Proposal for a Registered Report "Categorical Perception of Facial Expressions of Anger and Disgust Across Cultures"

Abstract

Although previous research has shown that people from Western cultures perceive emotional faces categorically, we know surprisingly little about whether categorical perception (CP) characterizes East Asians' judgments of facial expressions. Building on recent findings showing that East Asians are more likely than Westerners to see a mixture of emotions in facial expressions of anger and disgust, we investigate whether East Asians show CP for angry and disgusted faces. Specifically, participants from China and Canada will discriminate pairs of faces morphed along the continuum of anger and disgust to explore CP in both groups. If Chinese participants show no significant difference in accuracy and speed when discriminating between faces from different categories (Between-Category pairs) versus faces within a category (Within-Category pairs), then Chinese participants perceive angry and disgusted faces as varying continuously. However, if Chinese participants are better at discriminating Between-Category pairs than Within-Category pairs, then Chinese participants perceive angry and disgusted faces categorically. Further, if the difference in accuracy and speed in discriminating between Between-Category pairs and Within-Category pairs is significantly smaller for Chinese participants than for Canadian participants, then the size of the CP effect varies across cultures.

keywords: emotion; facial expressions; categorical perception; culture

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It is well established that people across all cultures can identify emotions, including anger, disgust, fear, sadness, and happiness, from facial expressions. Recognizing expressions entails mapping combinations of facial features onto specific emotion categories. To explain how this works, two accounts have been proposed (Etcoff & Magee, 1992; Fugate, 2013). One account holds that people perceive facial expressions as varying continuously along certain underlying dimensions, reflecting the incremental manifestation of different emotion-relevant features such as the activation of specific facial muscles. According to this view, membership in a particular emotion category (e.g., anger) is assigned by higher conceptual and linguistic systems, and perception is continuous rather than categorical. An alternative view is that people perceive facial expressions as belonging to discrete categories, because the perceptual mechanisms are specifically tuned to combinations of facial features that represent prototypical exemplars of emotion categories. Although evidence has accumulated showing that facial expressions of emotion are perceived categorically (Calder et al., 1996; Cong et al., 2019; De Gelder et al., 1997; Etcoff & Magee, 1992; Sauter et al., 2011; Young et al., 1997), this evidence is based primarily on studies of Western participants. To our knowledge, research has yet to examine whether Categorical Perception (CP) also characterizes judgments of facial expressions by East Asian participants. In the present study, our goal will be to investigate whether East Asians perceive facial expressions categorically and if/how this process differs from Western participants.

Categorical Perception

Categorization is considered one of the most fundamental of human cognitive abilities. The ability to sort things into groups can be innate or learned via prototypes or

exemplars that belong to that category or learned via boundaries that divide response regions (Ashby & Maddox, 2005; Medin & Schaffer, 1978; Nosofsky, 1986; Reed, 1972).

Here, we focus on CP, a phenomenon that accompanies the process of categorization in some (but not all) domains of stimuli (Harnad, 1987). CP refers to the perception of strict boundaries when there is a gradual change in a variable along a continuum (Fugate, 2013). For example, continuous changes along the visible light spectrum are parsed into discrete colors. Continuous stimuli are thus perceived as belonging to distinct categories marked by a clear delineation, at which perception shifts from one category to the other (Harnad, 1987). A defining feature of CP is that when stimuli are separated by an equal physical distance, it is easier to discriminate between two stimuli that straddle a category boundary than when stimuli do not cross this boundary. For example, given the same wavelength difference, it is easier to distinguish between two colors from different categories (e.g., green and blue) than two colors from the same category (e.g., two different shades of green). CP has been found for colors (Bornstein & Korda, 1984), speech sounds (Liberman et al., 1957), and face identities (Angeli et al., 2008; Beale & Keil, 1995; Levin & Angelone, 2002). The present research focuses on CP of facial expressions of emotions (e.g., Fugate, 2013; Sauter, 2018).

