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# Cultural Differences in Perceiving Transitions in Emotional Facial Expressions: Easterners Show Greater Contrast Effects than Westerners

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Abstract

Past research suggests that East Asians (Easterners) are more likely than North Americans and Western Europeans (Westerners) to incorporate information from *concurrent* affective contexts when judging facial expressions. The present research extends this literature by investigating the impact of *temporal* affective contexts on emotion perception. Specifically, two experiments tested the hypothesis that when judging smiles, Easterners are more likely than Westerners to be influenced by preceding facial expressions. In Experiment 1, participants from China and Canada judged the valence of low-intensity smiles that were preceded by expressions of anger or high-intensity smiles. The results indicated that, compared to Canadian participants, Chinese perceivers were more influenced by preceding expressions, with larger differences in perceived valence of smiles preceded by different start emotions. Experiment 2 investigated whether this pattern of findings generalized to other Western populations and to other emotional transitions. Participants from China and the Netherlands judged the valence of (high- or low- intensity) smiles preceded by angry, fearful, or neutral expressions. Consistent with Experiment 1, Chinese participants' judgements of smiles were impacted more by the preceding expressions, a finding that was stable across emotions. Together, these findings demonstrate that Easterners, relative to Westerners, are influenced more by the preceding temporal emotional context when judging others' current smiling facial expressions.

*Keywords*: emotional transitions; culture; temporal emotional context; smile

**Cultural Differences in Perceiving Transitions in Emotional Facial Expressions: Easterners Show Greater Contrast Effects than Westerners**

With the development of technology and the internet, and with more international students, travelers, and migrants today than ever before, communities around the world are more and more connected. Cross-cultural communication is therefore becoming increasingly important in modern society (Gudykunst et al., 1996; Hall, 1976; Kittler et al., 2011). An important component of successful communication and harmonious social interactions is the accurate perception and understanding of other people's emotions based on their facial expressions (Freeman & Ambady, 2011; Niedenthal & Brauer, 2012; Van Kleef, 2009). The lion's share of emotion research to date has focused on the perception of static facial cues. Yet, in real life, facial expressions are embedded in contexts that provide additional information that can impact the interpretation of these facial cues. This contextual information may include bodily and vocal signals, social settings, and also preceding emotional expressions (e.g., Aviezer et al., 2008; Carroll & Russell, 1996; de Gelder, 2006; Fang et al., 2018; Russell & Fehr, 1987). Given that facial expressions in real life are typically dynamic, that is, changing over time (Krumhuber et al., 2013), it is important to understand how transitions from one facial expression to another shape perceptions of emotions, and how culture impacts this process.

Previous research has shown that the influence of contextual information on the perception of emotional expressions, in general, varies across cultures. For example, East Asians (henceforth Easterners) attend to and are more influenced by contextual information than West Europeans or North Americans (henceforth Westerners) in affective judgments of emotional facial expressions (Masuda et al., 2008; Stanley et al., 2013). However, this line of research has focused exclusively on *concurrent* emotional contexts, in which contextual information is provided simultaneously with the target facial expression, such as the

expressions of others in the surrounding environment (Masuda et al., 2008). No study to date has examined cultural differences in the extent to which temporal emotional contexts impact judgments of facial expressions. In the present research, we investigated whether the perception of smiling expressions is impacted by preceding facial expressions of the same target and whether this influence is stronger in Easterners than Westerners.

To this end, we first review studies related to the influence of temporal emotional context on the perception of facial expressions. Then we move on to East-West differences in sensitivity to context, specifically targeting the effects of culture on perceptions of emotional facial expressions. Next, we present two cross-cultural experiments in which we examine Eastern and Western perceivers' affective ratings of smiles when preceded by negative vs. non-negative facial expressions on Asian and White faces. Finally, we discuss the potential implications of cultural differences in decoding changing facial expressions for cross-cultural communication.

