Toward a dialect theory:
Cultural differences in the expression and recognition of facial expressions

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Abstract

Two studies provided direct support for a recently proposed dialect theory of emotion, positing that emotional expressions show cultural variations similar to linguistic dialects, thereby decreasing accurate recognition by out-group members. In Study 1, 60 participants from Quebec and Gabon posed facial expressions. Dialects emerged most clearly for Serenity and Contempt, also for Anger and Sadness, but not for Fear, Disgust, or Surprise. Shame and Embarrassment displayed recognizable but idiosyncratic expressive combinations. For happiness, Gabonese expressers showed open-mouthed smiles and rarely Duchenne smiles. In study 2, Quebecois and Gabonese judged these stimuli and stimuli standardized to erase cultural dialects. As predicted, an in-group advantage emerged for non-standardized expressions only, and most strongly for expressions with greater regional dialects according to Study 1.

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One of the enduring questions in the study of facial expressions of emotion is the issue of whether these expressions are universal—as proposed by Darwin (1872/1965) — or whether they are culturally determined. A considerable body of research supports the conclusion that the expression of emotion is largely universal and biologically evolved. The similarities between human and non-human emotional expressions—noted from Darwin in 1872 to Chevalier-Skolnikoff (1973) and Redican (1982) more recently—support the notion that these expressions reflect underlying emotional states that have evolved in light of their adaptive value. Such emotional expressions are also mutually recognizable across species boundaries. For example, chimpanzees react differentially to different human expressions of emotion (Itakura, 1994). Likewise, human children can interpret monkey vocalizations of aggression, fear, dominance, positive emotions, and submission, and their accuracy in doing so develops simultaneously with their ability to interpret human emotional behavior (Linnankoski, Laasko, & Leinonen, 1994). Within the human species, classic studies by Ekman, Izard, and their colleagues (Ekman, 1972, 1994; Ekman, Friesen, O'Sullivan, Chan, Diacoyanni-Tarlatzis, Heider, Krause, LeCompte, Pitcairn, Ricci-Bitti, Scherer, Tomita, & Tzavaras, 1987) demonstrate that displays of basic emotions are well recognized even across cultures that have had little or no contact with each other. This view is contrasted by perspectives that emphasize the importance of social prescriptions regarding appropriate emotional behavior in specific situations, which view such behavior as determined completely by cultural influences (e.g., Lutz & White, 1986; Wierzbicka, 1994).

Many approaches take an intermediate position (e.g., Ekman, 1972; Fiske, Kitayama, Markus & Nisbett, 1998; Mesquita, Frijda, & Scherer, 1997; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979) acknowledging both universals and cultural variations in the expression and recognition of emotion. The current paper focuses on one such intermediate perspective: the dialect theory of emotion. Dialect theory proposes the presence of cultural differences in the style of emotional expression that are subtle enough to allow accurate communication across cultural boundaries in general—yet substantive enough to result in a potential for miscommunication

(Elfenbein & Ambady, 2002; Elfenbein, Mandal, Ambady, Harizuka, & Kumar, 2004; Marsh, Elfenbein, & Ambady, 2003).

Elaborating Dialect Theory

In linguistics, dialects are the variants or varieties of a language used by different speakers who are separated by geographic or social boundaries (Francis, 1992; Romaine, 1994). Although there is an old adage that a language is simply a dialect with its own army and navy (Fasold, 1984)—suggesting a sometimes arbitrary distinction between the two concepts—linguists highlight a substantive difference in that dialects, but not separate languages, should be largely mutually comprehensible among speakers (O'Grady, Archibald, Aronoff, & Rees-Miller, 2001). Accordingly, the first main proposition of a dialect theory of emotion is that there is great overlap and general mutual intelligibility of emotional expressions across members of different cultural groups. That is, the language of emotion is universal. As with other languages, different cultures can express themselves in different dialects, which is the second proposition of dialect theory. The third proposition is that the presence of these dialects has the potential to create cross-cultural misunderstandings.

Again, concepts imported from linguistics help to articulate this theoretical framework. In particular, even small changes in language can create confusion. A *minimal pair* consists of "two forms with distinct meanings that differ by only one segment found in the same position in each form." (O'Grady et al., 2001, p. 65). Words in a minimal pair are easily confused for each other when enunciated differently, sometimes even through very small shifts (Burquest & Payne, 1993). For example, one of the authors once had a family friend—speaking with a French accent and newly arrived in the United States via an ocean cruise—who created bemusement when, upon being complimented on a beautiful wool sweater, responded that she had knit it on the sh[redacted]p (ship/sheep).

Extending these verbal concepts to the nonverbal communication of emotion, some expressions may be relatively easy to confuse with others taking a similar form. This fits with evidence, for example, that facial expressions of fear and surprise are frequently confused with each other. These confusions occur for judgments within a cultural group, but they occur more frequently for cross-cultural judgments (Elfenbein, Mandal, Ambady, Harizuka, & Kumar, 2002).

Likewise for vocal expressions, confusions of fear with sadness and joy with neutral are common within a single cultural group, but the same confusions are more common in judgments crossing cultural boundaries (Scherer, Banse, & Wallbott, 2001). In contrast, facial expressions of happiness are rarely confused with other facial expressions, because this expression is too distinctly different from other expressions – just as words with greater redundancy and distinction from others may be understood even when several phonemes are pronounced differently, because no other word is sufficiently similar to create confusion. One should note that confusions do not need to be symmetrical. That is, a given word A may be similar to another word B in one dialect, yet word B might not exist in a second dialect. In such a case, speakers of the first dialect may confuse A and B, whereas, speakers of the second dialect would attribute the same meaning to both variants. In sum, not all variations between forms may lead to problems in recognition, but sometimes small changes may entrain considerable potential for confusion.

The goal of the current research is to test the three propositions of dialect theory. For the first proposition, the classic cross-cultural judgment studies described above already support arguments for the general mutual intelligibility of emotional expressions across members of disparate cultural groups. However, to date the second and third propositions—that there are subtle emotional dialects across cultures with the potential to result in cross-cultural misunderstandings -- have been inferred rather than explicitly tested. Below we describe the base of research supporting these propositions.

Cross-cultural differences in emotional expressions

Evidence for the second proposition of the dialect theory so far is indirect and essentially stems from some of the same research that supports the notion of universality. Specifically, it has been observed in the classic studies on universals in emotional expression mentioned above that, although participants across cultures recognized posed emotion expressions at accuracy rates greater than expected by chance, samples outside the United States rarely achieved accuracy rates as high as American samples when viewing these American stimuli. For example, Ekman and colleagues reported accuracy rates ranging from 86% for Americans (Ekman, 1972) down to 53% for tribespeople in New Guinea (Ekman, Sorensen, & Friesen, 1969) when viewing American emotional expressions. In the most extreme case, the Bahinemo tribe they tested could not

respond to the individual photographs, and labeled them all as "angry" (Sorensen, 1975). Thus, members of different cultures judging American emotional expressions appear to vary substantially in their recognition accuracy.

Elfenbein and Ambady (2002) conducted a meta-analysis of cross-cultural emotion recognition studies and found – across different procedures and nonverbal channels -- that individuals were better at recognizing emotional expressions by members of their own cultural group. Geographical proximity and/or opportunities for cross-cultural contact seemed to reduce this disadvantage for the recognition of expressions from members of different cultural groups. Accordingly, Elfenbein and Ambady (2002, 2003) concluded that the in-group advantage could be attributed to subtle variations in the style of encoding across cultures, such that judgments are faster and more accurate for perceivers familiar with these subtle variations. They argued that the universal language of emotion might have dialects that differ subtly from each other, following Tomkins and McCarter's (1964) metaphor that cultural differences in emotional expression are like "dialects" of the "more universal grammar of emotion" (p. 127).