Categorical Perception of Emotional Facial Expressions

CP of emotional facial expressions means that when viewing a full continuum between two prototypical emotional facial expressions (e.g., from happiness to sadness), individuals perceive discrete emotion categories rather than a gradual continuum of emotional change. Individuals thus perceive discrete shifts in emotion category membership.

The first investigation of CP of emotional expressions was conducted by Etcoff and Magee (1992). They surmised that if expressions are perceived categorically, then within a series of facial expression stimuli differing by equal physical increments between two different expressions, the probability of participants identifying a given expression as a

particular emotion should not vary linearly across the series. Instead, perceptual judgments should change relatively abruptly at a boundary point. Specifically, pairs of faces should be discriminated more accurately when two stimuli straddle the category boundary (e.g., one predominantly angry face with some cues related to disgust and one predominantly disgusted face with some cues related to anger), compared to two stimuli that are identified as expressing the same emotion (e.g., two predominantly angry faces that both contain some cues to disgust but to different degrees).

To test their prediction, Etcoff and Magee (1992) converted prototypical photos of facial expressions into line-drawings and created a series of drawings representing equally interpolated steps between two different facial expressions posed by the same individual. These morphed faces were used in an ABX discrimination task, where participants were sequentially presented with faces A, B, and X and were asked to decide whether X was the same as A or B. Participants were more accurate in their judgments when A and B crossed a category boundary than when they were from the same category, despite A and B in both conditions being separated by an equal physical distance. These findings demonstrated that continua between emotional facial expressions were perceived categorically. Since then, the ABX discrimination task and its variants (e.g., the X-AB discrimination task, in which instead of presenting A, B, and X sequentially, A and B are presented simultaneously after X) have been used in the perception of facial expressions to study whether emotional expressions are perceived categorically or as varying continuously. Using this paradigm, Calder and others replicated and extended Efcoff and Magee's finding with photographic stimuli and a wider range of emotions (e.g., Calder et al., 1996; De Gelder et al., 1997; Young et al., 1997). Notably, researchers have found that CP of emotional facial expressions is also present in pre-verbal infants (Cong et al., 2019; Kotsoni et al., 2001; Lee et al., 2015).

Culture and Emotion Perception

The research on CP of facial expressions has largely been conducted in a Western context and only a limited number of studies have explored the impact of culture on this process. Wang et al. (2006) investigated how Chinese perceivers identified morphed emotional faces that were developed along the continua between expressions of happiness and surprise, expressions of surprise and fear, expressions of fear and sadness, expressions of sadness and disgust, expressions of disgust and anger, and expressions of anger and happiness by choosing one of the six corresponding emotion labels. They found that the frequency curves for correctly labeling each emotion across the morphed photographs showed six discrete peaks, indicating a relatively abrupt shift from one emotion to another around the boundary point of each emotion pair. This study, however, did not examine the defining feature of CP – that it is easier to discriminate between stimuli that straddle the category boundary than to discriminate between stimuli that do not cross the boundary. The results, however, do suggest that Chinese perceivers may also perceive emotional expressions categorically.

To date, only Sauter and colleagues (2011) have directly investigated CP of emotional facial expressions in a non-Western sample. In their study, CP related to anger and disgust expressions was examined among Germans and native speakers of Yucatec Maya, a language with no lexical labels that distinguish between these two emotions. The results demonstrated that both German and Yucatec participants were better in discriminating between-category pairs of faces (with one predominantly angry and one predominantly disgusted face) than within-category pairs of faces (with both showing predominantly anger or predominantly disgust). Notably, the magnitude of this effect did not differ across the language groups. These findings suggest that the perception of emotional expressions may be categorical across cultural groups, and that CP of emotional expressions is not driven by lexical labels.

