions (as in Experiment 1) along with sad, disgusted, fearful, and surprised expressions. Experiment 2 also included a second exposure to the actors seen during the face-perception task. During this second task, participants judged the emotion displayed by each of the actors. Based on previous findings that actors previously seen displaying a positive rather than negative expressions was better recognized when later seen displaying a neutral expression (i.e., D'Argembeau et al., 2003a; D'Argembeau et al., 2003b; D'Argembeau & Van der Linden, 2004; D'Argembeau & Van der Linden, 2007), and because classification accuracy rates are highest for happy facial expressions (Calder, Young, Keane, & Dean, 2000; Wallbott & Ricci-Bitti, 1993), participants' recognition accuracy for person identity was expected to be highest for actors previously seen displaying a happy expression. Furthermore, if participants rated the neutral expressions as being more emotionally negative than neutral, and this negative emotion associated with the neutral expressions seen at inspection is boosting recognition rates for actors seen with a negative expressions at test, then participants in the neutral expression at encoding condition should show the highest recognition rates for actors displaying angry, sad and disgust expressions at test.

As in Experiment 1, participants' judgment accuracy was assessed using Wagner's (1993) method for calculating unbiased hit rates and chance values. Paired *t*-tests revealed that participants performed at a level exceeding their own chance values, all $p_s < .001$ (see Table 2). Difference scores were calculated for each participant by subtracting chance values from unbiased hit rates.

Recognition accuracy. A 2 (encoding condition: emotion expressions at inspection, neutral expressions at inspection) × 6 (facial expression: happy, angry, sad, fear, surprised, disgusted) analysis of variance performed on difference scores (unbiased hit rates − chances

rates) to explore the influence of encoding condition and emotional expression on participants' ability to recognize the actors revealed a main effect of emotional expression, which was qualified by a significant interaction of emotional expression and encoding condition. Whether participants initially saw actors displaying an emotional or a neutral expression, in combination with whether the actors were happy, angry, sad, fearful, surprised or disgusted, altered their ability to recognize the actor, $F(5, 156) = 2.9$, $p < .05$ (see Figure 4). Pairwise comparisons revealed that participants recognized significantly more actors displaying neutral expressions at test when they had previously seen the actor displaying a surprised expression ($p = .03$) or a happy expression (marginal, $p = .11$) rather than a disgusted expression. Participants who saw actors displaying neutral expressions at encoding, however, also recognized significantly more actors displaying surprised expressions at test than actors displaying either fearful ($p = .02$), disgusted ($p = .002$), happy ($p = .001$) or sad expressions ($p < .001$). There seems to be something special about surprised expressions, that regardless of when participants receive expression information (at inspection or at test) it aids in the recognition of the actor associated with that expression. As in Experiment 1, participants also had marginally higher recognition rates for actors displaying angry expressions at test than actors displaying happy ($p = .06$) or sad expressions ($p = .08$). In other words, actors initially seen displaying happy expressions may be encoded in a special way that allows them to be better recognized later, when displaying neutral expressions, than actors encoded while displaying disgusted expressions. When emotional expression information is withheld from participants until recognition, however, the newly added expression information displayed by actors with angry expressions at test makes them more easily recognized than actors displaying happy or sad expressions. Overall, participants in the emotional expressions at encoding condition had significantly higher recognition rates than

participants in the neutral expressions at encoding condition for happy expressions (p = .02) and marginally higher recognition rates for sad expressions (p = .11).

Confidence ratings. A 2 (encoding condition: emotion expressions at inspection, neutral expressions at inspection) × 6 (facial expression: happy, angry, sad, fear, surprised, disgusted) analysis of variance performed on mean confidence ratings for recognition accuracy (hits for person identity) to explore the influence of encoding condition and emotional expression on participants' confidence in their ability to recognize the actors revealed a main effect of emotional expression, which was qualified by a significant interaction of emotional expression and encoding condition.. Whether participants initially saw actors displaying an emotional or a neutral expression, in combination with whether the actors were happy, angry, sad, fearful, surprised or disgusted, altered confidence in their judgments, $F(5, 116) = 4.4$, $p < .001$ (See Figure 5). Participants' increased recognition accuracy for actors initially seen displaying surprised or happy expressions, rather than disgusted expressions, was not accompanied by increased confidence in these same judgments. Pairwise comparisons using Bonferroni adjustments revealed that participants in the emotional expressions at encoding condition were significantly more confident in their recognition judgments for actors seen with happy expressions at inspection than for actors seen with sad expressions (p = .04). Participants were also marginally more confident in their recognition judgments for actors seen with surprised expressions at inspection than for actors seen with sad expressions (p = .10, marginal significance). Likewise, participants increased recognition accuracy for actors displaying a surprised or angry expression rather than a happy or sad expression at test was only partially accompanied by increased confidence in those judgments. Participants in the neutral expressions at encoding condition were significantly more confident in their recognition judgments for actors

seen with angry expressions at test than for actors seen with disgusted (p = .02), happy (p = .01), or surprised expressions (p = .02) at test.

Decision time. A 2 (encoding condition: emotion expressions at inspection, neutral expressions at inspection) × 6 (facial expression: happy, angry, sad, fear, surprised, disgusted) analysis of variance was performed on mean reaction times for recognition accuracy (hits for person identity) to explore the influence of encoding condition and emotional expression on participants' decision time for person identity recognition judgments. The time it took participants to make their judgment was not effected by encoding condition or emotional expression (all p_s > .05).