A further observation providing indirect support for this notion of cultural dialects is that the in-group advantage disappears in cases when stimulus materials from different groups are constrained to have an identical appearance across cultures (e.g., Beaupré & Hess, 2003; Biehl, Matsumoto, Ekman, Hearn, Heider, Kudoh, & Ton, 1997). Likewise, the in-group advantage is greater for left than for right hemifacial composites, in a study using chimeric faces composed of left versus right hemifaces (Elfenbein, Mandal, Ambady, Harizuka, & Kumar, 2004). The most plausible explanation for such a finding would be for the in-group advantage to result from subtle differences in the appearance of stimuli, given that all other factors—in light of the repeated-measures nature of the study—were held constant while perceivers judged the two separate sides of expressors' faces. Yet so far no study has attempted to directly describe dialect expressions and their potential to decrease recognition accuracy. This is the goal of the present research.

Cultural Familiarity versus Decoding Rules

It can be argued that the differences in emotion recognition rates for cultural in-group versus out-group expressions could be explained through other mechanisms. Thus, the first

researchers to note an in-group advantage in their data referred to it as ethnic bias (e.g., Kilbride & Yarczower, 1983; Markham & Wang, 1996), suggesting that individuals may be less motivated to decode accurately emotional expressions from members of visibly different cultural groups. This fits with evidence that decoders are more accurate in their judgments of emotions they believe to have been expressed by in-group rather than out-group members (Hess, Senecal, & Kirouac, 1996; Thibault, Bourgeois, & Hess, 2005). Further, stereotypes about the likely emotions experienced by members of different cultural groups (Kirouac & Hess, 1999) may reduce comprehension of out-group emotional expressions. Yet, other empirical results demonstrate an in-group advantage that is difficult to attribute to stereotype bias. For example, in studies of still facial expressions among multiple Caucasian groups (e.g., Ekman, 1972; Izard, 1971), participants did not know the origin of stimulus persons, and hence could plausibly respond to the emotional expressions as being from out-group members only if there were some cues to cultural group membership present in the expressions themselves.

The language employed by the decoders also may impact on decoding accuracy. Thus, when emotion concepts are translated from one language to another, the labels applied may evoke subtly different connotations and thereby bias decoding (Matsumoto & Assar, 1988; Mesquita & Frijda, 1992). Yet, as with ethnic bias, some studies show in-group advantage in settings where decoder groups sharing the same native language (Elfenbein & Ambady, 2002b).

Another account for cross-cultural differences in the recognition of emotion focuses on the impact of *decoding rules* (Buck, 1984), which—corresponding to the concept of display rules (Ekman, 1972)—are cultural rules that apply to the appropriate perception of emotions. Thus, Matsumoto (1989) argued that members of collectivistic cultural groups inhibit their ability to understand negative expressions that could threaten to damage social harmony. Yet, for decoding rules to be the cause of in-group advantage, it would be necessary that they reduce the accuracy of emotion recognition more for out-group than for in-group judgments. However, the theoretical foundation for decoding rules generally suggests the opposite—that is, because they are applied in the service of maintaining group harmony, they would be preferentially applied to the in-group. . The presence of an in-group advantage for positive emotion (Elfenbein &

Ambady, 2002b) further speaks to the difficulty of explaining the in-group advantage via decoding rules, which have been posited largely in terms of regulating negative emotion.

Given these proposed influences on cultural variation in the accuracy of recognizing emotional expressions, it is important for any test of dialect theory to be conducted in contexts that limit alternative explanations. Thus, for the present research, we test groups that are culturally dissimilar yet share the same primary language of communication, as well as have comparable age and education levels: French-speaking university students from Quebec in Canada and from Gabon in Africa. Second, we account for the possible impact of stereotype bias and decoding rules by using two sets of stimulus materials from each cultural group—one in which expressions may show cultural dialects and one in which expressions have been standardized to erase possible cultural dialects (Beaupré & Hess, in press; Matsumoto, 2002). In fact, the perceiver effects discussed above—such as greater motivation or preference for one's own ethnic group, stereotypes about the likely emotions experienced by different groups, or decoding rules—should all be equal for these two sets of expressions.

Thus, a finding of in-group advantage for the dialect expressions, but not for the standardized expressions, allows the inference that the in-group advantage resulted from cross-cultural differences in expressive style rather than other possible factors.

Dialects versus Display Rules

It has also been argued that differences in emotional expression across cultural groups may result from mechanisms other than nonverbal dialects (e.g., Matsumoto, 2002). In this context, it is pertinent to distinguish between the concepts of cultural dialects and cultural display rules, as many studies that found cross-cultural differences in the encoding or decoding of emotions have related these to the latter concept.

Ekman (1972) referred to *display rules* as "management techniques" (p. 225) allowing individuals to "decouple their expressions from their feelings." (p. 127). They are defined "as procedures learned early in life for the management of affect displays and include deintensifying, intensifying, neutralizing, and masking an affect display. These rules prescribe what to do about the display of each affect in different social settings; they vary with the social role and demographic characteristics, and should vary across cultures." (Ekman et al., 1969, p. 87). That is,

display rules interrupt the coherence between the emotional experience and the emotion that is displayed. This interruption is possible because emotional expressions are impacted not only by internal feeling states, but also by motivations, social context, and learned cultural conventions that serve to modulate emotional displays, often voluntarily but also without awareness (Fridlund, 1991; Hess, Banse, & Kappas, 1995; Kappas, 2003).

Examples of display rules include an airline flight attendant smiling at a rude passenger (Hochschild, 1983), or a bill collector showing anger to an indifferent debtor but a sympathetic display to an apologetic debtor (Rafaeli & Sutton, 1989; Sutton, 1991). Display rules thus have a social relational function that may vary across cultures. For example, Ekman (1972) argued that display rules in collectivist societies such as Japan serve to promote greater harmony and cooperation by suppressing the display of negative sentiments. This background helps to make clear that display rules and dialects—although they both represent forms of cultural influence on emotional displays—refer to orthogonal concepts. Dialects do not presuppose any divergence between internal feelings and outward displays. A dialect arises when there are cultural differences in the physical characteristics of a display, even under complete coherence between experienced and expressed emotion.

Thus, from an empirical perspective, it is important for research on cultural dialects to examine expressions produced in a setting in which participants from multiple cultural groups aim to show the same emotional display. In the case of facial expressions, we thus operationalize the presence of cultural dialects in terms of systematic differences across cultures in the facial muscles activated to pose the same intended emotions. Thus the clearest test involves purposeful expressions intentionally designed to communicate clearly an emotional state. Therefore, the present protocol asks participants to pose expressions with the goal of being well understood by friends. Posed expressions have the potential to signal the normative expressions in both groups, rather than the idiosyncratic expressive repertoire of the individual encoders. If participants from multiple cultural groups aim to show the same emotional display, but that display nonetheless shows systematic differences in its physical form across cultures, this provides evidence for the presence of nonverbal dialects. By contrast, spontaneous facial expressions, elicited by films or other means would be subjects to display rules as well as dialects.

Dialects Across Emotions

Although the discussion above does not distinguish between different emotional states, there are ample reasons to expect that emotional dialects may not impact each emotional expression equally. Emotions differ regarding the type of intention communicated between the sender and a receiver of the expression. In this way, facial emotion displays are inherently polyvalent. They do not only serve to signal emotional states, but may be used as emblems (Ekman, 1979), as interjections (Motley, 1993), and as signals to indicate that we empathize and understand another person's state (Bavelas, Black, Lemery, & Mullett, 1986). In their role as interactional signals, emotion expressions also serve to establish and maintain aspects of relationships between interaction partners. For example, facial expressions of anger also serve to communicate high dominance and low affiliation, whereas expressions of happiness communicate both high dominance and high affiliation (Hess, Blairy, & Kleck, 2000; Knutson, 1996).

For these reasons, we argue that regional dialects have a greater impact on those emotions that are used frequently to signal social intent, rather than on those that are more biologically determined—for example, strongly linked to reflexes or highly similar even across different mammalian species. For example, as Darwin noted (1872), displays of fear are very similar across mammals, hence they should not be expected to vary much across cultural groups of humans. Likewise, both disgust and surprise share the majority of their features with reflexes closely linked to the typical elicitators of these emotions, the gustofacial reflex for disgust, and the startle reflex for surprise. Again, the possible impact of cultural dialects on such expressions may be muted. By contrast, contempt is an emotion generally employed as a means of social sanction, and should therefore have more room to lend itself to variations. Anger may be an intermediate case, in that it has some features that are shared across species, especially the stare, but like contempt it also serves a strong social role.