A growing number of studies, however, suggest that people from different cultures vary in how well they recognize certain facial expressions (Beaupré & Hess, 2005; Jack et al., 2009; Matsumoto, 1992; Yik & Russell, 1999). Specifically, East Asians are known to make more misclassifications than Westerners in recognition tasks of facial expressions of anger, disgust, and fear. That is, East Asian perceivers more commonly misrecognize disgust as anger (and vice versa) and fear as surprise. It is noteworthy that these confusions also occur in Western perceivers, but to a lesser degree (Matsumoto, 1992). Anger and disgust (and also fear and surprise) are widely held to be distinct emotions, which are characterized by different patterns of facial, vocal, and autonomic physiological components and appraisals (Ekman & Cordaro, 2011; Jehna et al., 2011; Russell & Giner-Sorolla, 2013). However, some researchers have highlighted that these emotions are conceptually related and correspond to similar patterns of appraisals (Chapman & Anderson, 2013; Frijda et al, 1989; Smith & Ellsworth, 1985). For example, both anger and disgust are characterized by high arousal and negative valence, are other-focused, and both are considered to be morally-relevant emotions (Haidt, 2003). Disgust is also semantically close to anger (Russell & Fehr, 1994). It has even been shown that the term "disgust" is sometimes used by lay people as a synonym of "anger" (Nabi, 2002). In addition to conceptual similarities, facial expressions of anger and disgust also have perceptual (or morphological) similarities (Gagnon et al., 2010; Roy-Charland et al., 2014). For example, facial expressions of anger and disgust have in common the lowering of the inner part of the eyebrow. For anger, this change in appearance is produced by lowering the eyebrows, whereas for disgust it is produced by wrinkling the nose (Gagnon et al., 2010). By using electromyography (EMG) to measure facial muscle movements, Whitton and colleagues (2014) found that corrugator and levator activity seemed to rise and fall in tandem in response to manipulations of incidental anger and disgust. Because of these conceptual and perceptual similarities, researchers have found not only in adults (Jack et al.,

2009) but also in children (Widen & Russell, 2003, 2008) that perceivers may confuse facial expressions of disgust with anger.

As to why East Asians recognize facial expressions of anger and disgust less accurately than Western Caucasians, recent research has found that it may be because East Asians are more likely than Westerners to see a mixture of emotions when viewing these facial expressions (Fang et al., 2018, 2019). For example, when observing a facial expression of anger, Chinese participants perceive primarily anger, but also – to a greater degree than Dutch participants – disgust. Likewise, when observing a disgusted face, Chinese participants are more likely than Dutch participants to perceive both anger and disgust (Fang et al., 2018). Moreover, this pattern of results is not limited to angry and disgusted faces based on Western prototypes (prototypes defined in the FACS manual), but also includes angry and disgusted faces based on Chinese prototypes (facial expressions produced by Chinese models posing facial expressions that would be best understood by friends from their own culture; Fang et al., 2019).

Together these findings raise a number of possibilities regarding East Asians' perceptions of facial expressions of anger and disgust. In the present research, we seek to explore three competing hypotheses: East Asians do not perceive angry and disgusted faces categorically; rather, they perceive angry and disgusted faces as varying continuously along certain dimensions (H1); East Asians exhibit CP for angry and disgusted faces, but the magnitude of the CP effect is smaller than that for Westerners (H2); East Asians exhibit CP for angry and disgusted faces, and the magnitude of CP effect does not differ from that for Westerners (H3). We believe that a focus on anger and disgust is interesting and fitting in light of our goal to understand how culture shapes categorical emotion perception. That said, we acknowledge that other emotion pairs (e.g., fear-surprise) could also be investigated. Given the current project's focus on anger and disgust, any conclusions emerging from our

data may be limited to the specific case of anger versus disgust. More research would be needed to empirically establish generalizability to other emotion pairs, although we submit that such generalizability would seem plausible on theoretical grounds.