Perceived emotion. In order to explore participants' judgments of perceived emotion displayed in the actors' expressions, the frequencies of emotion judgment ratings for each expression was examined (see Table 3). Participants demonstrated high agreement in their perception of expressions of happiness; over 90% of emotion ratings for happy expressions indicated either a moderate or strong positive emotion. Likewise, at least 70% of participants' emotion ratings for expressions of anger and disgust indicated a moderate or strong negative emotion. The frequency of emotion ratings for neutral and surprised expressions, however, were more ambiguous. While approximately 40% of participants' ratings of surprised expressions indicated neutral emotion, 21% of participant ratings indicated that surprised expressions were mildly positive and 21% indicated that surprised expressions were mildly negative. Furthermore, only 27% of participants' ratings of neutral expression indicated neutral emotion. Participants perceived neutral expressions as being more negative than positive or neutral; 46% of ratings indicated that participants perceived neutral expression as being negative while 28% of ratings indicated that participants perceived neutral expression as being positive.

Finally, a one-way analysis of variance was employed to test for differences in participants' mean emotion ratings of the actors' expressions. Perceived emotion of the actors' expressions differed significantly across emotional expressions, $F(6, 4354) = 456.9$, $p < .001$ (see Figure 6). Pairwise comparisons using Bonferroni adjustments revealed that participants rated actors' disgusted and angry expressions as being strongly negative and not significantly different from one another ($p = .93$). Emotional expressions of sadness and fear, however, were rated as mildly negative. Neutral and surprised expressions were rated more emotionally neutral rather than positive or negative. Finally, happy expressions were rated as being strongly positive. Ratings for all emotional expressions were significantly different from one another (all ps $> .05$) with the exception of anger and disgust.

Exposure time to emotional expressions. A second purpose of including a second judgment during the face-perception task was to double the exposure time to faces. While participants in Experiment 1 only saw each actor in the face-perception task for 5 s, participants in Experiment 2 saw each actor twice, for a total of 10 s. It was predicted that this longer exposure time would overall increase recognition accuracy (see Tables 1 and 2). Results from Experiment 2 seem to suggest that the longer exposure time increased recognition accuracy, especially for participants who viewed actors initially displaying emotional expressions. In Experiment 1, participants' recognition accuracy rates were 5% higher than their chance values for actors displaying neutral expressions who were previously seen displaying happy expressions or an angry expression. In Experiment 2, participants' recognition accuracy rates increased to 10% higher than their chance values for actors displaying neutral expressions who were previously seen displaying happy expressions. Likewise, participants' recognition accuracy rates increased from 5% (Experiment 1) to 9% higher than their chance values for actors displaying

neutral expressions who were previously seen displaying angry expressions. Recognition accuracy rates for participants who initially viewed actors displaying neutral expressions increased from 4% (Experiment 1) to 5% (Experiment 2) above chance for actors later seen with a happy expression. Likewise, recognition accuracy rates increased from 8% (Experiment 1) to 10% (Experiment 2) above chance for actors later seen with an angry expression.

The results from the present study illustrate the differential effect emotional expressions have on recognition accuracy for person identity. While it seems as though surprised expressions boost recognition accuracy regardless of encoding condition, happy expressions boost recognition rates when seen at encoding whereas angry expressions do the same when seen at recognition. Contrary to predictions, happy expressions did not demonstrate the highest recognition rate. However, participants recognized significantly more actors displaying neutral expressions that were previously seen displaying happy expressions rather than disgusted expressions, which not only replicates the recognition memory advantage for faces previously seen with a positive rather than a negative expression (i.e., D'Argembeau et al., 2003a; D'Argembeau et al., 2003b; D'Argembeau & Van der Linden, 2004; D'Argembeau & Van der Linden, 2007) but also replicates studies in our laboratory (VonWaldner & Mendolia, 2010). Also of significance, the results of Experiment 2 replicate the findings of Experiment 1, suggesting that there is something special about angry expressions that makes the actors displaying an angry expressions more easily recognized than actors displaying happy or sad expressions.

GENERAL DISCUSSION

The overall purpose of the present studies was to explore the role of emotion in person identity recognition—specifically, whether a person's emotional expression affects the accuracy with which the person's identity may be remembered. Furthermore, both studies were designed to explore whether emotional expression information enhances person identity recognition when such information is presented at inspection (i.e., the expression may help us to process or learn the face in a special way), or whether emotional expression information enhances person identity recognition when such information is presented at test (i.e., the new expression information may help us to retrieve the memory trace).

In Experiment 1, participants viewed actors displaying either happy or angry expressions at inspection and were then tested with actors displaying neutral expressions, or participants viewed actors displaying neutral expressions at inspection and were then tested with actors displaying happy and angry expressions. Results from Experiment 1, contrary to predictions, suggest that emotional expressions influence memory for a person's identity when the expression information is available at the time of recognition but not when emotional expression information is available during inspection. In other words, when emotional expressions were present during the recognition test, participants' accuracy rates were higher for actors displaying angry expression as compared to actors displaying happy expressions. When emotional expression information was available at inspection, however, this added piece of information encoded for each actor did not seem to influence participants' memory for those actors.

In Experiment 2, participants not only viewed happy and angry expressions, but also fearful, sad, surprised and disgusted expressions, again, either at inspection or at test. Experiment 2 was designed to examine whether emotional expression with different decoding strategies influences recognition accuracy for person identity. Results indicated that surprised expressions improved recognition accuracy regardless of whether emotional expression information was present at inspection or at test. Although the results from Experiment 1 did not support the predicted hypothesis that participants would recognize more actors displaying a neutral expressions who previously displayed a happy expression rather than an angry expressions, Experiment 2 did partially support this hypothesis. Participants recognized significantly more actors displaying neutral expressions who previously displayed a happy expression rather than a disgusted expression. Not only does this finding replicate previous studies in our laboratory (VonWaldner & Mendolia, 2010), but this also replicates the recognition memory advantage for faces previously seen with a positive rather than a negative expression (i.e., D'Argembeau et al., 2003a; D'Argembeau et al., 2003b; D'Argembeau & Van der Linden, 2004; D'Argembeau & Van der Linden, 2007). Replicating the findings of Experiment 1, participants in Experiment 2 recognized significantly more actors displaying angry rather than happy or sad expressions who they had previously seen displaying a neutral expression.