Overview of Studies

This paper presents the results of two studies designed to directly test the propositions of dialect theory for which previous evidence has been indirectly derived. Specifically, we aim to test the second and third propositions of dialect theory: that there are subtle differences in

emotion expressions across cultures and that these subtle dialects have the potential to reduce decoding accuracy. Study 1 has the goal of demonstrating that there is broad universality in emotional expression across groups, while highlighting the presence of subtle differences as well. Study 2 tests the hypothesis that those subtle differences, in turn, lead to reduced accuracy in interpersonal judgments. Thus, the present research proposes a two-pronged approach by studying both encoding and decoding differences.

Participants were male and female university students from sub-Saharan Africa (Gabon) and North America (Quebec). These two groups are culturally dissimilar and visibly different from each other, thus providing the chance to study the phenomenon of interest in a setting that enhances the extent of possible effects. However, the two groups share the same primary language and other characteristics possibly representing confounds identified by past research on the communication of emotion. In both regions, the language of education is French, and students tend to be first generation University attendees. Thus, across groups variables that have been implicated in creating apparent decoding differences, such as gender, language, age, and education level, were comparable (Hall, 1978, 1984; Izard, 1971; Kirouac & Doré, 1985; Matsumoto & Assar, 1988; Mesquita & Frijda, 1992).

STUDY 1

The dialect theory of emotion argues that cultural differences in the expression of emotion are like dialects of a universal language. Study 1 tested the first two hypothesis derived from this theory:

Hypothesis 1: There is large overlap in the appearance of emotional expressions across cultural groups.

Hypothesis 2: There are subtle and reliable differences in the style of emotional expression across cultural groups.

Consistent with earlier arguments, a third hypothesis is that the presence of cultural differences varies across emotional states:

Hypothesis 3: Evidence for subtle and reliable differences in the style of emotional expression across cultural groups will be weaker for those emotions that are either very similar across mammals or share expressive components with a reflex related to their typical

elicitors (e.g., disgust, fear, surprise), and stronger for those emotions with a strong component of social signaling (e.g., contempt).

Method

Participants. Fifteen men and 15 women were recruited at each location (University of Quebec at Montreal, Canada and Omar Bongo University, Libreville). Participants' ages ranged from 20 to 30 years (Gabonais $M = 26.1$, $SD = 2.6$; Quebecois $M = 26.1$, $SD = 4.5$). All participants were undergraduate or graduate students at the university at which they were recruited. All were competent speakers of French who had acquired the language before the age of 6 and spoken it consistently to adulthood.

Procedure. As discussed above, with the goal of eliciting cultural norms for appropriate expressions in a social context, the protocol asked participants to provide displays intentionally designed to communicate clearly their emotional state. For this, participants were asked to pose emotional expressions such that "their friends would be able to understand easily what they feel." For each pose, participants received the emotion label as well as a dictionary definition of the emotion term. Definitions were taken from a standard French Dictionary (Petit Robert, 2004). Participants were allowed to use a mirror to test various expressions. Participants were filmed throughout the session. Once they were satisfied with their pose, they pressed a button and the experimenter provided them with the next label. Experimenters kept out of view of the participants during the posing phases and did not provide feedback or recommendations of any kind.

Using this protocol, each participant posed 10 emotional states: Anger (*Colère*) Contempt (*Mépris*), Disgust (*Dégoût*), Embarrassment (*Embarrass*), Fear (*Peur*), Happiness (*Joie*), Sadness (*Tristesse*), Serenity (*Sérénité*), Shame (*Honte*), and Surprise (*Surprise*). These consisted of the 6 states largely agreed to represent basic emotions (Anger, Disgust, Fear, Happiness, Sadness, and Surprise; e.g., Ekman, 1972, 1992), two states considered by some but not all theorists as basic emotions (Contempt and Shame; e.g., Matsumoto, 1992; Izard, 1971; Izard & Haynes, 1988; Ricci Bitti, Brighetti, Garotti, & Boggi-Cavallo, 1989; Russell, 1991), along with the sampling of two secondary emotions Embarrassment and Serenity (e.g., Keltner & Anderson, 2000; Keltner & Buswell, 1997).

Coding of emotional expressions. As described above, we operationalized the presence of cultural dialects in facial expressions in terms of systematic differences across cultures in the facial muscles activated to pose the same intended emotions. In order to measure these possible cultural differences, the apex expressions of the attempt for which participants signaled their satisfaction were coded using Ekman and Friesen's (1978) Facial Action Coding System (FACS) by a certified FACS coder. These codes allow a detailed description of the expressive features of the face. The apex expressions were then digitized and saved as still photographs. For the following analyses, Action Units that were shown by at least 5 participants were dummy coded for absence and presence for each participant. Action units related to head or eye movements were grouped together unless they reached the criterion of being shown by at least 5 individuals. Any action unit shown by fewer than 5 expressors was coded as "other." This coding procedure allowed us to operationalize the universality of emotional expression in terms of similarity in the action units in expressions produced by members of different cultural groups. Likewise, dialects were operationalized in terms of the use of systematically different action units across cultures for the desired communication of the same emotional state.

Results

Table 1 summarizes the frequency of facial action unit enervation for each emotional state for each cultural group. In Figure 1, the first column shows the AU pattern of the prototypical emotion expressions that have been used in transcultural emotion recognition studies (e.g., Ekman et al., 1987) or that have been proposed to be universal in other contexts (Keltner, 1995; Wiggers, 1982). Columns two and three show the best representative of proposed dialect expressions from the current study.

Hypothesis 1 predicted a sizeable overlap in the appearance of emotional expressions across the two cultural groups. In order to test this hypothesis, we created a composite profile separately for each cultural group for each emotion that consisted of the frequency of enervation for each FACS code. Speaking to the status of emotional expression as a universal language, the correlations between these composites for the two cultural groups were substantial, and indicated high levels of similarity: Anger (r=.91), Contempt (r=.72), Disgust (r=.95),

Embarrassment (*r*=.77), Fear (*r*=.97), Happiness (*r*=.87), Sadness *r*=.66), Serenity (*r*=.35), Shame (*r*=.70), and Surprise (*r*=.98), for a substantial average similarity level of *r*=.87.

The second hypothesis was that the universal language of emotion contains subtle and reliable dialects in the form of differences in the appearance of facial expressions across cultural groups. In order to test this hypothesis, we performed discriminant analyses on the facial action codes of the emotional expressions. Such an analysis is akin to a logistic regression performed once for each emotion, in which the participant is the unit of analysis, the series of facial action units—present versus absent—serve as predictor variables and the cultural group is the dependent variable. The goal of the analysis is to determine which, if any, elements of emotional expression are more often associated with one rather than the other cultural group. If it is possible to classify encoders based on the absence and presence of specific expressive elements in their poses, then this would speak towards the existence of a commonly held regional variation in the expression. In support of this proposition, Table 2 summarizes the results of the discriminant analyses for each emotion. As goodness-of-fit statistics, smaller values of Wilk's Lambda and larger values of Chi^2 represent better discrimination between the two cultural groups on the basis of their facial expressions. Table 2 also includes the total percent correct classified and the percent correct classified for each encoder group for all significant analyses. Quebecois and Gabonese encoders can be reliably distinguished on the basis of their pattern of expressions for some emotions.

The third hypothesis was that evidence for emotional dialects would vary across the emotional states tested, in particular greater for those emotions that are either very similar across mammals or share expressive components with a reflex related to their typical elicitors (e.g., disgust, fear, surprise), and weaker for those emotions with a strong component of social sanction (e.g., contempt). In support of Hypothesis 3, the best classification results were obtained for serenity (93%) followed in decreasing order by contempt (86.7%), sadness (81.7%), happiness and shame (76.7%), anger (71.7%) and finally surprise (66.7%). No significant discriminant functions emerged for disgust, embarrassment, or fear. The clearest evidence for cultural dialects was found for serenity, sadness and contempt expressions for which at least one group was classified

above 90% correct. For surprise, Quebecois encoders were classified at chance level. Below we describe the results for each emotion in more detail.

