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When Familiarity Breeds Accuracy: Cultural Exposure and Facial Emotion Recognition

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Two studies provide evidence for the role of cultural familiarity in recognizing facial expressions of emotion. For Chinese located in China and the United States, Chinese Americans, and non-Asian Americans, accuracy and speed in judging Chinese and American emotions was greater with greater participant exposure to the group posing the expressions. Likewise, Tibetans residing in China and Africans residing in the United States were faster and more accurate when judging emotions expressed by host versus nonhost society members. These effects extended across generations of Chinese Americans, seemingly independent of ethnic or biological ties. Results suggest that the universal affect system governing emotional expression may be characterized by subtle differences in style across cultures, which become more familiar with greater cultural contact.

> The individual who moves from one class to another or from one society to another is faced with the challenge of learning new "dialects" of facial language to supplement his knowledge of the more universal grammar of emotion. (Tomkins & McCarter, 1964, p. 127)

To what extent is the recognition of emotion universal versus variable by culture? Researchers in psychology have spent decades in pursuit of this question. Extreme positions taken by early theorists have gradually given way to recent interactionist perspectives integrating evidence for both universality and cultural specificity (e.g., Ekman, 1972; Fiske, Kitayama, Markus, & Nisbett, 1998; Markus & Kitayama, 1991; Mesquita & Frijda, 1992; Mesquita, Frijda, & Scherer, 1997; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979; Scherer, 1997). This article seeks to contribute to this literature by showing that cultural familiarity is associated with greater accuracy in emotion recognition, such that individuals can more effectively understand universal emotions expressed by members of a cultural group to which they have greater exposure.

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Cultural Differences in Emotion Recognition

Most of the early classic studies of cross-cultural emotion recognition (e.g., Ekman, 1972; Izard, 1971) did not examine cultural differences "because the researchers were interested at that time in exploring agreement, not disagreement" (Matsumoto & Assar, 1992, p. 86). Despite providing strong evidence for universality, in that participants across cultures viewing posed expressions recognized the intended category at accuracy rates greater than that expected by chance, the same classic studies also suggested systematic cultural differences. Samples outside the United States rarely achieved accuracy as high as American samples when viewing the American stimuli. For example, in Izard's (1971) large-scale study, American and European groups correctly identified 75%–83% of the facial photographs, whereas Japanese correctly identified 65% and Africans correctly identified only 50%. Thus, it seems that emotions are recognizable at above-chance levels across cultures, but at the same time there is also cultural variation in emotion recognition accuracy.

Recent speculation about the cause of cultural variation in emotion recognition accuracy has focused on in-group familiarity, whereby emotion recognition appears to be more accurate when members of the same cultural group that express the emotional stimuli also make the judgments (Elfenbein & Ambady, 2002a, 2002b, 2003). A meta-analysis (Elfenbein & Ambady, 2002b) provided evidence for an in-group advantage that replicated across a range of experimental methods and nonverbal channels of communication, as well as across each of the positive and negative basic emotions. Further, this in-group advantage replicated when examining only balanced studies, in which members of every cultural group in the study judged emotions expressed by members of every other group. These balanced studies control for possible differences in the main effects of emotional expression and recognition ability across cultures while examining the impact of cultural match versus mismatch on communication accuracy in the form of an interaction effect.

Interestingly, the in-group advantage effect shares many common features with the same-race effect extensively documented in

research on facial recognition (e.g., Anthony, Cooper, & Mullen, 1992), showing that individuals can more accurately recognize whether they have previously seen a face with members of their own ethnic group. The effect, also referred to as "cross-race," appears to originate in differences in the diagnostic cues that members of different groups use to store information about faces (Ellis, Deregowski, & Shepherd, 1975; Sporer, 2001a, 2001b). Individuals generally pay attention to the cues that are particularly diagnostic for members of their own ethnic group. However, these same cues may not assist as clearly in distinguishing among faces of out-group members. A similar origin might be postulated for the in-group advantage in emotion recognition.

Explaining the In-Group Advantage

Several different explanations have been suggested for the in-group advantage. Lack of familiarity with experimental procedures as well as translation difficulties (Mesquita & Frijda, 1992) can each contribute to higher performance from members of cultures in which the experimental procedures and stimuli originated. However, these factors could not be solely responsible for the findings of in-group advantage. Notably, the in-group advantage replicates consistently across balanced studies in which absolute differences across participants, such as familiarity with procedures, are main effects controlled before the calculation of the in-group advantage as an interaction effect. The in-group advantage also replicates across cultural groups sharing a native language (Elfenbein & Ambady, 2002b). However, the frequent overlap between language and cultural group membership presents a confound making it difficult to separate the two variables in many cross-cultural studies.

Some of the first researchers to notice the effect considered it to be *ethnic bias* (Kilbride & Yarczower, 1983; Markham & Wang, 1996), with the term *bias* implying that the in-group advantage resulted from lesser motivation to understand emotions expressed by members of recognizably different cultures. Indeed, researchers have found that emotion recognition rates can differ when judges believe that expressors are members of their own versus a different cultural group (Hess, Senecal, & Kirouac, 1996). Bias or differences in motivation when judging out-group members can contribute to in-group advantage, but cannot account for its presence in certain settings. For example, some studies had stimuli so minimal that it is implausible for participants to determine the cultural group membership of the emotional expressors in the absence of cultural differences in the expressions themselves—for example, in filtered vocal tones and in facial photographs among multiple Caucasian groups (Elfenbein & Ambady, 2002b). Recent evidence also shows that the in-group advantage is stronger when judging composite photographs using the more intense left rather than the right facial hemisphere (Elfenbein, Mandal, Ambady, Harizuka, & Kumar, in press), which demonstrates that bias alone does not cause the in-group advantage because presumably judges use the same degree of bias when judging each half of the same facial expression.

For cultural differences to emerge in the above studies, the markers of group membership were likely contained within the style of emotional expression itself. Thus, the most parsimonious explanation of the in-group advantage might lie in subtle differences in expressive behavior across cultural groups, such that individuals can more accurately recognize emotions expressed in a style matching their own. This explanation emphasizes the *incremental* effect of cultural learning. Universal affect programs can largely determine emotional expression (Ekman, 1972; Tomkins & McCarter, 1964), whereas stylistic differences across cultures create small adjustments to these core programs. Along these lines, Rosenthal et al. (1979) argued that several nonverbal behaviors are likely descended from a common "nonverbal 'language,'" but that some of the specifics of this language vary across disparate cultural groups (p. 224). Thus, this view does not argue against universality in emotional communication. Rather, it argues only against extreme interpretations. Further, an explanation of the in-group advantage focusing on cultural style does not preclude display rules (Ekman, 1972) or decoding rules (Buck, 1984; Matsumoto, 1989; Schimmack, 1996) from existing alongside cultural differences in expressive style.

Cultural Familiarity

The goal of this article is to examine evidence for the effect of cultural familiarity on greater accuracy and efficiency in emotion recognition. Previous research on cross-cultural emotion recognition is suggestive of this effect. Ekman and colleagues tested the Fore tribe from New Guinea with a series of American facial expressions of emotion. Analyses separating participants into three groups on the basis of their level of contact with Westerners revealed a strong association between cross-cultural contact and higher emotion recognition performance (Sorensen, 1975). Using Ekman and Friesen's (1976) American facial photos, Ducci, Arcuri, W/Georgis, and Sineshaw (1982) tested both urban Ethiopians with exposure to Western culture as well as rural Ethiopians with limited exposure. They also found greater emotion recognition performance for their participants with greater Western exposure. In these two studies, greater exposure may be confounded with other factors such as a higher degree of formal education or socioeconomic status, which are themselves factors that can relate to emotion recognition performance (Hall, Halberstadt, & O'Brien, 1997; Izard, 1971; Kirouac & Doré, 1985). Both studies also tested only contact by non-Western groups becoming familiar with Western groups, and not vice versa. Furthermore, these studies tested participants only with emotional expressions that originated in a foreign culture, without controlling for individual differences in ability by testing participants with emotional expressions originating in their own culture. This prevents analyses that would distinguish whether their higher performance was specific to emotional expressions from the group with which they had contact, versus higher performance regardless of the stimuli's cultural origin. This suggests the need to conduct additional research with a design that is balanced to control for participants' accuracy in judging members of their own cultural group. Thus, it is difficult to interpret past findings unambiguously in terms of cultural familiarity.