Decoding strategies associated with emotional expressions. The present studies suggest that there is something special about expressions of happiness, anger, and surprise in their influence of person identity recognition. When considering the decoding strategies associated with each expression, there is some overlap in strategies used. Anger, rated by participants as the most negative emotion, and happiness, rated as the most positive emotion, are decoded in a

similar fashion (Wallbott & Ricci-Bitti, 1993) and primarily associated by distinct movement in the mouth area (Katsikitis, 1997). Surprise, on the other hand, rated as being most emotionally neutral, is predominantly associated with distinct movement in the eyebrow area, although expressions of anger are classified by eyebrow movement as well. The raised eyebrows associated with surprised expressions as well as the smile associated with happy expression serve as distinct emotion-consistent features that aid in the decoding and classification of these expressions of emotion (Calder, Young, Keane, & Dean, 2000).

Anger expressions influence person identity recognition. Taken together, the results from the present studies suggest that there is something unique about the emotion of anger such that when we see someone angry we are more likely to remember that person even though we haven't seen him or her express this particular emotion before. From an evolutionary perspective, based on the idea that emotions have an adaptive function for our survival, anger serves a means to destroy a barrier to the satisfaction of a need (Plutchik, 1984). In other words, when we see a person displaying an angry expression, we can infer that an obstacle or an enemy is blocking him or her from obtaining some desired goal or need. Since the predominant behavior associated with the emotion of anger involves the destruction of this barrier to goal attainment, it would benefit the observer to pay special attention to the person displaying an angry expression, especially if the expression of that emotion is directed at that observer. Because facial expressions of anger provide a warning that aversive consequences are likely, a bias in orienting attention to salient facial gestures that convey anger has been observed (i.e., Hansen & Hansen, 1988; Vuilleumier et al., 2001). Research has also demonstrated that emotional stimuli such as facial expressions of emotion alter the emotional affect of the observer (i.e., Lang, Bradley & Cuthbert, 1992; Bradley & Lang, 2007). In the present investigation then it seems likely that

participants would feel threatened by and thus pay more attention to actors who displayed angry expressions, which would then increase recognition accuracy ratings for these same actors as well.

Based on the threatening nature of the angry faces used in both Experiments 1 and 2, and the bias in attention paid to angry faces, it seems plausible that participants in Experiments 1 and 2 recognized more actors who were later seen displaying angry expressions due to the extra attention paid to those actors during the recognition test. Although participants in the emotional expressions at encoding condition also saw the threatening angry faces during inspection, this threat becomes irrelevant because actors who previously displayed an angry expression are now viewed in an emotionally neutral way. In other words, the social situation surrounding those particular actors has changed from being threatening to non-threatening, and thus not requiring any addition attention.

Surprise expressions influence person identity recognition. The results from Experiment 2 suggest that there is something special about surprised expressions that regardless of when participants receive expression information (at inspection or at test) surprised expressions aid in the recognition of the actor associated with that expression. From an evolutionary perspective, the emotion of surprise serves the general function of an interrupter mechanism (Tomkins, 1984). Surprise interrupts our current behavior or state of mind and reorients our attention to a new, possibly significant event (Plutchik, 1984). In other words, surprise can be considered an emotionally neutral precursor to all other emotions. After being interrupted by a novel situation, we will respond with happiness, fear, anger, disgust, or sadness depending on our appraisal of the interrupting stimulus (Tomkins, 1984).

The emotion of surprise is different from other basic emotions not only in emotional valence but also in the associated antecedent behavior as well. Anger, fear, sadness and disgust all have a negative valence while the emotion of happiness has a positive valence. Surprise, on the other hand, has neither a positive or negative valence. It is, instead, affectively neutral (Tomkins, 1984). Also different from the other basic emotions, the antecedent for the emotion of surprise is unknown (Plutchik, 1984). In other words, a person can experience surprise in response to a wide variety of situations. Other basic emotions included in Experiment 2 have stable antecedent events that reliably elicit each specific emotion. For example, as discussed above, we can infer that a person displaying an angry expression has had some sort of obstacle block him or her from obtaining a desired goal or need (Plutchik, 1984). Likewise, we also know that a person displaying a sad expression has experienced a significant loss of someone or something of value. Surprise, on the other hand, is an emotional response to some unexpected stimulus or situation. The situation can be positive, negative or even neutral. In the present investigation then, it seems likely that because of these obvious differences between emotional expressions of surprise and the other basic emotions included, participants may have directed more attention to actors displaying surprised expressions.

Because of these differences between surprise and the other basic emotions included in Experiment 2, it is not surprising that participants in both encoding conditions treated the actors displaying surprised expressions differently than actors displaying any of the other emotions. Participants who viewed actors displaying emotional expressions during the face-perception task may have paid more attention to the actors displaying surprised expressions, and therefore encoded these faces in a special way that allowed them to recognize these actors more readily than actors who were previously displaying other emotions. For example, because the emotion

of surprise is affectively neutral and the antecedent is unknown, participants may have to pay more attention to or think harder about actors displaying expressions of surprise when making personality trait judgments or emotion ratings. Likewise, if participants were paying more attention to or thinking harder about actors displaying surprised expressions, then it would necessarily follow that participants who viewed actors displaying neutral expression at inspection would recognize more actors who were displaying surprised expressions at test.