Serenity. Serenity expressions shown by Quebecois encoders were characterized by a slight smile, whereas the modal Gabonese expression was a neutral, relaxed face.

Contempt. The prototypical contempt expression has been described as a unilateral lip curl (AU14). In fact none of the encoders in the sample showed that expression. The most common combination for Gabonese encoders was AU10 combined with either AU15 or AU17 or both (47%). The most common expressive element for Quebecois encoders was AU4 (67%), which occurred in combination with a variety of other Action Units.

Sadness. For sadness the prototype expression (AU1+AU4+AU15) was shown by 17% of the Quebecois encoders but only 3% of the Gabonese encoders. The two expressive elements that distinguish the two groups were the presence of head movements other than head down and presence of AU4. It is possible to conclude that a Gabonese dialect involving head movements other than head down exists for sadness (67%), whereas Quebecois encoders tend to show an eyebrow frown with or without AU1 (67%).

Happiness. The most surprising entry is for happiness. Given that happiness expressions are transculturally recognized at rates above 90% (Ekman et al., 1987) we did not expect to find a dialect for this expression. Further, an extensive literature suggests that 'felt' happiness is characterized by a smile (AU12) combined with wrinkles around the eye (AU6). This was the expected prototype expression and this expression was shown by 57% of the Quebecois encoders. However, only 37% of the Gabonese encoders showed this pattern, but 90% of the Gabonese encoders showed an open mouthed smile.

Shame. Shame dialects were less well distinguishable but still showed significant discriminant functions and above chance classification for both groups. The two groups could be distinguished by the presence of idiosyncratic action units and the differential use of head movements. In fact, 60% of the Quebecois, but only 20% of the Gabonese encoders showed an idiosyncratic expressive element. Further, Gabonese encoders showed more often head and gaze down as well as other head movements. None of the other AUs, with the exception of AU4 was shown by more than 1/3 of the encoders of either group. Hence while it is possible to discern a

Gabonese dialect characterized by different signs of appeasement, Quebecois expressions were characterized by the greater presence of idiosyncratic movements, often combined with AU4. Yet, no single specific pattern emerged as modal for either group.

Anger. Anger dialects were also less well distinguishable but still showed significant discriminant functions and above-chance classification for both groups. It is noteworthy that 90% of all participants showed AU4 (eyebrow frown), which has been identified as a facial sign of goal obstruction (e.g., Darwin, 1872/1965; Pope & Smith, 1994), which is a central aspect of anger appraisals (Scherer, 1999). Thus, this component generalizes across groups. The two other AUs for the prototype expression, AU5 and AU23 were considerably less frequent. The most common combination for Gabonese encoders was AU4+AU5 usually in combination with one or more idiosyncratic AUs (53%). The most common combination for Quebecois encoders was AU4 with either AU5 or AU7 in combination with either AU23 or AU24 (27%).

We had predicted that emotion expressions that are either very similar across mammals or that share expressive components with a reflex related to their typical elicitors would be less likely to show dialects. This was predicted for fear, as fear expressions tend to be rather similar across mammals, as noted by Darwin (1872), as well as disgust (gusto-facial reflex) and surprise (startle reflex). This was indeed the case. Although a significant discriminant expression emerged for surprise, Quebecois encoders were classified only at chance level.

Fear. The most common fear expression was actually the prototype for surprise (AU1+2+5 with mouth open) and was shown by 43% of encoders from both groups.

Surprise. For surprise poses, 50% of the Quebecois and 60% of the Gabonese encoders showed the prototypical expression.

Disgust. 30% of the Quebecois and 27% of the Gabonese encoders showed the disgust prototype, but a combination with AU10 was also quite common (Q: 23%; G: 10%).

Embarrassment. Given the social functions of embarrassment displays it is noteworthy that no significant discriminant function emerged for this emotion. This may be due to the fact that for this expression, even more than for the shame expressions described above, a variety of highly idiosyncratic patterns emerged. However, it is noteworthy that one element proposed by Wiggers (1989) for shame and by Keltner (1995) for embarrassment, the lip bite (AU32, Q: 10%, G:

23%), was found with some frequency for both embarrassment and shame but no other emotion. Even so, this AU appeared relatively rarely and, when shown, was contained within a variety of patterns.

Discussion

Study 1 provided evidence in support of two of the main propositions of a new dialect theory of emotion. As in previous studies of spontaneous expressions across cultures (Camras et al., 1997; Ekman, 1972), we found great convergence for a series of emotional expressions posed to be consistent with a specific social context, supporting the observation that emotion expressions are generally universal.

Further, the study provided direct empirical support for the second proposition of dialect theory, which had so far been supported only by evidence derived indirectly from emotion recognition studies (e.g., Elfenbein and Ambady, 2002). As expected, the extent of these regional variations differed across the ten emotional states tested. We expected differences to be the strongest for emotions that have the most pronounced social signal functions such as contempt which is used as a means of social sanction, and least strong for those emotional expressions that have a strong reflex component (disgust) or which are highly similar across mammals (fear). In support of this notion, we found clear evidence for well specifiable dialects for serenity, sadness and contempt, as well as, somewhat surprisingly for happiness. A possible variation for anger and shame was also found, although for shame idiosyncratic variations were most common. In contrast, for fear, disgust, surprise, and embarrassment expressive patterns did not vary systematically between groups. For disgust, the prototype previously identified as universal (Ekman & Friesen, 1978) was the modal expression. For fear and surprise, the surprise prototype was found to be the modal expression for both states. This is consistent with the frequently noted high rate of confusion between these two emotions in rating studies, suggesting that individuals do not have a clear notion of the expressive difference between these emotions. For displays of embarrassment, participants chose a variety of idiosyncratic expressions.

Some surprising results also emerged, such as the high percentage of idiosyncratic AUs in expressions of Shame and Embarrassment. Another interesting case was posed by happiness. Gabonese encoders used markedly less often AU6, the so-called Duchenne marker of the 'felt'

smile (e.g., Frank & Ekman, 1993; Frank, Ekman, & Friesen, 1993). It has been suggested that AU6 is difficult to pose (e.g., Ekman & Friesen, 1982) — hence it is possible that this action unit is part of the repertoire but could not be expressed. However, this does not seem like a plausible explanation for the current finding given the large number of Quebecois who were able to do so. Further, in a recent study of emotion judgments, Thibault and Hess (2004) found that decoders from the same sub-Saharan region, in contrast to Quebecois decoders, did not use AU6 as a maker for the authenticity of smiles. Thus it seems possible that an open mouthed smile without Duchenne marker is a viable cultural variant for this region.

In sum, the findings from Study 1 support the notion that, although there appears to be broad universality in the normatively posed emotional expressions of the two groups we examined, culturally specific forms of expression exist for some emotions. This was particularly the case for those states, like sadness, happiness, and contempt, which social species like humans use for the regulation of social interactions by signaling social intent or as means of social sanction. Such a social function may vary systematically across regions. In contrast, for disgust and surprise, for which emotional expressions contain elements of associated biological reflexes, the modal expression was consistent across the two cultural groups.

STUDY 2

Study 1 provided evidence for the presence of cultural differences in the appearance of emotional expressions, yet not all such differences are necessarily nonverbal dialects. This is because dialects, by their definition, affect the accuracy of cross-cultural emotion judgments. Study 2 was designed to test this issue—the third proposition of dialect theory of emotion—by mapping differences in recognition onto differences in the expression of emotion. Dialect theory predicts that individuals understand more clearly emotions expressed in a culturally familiar style, resulting in a general cultural in-group advantage when dialects are present. However, differences in expressions do not necessarily have to translate into differences in recognition. That is, different variants of emotional expressions may be equally well recognized across groups, if they do not produce likely confusions with other plausible emotional states. Thus, it is important to examine the recognition impact of the cultural differences in expressions found in Study 1 before considering them to be emotional dialects.