## Perceiving Changing Facial Expressions

In an early study examining processes related to sequential emotion perception by Russell and Fehr (1987), participants were presented with two images of facial expressions in sequence and asked to make dimensional ratings (pleasure and arousal) and categorical judgments (angry, disgusted, surprised, etc.) about the emotions expressed in the image. The results demonstrated a contrast effect in which viewing the first facial expression shifted judgments of the second expression in the opposite direction. For example, a relatively neutral face was perceived as sad when presented after a happy face, but as happy when presented after a sad face. The authors proposed that because judgments of facial expressions are not only influenced by configurational features but also depend on how they compare with other expressions, the first facial expression can provide a frame of reference that

anchors observers' judgments of subsequent expressions (see also Manstead et al., 1983; Russell & Lanius, 1984).

Following this initial investigation, researchers have found further evidence for contrast effects in the perception of facial expressions using the adaptation approach (Hsu & Young, 2004; Webster et al., 2004; Xu et al., 2008). In a typical adaptation paradigm related to facial expressions, an adapting expression is presented for a few seconds, and succeeded by a target expression after a delay. Participants need to make a judgement of the emotion shown in the test expression. For instance, presentation of a happy facial expression made a subsequent neutral expression look slightly angry (Webster et al., 2004). Similarly, exposure to a sad expression facilitated the subsequent recognition of a happy expression and vice versa (Hsu & Young, 2004). These studies provide robust evidence that adapting to an initial facial expression shifts the perception of a subsequent expression in the opposite direction.

More recent research has investigated contrast effects in the perception of emotional expressions using dynamic facial cues (Sato & Yoshikawa, 2010). With the development of morphing techniques and software, experimenters can now create dynamic facial expressions that reflect the natural unfolding of expressions by gradually morphing one emotional expression into another (Ambadar et al., 2005; Sacharin et al., 2012; Sato & Yoshikawa, 2004, 2010). Research using dynamic cues has demonstrated that initial emotional expressions can shift perceptions of subsequent expressions in the opposite direction. For example, in a study by Jellema et al. (2011), participants were presented with video clips showing morphs from a happy expression to a neutral expression or from an angry expression to a neutral expression. Participants were asked to judge the expression in the last frame of the clip. The results revealed a significant effect of temporal emotional contexts, with the neutral faces being judged as more angry (and less happy) when preceded by happy as

compared to angry faces. Such contrast effects have also been found in judgments of subtle emotional expressions (Palumbo & Jellema, 2013).

Together, despite differences in methodologies (either sequential presentation of static emotional expressions or morphs changing from one emotion to another), past research has consistently shown that viewing an initial facial expression produces a contrast effect on affective judgments of subsequent expression. Building on this work, we used morphed dynamic facial expressions to examine whether an emotional facial expression would be judged as more positive when preceded by negative as compared to non-negative expressions in the present research. More importantly, we extended this work by investigating how culture shapes the impact of temporal emotional contexts on the perception of facial expressions.

## Culture and Context Sensitivity

It is well established that Westerners tend to have a more analytic pattern of attention, whereas Easterners have a more holistic pattern (Markus & Kitayama, 1991; for a review, see Nisbett et al., 2001). In particular, Westerners tend to perceive objects as discrete categories with defining attributes, whereas Easterners are more likely to perceive objects in terms of their relationships to other objects (Masuda & Nisbett, 2001; Nisbett & Masuda, 2003). As a result, individuals raised in Western cultures find it easier to isolate an object from its context and individuals raised in Eastern cultures tend to integrate the object within its surroundings (Masuda et al., 2008; Nisbett & Masuda, 2003).

These culturally divergent cognitive characteristics have been examined in a wide range of research domains (Masuda, 2017; Miyamoto, 2013; Varnum et al., 2010), including visual object perception (Ji et al., 2000; Kitayama et al., 2003), person memory (Masuda & Nisbett, 2001), and causal attributions (Masuda & Kitayama, 2004; Miyamoto & Kitayama, 2002). For example, in a study by Masuda and Nisbett (2001), American and Japanese

participants were presented with a video clip of an underwater world and were asked to describe the video. Whereas American participants generally focused on the central objects (the fish), Japanese participants included information about the context and the relationships among the objects (the pond, plants, animals, and fish). In a later surprise recognition test, Japanese participants' performance was facilitated when the fish were paired with the original contexts but was impaired when the fish were presented in new contexts. In contrast, for American participants, the context had a negligible impact on recognition accuracy. In a similar study (Masuda & Nisbett, 2006), Americans and East Asians were presented with still photographs or animated vignettes that involved changes in target object information (e.g., the target vehicle's color) or contextual information (e. g., the location of clouds). Whereas Americans were more sensitive to changes in target objects than contexts, East Asians were more sensitive to changes in contexts than target objects. Together, past findings provide consistent evidence that Easterners attend more to contextual information than do Westerners (Nisbett et al., 2001).