Elfenbein and Ambady's (2002b) meta-analysis provides some additional evidence for the impact of cultural familiarity, in that the in-group advantage in emotion recognition was smaller for samples that had greater cross-cultural exposure to each other. First, the in-group advantage was larger for cultural groups living across national borders than it was for cultural groups living together within the same nation, who presumably have more contact with each other. The in-group advantage was also smaller

for groups with greater physical proximity or greater average telephone communication.

Research on the same-race effect in facial recognition—that is, whether a participant has previously seen a particular face—echoes these findings suggesting evidence for cultural learning. The same-race effect, an in-group advantage in recognizing faces from one's own cultural group, was stronger cross-nationally than cross-ethnically (Sporer, 2001a, 2001b). Further, greater contact, as measured by statistics on ethnic integration at the neighborhood level, was associated with a smaller same-race effect, although there was no such difference using self-reported contact measures (Sporer, 2001a, 2001b). These findings suggest that cultural exposure can help individuals to overcome the tendency to recognize facial information more effectively from their own group members. This similarity between these findings in facial recognition and those in facial emotion recognition provides further support for the predicted relationship with cultural familiarity.

Thus, the first hypothesis for this study is for the association of cultural familiarity and the accuracy of cross-cultural emotion recognition.

> *Hypothesis 1:* Participants have greater accuracy when judging emotions expressed by cultural groups with which they are more familiar. Thus, the in-group advantage in emotion recognition accuracy varies on the basis of the level of exposure to the out-group culture, with greater accuracy in judging more familiar expressions.

Response Time in Emotion Recognition

In addition to emotion recognition accuracy, the latency of cross-cultural judgments may also provide evidence for the effects of cultural familiarity. Social psychologists have used response latency as a measure of processing efficiency across a range of social and cognitive judgments (Fazio, 1990; Fazio, Jackson, Dunton, & Williams, 1995; Smith & Lerner, 1986). Response times are generally faster for social judgments that are more practiced and familiar (Fazio et al., 1995; Smith & Lerner, 1986).

For emotion recognition judgments in particular, greater certainty, efficiency, and effectiveness appear to predict shorter decision processing time. Researchers have demonstrated that response times are faster for facial expressions that are more clear, unambiguous, and easy to judge (Dmitrieva & Gel'man, 2001; Kestenbaum & Nelson, 1992; Kirouac & Doré, 1983; Massaro & Ellison, 1996; Young, Rowland, Calder, & Etcoff, 1997). Emotion recognition responses become faster with age (Dmitrieva & Gel'man, 2001; Kestenbaum & Nelson, 1992). Further, these judgments appear not to suffer from a speed–accuracy tradeoff, as response time is faster for accurate judgments (Kirouac & Doré, 1983; Young et al., 1997) and for the emotional categories that are generally easier to judge (Kestenbaum & Nelson, 1992). There is evidence from other areas of nonverbal behavior that these types of judgments occur relatively automatically, and are thus most effective with relatively fast response time. For instance, Ambady and Gray (2002) found that cognitive load did not impair participants' judgments of "thin slices" of nonverbal behavior. Likewise, in the area of facial recognition, facial processing accuracy decreases under instructions that attempt to exhibit control over the natural process (Sporer, 2001b).

These findings suggest that response latency of emotion recognition could also display an in-group advantage. Emotional expressions posed by members of the in-group culture are likely to be more familiar, and therefore these practiced and less ambiguous judgments should require less processing time than judgments of out-group expressions. However, greater cultural exposure would serve to reduce this in-group advantage in response time, as cultural familiarity provides practice with judging out-group emotional expressions.

Thus, the second hypothesis for this study is for a benefit due to cultural familiarity in the response time of cross-cultural emotion recognition.

> *Hypothesis 2:* Participants show decreased response latencies when judging emotions expressed by cultural groups to whom they have greater exposure. Thus, the in-group advantage in emotion recognition response time varies on the basis of the level of exposure to the out-group culture, with greater speed in judging more familiar expressions.

Deliberate Sampling

Like most research in the cross-cultural communication of emotion, this study does not meet all the requirements for a controlled experiment. Because we cannot assign participants to cultural groups or to meaningful amounts of cultural exposure, for more precision in testing hypotheses it is worthwhile to sample participant groups carefully. Through this deliberate sampling, we can examine emotion recognition performance in terms of participants' relative level of cultural exposure to the societies from which the emotional stimuli originated. The current emotional stimuli draw from American and Chinese posers. Given extensive theory concerning emotional differences between collectivist versus individualist cultures (e.g., Bond & Hwang, 1986; Markus & Kitayama, 1991; Matsumoto, 1989; Russell & Yik, 1996), it is worthwhile to include cultural groups of each type. Both groups also have excellent previously validated photographs of facial expressions (Ekman & Friesen, 1976; Wang & Markham, 1999). However, our primary reason for choosing Chinese and American expressions is that it is possible to find participant groups widely varying in their exposure to the two cultures. There is a long history of immigration from China to the United States, providing the opportunity to explore cultural exposure across generations of Chinese Americans (Dion & Dion, 1996). Some students from China attend university in the United States, and both China and the United States attract students who are members of cultural groups distinct from their host country. Thus, with China and the United States serving as anchors, we were able to sample participants with a wide range of exposure to one group, to the other group, or to both.

Study 1

The first study examines Chinese and American participants with a range of exposure to China and the United States: (a) Chinese students residing in China, (b) Chinese students residing in the United States, (c) Chinese Americans, and (d) Americans of non-Asian ancestry. The first three of these groups are Chinese in ethnicity, but differ greatly in exposure to China versus the United States. The third and fourth of these groups are both American, but

they vary in their exposure to Chinese and American culture. Thus, this study helps to disentangle factors of cross-cultural exposure and ethnicity. The goal of the study is to examine the association between the accuracy and speed of judging emotional expressions and cultural familiarity with the groups posing the expressions.

Method

Emotional Expressions

In this study, we used black-and-white photographs of facial expressions. Separate judgment studies had validated both sets of photographs by demonstrating high recognition rates among members of the culture from which the photographs originated. Both sets of photographs were developed in the country of the posers' origin by researchers from that country. Two male and two female photographs from each cultural group displayed each of the following emotions: anger, disgust, fear, happiness, sadness, and surprise. These are the six emotions identified as "basic" in Ekman and colleagues' classic research, on the grounds that these emotions have unique signal characteristics that are highly recognizable across cultures (e.g., Ekman, 1972, 1992; Ekman & Friesen, 1986).

To match possible practice effects for individual posers, the final set of photographs for each cultural group contained 11 individual posers appearing on an average of 2.2 occasions. In an attempt to match the level of clarity in the emotional expressions of both groups, the particular photographs were selected from the larger sets so that the two resulting sets were approximately equal in terms of the average recognition level achieved by judges in reliability studies conducted in the nation in which the photographs were developed. The normative sample of American judges had an average of 89.5% (SD = 8.2%) correct recognition of the photographs selected, and the normative sample of Chinese judges had an average of 86.9% (SD = 10.1%) correct recognition of the photographs selected, and the difference between these was not significant, $t(46) = 0.99$, *ns*. Thus, the average recognition levels were similar for the two sets of photographs using previous samples. The minimum recognition levels were also similar, with a minimum of 71% for each American photograph and a minimum of 65% for each Chinese photograph. Both sets of stimuli have been used before in research on cross-cultural emotion recognition (e.g., Markham & Wang, 1996).

United States. Ekman and Friesen's (1976) Pictures of Facial Affect collection provided photographs of Caucasian American facial expressions.[1] The authors created this set to portray emotional expressions consistent with their theoretical model for the appearance of prototypical facial expressions of emotion, using the Facial Affect Coding System (FACS; Ekman & Friesen, 1978). Participants moved specific facial muscles rather than attempted to pose specific emotions. As previously described, a normative sample of American judges was used to establish recognition levels, with an average of 89.5% and minimum of 71% for each photograph. In a second validation study, all photographs had higher intensity ratings for the intended emotion than for any other choice.

China. Wang and Markham's (1999) collection provided photographs of Chinese facial expressions.[2] The authors created this set by instructing posers to imagine an emotional situation and to pose an appropriate expression for that emotional state. Posers were all residents of mainland China who had never lived outside of China. Wang and Markham cropped their photographs to match the appearance of Ekman and Friesen's (1976) set. As previously described, a normative sample of Chinese judged each emotional photograph used, with an average accuracy of 86.9% and minimum accuracy of 65%. In a second validation study, Wang and Markham confirmed that all photographs had higher intensity ratings for the intended emotion than for any other choice.