As mentioned above, a number of alternative explanations have been proposed to account for the observed in-group advantage, such as motivational factors and decoding rules. Yet, these factors should also affect equally non-dialect expressions shown by members of different ethnic groups. Hence, in addition to recruiting participants who were similar in terms of demographic background characteristics other than their cultural group, we also included a series of identical prototype emotional expressions from both groups. Thus, finding an in-group advantage for the culturally normative expressions collected in Study 1—but not for the standardized expressions—allows the inference that the in-group advantage resulted from cross-cultural differences in expressive style rather than other factors.

Further, the emotions included in Study 1 varied in the extent to which they demonstrated cultural differences. Thus, an in-group advantage for those emotional states for which strong differences emerged in Study 1—but not for the emotional states with weak evidence for differences—would lend support to the inference that the in-group advantage resulted from cross-cultural differences in expressive style. Thus, the hypothesis of Study 2 is:

Hypothesis: There will an in-group advantage for those expressions containing systematic cultural differences in their appearance.

Specifically, an in-group advantage should be present for the culturally normative expressions with the strongest evidence of regional differences in Study 1. However, there should be no evidence for an in-group advantage either for culturally normative expressions that lack evidence of regional differences in Study 1, or for the standardized prototype expressions. Thus, the goal of Study 2 was assess whether the differences in encoding style found between Gabonese and Quebecois posers translate into reliable differences in decoding accuracy.

Method

Participants. Twenty men and twenty women each were recruited at the University of Quebec at Montreal and at and Omar Bongo University, Libreville. Participants' age ranged from 20 to 30 years. All participants were undergraduate or graduate students at the university at which they were recruited, all were competent speakers of French who had acquired the language before the age of 6 and spoken it consistently to adulthood. None had taken part in Study 1.

Stimulus materials. A total of 648 black and white photographs of facial expressions served as the stimulus materials. *Culturally Normative Stimuli* consisted of expressions collected in Study 1. Digitizing and saving still photographs from the apex expression for each of the encoders resulted in 60 (number of encoders) x 10 (number of emotions) expressions. *Standardized Facial Expressions* consisted of expressions from the Montreal Set of Facial Displays of Emotion (MSFDE, Beaupré & Hess, in press) and included the emotional states of anger, sadness, fear, disgust, happiness and shame/embarrassment for male and female posers from Quebec and Sub-Saharan Africa (6 emotions x 2 genders x 4 posers = 48 photographs). The MSFDE was created by instructing participants via a directed facial action task to contract specific muscles so as to create a specific expressive pattern based on prototypes proposed by Ekman and Friesen (1978) and Wiggers (1982). Thus the appearance of the facial expressions in these photographs is standardized across groups. To prevent fatigue due to the large number of stimuli, each decoder viewed only half of the set of expressions.

Procedure. Participants individually viewed the photographs on a computer screen. Participants were instructed to look at each photo and to press a key corresponding to their judgment of the emotion shown by the encoder. A grid was placed over the keyboard to indicate key placements for the 10 emotion labels (happiness, serenity, fear, disgust, contempt, anger, surprise, sadness, shame, and embarrassment). Each photograph remained on the screen until the participant entered a response.

Scoring. Responses were scored as correct if the response matched the intended emotional state and incorrect otherwise.

Results

The goal of Study 2 was to assess whether the group differences in emotional expression style observed in the culturally normative expressions collected in Study 1 translate into cross-group differences in decoding accuracy. Specifically, the notion of nonverbal dialects argues that decoders are more accurate when they decode expressions from their in-group, rather than expressions encoded by members of an out-group, due to varying levels of familiarity with culturally specific styles of emotional expression.

We predicted that an in-group advantage should be present for the culturally normative expressions for which the strongest evidence of regional differences was found in Study 1. Table 3 presents the results for the 2 (expressor group) x 2 (perceiver group) Analysis of Variance (ANOVA) conducted on the culturally normative and the standardized emotion expressions. Table 4 shows the means and standard variations for decoding accuracy as a function of emotion expression, encoder group and decoder group. In-group advantage is defined as the extent to which emotion judgments are generally more accurate when the perceiver is a member of the same cultural group in which the expressions originated. The appropriate test for this effect is the encoder by decoder group interaction term. It is important to remember that cell means represent the cumulative impact of both the interaction and the two main effects and for this reason the absolute means can sometimes be misleading. For example, it is possible that some groups are more accurate overall and hence may always have higher accuracy than members of another group. Nonetheless, in such a context it may still be possible to observe a relative in-group advantage that emerges once the (statistically independent) main effects are removed. Thus, it may be worth making a distinction between an *absolute in-group advantage*, in which same-group accuracy levels are in all cases higher than different-group accuracy levels, versus a *relative in-group advantage,* where one group of expressions or perceivers are more accurate overall, but there is still significantly greater accuracy when judging expressions originating from the same cultural group. An absolute in-group advantage can be observed directly in the mean accuracy levels, whereas a relative in-group advantage can be observed in the interaction residuals after the subtraction of main effects (Rosenthal & Rosnow, 1991).

As predicted, for culturally normative expressions the expressor x perceiver interaction was significant — and in the direction indicating relatively greater accuracy for expressions originating from the in-group — for the emotional states (anger, contempt, sadness, and serenity) for which significant discriminant functions had emerged in Study 1. For the two expressions yielding the clearest evidence of group differences, contempt and serenity, the in-group advantage was absolute, so that a match of encoder/decoder group resulted in the highest absolute level of accuracy. Table 5 presents a confusion matrix plotting correct answer categories in one dimension and participant judgments in the other dimension. Overall, the same types of

confusions were found for both in-group and out-group judgments, only more so for out-group judgments. That is, the in-group advantage is essentially a case of reduction of noise.

There were also significant discriminant functions for shame and surprise, for which there were merely a trend of an in-group advantage that did not reach statistical significance. There were no significant discriminant functions in Study 1 for embarrassment or fear, and likewise there was no in-group advantage for these expressions in Study 2, supporting the notion that they do not have strong regional dialects.

Overall, there were two exceptions to the consistency of results between the two studies—for which those, and only those, expressions suggesting strong group differences in Study 1 also suggested in-group advantage in Study 2. First, disgust had no significant discriminant function, yet showed a relative in-group advantage in Study 2. Second, for happiness expressions Study 1 found group differences in appearance yet these expressions were equally recognizable across groups in Study 2. Thus, the two forms of happiness expressions can be considered variants that do not entrain decoding differences.

We also predicted that there should be no evidence of in-group advantage for the standardized expressions, which do not contain any regional differences in appearance. Hence these expressions can serve as s control condition to assess the influence of decoder biases due to stereotypes or decoding rules, as these should impact on all expressions including these prototypes. The absence of an in-group advantage for the standardized stimuli would support the notion that the findings for the culturally normative expressions were not due to decoder bias, but rather to the differences in encoding that were observed in Study 1. Overall, Quebecois participants were more accurate (M = .70, SD = .14) than were Gabonese decoders (M = .51, SD = .19, $t(78) = 4.97$, $p < .001$). This observation that North American decoders have been found to be more accurate in such tasks matches previous findings in the cross-cultural emotion recognition literature (e.g., Beaupré & Hess, in press; Biehl et al., 1997). Further, expressions by Gabonese encoders were slightly better recognized (M = .62, SD = .21) than were expressions by Quebecois encoders (M = .59, SD = .20, $t(79) = 2.55$, $p = .13$). Consistent with our predictions, the ANOVA models presented in Table 3 for the standardized expressions reveal no evidence for in-group advantage. The one interaction term that reached marginal significance was disgust. However,

for this emotion an out-group advantage was found, such that Quebecois participants were significantly better at decoding disgust expressions posed by sub-Saharan Africans (M = .71, SD = .26) than by members of their in-group (M = .52, SD = .32, $t(39) = 4.21$, $p < .001$), whereas Gabonese decoders' accuracy did not vary across groups. Thus, the in-group advantage found for culturally normative expressions does not appear to result from decoder biases.

Discussion

The goal of Study 2 was to demonstrate empirically that the cultural differences in facial expressions identified in Study 1 were, in fact, nonverbal dialects—that is, regional differences in the appearance of emotional expressions that can be recognized more easily and accurately by individuals with greater cultural familiarity.