Evidence against independent processing of identity and expression information. Although classical models of face recognition have posited separate functional routes for the processing of facial identity and the processing of facial expression (e.g., Bruce & Young, 1986), results from the present studies suggest that information about a person's identity and the emotional expression he or she displays are not processed completely independently of one another. For example, because person identity recognition was significantly higher for actors displaying one emotion rather than another, it necessarily follows that the successful processing of information about a person's identity depends, to an extent, on the emotion that person is displaying. Also, because certain emotions influenced person recognition when seen during encoding while others influenced person recognition when seen during recognition, the present findings thus suggest that the processing of facial identity and facial expression interact at different stages of the information processing sequence.

Limitations and future directions. In order to have a more complete picture of the nature of the relationship between emotional expressions and memory for a person's identity, limitations from the present studies should be addressed. Taken together, Experiments 1 and 2 suggest that emotional expressions differentially influence our memory for a person's identity. In order to better understand the influence of emotional expression on person identity

recognition, the present research design can be extended to include conditions in which participants see different emotional expressions during inspection and test. Specifically, from the present studies we know that participants who see actors displaying happy expressions, for example, will be more likely to recognize those actors when later seen displaying a neutral expression. Likewise, we can be confident that participants who see actors displaying neutral expressions will be more likely to recognize those actors when later seen displaying an angry expression. Therefore, what we want to understand is the influence of emotion on person identity recognition when one emotional expression is seen at inspection and another emotional expression is seen at test. If the decoding strategies associated with specific emotional expressions have unique influences on person identity recognition when expression information is available both at inspection and at test, then it is necessary to further explore the nature of the relationship between emotion and person identity recognition by using a design that incorporates emotional expressions at both inspection and test. Future directions for this current program of research should include a study in which participants are exposed to actors displaying various emotional expressions at inspection and are tested with the same actors displaying different emotions.

Once a complete picture of the influence emotional expression information has on our memory for others is realized, then analog models for witness identification procedures could potentially be developed. If we learn, for example, that participant who are exposed to angry faces recognize those same individuals best when seen at a later date displaying a happy expression, then perhaps witness identification procedures that include standard mug shots should include instead, a series of photos of the suspect displaying a variety of expressions. In other words, the basic research described here may potentially have the necessary implications to

move emotion, as in relates to expressions displayed by perpetrators, from an estimator variable to a system variable under the control of the criminal justice system. Since the current studies suggest that having this added piece of information at the time of recognition boosts recognition rates for certain emotions, it seems likely to follow that eye witnesses who are provided with this extra bit of facial information for the suspects in question would also recognize the individual who committed the crime with greater accuracy

In sum, the current studies presented here highlight the complex relationship between emotional expressions and memory for a person's identity. Results indicate that emotional expression information differentially influences our memory for others, with some expressions exerting their greatest influence when such information is available at inspection, while others are more influential when expression information is available during test. The results of the present studies are significant in both their contributions made to the understanding of this complex relationship as well as the manner in which they highlight the next step necessary for learning the final piece to this complex puzzle of emotional expressions and memory for others.

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Table 1

Unbiased Hit Rates and Chance Values for Person Identity Recognition as a Function of Encoding Condition and Facial Expression (Experiment 1)

	Expression at Encoding (Recognition)	
Emotional Expression	Emotional (Neutral)	Neutral (Emotional)
Happy	.33 (.28)	.33 (.29)
Angry	.32 (.27)	.41 (.33)
N	119	108

Note. Values in parentheses indicate chance levels calculated using Wagner's (1993) method.

Table 2

Unbiased Hit Rates and Chance Values for Person Identity Recognition as a Function of Encoding Condition and Facial Expression (Experiment 2)

	Expression at Encoding (Recognition)	
Emotional Expression	Emotional (Neutral)	Neutral (Emotional)
Afraid	.38 (.30)	.49 (.41)
Angry	.40 (.31)	.47 (.37)
Disgusted	.31 (.27)	.44 (.35)
Happy	.42 (.32)	.38 (.33)
Sad	.37 (.30)	.46 (.42)
Surprised	.46 (.34)	.55 (.39)
N	93	81

Note. Values in parentheses indicate chance levels calculated using Wagner's (1993) method.

Table 3

Frequency Distribution of Emotion Ratings as a Function of Emotional Expression

	Emotion Rating (%)						
	Negative			Neutral			Positive
Emotional Expression	0	1	2	3	4	5	6
Afraid	12.1	24.1	33.2	22.6	6.5	.3	1.2
Angry	40.9	28.5	16.3	9.5	3.0	.6	1.2
Disgusted	47.1	27.8	16.7	6.4	1.2	.3	.6
Happy	.3	0	0	.9	7.1	30.5	61.3
Sad	24.6	29.7	30.5	12.9	1.4	.3	.6
Surprised	5.4	4.5	21.1	40.2	21.1	4.8	2.7
Neutral	12.8	12.9	19.9	26.6	15.4	8.3	4.1

Figure 1. Recognition accuracy for person identity as a function of encoding condition and emotional expression. Difference scores were calculated by subtracting chance values from unbiased hit rates.

Figure 2. Mean reaction time for recognition accuracy (hits for person identity) as a function of encoding condition and emotional expression.