The Present Research

The present research aims to examine whether East Asians perceive facial expressions of anger and disgust categorically, and whether the size of the CP effect for East Asians is different from that for Westerners. Judgments of facial expressions on both Asian and White actors will be made by participants from China and Canada. Samples from these two countries are commonly used to investigate East-West differences (e.g., Beaupré, & Hess, 2005; Grossmann et al., 2016).

Following the standard approach in investigations of CP of emotional expressions, participants will be instructed to complete two separate tasks. In the first task, participants will discriminate between pairs of facial expressions that are morphs containing differing proportions of anger and disgust. The purpose of this discrimination task is to test the defining feature of CP by comparing the ability of participants to discriminate between faces within a category (Within-Category) and faces in different categories (Between-Category) that vary by the same physical distance. Afterwards, participants will identify emotions on these faces with a two-alternative forced identification task. The purpose of this identification task is to establish the category boundary on the morph continuum, where expressions to one side of the boundary are more likely to be perceived as anger and expressions on the other side of the boundary are more likely to be perceived as disgust.

The criterion for testing CP is whether better discrimination occurs for Between-Category pairs than Within-Category pairs. Better discrimination can be operationalized as higher accuracy or faster response latencies. In the present study, we will examine both criteria. We will thus perform a 2 (Expresser Culture: Asian vs. White) × 2 (Trial Type:

Between-Category vs. Within-Category) × 2 (Perceiver Culture: Chinese vs. Canadian) mixed-design ANOVA on accuracy and response latencies separately, with Expresser Culture and Trial Type as within-subject factors and Perceiver Culture as a between-subjects factor. If H1 – that Chinese participants perceive angry and disgusted faces as varying continuously along certain dimensions – is correct, then Chinese participants would show no difference in accuracy and response latencies between Between-Category and Within-Category pairs. Specifically, a significant interaction between Perceiver Culture and Trial Type would be expected, with the effect of Trial Type significant for Canadian but not Chinese participants. If H2 – that Chinese participants exhibit weaker CP effects for angry and disgusted faces than Canadian participants – is correct, then Chinese participants would identify Between-Category pairs more accurately and faster than Within-Category pairs, and Chinese participants would differ less than Canadian participants between the two trial types. Specifically, a significant interaction between Perceiver Culture and Trial Type would be expected, with a significant effect of Trial Type for both groups. If H3 – that Chinese and Canadian participants show a similar CP effect for angry and disgusted faces – is correct, then both groups would identify Between-Category pairs more accurately and faster than Within-Category pairs, and the two groups would differ similarly between the two trial types. Specifically, only a main effect of Trial Type would be expected, and the interaction between Perceiver Culture and Trial Type would be nonsignificant.

Method

Participants

To provide an estimate of the sample size, we performed a power analysis for Bayesian hypothesis testing because it is usually more conservative than null hypothesis significance testing (NHST). Using the BayesFactor package (Morey & Rouder, 2018) in R, we set the true effect at Cohen's $d = 0.43$ (the smallest effect size of the CP effect on the

anger-disgust morph continuum found in Sauter et al., 2011) with 100,000 simulations and Bayes factor = 6 in estimating an appropriate sample size. This analysis revealed that 150 participants from each cultural group are needed to achieve 80% power. We thus intend to recruit 150 Chinese participants from a University in China and 150 European Canadian participants from a University in Canada for the experiment. The two cultural samples will be matched in terms of gender ratio. In addition, because participants in both cultures are university students, they are expected to be of similar age, education level, and socioeconomic status. Participants will receive either partial course credit or money for their participation. The study has been approved by the ethics committee of York University, Canada (ethics number: e2018-028) and Zhejiang University, China (ethics number: [2021]043).