In spite of the difference in instructions given to the two sets of posers to elicit emotional expressions, we used the Pictures of Facial Affect because of their extremely wide popularity in emotion recognition research. Because Ekman and Friesen (1978) developed their model for prototypical expressions within the United States, it can be assumed to be consistent with American norms governing the appearance of appropriate facial expressions. Thus, both of the sets of photographs portray facial expressions on the basis of the norms of the culture in which they originated.

Participants

Participants were sampled from four different groups presumed to vary in their exposure to Chinese and American culture. In order from greater exposure to Chinese versus American culture, the groups are as follows: Chinese students in China, Chinese students in the United States, Chinese Americans, and Americans of non-Asian ancestry. Participants were recruited in public areas on college campuses, and they completed the judgment task individually using laptop computers. Each research assistant had a computer as well as a sign advertising payment for completing a computerized survey. Potential participants who requested more information received the informed consent form or a verbal description of its contents, which contained a general cover story that the study examined how different people understand emotional expressions.

Chinese students in China (N = 32, 21 males and 11 females). All participants in China were students of Chinese ancestry who reported never having lived in the United States or Europe. They resided in a medium-sized city 3 hr south of Shanghai. The experimenter was a research assistant who is a native speaker of Mandarin Chinese who was born and raised in China. Students were recruited in a public area on campus. To confirm students' cultural background, after completing the emotion recognition measures, participants filled out a brief survey asking them to list their gender, region of origin, and whether they had ever visited the United States or Europe.

Chinese and American students in the United States. Participants in the United States were students residing in a large northeastern city. Students were recruited in public areas around the campus, including dining halls, academic building lobbies, and waiting areas for student theater productions. The experimenter was the primary investigator along with two research assistants, in most cases including the same research assistant who served as the experimenter in China. To classify students by cultural background, after completing the emotion recognition measures, students filled out a brief survey asking them to list (a) their gender, (b) their family's country of origin, (c) their country of birth, (d) the country of birth of their mother, father, maternal grandparents, and paternal grandparents, and (e) how much total time they had spent in China, Taiwan, or Hong Kong, and how much total time in the United States.

Chinese students (N = 12, 5 males and 7 females) were those who listed their own birthplace as China, Hong Kong, or Taiwan, and who came to the United States later than age 12. One participant was included in this category who listed his birthplace as Singapore but all grandparents' birthplace as China. Chinese students reported living in the United States an average of 2.4 years (SD = 1.6 years).

Chinese American students (N = 71, 24 males and 47 females) were those who reported that they were born in the United States or came to the United States at no later than age 12. Further, they listed parents or

[1] The American photographs used in this study were a-1-06, em-5-24, em-4-17, gs-2-1, gs-1-16, jj-4-8, jj-3-20, mf-2-5, mf-2-13, mo-1-30, nr-1-6, nr-2-15, nr-1-19, nr-2-7, nr-1-14, nr-3-29, pe-3-16, pe-2-21, pf-1-16, sw-2-30, wf-2-12, wf-3-28, wf-3-1, and wf-2-16 from Ekman and Friesen's (1976) Pictures of Facial Affect collection.

[2] The Chinese photographs used in this study were a6-02, a6-05, a6-06, a6-08, d3-01, d3-02, d3-08, d3-12, f5-02, f5-03, f5-08, f5-11, h1-03, h1-04, h1-07, h1-11, s4-02, s4-08, s4-10, s4-11, sur2-02, sur2-03, sur2-05, and sur2-10 from Wang and Markham's (1999) collection.

grandparents born in China, Hong Kong, or Taiwan, or they reported their country of family origin as China, Hong Kong, or Taiwan. From their listing of family birthplaces, we were able to determine how many generations their family had lived in the United States. Immigrant generation ("zero" generation) students listed that they, their parents, and grandparents were all born outside the United States. "First generation" participants listed that they were born in the United States, but that their parents and grandparents were not. "Second generation" participants reported that they and their parents were born in the United States, but grandparents born outside. "Third generation" participants reported that they, their parents, and their grandparents were all born in the United States. We coded participants reporting an unequal number of generations, for example with a father born in the United States and a mother born in China, using an average value across the listings. The average generation of Chinese American participants was 0.89 (SD = 0.81). No Chinese American participant reported being of mixed ethnicity or biracial, which would consist of a family origin including both Chinese and non-Chinese ethnicity.

American students of non-Asian ancestry (N = 83, 42 males and 41 females) were those who reported that they were born in the United States or came to the United States at no later than age 12. Further, they listed a country of family origin outside of Asia and no parents or grandparents born in Asia.

Judgment Tasks and Procedure

Participants viewed the photographs of facial expressions using a computerized task programmed with SuperLab (1997) laboratory software and IBM-PC compatible computers. Each photograph appeared on the computer screen at 288 pixels wide (4 in. or 10.2 cm) and 391 pixels tall (5.4 in. or 13.8 cm), in a randomized order differing for each participant. During the judgment task, all participants viewed the photographs from both cultural groups. Each photograph remained on the screen until the participant entered a permitted response, which was a "forced choice" of one of the six emotions listed. The SuperLab software recorded the amount of time that had elapsed from the presentation of the photograph until the participant recorded the response. Response choices used the students' language of school instruction, which was English for participants in the United States and Mandarin Chinese for participants in China. Responses in Mandarin Chinese were translated by a native speaker and then back-translated by another native speaker of Mandarin. The translations were as follows: *haipa* (afraid), *shengqi* (angry), *yanwu* (disgust), *gaoxing* (happy), *nanguo* (sad), and *chiqing* (surprise). After finishing the emotion recognition exercise, participants completed the short questionnaire containing questions about their cultural and demographic background, described previously.

Scoring

Accuracy. Percentage accuracy hit-rate scores indicate the number or proportion of occasions that participants labeled stimuli with the intended category. These are the diagonal entries in a confusion matrix, a table plotting in one dimension the intended category of stimuli, and in the other dimension the participant's responses. Although it is common for studies of emotion recognition accuracy to use such hit rates exclusively, researchers have argued that these values incorporate response bias into the measure of accuracy (Banse & Scherer, 1996; Elfenbein, Mandal, Ambady, Harizuka, & Kumar, 2002; Rosenthal, 1987; Wagner, 1993). For example, Sorensen (1975) reported that members of the Bahinemo tribe of New Guinea labeled all of Ekman and Friesen's (1976) photographs of facial expressions as "angry." Thus, in spite of correctly identifying anger expressions 100% of the time, participants could not distinguish anger from other emotions. After reviewing many possible corrections for such response bias, Wagner (1993) argued that the "unbiased hit rate" is the most conservative measure of accuracy in categorical judgment studies. The unbiased hit rate is the hit rate multiplied by 1 minus the rate of false alarms, normalized using an arcsine transformation. Analyses below use the unbiased hit rate, but for the purpose of comparison we also report the results of hypothesis tests using conventional percentage accuracy.

Response time. Analyses below use the natural logarithm of the response-time values recorded by the SuperLab (1997) software. The logarithmic transformation helps to normalize latency data and to lessen the impact of outliers (Ratcliff, 1993; Smith & Lerner, 1986).

Results

Emotion Recognition Accuracy

Tables 1 and 2 contain confusion matrices for the recognition of emotional expressions from the United States and China, respectively. Conventional hit rates are the diagonal entries on these tables. Unbiased hit rates were calculated using the confusion matrix for each individual participant, and were analyzed using a 4 (judge cultural group) $\times$ 2 (judge gender) $\times$ 2 (expressor culture) unweighted means analysis of variance (ANOVA). Because of variability in the number of participants across conditions, the unweighted means correction increases the size of error terms (Rosenthal & Rosnow, 1991). Table 3 lists the mean levels of unbiased accuracy across cultural groups. There were significant effects for the cultural group of judges, $F(3, 190) = 6.37$, $p < .001$, and Tukey post hoc tests reveal that Chinese participants in China had lower overall emotion recognition accuracy than members of the other three groups. Consistent with past findings on gender differences in nonverbal communication (Hall, 1978, 1984), female participants were significantly more accurate than males, $F(1, 190) = 5.07$, $p < .03$, $r = .16$. There was no significant interaction between judge gender and judge cultural group, $F(3, 190) = 1.39$, *ns*, nor between judge gender and expressor culture, $F(1, 190) = 0.31$, *ns*. Participants were significantly more accurate with American than Chinese photographs, $F(1, 190) = 12.93$, $p < .001$, $r = .25$.