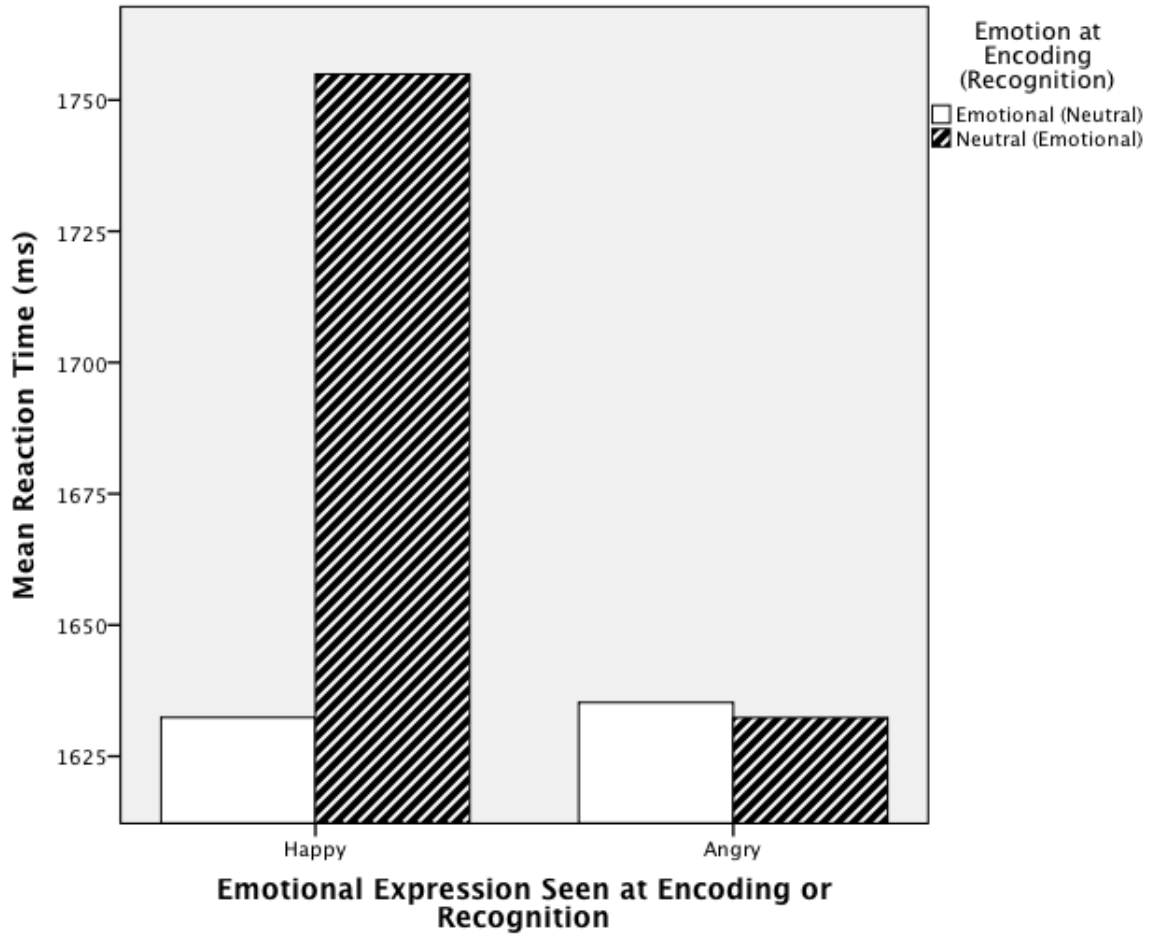


Figure 3. Mean confidence rating for recognition accuracy (hits for person identity) as a function of encoding condition and emotional expression. Higher scores indicate greater confidence.