Cultural differences in context sensitivity have also been found in perceptual judgments of facial expressions of emotion. Masuda and colleagues (2008) presented both American and Japanese participants with cartoons depicting a person who was either happy, sad, angry, or neutral. In the image, the target person was surrounded by other people who either expressed the same emotion as the target person or a different emotion. The results showed that the emotional expressions of the social surroundings influenced Japanese, but not American, participants' judgments of the emotions of the focal person. For example, Japanese participants judged a target person with a happy expression as happier when surrounded by others who were happy compared to sad, whereas the social surroundings of the target person did not impact American participants. These differences in perceptual judgments reflect differences in attention, as evidenced by the fact that Japanese participants

attended more to the surrounding people than American participants. These findings suggest that when decoding emotional expressions, Easterners may attend to and be influenced more by concurrent visual information relating to the presence of others (Markus & Kitayama, 1991, 1994; Masuda et al., 2012).

Despite substantial evidence for cultural differences in sensitivity to concurrent contexts, only a few studies have examined whether Easterners are also more sensitive to temporal contexts than Westerners (Guo et al., 2012; Ji et al., 2009; see Gao, 2016, for a review). In a study by Ji and colleagues (2009), Canadian and Chinese participants were asked to read a description of a theft, along with a list of behaviors that occurred in the past or the present. The results indicated that Chinese participants judge behaviors that have taken place in the past as more relevant than Canadians. Other research has demonstrated that Chinese and Chinese Canadians placed more monetary value on a past event than on an identical future event, whereas European Canadians attached more monetary value on an event in the future than in the past (Guo et al., 2012). In sum, like cultural differences found in sensitivity to concurrent contexts, the limited evidence indicates that Easterners may also be more sensitive to temporal contexts than Westerners. We thus expected that when judging final emotions in changing facial expressions, the start emotion may produce a larger contrast effect in Easterners compared to Westerners.

## Perceiving Changing Smiles Across Cultures

Research by Ishii and colleagues (2011) provides preliminarily evidence for the cultural differences in judgments of changing smiling expressions. In their experiment, participants were presented with clips of expressions in which the start emotion of either happiness or sadness changed to a neutral expression. Participants were instructed to indicate when the target no longer expressed the start emotion. Japanese participants judged the offset of smiles to occur earlier than American participants, but the two groups did not differ in

their judgements of the offset of sad expressions. These findings suggest that cultural differences may exist in sensitivity to the disappearance of certain emotions, such as smiles, but they do not provide evidence on how temporal emotional expressions impact the perception of subsequent expressions. Although it is important to know whether certain cultures are more sensitive to the disappearance of early emotions, how participants from different cultures may be differentially influenced by these early emotions when interpreting subsequent emotions is currently unknown. In the present research, we therefore investigated the perception of final smiling expressions that changed from different start emotions that were either positive, negative, or neutral.

The decision to focus on the perception of smiling expressions was based on several considerations. First, the smile is a ubiquitous facial expression in daily life (Calvo et al., 2014). Although it is a simple and highly recognizable expression (Ekman, 2003; Sauter, 2010), the smile can be interpreted in many ways and its meaning is often ambiguous (Hess et al., 2002; Niedenthal et al., 2010; Rychlowska et al., 2017). A smile can communicate happiness, affiliative intent, or a person's social status. Although previous research has shown that different smile types (reward, affiliative, and dominant smiles) have different facial configurations, the accuracy of judging smile types based on facial configurations is low because participants often confuse affiliative with reward smiles (Rychlowska et al., 2017). This finding suggests that in order to interpret a given smile accurately, perceivers may need to take more contextual information into account. Furthermore, it has been noted that smiles may be used differently across cultures (Ekman, 1972; Ishii et al., 2011; Matsumoto & Kudoh, 1993; Rychlowska et al., 2015). For instance, smiles are used more often as a mask to cover expressers' negative feelings in Eastern than Western cultures (Ekman, 1972; Sun, 2010). A recent cross-cultural study on individuals' motives for smiling further suggests that people from different cultures differ in why they smile. For example,