Facial Expression Stimuli

One Asian female and one Asian male depicting facial expressions of anger and disgust were selected from the Taiwan Facial Expression Image Database (TFEID; Chen & Yen, 2007), and one White female and one White male depicting the same emotions were selected from the Amsterdam Dynamic Facial Expression Set (ADFES; Van der Schalk et al., 2011). Facial expressions in both databases were produced using instructions from the Facial Action Coding System (FACS; Ekman et al., 2002). Although each emotion can be expressed through a variety of combinations of muscle movements, the two expression databases we purposefully selected are generally consistent in terms of the muscle movements used for the angry and disgusted expressions. In particular, both databases contain brow lowerer (Action Unit 4 [AU4]), upper lid raiser (AU5) and lip presser (AU24) for the angry expression, and nose wrinkler (AU9) and upper lip raiser (AU10) for the disgusted expression. These AUs are therefore crucial for differentiating anger and disgust. We FACS coded all of the stimuli, and

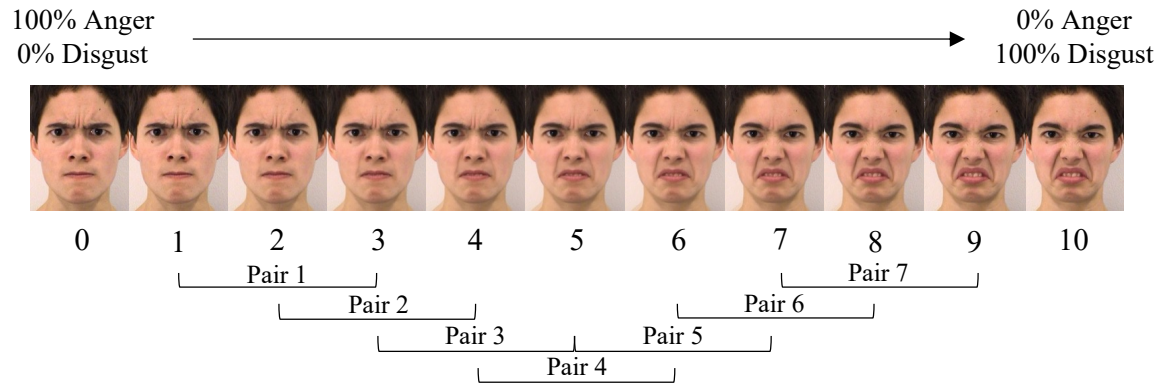
established empirically that the crucial AUs of each emotional expression are similar across cultures and actors. See Table S1 for the FACS-coded AUs of all facial stimuli.

The ADFES consists of dynamic expressions changing from a neutral expression to a specific emotional state. To ensure the intensity of expression was similar across the White and Asian stimuli, we conducted a pilot study with 20 White Dutch (Mage = 23.71 years; 6 men, 14 women) and 20 Asian Chinese (Mage = 27.60 years; 12 men, 8 women) participants to select the frame of each White stimulus that best matched the intensity of the corresponding Asian stimulus. We extracted 150 frames from each original clip of the White actors (ranging from 6 to 6.5 s) to form new stimulus sequences. The number of frames was computed by multiplying 24 fps (the common frame rates used in films) by 6.25 (the mean of 6 and 6.5). A photograph of one of the Asian facial expressions was presented on the left side of the screen, while the corresponding sequential White facial expressions were presented on the right side of the screen. Participants were asked to drag the slider bar underneath the clip to choose the frame that was most similar in terms of intensity to the Asian stimulus. Each comparison between Asian and White stimuli included two trials with different initial positions of the slider bar, one starting from the first frame of the clip and the other starting from the last frame of the clip. Each participant completed a total of 16 trials of stimulus evaluation (4 actor pairs × 2 emotions [anger, disgust] ×2 initial positions of the slider bar).[1] An independent t-test was used to compare Chinese and Dutch participants' selected frames for each pair of stimuli. No significant differences were found between the two groups (Table S2). Therefore, the average frame across all participants was used to select the final stimuli for each White actor – resulting in sets of Asian and White facial expressions matched in terms of both AUs and perceived intensity. See Table S1 for the coded AU intensities of all facial stimuli.