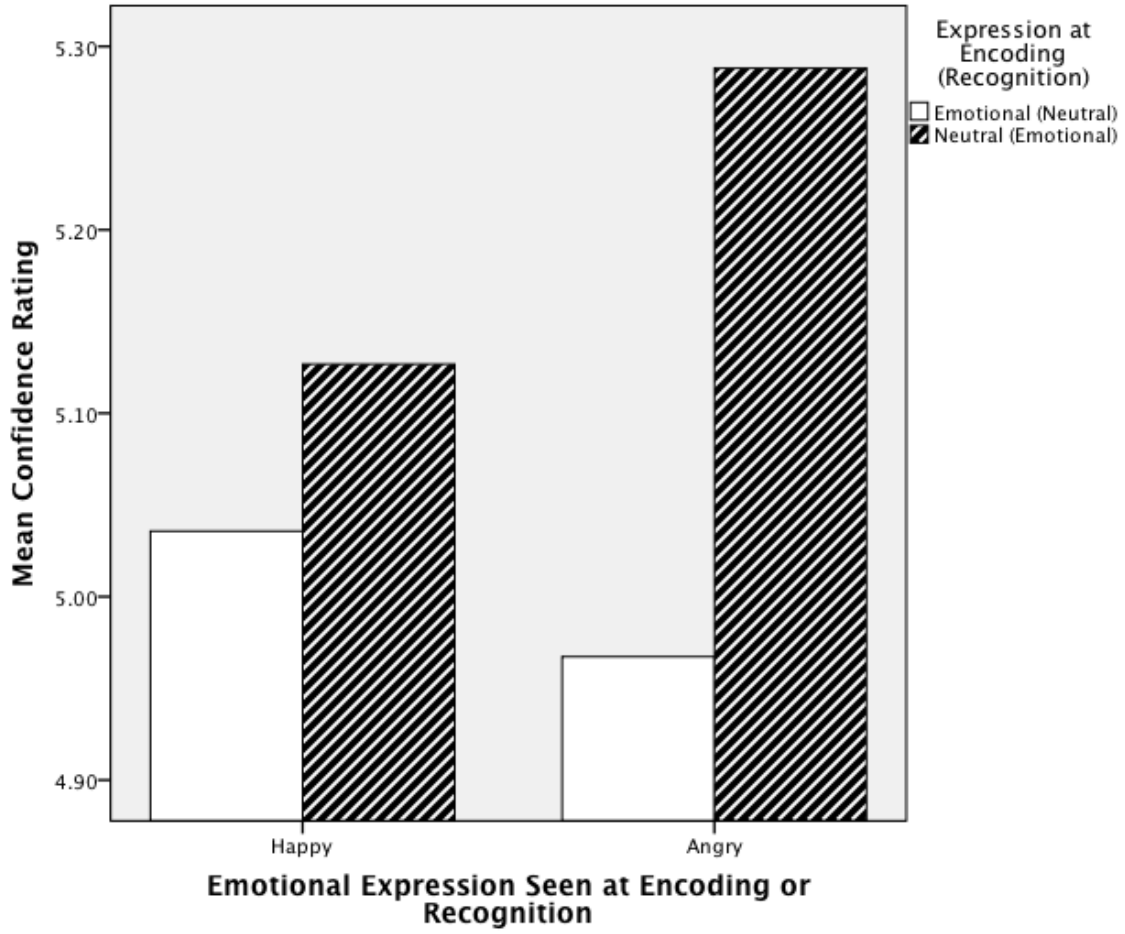


Figure 4. Recognition accuracy for person identity as a function of encoding condition and emotional expression. Difference scores were calculated by subtracting chance values from unbiased hit rates.

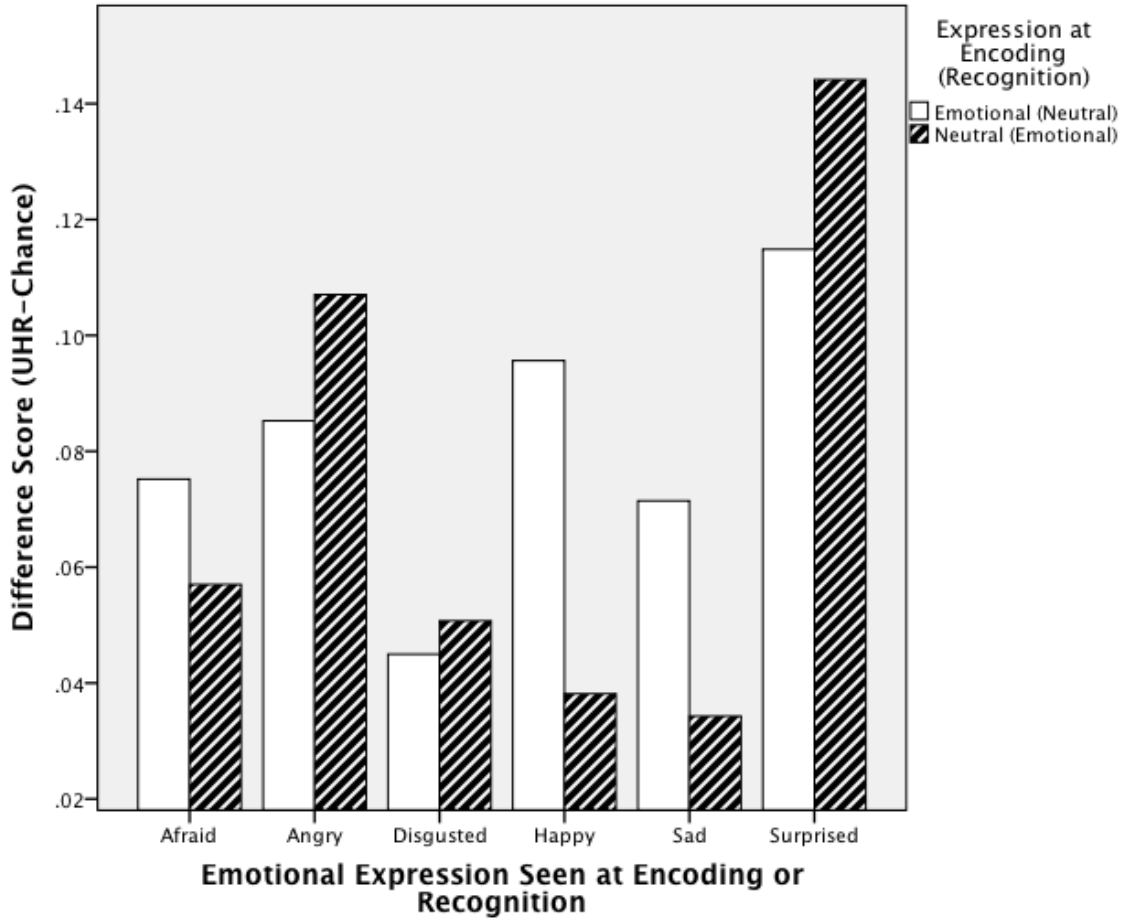


Figure 5. Mean confidence rating for recognition accuracy (hits for person identity) as a function of encoding condition and emotional expression. Higher scores indicate greater confidence.