In the current study, we examined the decoding of expressions that both did and did not contain clearly measurable cultural differences. In the case of the culturally normative emotional expressions collected in the first study, we found in general that the clearer the evidence for cultural differences in expression in Study 1, the clearer the evidence for an in-group advantage in decoding in Study 2. For those emotions where dialect patterns were either absent or less clearly defined, no in-group advantage was found, supporting the conclusion from Study 1 that no regional dialects exist for these emotions.

Two exceptions from this trend of coherence in the results between the two studies emerged for happiness and disgust. In the case of happiness, the two cultural variants were recognized equally well across groups. We argue that, in terms of dialect theory, happiness was not part of a minimal pair or even near-minimal pair. Without a plausible distracter, differences in expressions do not necessarily translate into differences in recognition. Conceptually, this means that such a variant should not be considered a nonverbal dialect, as the potential for incorrect decoding is central to our notion of nonverbal dialects. By contrast, the variant of happiness may be better considered a *nonverbal accent* (Marsh, Elfenbein, & Ambady, 2003), in which a difference in the appearance of emotional expressions across cultural groups may be visible but does not necessarily interrupt accurate recognition.

For disgust, an in-group advantage in recognition emerged and yet there was no identified difference in the appearance of expressions. Further, for the standardized disgust

expressions of the MSFDE an out-group advantage for Quebecois decoders emerged. Specifically, Quebecois decoders tended to rate disgust expressions posed by members of their own group as contempt (23%) or anger (23%). This tendency to mislabel the facial expression of disgust as contempt or anger in a categorical recognition study has been previously observed by Matsumoto and Ekman (2004) for United States decoders and by Thibault, Michaud, Chaiken, Hess, & Matsumoto, (2005) for Quebecois decoders. Matsumoto and Ekman (2004) attributed this effect to a linguistic confusion. However, the observation that this tendency extends to individuals from a French speaking North American community as well as the present observation that this tendency is much reduced when labeling faces from a cultural out-group, suggests instead the presence of a cultural decoding norm. Given that the disgust prototype was the modal expression shown by the encoders in Study 1, the main difference between the two stimulus sets is that the disgust expressions from Study 1—for which a relative in-group advantage emerged—are less intense than the standardized prototype expressions—for which an out-group advantage was found. We speculate that strong expressions of disgust may create greater confusion or may invoke decoding rules that do not apply to weak expressions. Specifically, showing strong disgust in the North American culture may be socially sanctioned unless used as a substitute for anger or contempt. Hence these strong expressions of disgust are mislabeled, whereas weaker expressions are not.

The finding that no in-group advantage emerge for expressions standardized to erase cultural differences supports the argument that in-group advantage in decoding results from cultural differences in expressive style. These results for standardized expressions also argue against possible alternate explanations for the findings with culturally normative expressions, in that any decoder biases should equally impact decoders' judgments of both standardized and normative expressions. This suggests that the in-group advantage observed for culturally normative expressions is unlikely to result from decoder biases alone.

General discussion

The present research aimed to test the hypotheses that facial expressions of emotions show subtle regional variants, similar to dialects in language, and that the presence of these variations leads to greater cross-cultural misunderstanding of emotional expressions. Taken

together, the two studies reported here support these predictions and thereby provide direct support for all three propositions of the dialect theory of emotion.

Specifically, in keeping with the body of evidence on the universality of emotion, the first proposition of dialect theory -- that expressions show considerable similarities across cultures—was also supported. Any dialectic regional variants are overlaid onto the universal language of emotion. Likewise, the Study 2 documented that both groups recognized all expressions with accuracy rates greater than that expected by chance alone, supporting the long-standing notion that emotional facial expressions are cross-culturally recognized.

Further, in line with the second proposition of dialect theory, we predicted and found that regional variants were especially likely for emotions that are frequently used to signal social intent such as contempt, and least likely for emotion expressions with strong reflex components such as disgust and surprise or which are very similar in appearance across mammals such as fear. Finally, it is central to the idea of nonverbal dialects is that they create a potential for decoding errors for those who are less culturally familiar with these regional differences in style. Study 2 provided the first direct empirical support for this third proposition of dialect theory. Thus in Study 2, perceivers were relatively more accurate in judging expressions originating for their own cultural group for those expressions in which regional differences had been identified in the first study. However, in general there was no such in-group advantage for those expressions for which no regional variations had emerged.

Specifically, clear evidence for a regional dialect was found in both the encoding and the decoding study for contempt and serenity. The existence of dialect patterns for anger, and sadness was also supported, albeit to a lesser extent. Finally, for fear and surprise clear evidence for the absence of a dialect pattern was found. Embarrassment and shame both seemed to be more characterized by a large variety of idiosyncratic variants that, however, tended to be recognized at levels comparable to other emotions. For happiness regional variants were found which, however, were equally well recognized. For disgust a somewhat confusing pattern emerged, which hints at the existence of decoder biases for North American decoders varying as a function of the intensity of the expression.

In sum, the present research adds to our understanding of the source of the cultural differences that can modulate emotion recognition rates across groups. Recognizing the presence of regional variations in expressive behavior is an important step for further work in the field.

Expanding the dialect argument helps to distinguish its impact on cross-cultural differences in expression and recognition from the related concepts of display and decoding rules. Display rules presuppose a decoupling of outward expressions from true feelings, just as decoding rules are the result of decoupling actual perceptions of emotional displays from the perceptions that an individual acknowledges. The tendency to enact such rules may vary across cultures. By contrast, the expression and recognition of dialects is likely independent of the convergence of inward feeling and outward expression. In-group advantage results from familiarity with cultural differences in the norms for the appearance of expressions, not from management techniques that are also part of the process of communicating emotion. In the present research, the possible impact of display rules was muted in the expression study through the use of a protocol instructing participants to display emotional expressions that should be clear and comprehensible to close friends. The possible impact of decoding rules was controlled in the recognition study through the use of additional stimuli containing expressions that had been standardized across encoder groups using a directed facial action task. Because any decoding biases should be present equally for the both types of expressions, and no evidence of in-group advantage emerged for the standardized expressions, this argues against the possible role of decoding biases in producing the current findings.

Limitations and Future work

The current studies have important limitations that should be addressed by future work. Two cultural groups, the Quebecois and the Gabonese, were sampled deliberately due to their match on key attributes such as language and education level, together with strong cultural distinctiveness and relatively little cross-group contact. Future work should sample more widely among cultural groups. Facial expressions were a worthwhile starting point due to the ready accessibility of Ekman and Friesen's (1978) Facial Action Coding System to measure and describe cultural differences in emotions. Future work should investigate nonverbal channels of communication other than the face, such as vocal tone and body movement.

We used posed expressions in the current study in order to allow a protocol that elicited culturally normative expressions without interference from display rules. Thus, the current study examined *signals* that participants wanted to send in order to accomplish the communication of an internal state. These may be different from displays that are a *symptom* of actual experience of that state. Both of these are messages (Hess et al., 1995), but they may differ subtly. In light of research suggesting that facial expressions associated with a concurrent feeling state enervate different neural pathways than voluntarily posed facial expressions (e.g., Rinn, 1984), future work should also include spontaneous elicitation methods. In doing so, however, care would have to be taken to reduce the impact of display rules. Yet, because social influences may be overlearned, spontaneous expressions may not be all that different from posed expressions (Hess et al., 1995). Thus, the future inclusion of spontaneous expressions would be a complement rather than replacement of the current research.

Further work should also provide more and increasingly stricter evidence that in-group advantage results from greater familiarity with the culturally specific elements of emotional expressions. In research to date, including the current work, there has been a confound in the sense that actual in-group members always happened to be the posers for expressions that use the in-group's expressive style. Future work should separate out these two factors. For example, one could use a directed facial action task in which Gabonese and Quebecois expressors attempt to produce both culturally congruent poses as well as culturally incongruent poses consisting of the expressions found to be characteristic of the cultural out-group. Using a 2 (cultural group of expressor) x 2 (cultural group of expressive style) x 2 (cultural group of perceiver) design, true in-group advantage due to cultural familiarity would be characterized by the cultural group of expressive style x perceiver interaction. By contrast, in such a design the cultural group of expressor x perceiver interaction would indicate ethnic bias (see also Matsumoto, 2005). Other work might use computerized animation to simulate the effect of having a third cultural group produce both Gabonese and Quebecois normative expressions, and would observe whether Gabonese and Quebecois perceivers better recognize those expressions originating from their own cultural group (see also Elfenbein, 2005). Such designs would provide yet better indication

that familiarity with culturally acquired elements of expressive style—rather than in-group favoritism—accounts for the empirical results.