We used a digital program (Fantamorph; http://www.fantamorph.com) to morph the expressions of each actor to create continua of expressions with a mix of anger and disgust in different proportions. Following the most common approach used in the research of CP of facial expressions (e.g., Calder et al., 1996; Cong et al., 2019; De Gelder et al., 1997; Etcoff & Magee, 1992), one expression is selected at 10% intervals in this successive variation of each actor's angry expression morphing into a disgusted expression. This generates 11 expressions for each actor, including the prototypes of the anger and disgust expressions (0 and 10), and 9 morphs in between (morphs 1-9). See Figure 1 for an example.

Figure 1

Range of Morphs on the Anger-Disgust Continuum and the Emotion Pairs used in the Discrimination Task.



Procedure

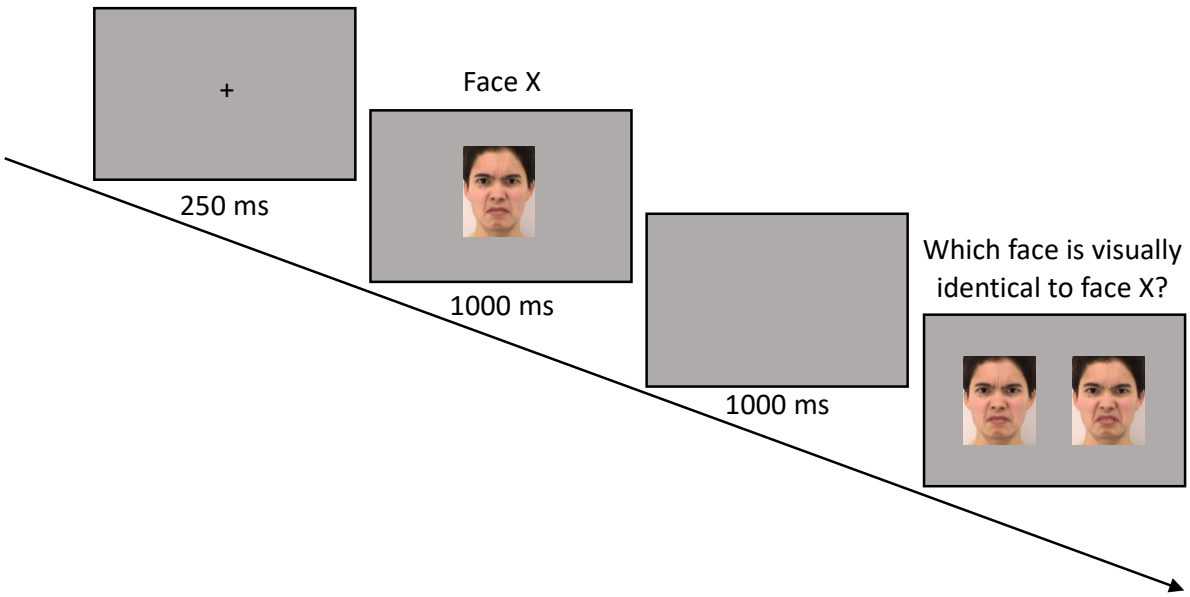
Discrimination Task

In accordance with earlier experiments (Calder et al., 1996), the stimulus set in the discrimination task will be comprised of nine morphed facial expressions (morphs 1-9). Exclusion of the prototypical faces avoids participants using the small variation in picture quality between the prototypical faces and the morphed faces to discriminate between pairs of faces that include either of the prototypical faces. Because in sequential ABX discrimination tasks participants are required to hold representations of A and B in memory in order to