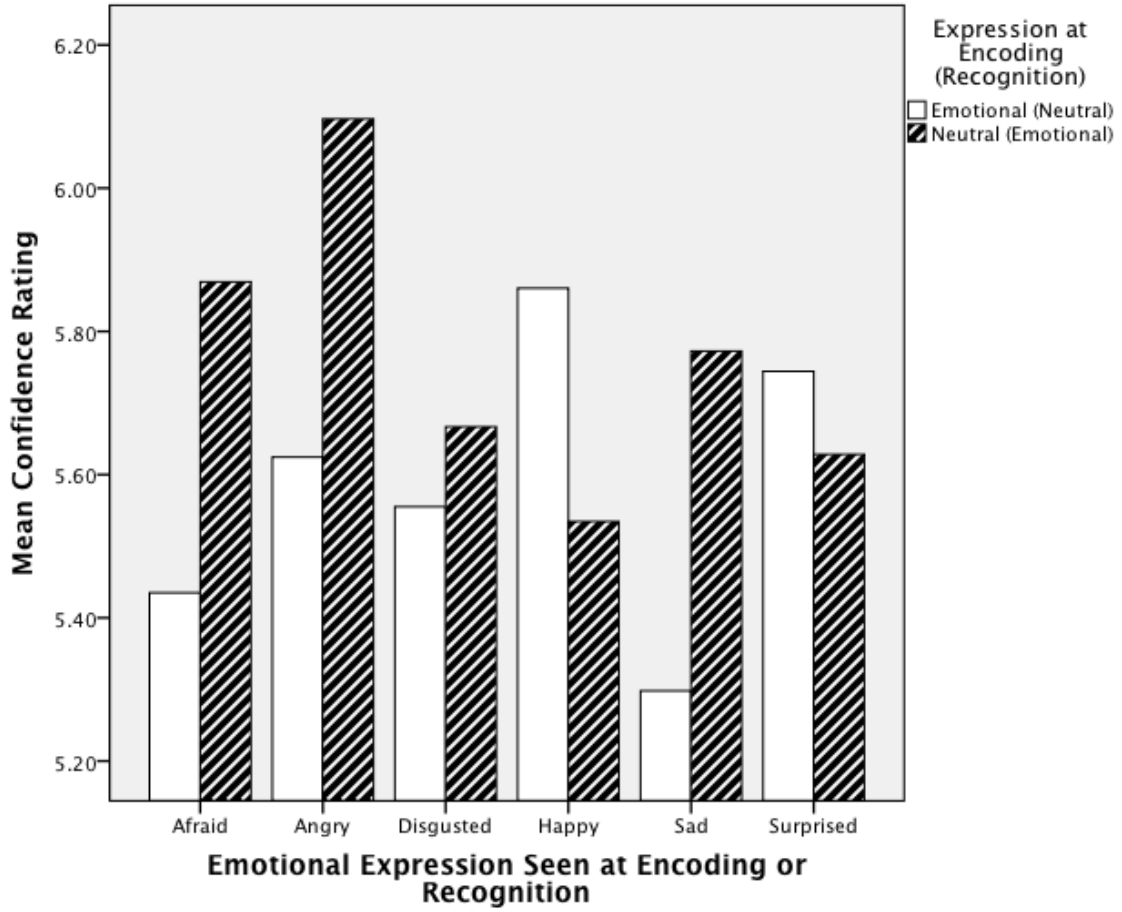
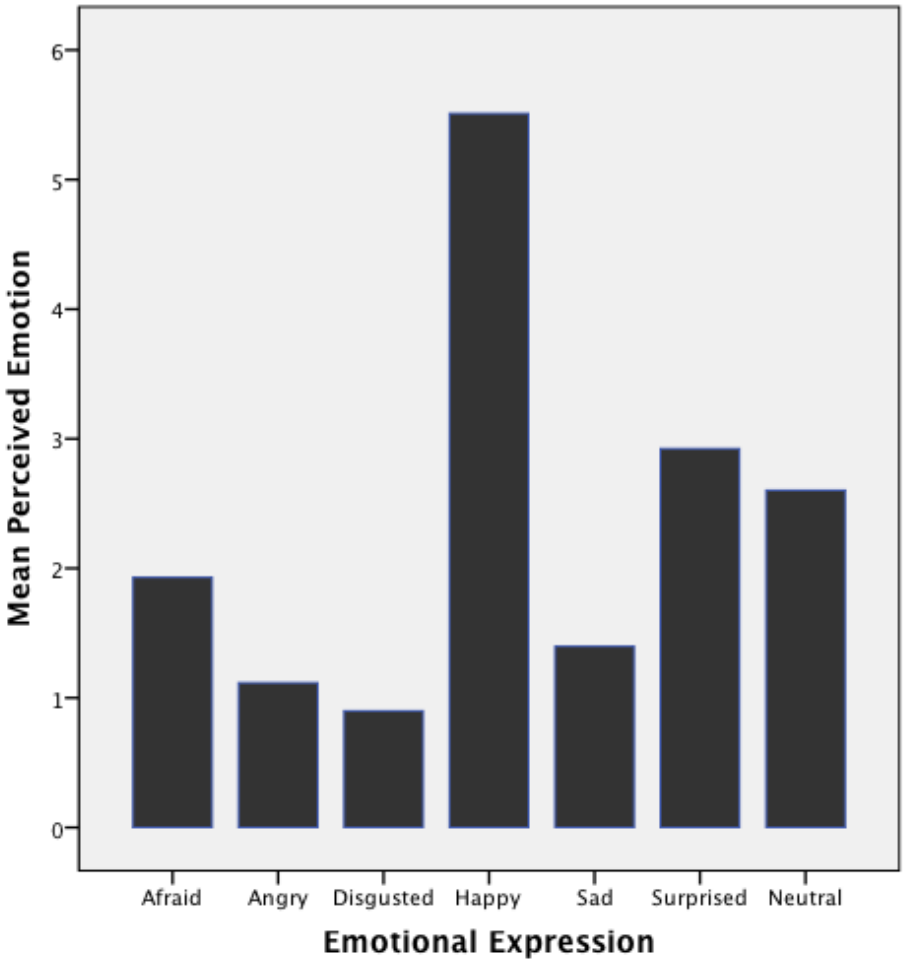


Figure 6. Mean perceived emotion as a function of emotional expression displayed by actors. Emotional expressions were rated on a 7-point scale with anchors of 0 (*negative*) and 6 (*positive*).