Cultural dialects and cultural learning

At a basic level, the presence of nonverbal dialects is a barrier to effective communication across cultural groups. Across domains from family life to friendship to working productively, there are times that one wants to send clear signals and times one wants to read clearly the signals sent by others. Although the current stream of research indicates that this can be harder to do when interacting with members of a cultural out-group, it also provides guidance for overcoming such a limitation. If in-group advantage results indeed from greater familiarity with the culturally specific elements of nonverbal expression, then it should be possible to design training and intervention programs that promote greater familiarity with these elements—and thus eliminate the in-group advantage. Such speculation is consistent with evidence that in-group advantage is lower across cultural groups that enjoy greater physical proximity or cross-group communication (Elfenbein & Ambady, 2002b), and lower for individuals who live in another country to attend university (Elfenbein & Ambady, 2003). By contrast, if in-group advantage resulted from motivation or bias, rather than knowledge and information, then the phenomenon would be harder to correct. Thus, the current findings suggest optimism for the effective functioning of a global and multicultural society.

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Table 1. *Facial Action Units Appearing in Posed Culturally Normative Expressions of Emotion from Participants in Gabon and Quebec*

	Anger		Contempt		Happiness		Sadness		Serenity		Shame		Fear		Disgust		Embarrassment		Surprise	
	Q	G	Q	G	Q	G	Q	G	Q	G	Q	G	Q	G	Q	G	Q	G	Q	G
AU 1 (Inner Brow Raiser)	.03	.20[a]	.30[a]	.07			.30	.13			.30[a]	.07	.63	.67	.23	.07	.37	.27		
AU 2 (Outer Brow Raiser)			.13	.07	.03	.13[c]							.60	.60			.33	.23	.83	.90[c]
AU 4 (Brow Lowerer)	.90	.90	.67[a]	.30			.67[a]	.33			.43[a]	.17	.37	.33	.70	.77	.33	.27		
AU 5 (Upper Lid Raiser)	.47	.60	.13	.07									.87	.83	.07	.17	.20	.13	.83	.80
AU 6 (Cheek Raiser)					.57	.37									.30	.23				
AU 7 (Lid Tightener)	.40	.23	.33[a]	.10			.30	.17	.10	.03					.30	.23	.30[a]	.10[d]		
AU 9 (Nose wrinkler)			.07	.13											.47	.50				
AU 10 (Upper Lid Raiser)	.07	.10[b]	.40	.70[a]											.40	.40	.10	.03		
AU 12 (Lip Corner Puller)			.10	.13	1.0	1.0			.93[a]	.17	.07	.13			.23	.20	.33	.23	.87[a]	.63
AU 14 (Dimpler)											.13	.17					.13	.20		
AU 15 (Lip Corner Depressor)			.10	.30[a]			.40[a]	.17							.10	.23				
AU 16 (Lower Lip Depressor)	.17[a]	.00																		
AU 17 (Chin Raiser)	.20	.20	.50	.60			.30	.20			.23	.13			.33	.50	.27	.17		
AU 18 Lip Puckerer)	.10	.30[a]											.07	.07						
AU 20 (Lip Stretcher)																				
AU 22 (Lip Funneler)																				
AU (23 Lip Tightener)	.17	.03																		
AU 24 (Lip Pressor)	.17	.03																		
AU 25/26/27 (mouth open)					.67	.90[a]							.80	.60	.57	.40	.20	.17	.73	.90
AU 32 (Lip bite)											13	14					.10	.23		
AU 41-46 (Eye lid movements)			.17	.03					.23[a]	.00					.13	.03	.03	.03		
AU 51-58 (Head positions)			.27	.40			.07	.67[a]	.13	.17	.20	.50[a]	.03	.20[a]	.13	.33	.33	.37		
AU 53 (Head up)									.27	.17										
AU 54 (Head down)							.17	.23			.33	.63[a]							.13	.17
AU 55 (Head tilt left)									.13	.03										
AU 61-64 (gaze directions)											.07	.17	.00	.13[a]			.17	.03		
AU 64 (Eyes down)							.17	.13			.20	.30					.10	.10		
Neutral face									.00	.47[a]										
IndividualaUs shown less than 5 times across groups	.43	.43	.43	.40	.20	.27	.33	.23	.17	.20	.60	.20	.30	.20	.40	.27	.47	.37	.40[a]	.07
Protoytype	.10	.03	.00	.00	.57	.37	.17	.03			.00	.00	.13	.03	.30	.27	.00	.03	.50	.60

NB: a: $p < .05$; b: Combination AU9/10; c: Combination AU1+2; Combination AU6/7

AU indicates action unit, G indicates posers from Gabon, Q indicates posers from Quebec

Table 2

Results of discriminant analyses of culturally normative facial expressions of emotion

Emotion	*Wilk's lambda*	*Chi²*	*p*	*Canonical Correlation*	*Overall % correct classified*	*Quebecois % correct classified*	*Gabonese % correct classified*
Anger	.63	23.72	.022	.61	71.7	66.7	76.7
Contempt	.56	30.37	.004	.67	86.7	90.0	83.3
Disgust	.75	14.90	.385	.50	-	-	-
Embar-rassment	.74	14.72	.615	.51	-	-	-
Fear	.83	10.00	.441	.42	-	-	-
Happiness	.76	15.29	.004	.49	76.7	83.3	70.0
Sadness	.52	35.05	.001	.69	81.7	93.3	70.0
Serenity	.29	66.76	.001	.84	93.3	100.0	86.7
Shame	.61	26.11	.004	.60	86.7	66.7	76.7
Surprise	.79	13.00	.043	.46	66.7	50.0	83.3

Notes: As goodness-of-fit statistics, smaller values of Wilk's Lambda and larger values of Chi^2 represent better discrimination between the two cultural groups on the basis of their facial expressions. Percent correct classification not listed for non-significant discriminant analyses

Table 3

Analysis of Variance of ratings of facial expressions of emotions

	Expressor effect		*Perceiver effect*		*Expressor x Perceiver Interaction*		
Emotion	F(1,78)	p	F(1,78)	p	F(1,78)	p	r
Culturally Normative Expressions							
Anger	54.61	.001	0.06	.81	19.74	.001	.45
Contempt	7.92	.006	0.08	.78	36.99	.001	.57
Disgust	6.75	.011	17.76	.001	36.35	.001	.56
Embarrassment	0.03	.873	1.95	.166	0.02	.897	-.02
Fear	39.7	.001	0.79	.377	0.23	.630	.05
Happiness	2.7	.104	5.27	.024	0.1	.750	-.04
Sadness	4.09	.047	2.24	.139	4.75	.032	.24
Serenity	1.44	.234	1.27	.264	10.25	.002	.34
Shame	6.3	.014	0.27	.606	1.48	.228	.14
Surprise	0.42	.517	3.93	.051	3.68	.059	.21
Standardized Expressions							
Anger	7.67	.007	1.85	.178	1.28	.261	.13
Disgust	13.01	.001	27.74	.001	3.93	.051	-.22
Fear	2.68	.106	7.25	.009	1.28	.261	-.13
Happiness	9.04	.004	2.37	.128	1.59	.212	.14
Sadness	9.20	.003	26.76	.001	.09	.767	-.03
Shame	1.98	.163	5.01	.028	.32	.574	.06

Note: Poses of Contempt, Embarrassment, Serenity, and Surprise were not available in the MSFDE set of standardized expressions

Table 4

Means and standard deviations for judgment accuracy with culturally normative expressions as a function of intended emotion, encoder group and decoder group.