decide whether face X matches face A or B, the results may reflect short-term memory performance rather than a perceptual phenomenon (see Calder et al, 1996). To rule out this possibility in the present study, we will utilize an X-AB discrimination task (Cong et al., 2019; Sauter et al., 2011) (see Figure 2). Specifically, in this task, each trial will begin with a 250 ms fixation followed by the first stimulus, face X, presented in the center of the screen for 1000 ms. After a blank screen for 1000 ms (in order to allow the sensory memory of face X to fade), the target and distractor stimuli, faces A and B, will appear *side-by-side* until participants indicate which of the two stimuli, faces A or B, is visually identical to face X. Faces A and B will differ by 2 steps (20%) along the continuum, resulting in a total of 28 face pairs (7 pairs per actor × 4 actors). The reason for choosing 2 steps (20%) instead of 1 step (10%) is that it is possible that the participant's category boundary happens to be on one of the morphed pictures (e.g., morph 5 is judged as anger in 50% of the trials), making it difficult to define between-category pairs in that case. All face pairs will be presented eight times (twice in each of the four orders: A-AB, A-BA, B-AB, B-BA), resulting in a total of 244 trials. All pictures will subtend 8° × 12° of visual angle of participants seated at an average distance of 60 cm from the screen. Participants will be instructed to respond as quickly and accurately as possible. No feedback will be provided. The experiment will start with six practice trials, using morphs of two actors from the Radboud Faces Database and the Taiwan Corpora of Chinese Emotions that will not be used in the experimental trials. The order of all experimental trials will be randomized.

Figure 2

The Procedure for the Discrimination Task

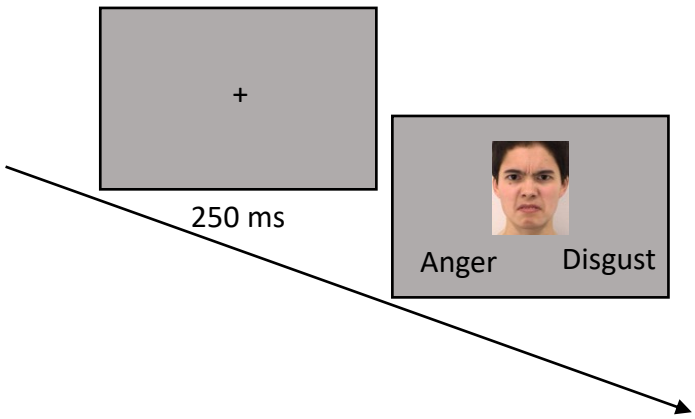


Identification Task

After completing the X-AB discrimination task, participants will be asked to identify the expression on each face (see Figure 3). In this task, each trial will begin with a central fixation for 250 ms, followed by one picture and two response alternatives below the image, "anger" and "disgust." The left or right position of the response alternatives will be counterbalanced between participants. For Chinese participants, we will provide the corresponding translations, "气愤(qifen/anger)" and "厌恶(yanwu/disgust)," which have been used in other cross-cultural studies of these emotions (Fang et al., 2018, 2019). Participants will be asked to indicate which of the two emotions is expressed. Participants will be shown the nine morphed faces from the X-AB discrimination task plus the two prototypical faces. Each face will appear once in each block and participants will complete 4 blocks of 44 trials each for a total of 176 trials. The order of stimuli will be random for each participant.

Figure 3

The Procedure for the Identification Task



After completing both the Discrimination and Identification tasks, participants will be asked to provide basic demographic information (e.g., sex, age, race). The instructions for Chinese participants in both tasks will be translated from English into Chinese by means of the standard translation/back-translation procedure.

Analysis Plan

Data exclusion

If a participant's overall accuracy on the emotion discrimination task is more than two standard deviations below the mean or his/her overall response latency is more than two standard deviations above the mean, the participant's data will be excluded (Cong et al., 2019).