In support of Hypothesis 1, that the in-group advantage in accuracy varies according to the level of exposure across cultural groups, there was a significant interaction between the cultural group of the judge and the culture of the expressor, $F(3, 190) = 4.67$, $p < .004$. The specific contrast predicted on the basis of cultural familiarity is that the relative advantage with American photographs would be greatest for American participants of non-Asian ancestry, then for Chinese American participants, followed by Chinese participants living in the United States, and finally by Chinese participants living in China. Figure 1 illustrates these values, which appear in relative magnitude as predicted. Tukey post hoc tests reveal that each category of participants has a significantly different value from that two categories away, but none are significantly different from the category directly adjacent. The differences between Chinese Americans and both adjacent groups were marginally significant (Chinese in the United States, $p = .07$; Americans of non-Asian ancestry, $p = .09$). For comparison, we confirmed that the interaction between the cultural group of the judge and the culture of the expressor was also significant using emotion recognition accuracy measured by conventional hit rates, $F(3, 190) = 5.19$, $p < .002$. Tukey post hoc tests reveal the same pattern of differences across participant groups using conventional and unbiased hit rates.

Table 1
Emotion Recognition and Confusion Percentages for Judgments of American Emotional Expressions

Expressed emotions	Perceived emotions						
	Happy	Afraid	Angry	Disgusted	Sad	Surprised	Total
Americans of non-Asian descent							
Happy	**99.0%**	0.0%	0.5%	0.0%	0.3%	0.3%	100%
Afraid	0.6%	**65.4%**	1.2%	1.2%	6.9%	24.7%	100%
Angry	0.3%	1.8%	**86.4%**	6.3%	3.9%	1.2%	100%
Disgusted	0.3%	0.0%	26.2%	**72.6%**	0.6%	0.3%	100%
Sad	0.3%	5.4%	3.9%	8.7%	**79.5%**	2.1%	100%
Surprised	0.9%	7.8%	0.0%	1.2%	0.0%	**90.1%**	100%
Total category use	16.9%	13.4%	19.7%	15.0%	15.2%	19.8%	100%
Chinese Americans							
Happy	**99.7%**	0.0%	0.0%	0.0%	0.0%	0.3%	100%
Afraid	0.4%	**52.8%**	0.7%	3.5%	7.4%	35.2%	100%
Angry	0.7%	1.8%	**83.1%**	5.6%	6.0%	2.8%	100%
Disgusted	1.4%	0.0%	25.4%	**71.5%**	1.1%	0.7%	100%
Sad	0.4%	5.3%	1.8%	7.4%	**83.7%**	1.4%	100%
Surprised	0.7%	10.6%	0.0%	0.7%	0.4%	**87.7%**	100%
Total category use	17.2%	11.7%	18.5%	14.8%	16.4%	21.4%	100%
Chinese living in the United States							
Happy	**98.3%**	0.0%	0.0%	0.0%	0.0%	1.7%	100%
Afraid	0.0%	**62.5%**	0.0%	6.3%	4.2%	27.1%	100%
Angry	0.0%	4.2%	**83.3%**	4.2%	2.1%	6.3%	100%
Disgusted	2.1%	2.1%	33.3%	**58.3%**	4.2%	0.0%	100%
Sad	0.0%	4.2%	0.0%	8.3%	**85.4%**	2.1%	100%
Surprised	4.2%	12.5%	0.0%	0.0%	2.1%	**81.3%**	100%
Total category use	17.4%	14.2%	19.4%	12.8%	16.3%	19.7%	100%
Chinese living in China							
Happy	**96.8%**	1.6%	0.0%	0.8%	0.0%	0.8%	100%
Afraid	0.8%	**21.4%**	7.1%	4.0%	11.9%	54.8%	100%
Angry	1.6%	7.1%	**56.7%**	16.5%	11.0%	7.1%	100%
Disgusted	0.0%	3.2%	30.2%	**54.0%**	9.5%	3.2%	100%
Sad	5.6%	4.8%	10.3%	4.0%	**72.2%**	3.2%	100%
Surprised	6.3%	16.7%	1.6%	1.6%	0.0%	**73.8%**	100%
Total category use	18.5%	9.1%	17.6%	13.5%	17.4%	23.8%	100%

Note. Bold typeface is used to denote the values in the diagonal cells, which represent the hit-rate accuracy coefficients. Values may not add to 100.0% because of rounding.

We also examined differences in emotion recognition across Chinese Americans in terms of the number of generations that their family had lived in the United States. Figure 2 displays their average accuracy with American and Chinese facial expressions, including all participants beyond the first generation together in a single category. It should be noted that in this analysis—in which the different participant groups are the most similar to each other in terms of education level, language, and socioeconomic status—there is no significant difference in the total accuracy of emotion recognition across groups, $F(2, 65) = 0.34$, *ns*. In support of Hypothesis 1, in a 3 (judge generation) $\times$ 2 (judge gender) $\times$ 2 (expressor culture) unweighted means ANOVA, there was a significant interaction between the expressor culture and the generation of judges, $F(2, 65) = 6.66$, $p < .003$. Tukey post hoc tests reveal that immigrant generation participants have a lower advantage in judging American facial expressions than do participants who were born in the United States, in their first generation, second generation, or beyond. For comparison, we confirmed that the interaction between the generation of the judge and the culture of the expressor was also significant using emotion recognition accuracy measured by conventional hit rates, $F(2, 65) = 3.62$, $p < .04$. Tukey post hoc tests reveal the same pattern of differences across generations using conventional and unbiased hit rates.

Emotion Recognition Response Time

Table 4 lists response times for the recognition of emotional expressions from the United States and China by the four cultural groups of judges. Longer response time correlated only weakly with lower accuracy ($r = .11$), suggesting that the two measures offer distinct perspectives on the efficiency of understanding emotional expressions. Response times were analyzed using a 4 (judge cultural group) $\times$ 2 (judge gender) $\times$ 2 (expressor culture) unweighted means ANOVA. There were significant effects for the cultural group of judges, $F(3, 190) = 4.20$, $p < .007$, and Tukey post hoc tests reveal that Chinese participants in China had slower responses than members of the other three groups. There were no gender differences in overall response time, $F(1, 190) = 0.02$, *ns*, nor significant interactions between judge gender and judge cultural group, $F(3, 190) = 0.69$, *ns*, or between judge gender and expressor culture, $F(1, 190) = 0.81$, *ns*. Participants were marginally faster with American than Chinese photographs, $F(1, 190) = 3.72$, $p < .06$, $r = .14$.

In support of Hypothesis 2, that the in-group advantage in response time varies according to the level of exposure across cultural groups, there was a significant interaction between the cultural group of the judge and the culture of the expressor, $F(3,$

Table 2
Emotion Recognition and Confusion Percentages for Judgments of Chinese Emotional Expressions