Encoder	*Quebecois*				*Gabonese*			
Decoder	*Quebecois*		*Gabonese*		*Quebecois*		*Gabonese*	
Emotion	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Anger	.47	.19	.26	.16	.38	.22	.33	.26
Contempt	.37	.17	.29	.17	.22	.14	.42	.22
Disgust	.54	.17	.29	.18	.40	.17	.35	.19
Embarrassment	.31	.17	.27	.18	.31	.16	.26	.16
Fear	.33	.20	.30	.17	.19	.17	.18	.15
Happiness	.80	.18	.69	.27	.78	.17	.65	.33
Sadness	.39	.18	.28	.18	.38	.18	.38	.21
Serenity	.55	.17	.50	.27	.42	.20	.53	.27
Shame	.27	.11	.21	.13	.27	.15	.25	.17
Surprise	.56	.13	.54	.15	.45	.23	.50	.23

Table 5

Emotion Recognition Matrix for Culturally Normative Expressions

Expressed Emotions	*Perceived Emotions*											
	Anger	*Contempt*	*Disgust*	*Embarrassment*	*Fear*	*Happiness*	*Sadness*	*Serenity*	*Shame*	*Surprise*	*Missing*	*Total*
Quebecois expressions												
Quebecois judges												
Anger	**47%**	20%	6%	9%	4%	0%	6%	2%	3%	3%	1%	100%
Contempt	14%	**37%**	14%	12%	1%	1%	10%	6%	3%	2%	1%	100%
Disgust	6%	15%	**54%**	7%	4%	0%	8%	1%	4%	1%	1%	100%
Embarrassment	5%	11%	8%	**31%**	5%	9%	3%	5%	11%	12%	1%	100%
Fear	2%	3%	6%	11%	**27%**	2%	1%	2%	2%	46%	1%	100%
Happiness	0%	0%	0%	2%	10%	**70%**	2%	10%	1%	4%	1%	100%
Sadness	5%	13%	5%	12%	2%	2%	**37%**	7%	17%	1%	1%	100%
Serenity	1%	9%	1%	6%	0%	17%	6%	**55%**	4%	1%	1%	100%
Shame	7%	8%	8%	23%	5%	0%	14%	5%	**28%**	3%	1%	100%
Surprise	0%	1%	1%	4%	5%	30%	0%	3%	0%	**56%**	1%	100%
Gabonese judges												
Anger	**39%**	7%	7%	11%	4%	2%	8%	9%	9%	5%	4%	100%
Contempt	14%	**23%**	10%	17%	3%	1%	10%	12%	7%	3%	4%	100%
Disgust	11%	18%	**30%**	11%	9%	2%	10%	3%	7%	2%	4%	100%
Embarrassment	7%	7%	7%	**28%**	7%	8%	7%	12%	11%	7%	4%	100%
Fear	3%	2%	5%	10%	**28%**	4%	4%	4%	10%	38%	4%	100%
Happiness	1%	2%	2%	6%	13%	**59%**	2%	9%	3%	4%	5%	100%
Sadness	10%	7%	3%	10%	5%	3%	**29%**	13%	16%	3%	4%	100%
Serenity	2%	5%	2%	8%	4%	16%	12%	**43%**	8%	3%	4%	100%
Shame	9%	5%	4%	22%	4%	2%	11%	12%	**28%**	5%	4%	100%
Surprise	1%	2%	1%	5%	5%	31%	2%	5%	3%	**45%**	5%	100%
Gabonese expressions												
Quebecois judges												
Anger	**26%**	19%	4%	10%	6%	0%	16%	6%	6%	7%	1%	100%
Contempt	6%	**29%**	26%	11%	1%	3%	12%	6%	6%	1%	1%	100%
Disgust	10%	15%	**40%**	7%	4%	5%	12%	1%	3%	5%	1%	100%
Embarrassment	2%	9%	2%	**31%**	1%	5%	13%	13%	13%	11%	1%	100%
Fear	2%	5%	2%	13%	**19%**	1%	8%	6%	9%	36%	0%	100%
Happiness	0%	1%	0%	2%	0%	**78%**	1%	14%	0%	5%	1%	101%
Sadness	2%	11%	1%	15%	1%	4%	**34%**	17%	14%	1%	1%	100%
Serenity	5%	13%	2%	9%	1%	1%	12%	**48%**	4%	5%	1%	100%
Shame	2%	9%	2%	25%	1%	4%	22%	11%	**19%**	5%	0%	100%
Surprise	0%	2%	1%	6%	3%	24%	2%	6%	1%	**54%**	1%	100%

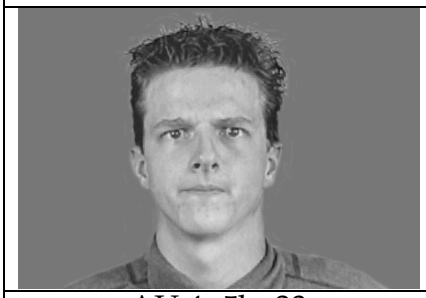
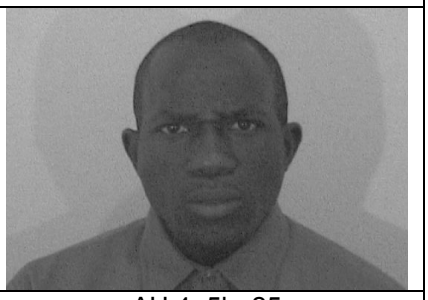
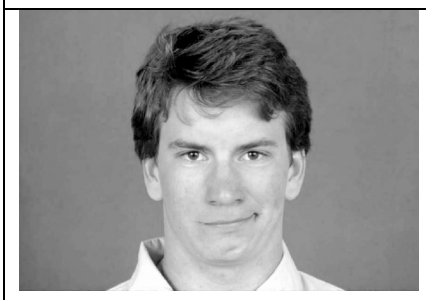
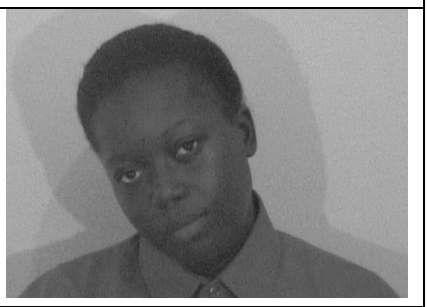
Table 5, *Continued.*

Expressed Emotions	*Perceived Emotions*											
	Anger	*Contempt*	*Disgust*	*Embarrassment*	*Fear*	*Happiness*	*Sadness*	*Serenity*	*Shame*	*Surprise*	*Missing*	*Total*
Gabonese expressions												
Gabonese judges												
Anger	**34%**	7%	4%	12%	4%	2%	12%	11%	5%	9%	5%	100%
Contempt	5%	**43%**	19%	9%	2%	2%	8%	5%	5%	2%	4%	100%
Disgust	7%	21%	**36%**	9%	6%	3%	6%	2%	4%	7%	4%	100%
Embarrassment	5%	5%	5%	**26%**	3%	8%	12%	13%	10%	11%	4%	100%
Fear	3%	2%	2%	11%	**18%**	2%	9%	9%	6%	37%	5%	100%
Happiness	1%	1%	1%	4%	2%	**69%**	2%	13%	3%	7%	5%	100%
Sadness	4%	5%	2%	12%	1%	6%	**38%**	21%	10%	1%	5%	100%
Serenity	4%	3%	1%	8%	2%	3%	15%	**53%**	6%	4%	4%	100%
Shame	3%	3%	1%	18%	3%	3%	27%	14%	**24%**	3%	5%	100%
Surprise	2%	2%	1%	5%	3%	23%	4%	7%	6%	**49%**	4%	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% due to rounding

Figure Caption

Figure 1. Illustrative examples of regional dialect variations for anger, contempt, serenity, sadness, happiness, and shame

Prototype	Quebecois	Gabonese
Anger		
		
AU 4+5b+23	AU 4+7+23	AU 4+5b+25
Contempt		
		
AU14 (unilateral)	AU 4+7	AU 10+17
Sadness		
		
AU 1+4+15b	AU 4	AU 56
Serenity		
		
None	AU 12b	Neutral face

Shame		
		
AU 32+54	Au 4+14	AU 54