Analysis Plan: Identification Task

The aim of the analysis of the identification data is to establish the point on the morph continuum where expressions on one side of the boundary point are more likely to be perceived as anger and expressions on the other side of the boundary are more likely to be perceived as disgust. In order to establish the boundary between anger and disgust, we will first calculate the percentage of trials that are judged as “anger” for each picture for each participant. The boundary will be set at the point at which the proportion of trials that is

judged as expressing anger is higher than 50% for morph *N*, while for morph *N*+1, the proportion of trials that is judged as expressing anger is lower than 50%.

Analysis Plan: Discrimination Task

We will thus perform a 2 (Expresser Culture: White vs. Asian) × 2 (Trial Type: Between-Category vs. Within-Category) × 2 (Perceiver Culture: Canadian vs. Chinese) mixed-design ANOVA on accuracy and response latencies separately, with Expresser Culture and Trial Type as within-subject factors and Perceiver Culture as a between-subjects factor. Following the analytic strategy of Sauter et al. (2011), we will conduct analysis on one Between-Category (faces A and B with different predominant emotions as established in the identification task) and two Within-Category pairs (faces A and B with the same predominant emotion as established in the identification task). For example, if the category boundary in the identification task falls between morphs 4 and 5, and morph 5 is closer to the category boundary than morph 4, then the Between-Category pair would be morphs 4 and 6 and the two Within-Category pairs would be morphs 2 and 4, and morphs 6 and 8, respectively. Because the category boundaries may be different for each participant, we will calculate the category boundaries for each participant individually, rather than averaging the category boundaries of all participants. For example, the Between-Category pair for one participant may be morphs 4 and 6, while the Between-Category pair for another participant might be morphs 3 and 5. If the current X-AB task is valid, the main effect of Trial Type would be significant for Canadian participants.

The first competing hypothesis that Easterners do not perceive angry and disgust expressions categorically (H1) would be supported by a significant two-way interaction between Perceiver Culture and Trial Type. In this scenario, simple effects analyses would be expected to show that Canadian, but not Chinese, participants show better accuracy and faster responding for Between-Category compared to Within-Category pairs. To provide evidence

of an absence of CP in Chinese participants, a Bayesian t-test will be conducted for the effect of Trial Type on Chinese participants' performance on accuracy and response latencies separately. The Bayes Factor (BF) for a null effect of Trial Type on accuracy and response latencies by Chinese participants should be larger than 3 to allow for a conclusion that no CP is present in Chinese participants (Wagenmakers et al., 2011).

The second competing hypothesis is that the size of the CP for East Asian perceivers of angry and disgust expressions is *smaller* than for Western perceivers (H2). This hypothesis would be supported by a significant two-way interaction between Perceiver Culture and Trial Type. Although both Chinese and Canadian participants would be expected to demonstrate significantly better accuracy and faster response latencies for Between-Category compared to Within-Category pairs, an independent t-test would indicate that the difference scores related to accuracy and response latencies of Between-Category and Within-Category pairs for Chinese participants would be smaller than for Canadian participants.

The third competing hypothesis is that the magnitude of CP for East Asian perceivers of angry and disgust expressions does not differ from Western perceivers (H3). This hypothesis would be supported by a main effect of Trial Type, not qualified by Perceiver Culture. Results would be expected to show that both groups of participants will be faster and more accurate in identifying Between-Category pairs than Within-Category pairs. To provide evidence that the magnitude of CP does not vary across cultures, a Bayesian repeated measures ANOVA will be conducted to compare the main effects model (including main effects of Trial Type and Perceiver Culture) against the Null model and to compare the interaction model (including both main effects as well as their interactions) against the Null model, respectively. The BF for the main effects model (against the Null model) divided by the BF for the interaction model (against the Null model) should be larger than 3 to allow for

a conclusion that no interaction between Perceiver Culture and Trial Type is present (Wagenmakers et al., 2011).

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Notes

[1] This pilot study was conducted together with another pilot study (see Fang et al., 2019), the purpose of which was to match the perceived intensity of various emotional expressions on Asian and White faces for use in future studies.