	Perceived emotions						
Expressed emotions	Happy	Afraid	Angry	Disgusted	Sad	Surprised	Total
Americans of non-Asian descent							
Happy	**99.7%**	0.0%	0.0%	0.0%	0.0%	0.3%	100%
Afraid	0.3%	**82.8%**	0.6%	5.1%	2.1%	9.0%	100%
Angry	2.1%	19.3%	**37.0%**	6.9%	11.4%	23.2%	100%
Disgusted	0.6%	0.3%	46.4%	**50.9%**	1.5%	0.3%	100%
Sad	0.9%	17.5%	0.6%	7.6%	**72.2%**	1.2%	100%
Surprised	0.9%	18.7%	0.9%	0.3%	0.3%	**78.9%**	100%
Total category use	17.4%	23.1%	14.3%	11.8%	14.6%	18.8%	100%
Chinese Americans							
Happy	**98.6%**	0.0%	0.0%	0.0%	0.4%	1.1%	100%
Afraid	0.0%	**73.9%**	0.7%	7.4%	3.2%	14.8%	100%
Angry	0.7%	22.9%	**45.1%**	6.3%	10.6%	14.4%	100%
Disgusted	0.0%	1.4%	43.7%	**53.5%**	1.4%	0.0%	100%
Sad	1.1%	17.3%	0.7%	7.0%	**73.6%**	0.4%	100%
Surprised	0.4%	19.4%	2.5%	0.0%	0.4%	**77.5%**	100%
Total category use	16.8%	22.5%	15.4%	12.4%	14.9%	18.0%	100%
Chinese living in the United States							
Happy	**100.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Afraid	0.0%	**70.8%**	0.0%	12.5%	8.3%	8.3%	100%
Angry	0.0%	31.3%	**45.8%**	6.3%	8.3%	8.3%	100%
Disgusted	0.0%	0.0%	27.1%	**62.5%**	8.3%	2.1%	100%
Sad	0.0%	8.3%	0.0%	12.5%	**72.9%**	6.3%	100%
Surprised	0.0%	4.2%	2.1%	2.1%	2.1%	**89.6%**	100%
Total category use	16.7%	19.1%	12.5%	16.0%	16.7%	19.1%	100%
Chinese living in China							
Happy	**96.1%**	0.0%	0.0%	1.6%	1.6%	0.8%	100%
Afraid	0.0%	**39.1%**	2.3%	9.4%	28.1%	21.1%	100%
Angry	3.1%	13.4%	**49.6%**	11.8%	4.7%	17.3%	100%
Disgusted	3.1%	0.8%	21.9%	**56.3%**	15.6%	2.3%	100%
Sad	4.0%	7.9%	3.2%	5.6%	**77.0%**	2.4%	100%
Surprised	5.5%	11.7%	3.9%	0.8%	1.6%	**76.6%**	100%
Total category use	18.6%	12.1%	13.5%	14.2%	21.4%	20.1%	100%

Note. Bold typeface is used to denote the values in the diagonal cells, which represent the hit-rate accuracy coefficients. Values may not add to 100.0% because of rounding.

190) = 4.03, $p < .009$. The specific prediction based on cultural familiarity is that the relative advantage in speed with American photographs would be greatest for American participants of non-Asian ancestry, then for Chinese American participants, followed by Chinese participants living in the United States, and finally by Chinese participants living in China. Figure 3 illustrates these values. Tukey post hoc tests reveal that Chinese students in China had a relatively higher advantage in speed judging Chinese rather than American facial expressions than did the other three categories of participants residing in the United States. There was no support for Hypothesis 2 on the basis of examining the interaction between Chinese Americans participants' generation in the United States and their advantage in response time for American over Chinese facial expressions, $F(2, 65) = 0.02$, *ns*.

Discussion

This study, examining Chinese and American participants with a wide range of exposure to both China and the United States, provides strong evidence for the effects of cultural familiarity on the accuracy and latency of emotion recognition. These findings reveal that the effects of cultural familiarity can begin to occur within a relatively short time period. Chinese students residing in the United States for an average of 2.4 years could better recognize facial expressions of members of their host culture than the expressions of their fellow in-group members. However, these results also provide evidence that the effects of cultural familiarity extend over a long period of time, across generations in the case of Americans of Chinese ancestry. The large decrease across generations in Chinese American participants' accuracy in understanding Chinese emotional expressions is especially strong evidence for the impact of cultural familiarity on the understanding of emotion.

This study also provides evidence for an in-group advantage in the response time of emotion recognition judgments. Chinese and American participants residing in their own nations were faster in responding to emotions expressed by members of their own culture. Further, this in-group advantage disappeared for Chinese students who had been in the United States for even a relatively short period. This suggests that participants were more efficient in their judgments of in-group members' emotions, and further that cultural exposure can help to improve the efficiency of emotion recognition.

Table 3
Recognition Accuracy With Chinese and American Emotional Expressions

Emotion	Chinese in China	Chinese in the United States	Chinese Americans	Non-Asian Americans	*M*
Chinese expressions					
Happy	1.194	1.571	1.476	1.460	1.425
Afraid	0.266	0.494	0.459	0.586	0.451
Angry	0.396	0.378	0.282	0.212	0.317
Disgusted	0.526	0.564	0.492	0.456	0.510
Sad	0.588	0.710	0.765	0.726	0.697
Surprised	0.616	0.980	0.691	0.684	0.743
M	0.598	0.783	0.694	0.687	0.691
American expressions					
Happy	1.243	1.404	1.482	1.492	1.405
Afraid	0.146	0.602	0.477	0.668	0.473
Angry	0.368	0.667	0.827	0.848	0.677
Disgusted	0.450	0.539	0.793	0.806	0.647
Sad	0.654	1.015	0.932	0.909	0.878
Surprised	0.446	0.722	0.732	0.877	0.694
M	0.551	0.825	0.874	0.933	0.796
Total	0.575	0.804	0.784	0.810	0.743
n	32	12	71	83	

Note. Accuracy expressed in unbiased hit rate (arcsin-transformed).

Although the careful sampling of participant groups with varying levels of acculturation to the groups posing the stimuli does provide strong evidence for the effects of cultural exposure, there are important limitations. We discuss a number of these limitations in the General Discussion below. Study 2 attempts to address one prominent limitation, the confound between level of exposure to a cultural group and membership in the corresponding ethnic group. That is, group members presumably share knowledge of cultural norms for emotional expression. However, those norms can also be learned by sojourners whose cultural background is distinctly different. In documenting support for the impact of cultural familiarity, it is important to provide evidence arguing against the impact of biologically programmed influences and against other possible effects associated with in-group membership. Thus, it would be worthwhile to collect additional data from participants who could help to disentangle this confound.

Study 2

The second study examines participants who are not Chinese or American, but who have extensive exposure to one of these two

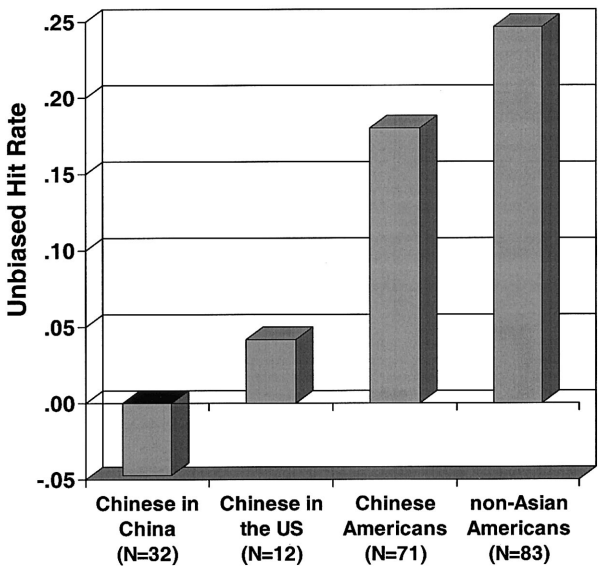

Figure 1. Accuracy advantage for American over Chinese emotional expressions. US = United States.

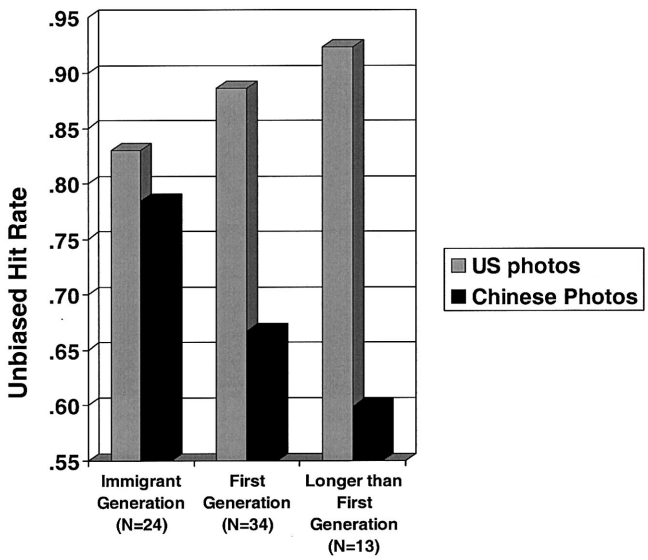

Figure 2. Emotion recognition accuracy of Chinese Americans by generation in the United States. US = United States.