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M. A. Experimental Social Psychology, The University of Mississippi (2009)
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Thesis: The Influence of Emotional Awareness on the Effects of Mood on Judgment

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Classroom Leader

As classroom leader for the course listed below, I presented lectures, facilitated classroom activities, reviewed papers, graded quizzes, and met with students individually to clarify class material.

Introduction to Psychological Research,
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Research and Publications

Publications

Kitchens, M. B., Corser, G. C., Gohm, C. L., VonWaldner, K. L., & Foreman, E. L. (2010). Predicted and experienced affective responses to the outcome of the 2008 Presidential election. *Psychological Reports, 107*, 837–846.

McCutcheon, L.E., Aruguete, M., Scott, V. B., Jr., & VonWaldner, K. L. (2004). Preference for solitude and attitude toward one's favorite celebrity. *North American Journal of Psychology, 6,* 499–506.

Manuscripts in Preparation

Paris, K. V. Burns, A. M. & Mendolia, M. The effect of cues peripheral to the face on memory for person identity and emotional expression.

Mendolia, M. & Paris, K. V. The role of encoder and decoder emotion on person identity and emotional expression recognition.

Corser, G. C., Kitchens, M. B., Paris, K. V., Foreman, E. L., & Gohm, C. L. A method for removing inattentive participants from a data set.

Conference Presentations

National

VonWaldner, K. L., Phillips, M. E., & Mendolia, M. (2011, January). *Cues peripheral to the face differentially alter memory for person identity and facial expression.* Poster presented at the annual meeting of the Society for Personality and Social Psychology, San Antonio, TX.

Foreman, E. L., VonWaldner, K. L., & Gohm, C. L. (2011, January). *Trait emotional clarity influences the effect of mood on judgments.* Poster presented at the annual meeting of the Society for Personality and Social Psychology, San Antonio, TX.

VonWaldner, K. L., & Mendolia, M. (2010, January). *Happy expression improves memory for facial identity, whereas disgust expression improves memory for facial expression.* Poster presented at the annual meeting of the Society for Personality and Social Psychology, Las Vegas, NV.

Foreman, E. L., VonWaldner, K. L., & Gohm, C. L. (2010, January). *Trait attention to emotion influences the effect of mood on decision making*. Poster presented at the annual meeting of the Society for Personality and Social Psychology, Las Vegas, NV.

Kitchens, M. B., VonWaldner, K. L. & Gohm, C. L. (2009, February). *Dispositional emotional clarity influences when affect is used as information.* Poster presented at the annual meeting of the Society for Personality and Social Psychology, Tampa, FL.

VonWaldner, K. L., Corser, G. C., Kitchens, M. B., & Gohm, C. L. (2007, May). *In-group/out-group influence on perceptions of negative and positive events*. Poster presented at the annual meeting of the Association for Psychological Science, Washington, D.C.

VonWaldner, K. L. & Scott, V. B., Jr. (2006, May). *Effects of self-awareness and self-consciousness on stereotyped behavior*. Poster presented at the annual meeting of the Association for Psychological Science, New York, NY.

Scott, V. B., Jr., VonWaldner, K. L., & Craven, B. (2005, May). *Validation of the Pediatric Attention Disorder Diagnostic Screener*. Poster presented at the annual meeting of the Association for Psychological Science, Los Angeles, CA.

VonWaldner, K. L. & Scott, V. B., Jr. (2005, May*). Rumination, self-esteem, and contingencies of self-worth as predictors of academic success.* Poster presented at the annual meeting of the Association for Psychological Science, Los Angeles, CA.

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Scott, V. B., Jr., Cardell, A. M., & VonWaldner, K. L. (2004, May). *Cross-validation of the Anti-Muslim Prejudice Scale*. Poster presented at the annual meeting of the Association for Psychological Science, Chicago, IL.

Regional

VonWaldner, K. L., Desselles, S. M., Kitchens, M. B., Corser, G. C., Gohm, C. L. (2007, October). *Trait emotional intensity predicts better performance at identifying positive features of the environment but worse performance on negative features*. Poster presented at the annual meeting of the Society of Southeastern Social Psychologists, Durham, NC.

Scott, V. B., Jr., VonWaldner, K. L., & McCutcheon, L. E., (2005, April). *Relationship between attitudes toward one's favorite celebrity and intelligence.* Poster presented at the annual meeting of the Southeastern Psychological Association, Nashville, TN.

VonWaldner, K. L., & Scott, V. B., Jr., (2005, April). *Contingencies of self-worth and academic success.* Poster presented at the annual meeting of the Southeastern Psychological Association, Nashville, TN.

VonWaldner, K. L., & Scott, V. B., Jr., (2005, April). *Contingencies of self-worth and academic success.* Paper presented at the annual Carolinas Psychology Conference, Raleigh, NC

Cardell, A. M., VonWaldner, K. L., & Scott, V. B., Jr. (2004, April). *Can attitudes be classically conditioned?* Paper presented at the annual Carolinas Psychology Conference, Raleigh, NC.

VonWaldner, K. L., Cardell, A. M., & Scott, V. B., Jr. (2004, April). *Validation of the Anti-Muslim prejudice scale.* Paper presented at the annual Carolinas Psychology Conference, Raleigh, NC.

Professional and Honor Organizational Membership

Society for Personality and Social Psychologists, 2006–present

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Honors, Awards, and Recognition

Treasurer, Psi Chi Honor Society, Armstrong Atlantic State University, 2004-2005

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