Table 4
Response Time (in Log-Seconds) With Chinese and American Emotional Expressions

Emotion	Chinese in China	Chinese in the United States	Chinese Americans	Non-Asian Americans	*M*
Chinese expressions					
Happy	3.16	3.16	3.21	3.18	3.18
Afraid	3.57	3.49	3.52	3.48	3.52
Angry	3.62	3.58	3.61	3.59	3.60
Disgusted	3.62	3.47	3.42	3.39	3.47
Sad	3.55	3.40	3.52	3.49	3.49
Surprised	3.52	3.45	3.41	3.40	3.44
M	3.51	3.42	3.45	3.42	3.45
American expressions					
Happy	3.24	3.20	3.18	3.20	3.21
Afraid	3.67	3.52	3.52	3.50	3.55
Angry	3.63	3.45	3.45	3.45	3.49
Disgusted	3.56	3.48	3.41	3.37	3.46
Sad	3.66	3.37	3.45	3.43	3.47
Surprised	3.50	3.39	3.37	3.35	3.40
M	3.54	3.40	3.40	3.38	3.43
Total	3.52	3.41	3.42	3.40	3.44
n	32	12	71	83	

cultures. Given that China and the United States both attract students from distinct cultural groups, it is possible to find participants with strong cross-cultural exposure to one of the stimulus groups, but not to the other. In the case of China, we include students from Tibet, who were raised in Tibet and currently reside in China. In the case of the United States, we include students from Africa, of Black African ancestry, who were raised in Africa and currently reside in the United States. Each participant group was raised in their region of ethnic origin and had since moved either to China or to the United States. Thus, this study provides further evidence to disentangle the factors of cross-cultural exposure and ethnicity. Results consistent with those of Study 1 would suggest that biological factors, or other factors associated with membership in one of the two ethnic groups, are not responsible for any apparent effects of cross-cultural familiarity in emotion recognition. Consistent with the impact of cultural familiarity, we predict that there is an advantage in emotion recognition accuracy and response time when judging emotional expressions originating in the society to which participants have greater cultural exposure.

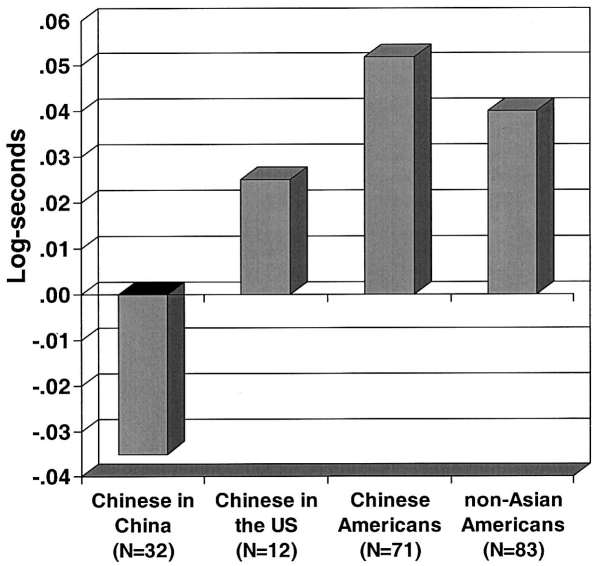

Figure 3. Reaction time advantage for American over Chinese emotional expressions. US = United States.

Method

Emotional Expressions, Judgment Task, and Procedure

Study 2 used the same emotional expressions, judgment task, and other procedures as in Study 1.

Participants

Tibetan students living in China (N = 11, 9 males and 2 females). All Tibetan participants were students of Tibetan ancestry residing in China who reported never having lived in the United States or Europe. They resided in a medium-sized city 3 hr south of Shanghai, China. The experimenter, a native speaker of Mandarin Chinese who was born and raised in China, was the same research assistant who served in Study 1. Students were recruited in a public area on campus. To confirm students' cultural background, after completing the emotion recognition measures, students filled out a brief survey asking them to list their gender, region of origin, and whether they had ever visited the United States or Europe. All Tibetan participants reported that they were raised in Tibet.

African students living in the United States (N = 12, 5 males and 7 females). All African participants were students of Black African ancestry residing in a large city in the northeastern United States who reported never having lived in China, Taiwan, or Hong Kong. Students were recruited through posters in public areas on campus, as well as through an e-mail list associated with an African student group recognized by the university. The experimenter was a research assistant. To confirm students' cultural background, after completing the emotion recognition measures,

students filled out a brief survey asking them to list their gender, along with a list of all countries in which they had lived and for what amount of time. All African participants reported that they had been raised in Africa (Botswana $n = 1$, Ethiopia $n = 1$, Ghana $n = 2$, Kenya $n = 2$, Nigeria $n = 2$, Uganda $n = 1$, Zimbabwe $n = 3$).

Results

Table 5 contains confusion matrices for participants' recognition of emotional expressions from the United States and China. Conventional hit rates are the diagonal entries on these tables. Table 6 lists the mean levels of unbiased accuracy and response time across cultural groups of judges and targets. Table 6 also lists the degree of advantage that each group achieved when judging the emotional expressions of members of the group to which they had cross-cultural exposure.

Emotion Recognition Accuracy

Unbiased hit rates were calculated using the confusion matrix for each individual participant, and were analyzed using a 2 (judge cultural group) × 2 (judge gender) × 2 (expressor culture) ANOVA with an unweighted means correction because of unequal sample sizes (Rosenthal & Rosnow, 1991). The two cultural groups of judges did not differ in overall emotion recognition accuracy, $F(1, 19) = 1.04$, *ns*. The advantage for female participants did not reach statistical significance, $F(1, 19) = 0.65$, *ns*, $r = .18$. There was no significant interaction between judge gender and judge cultural group, $F(1, 19) = 1.65$, *ns*, or between judge gender and expressor cultural group, $F(1, 19) = 0.14$, *ns*. Participant accuracy did not differ across American and Chinese photographs, $F(1, 19) = 1.01$, *ns*. In support of Hypothesis 1, that the relative advantage in emotion recognition accuracy varies according to the level of exposure across cultural groups, there was an interaction between the cultural group of the judge and the culture of the expressor—unbiased hit rates, $F(1, 19) = 3.37$, $p = .08$, $r = .39$; conventional hit rates, $F(1, 19) = 4.40$, $p < .05$, $r = .43$—reaching marginal significance for unbiased hit rates and conventional significance levels for standard percentage accuracy. These effect sizes are comparable with those in Study 1, even slightly higher.

Table 5
Emotion Recognition and Confusion Percentages for Judgments of Emotional Expressions

	Perceived emotions						
Expressed emotions	Happy	Afraid	Angry	Disgusted	Sad	Surprised	Total
	African judges living in the United States						
American photographs							
Happy	**100%**	0%	0%	0%	0%	0%	100%
Afraid	0%	**58%**	2%	2%	2%	35%	100%
Angry	0%	2%	**92%**	2%	4%	0%	100%
Disgusted	0%	2%	21%	**75%**	2%	0%	100%
Sad	0%	4%	6%	4%	**83%**	2%	100%
Surprised	0%	4%	0%	4%	0%	**92%**	100%
Total category use	20%	11%	19%	14%	15%	21%	100%
Chinese photographs							
Happy	**98%**	0%	0%	0%	2%	0%	100%
Afraid	0%	**88%**	0%	8%	2%	2%	100%
Angry	0%	29%	**50%**	2%	2%	17%	100%
Disgusted	0%	0%	38%	**56%**	6%	0%	100%
Sad	0%	23%	2%	4%	**71%**	0%	100%
Surprised	0%	19%	0%	0%	0%	**81%**	100%
Total category use	16%	26%	15%	12%	14%	17%	100%
	Tibetan judges living in China						
American photographs							
Happy	**86%**	5%	0%	0%	2%	7%	100%
Afraid	7%	**16%**	11%	2%	11%	52%	100%
Angry	2%	2%	**61%**	11%	11%	11%	100%
Disgusted	2%	5%	18%	**66%**	7%	2%	100%
Sad	0%	2%	11%	0%	**75%**	11%	100%
Surprised	9%	11%	0%	5%	2%	**73%**	100%
Total category use	18%	7%	17%	14%	18%	26%	100%
Chinese photographs							
Happy	**93%**	5%	2%	0%	0%	0%	100%
Afraid	0%	**50%**	2%	9%	9%	30%	100%
Angry	0%	7%	**50%**	9%	2%	32%	100%
Disgusted	2%	0%	23%	**68%**	5%	2%	100%
Sad	2%	5%	5%	5%	**82%**	2%	100%
Surprised	7%	16%	9%	2%	2%	**64%**	100%
Total category use	17%	14%	15%	16%	17%	22%	100%

Note. Bold typeface is used to denote the values in the diagonal cells, which represent the hit-rate accuracy coefficients. Values may not add to 100.0% because of rounding.

Table 6
Emotion Recognition Accuracy and Reaction Time (in Log-Seconds) for Judgments of Emotional Expressions

	American photographs		Chinese photographs		Advantage for exposed group	
	Unbiased hit rate	Reaction time	Unbiased hit rate	Reaction time	Unbiased hit rate	Reaction time
African judges living in the United States						
Happy	1.571	3.20	1.511	3.17	0.060	−0.03
Afraid	0.575	3.43	0.554	3.51	0.021	0.08
Angry	0.889	3.45	0.406	3.64	0.483	0.19
Disgusted	0.907	3.41	0.529	3.44	0.378	0.03
Sad	1.020	3.56	0.714	3.63	0.306	0.08
Surprised	0.835	3.39	0.810	3.44	0.026	0.05
M	0.966	3.41	0.754	3.47	0.212	0.07
Tibetan judges living in China						
Happy	1.061	3.38	1.260	3.25	0.199	0.12
Afraid	0.129	3.49	0.502	3.57	0.374	−0.07
Angry	0.439	3.47	0.334	3.59	−0.104	−0.12
Disgusted	0.741	3.50	0.642	3.48	−0.099	0.02
Sad	0.644	3.53	0.925	3.46	0.281	0.07
Surprised	0.443	3.35	0.457	3.49	0.015	−0.15
M	0.576	3.45	0.687	3.47	0.111	−0.02
Both groups	0.771	3.43	0.720	3.47	0.162	0.02

Note. Accuracy values are unbiased hit rates, log-transformed (Wagner, 1993).

Tibetans living in China were relatively more accurate with Chinese rather than American facial expressions, and Africans living in the United States were relatively more accurate with American rather than Chinese facial expressions.

Emotion Recognition Response Time

Response times were analyzed using a 2 (judge cultural group) × 2 (judge gender) × 2 (expressor culture) ANOVA with an unweighted means correction for unequal sample sizes (Rosenthal & Rosnow, 1991). As in Study 1, longer response time correlated weakly with lower accuracy ($r = .18$), suggesting overlap but distinction between the two measures. The two cultural groups of judges did not differ in overall response time, $F(1, 19) = 0.12$, *ns*. There was no gender difference in response time, $F(1, 19) = 0.00$, *ns*, nor a significant interaction between judge gender and judge cultural group, $F(1, 19) = 0.33$, *ns*, or between judge gender and expressor cultural group, $F(1, 19) = 0.08$, *ns*. Participant response time was faster for American rather than Chinese photographs, $F(1, 19) = 10.28$, $p < .01$. In support of Hypothesis 2, that the relative advantage in emotion recognition response time varies according to the level of exposure across cultural groups, there was a significant interaction between the cultural group of the judge and the culture of the expressor, $F(1, 19) = 4.96$, $p < .04$, $r = .46$. Tibetans living in China were relatively faster with Chinese rather than American facial expressions, and Africans living in the United States were relatively faster with American rather than Chinese facial expressions.

Discussion

Our study examined participants who are not Chinese or American, but who have extensive exposure to one of these cultures: Tibetans living in China and Africans living in the United States. Both groups were raised in their region of ethnic origin, and have since moved to a new host culture. Thus, these results strongly suggest the effect of cultural familiarity in emotion recognition, by disentangling further the factors of cross-cultural exposure, group membership, and ethnicity. Finding such trends among members of groups distinct from those of the host culture argues against the possibility that biological or other membership-based factors were responsible for previous results documenting greater performance for groups with greater cultural familiarity. Thus, these findings provide the clearest evidence to date for the impact of cross-cultural exposure on emotion recognition.

This study has important limitations, and in the General Discussion we discuss a number of limitations applying to both studies. For Study 2 in particular, the main limitation is the sample size. Given the unique and highly specific populations from which we drew, sampled deliberately for their combination of cultural background and cultural exposure, it was difficult to recruit even 23 participants. Thus, trends with effect sizes that were comparable with, and even slightly larger than, those in Study 1 did not always reach desirable levels of statistical significance. The replication of other results, particularly the findings of the first study, compensates for this limitation. However, future research should further replicate these results.

General Discussion

Our studies provide the strongest evidence to date for the impact of cross-cultural exposure on the effectiveness of emotion recognition judgments. Participants were more accurate in judging emotions expressed by a cultural group with which they had greater familiarity. Through the deliberate sampling of cultural groups for inclusion in these studies, we eliminate many alternative hypotheses for these findings. Previous research had used fully between-

subjects designs examining the relationship between cross-cultural exposure and accuracy in understanding emotional expressions from different cultures. Most of this work examined non-Western groups with varying exposure to the Western countries from which research stimuli originated (Ducci et al., 1982; Sorensen, 1975). Because these studies were not balanced to control for main effects in emotion recognition ability, these findings could have reflected differences in emotion recognition skill, or the general ability to complete an experimental task, rather than differential familiarity with the culturally specific elements of emotional behavior. By contrast, our studies tested participants with emotional expressions originating in two cultures, with which they had varying levels of cross-cultural exposure. The studies attempted to disentangle the ethnic background of participants from their cultural exposure, which have tended to co-occur in past research. In Study 1, we examined Chinese and American participants with a range of exposure to both groups, and were thus able to disentangle these effects. Going one step further, Study 2 examined Tibetans living in China and Africans living in the United States, who had strong exposure to one group posing the emotional expressions, but had ethnic membership in neither. Thus, our core finding—that recognition was more effective with emotional expressions from a culturally familiar group—is unlikely to result from biological or ethnic influences, or other absolute differences across groups.

These studies also provide new evidence for cross-cultural differences in response time with emotion recognition. With few exceptions (e.g., Kirouac & Doré, 1983), previous research has focused on judgment responses and not the latency required for such responses. Study 1 provides the first evidence for an in-group advantage in the response time of emotion recognition judgments. Chinese and American participants residing in their own nations were faster in responding to emotions expressed by members of their in-group culture. Further, this in-group advantage was smaller for groups with greater cross-cultural exposure. These findings suggest that in-group judgments are more efficient than out-group judgments of emotion and that cultural exposure can help to improve the efficiency of emotion recognition.

Taken together, these findings provide support for the impact of cultural differences on the understanding of emotion. Although the communication of emotion may be a universal language, there may also be subtle differences in the style of emotional expression across cultures. Subtle differences in expressive behavior across cultures can lead to greater ability in understanding emotions expressed in a familiar style. However, we can overcome the potential communication barriers caused by these subtle differences through cross-cultural exposure. These effects can begin to occur within a relatively short period. Chinese students residing in the United States for an average of 2.4 years could better recognize facial expressions of members of their host culture than those of their fellow in-group members from their home country. We speculate that sojourners to a new culture—because of their limitations with the new verbal language—may come to rely more strongly on nonverbal communication, and may even be more sensitive to emotional expressions in the new culture than they had been in their home culture. Our results also provide evidence that the impact of cultural familiarity can extend over a long period, even across generations in the case of Americans of Chinese ancestry.

Main Effects Across Cultural Groups

This article focuses on the extent to which individuals are more effective in their judgments of facial expressions depending on their degree of cultural familiarity with the group posing the expression. However, there was also evidence for some main effects in accuracy and response time across the cultural groups posing and judging the facial expressions. Because this study focuses on an interaction effect, which is calculated after main effects are controlled, these main effects should not alter the reported results, but are nonetheless important to consider.

In general, the photographs of American facial expressions were judged more accurately and quickly than were the photographs of Chinese facial expressions. This is likely due to differences in the methods that the researchers used for creating these sets of stimulus materials. Whereas Ekman and Friesen (1976) created their American photographs with the goal of portraying intense versions of prototypical facial expressions that would be highly recognizable, by contrast Wang and Markham (1999) created their Chinese photographs with the goal of eliciting situationally appropriate facial expressions that would be relatively natural. These differences in the method of posing the facial expressions likely led to American expressions that were more intense but less authentic than the Chinese expressions. Following the posing sessions, Ekman and Friesen's (1976) photographs were subjected to a more extensive degree of pretesting for high recognition rates. Further, the particular six emotions tested were chosen on the basis of research conducted in the United States, and it may be the case that these emotional categories were less salient to the Chinese posers, who consequently expressed them with a lower level of clarity.[3] These factors likely contributed to the main effects in our study, in which American photographs were generally better recognized than the Chinese photographs.

In addition to main effects across cultural groups of expressors, there were also main effects across cultural groups of judges. In general, participants in China were less accurate and less quick to judge facial expressions of emotion than were participants in the United States. There are likely methodological as well as conceptual reasons for this finding. First, the participant groups in the two nations may have had differences other than their location of residence. Participants in the United States attended a highly elite institution and were comfortable with computers and in many cases with experimental participation. By contrast, those in China attended a more modest program, had less facility with computers, and were less familiar and comfortable with participating in psychology experiments. They achieved lower accuracy with the Chinese photographs than did the normative sample of Chinese participants drawn from a more prestigious university in a larger city (Wang & Markham, 1999). For those comparisons among groups that were more closely matched in terms of socioeconomic and educational background—Chinese students in the United States, Chinese Americans, and Americans of non-Asian ancestry—there were no such main effects across different groups of judges in their emotion recognition accuracy. There are additional conceptual reasons contributing to an explanation for why participants from China were generally slower and less accurate in

[3] We thank an anonymous reviewer for raising this point.

emotion recognition than participants from the United States. Because details of the study—such as the specific emotions tested, the language used to list emotions, and the use of a forced-choice method in which participants must choose only a single alternative—all derived from research conducted in North America, these factors may have been less suitable for the Chinese participants.[4] It is also possible that Chinese participants are less attuned to facial expressions of emotion, because of differences in cultural rules regarding the expression of emotion.[5]

Limitations

These studies have a number of weaknesses that would be worthwhile to address in future work. The first is that, similarly to the proxies used in most cross-cultural research, we used indirect measures of cultural familiarity in terms of cultural group background and exposure, in particular the length of time residing alongside particular groups. Although these implicit measures generally correspond to other indices of acculturation (Dion & Dion, 1996), it is important to replicate these findings using direct measures of cultural exposure. Indeed, if validated in this context, emotion recognition efficiency itself also has potential use as an instrument to measure familiarity and acculturation. Given the sensitive nature of cultural background, it would be desirable to have a skill-based instrument that is less liable to the problems of desirability and awareness inherent in self-report measures.

A second important weakness is that our studies are observational and cross-sectional, with results examined across individuals who may have self-selected into their levels of acculturation. The strongest evidence for familiarity and learning from cross-cultural exposure would come from a longitudinal study examining participants over an extended period, both before the decision to become sojourners to another culture as well as after they arrive. This type of evidence would be able to shed light on some patterns in our results that we argue are likely to result from artifact. In particular, Chinese students living in the United States judge Chinese expressions less accurately than they judge American expressions—so that it appears they may have "forgotten" how to judge the expressions of their home culture. Our core argument in this article is that exposure to a new culture increases the effectiveness of recognizing emotional expressions from the new culture. In fact, it is possible that sojourners to a new culture—because of their limitations with the new verbal language—may come to rely more strongly on nonverbal communication and may even be more sensitive to emotional expressions in the new culture than they had been in their previous culture. However, this does not mean that they have forgotten their previous culture's expressions. Rather, their accuracy with expressions from their home country may be unchanged over time, even as they may perform more accurately and quickly with expressions from the new culture. A longitudinal study would be able to distinguish whether this pattern involves true forgetting—that is, a decrease over time in accuracy judging expressions from participants' home country—which our data cannot address. One should note the distinction between this effect of "forgetting" and the decrease over generations of Chinese Americans in their accuracy at understanding Chinese facial expressions. In this latter case, the "loss" is between subjects—with the newer generations failing to gain familiarity with the emotional expressions of their family's culture of origin—rather than a loss within subjects, in which an individual participant may forget what he or she already knows.

Another source of evidence that goes beyond an observational and cross-sectional design could come from an intervention study, in which an experimental group receives direct instruction to aid cultural learning, whereas a control group receives only additional familiarity with the experimental task. However, evidence for the ability to train nonverbal sensitivity skills is weak (Ambady, Bernieri, & Richeson, 2000), which presents a challenge for experimental research in this area.

An additional weakness in our research is that the cultural background of emotional expressors was immediately obvious to participants because of visible ethnic differences. Thus, results may reflect possible priming of that cultural group. Participant responses could incorporate subtle stereotypes about the likely emotions expressed by members of particular cultural groups (e.g., Hess et al., 1996). Further, participants may be motivated to be more effective when judging the emotional expressions of the group with which they identify more strongly. Research on priming in emotion recognition suggests that these effects are possible. When presenting American facial expressions, Sorensen (1975) found higher accuracy for New Guinea tribespeople tested in the more westernized Pidgin language rather than their native Fore language. Likewise, Matsumoto and Assar (1992) found higher accuracy for Indian participants tested in English rather than Hindi when viewing facial expressions developed in the United States. Studies have demonstrated that language of administration can be a powerful prime for bilingual participants (e.g., Sanchez-Burks et al., 2003). In our study, administering the protocol in English for Chinese and Chinese American participants in the United States may have served as a prime that improved their relative efficiency in judging American relative to Chinese emotional expressions. Research investigating stereotypical attitudes has used facial photographs from different races as a typical prime (Fazio et al., 1995). Previous findings on the limitation of such motivational effects on emotion recognition (Elfenbein & Ambady, 2002b; Elfenbein et al., in press) suggest that they cannot entirely account for the findings of an in-group advantage; however, it is possible for them to contribute to the effect's magnitude. Thus, it is important to replicate the effects of cultural familiarity in emotion using stimuli that do not allow the identification of cultural group membership. For example, future work can include cultural groups that are visibly similar, stimuli using filtered audio, or video altered so that the cultural background is not visible.

Further, this study used laboratory methods of assessing the accuracy of emotion recognition that differ substantively from the natural process as it occurs outside of the laboratory. Notably, a forced-choice system for responding to facial expressions limits the opportunity to observe the attribution that participants would have made in the absence of this structured response. Being forced to choose only a single option is an act that itself may differ in appropriateness across cultural groups,[6] and prompting of specific emotional categories may alter responses. Future research should

[4] We thank two anonymous reviewers for raising these points.

[5] We thank an anonymous reviewer for raising this point.

[6] We thank an anonymous reviewer for raising this point.

not be limited to forced-choice response settings, but instead should collect unconstrained ratings on multiple emotions.

Emotional Dialects and Further Research

Our findings add to growing evidence in favor of a speculative "dialect" theory that incorporates both the universality and cultural specificity of communicating emotion (Elfenbein & Ambady, in press). Just as emotional expression may be a universal language, as with other forms of language it is likely to have "dialects" differing in the nuances of expression and interpretation. Subtle differences across cultures in emotional expressive style may lead us to be more effective in understanding emotions expressed by cultural groups with which we are familiar. One important piece of such a dialect theory is cultural learning, which is implied by greater accuracy with more familiar groups. The present study provides the strongest evidence that we judge a cultural group's emotional expressions more effectively the more opportunity we have for exposure to that group. It appears that, over time, we can learn to understand subtle differences in expressive style across cultures.

In addition to remedying the limitations of our studies, future research should seek to test each step of a dialect theory of emotion. First, it is important to document specific cultural differences in the expression of universal emotions, both in spontaneous and carefully matched settings. Research on spontaneous and posed emotion across cultures has examined patterns of similarity, but has not examined differences in the same data (Camras, Oster, Campos, Miyake, & Bradshaw, 1997; Ekman, 1972). Next, it is important to demonstrate that participants can recognize better those emotional expressions using the stylistic patterns specific to their own group. The strongest evidence for a dialect theory would come from high recognition levels of these particular stylistic patterns, even if expressed by an apparent out-group cultural member. Experimenters can train members of other groups to make such expressions, or computerized animation can portray them on a face appearing to be from a different culture. Thus, we can distinguish between the predictions made by a dialect theory and the effects of motivation or priming with in-group members. A dialect theory of emotion is still speculative and emerging, based primarily on its fit with empirical studies on the in-group advantage, and our research adds one piece to this growing literature.

At the end of their article, Ekman et al. (1987) concluded that "the evidence now for universality is overwhelming, whereas that for cultural differences is sparse" (p. 717). Likewise, at the beginning of his review of cross-cultural studies on facial expressions of emotion, Russell (1994) listed quotes from many researchers arguing for the overwhelming universality of emotional expression and understanding. By contrast, our findings contribute to a growing body of literature documenting balance among findings for universals and cultural differences in the communication of emotion.

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