whereas feelings related to social bonding were rated as more conducive to smiling for Westerners, feelings related to social hierarchies were judged by Easterners as more conducive to smiling (Rychlowska et al., 2015).

Overall, these studies suggest that smiles are ambiguous because of their association with multiple meanings and with different motives across cultures. An accurate interpretation of others' emotional expressions, especially positive ones, is important because they can play a key role in establishing social relationships and maintaining relationship satisfaction (Gable et al., 2004, 2006). It is thus important to gain more knowledge about processes related to perceiving smiles in Eastern and Western cultures.

## The Current Research

The goal of the current research was to investigate the impact of temporal emotional contexts on the perception of smiling expressions across cultures. Specifically, the perceived valence of smiles that were preceded by different start emotions was examined in Easterners and Westerners across two experiments. In Experiment 1, participants from China and Canada were presented with Asian and White faces with smiles preceded by a positive or negative emotion. Because happiness is the only positive "basic" emotional expression (Ekman, 1972), we used clips of high-intensity smiles changing to low-intensity smiles to represent a transitioning process with positive start emotions. To represent a transitioning process with negative start emotions, clips of anger expressions changing to low-intensity smiles were used. In Experiment 2, to investigate the generalizability of our findings to other emotion transitions, we included clips of emotional expressions changing from a negative (anger and fear) or neutral expression to two types of smiles (low or high intensity). Furthermore, to examine whether the pattern of findings would extend to other populations, participants from a different region of China and from the Netherlands were presented with Asian and White faces depicting emotional transitions. In both experiments, the participants'

task was to judge the valence (positivity and negativity) of the final facial expressions. Based on previous research (e.g., Jellema et al., 2011; Palumbo & Jellema, 2013), we expected contrast effects with final smiles being perceived as more positive when preceded by negative facial expressions than by non-negative (positive or neutral) facial expressions. More importantly, we expected that Easterners would be more influenced by preceding expressions than Westerners, with larger contrast effects for Easterners compared to Westerners.

Our general expectation of contrast effects was based on robust evidence from previous research for such effects across a variety of stimuli, including changing facial expressions (see above). It is important to note, however, that there is also some evidence for assimilation effects. Specifically, Masuda and colleagues (2008, 2012) observed assimilation effects when participants were asked to judge the emotion of a target person surrounded by other people. That is, the expressions of the surrounding people shifted perceptions of the expression of the target person in the same direction. In the present research, however, our interest is in how people judge a target's final emotional expression against the background of his or her own preceding expression rather than in the context of concurrent expressions of others. Given that previous studies examining perceptions of such sequential (rather than concurrent) emotional expressions yielded robust evidence for contrast effects (e.g., Jellema et al., 2011; Palumbo & Jellema, 2013), we expected that a target's preceding expressions would produce a contrast effect on judgments of the target's final expression.

Finally, it is noteworthy that the focus of the current research is on the perceived positivity/negativity of the final smiling expressions rather than on the accuracy of recognition of smiling expressions. Although previous research has shown that perceivers are better at recognizing their own group's emotional facial expressions (e.g., Elfenbein & Ambady, 2002), there is no evidence that such ingroup advantage also occurs for positivity/negativity judgments of facial expressions. Therefore, we did not expect that the

effect of start emotions on the perceived valence of the final smiling expressions would vary when judging expressions displayed by ingroup vs. outgroup members.

## Pilot Study and Creation of Stimuli

To create clips of changing facial expressions, we selected four Asian actors (two women, two men) from the Taiwan Facial Expression Image Database (TFEID; Chen & Yen, 2007) and four White actors (two women, two men) from the Amsterdam Dynamic Facial Expression Set (ADFES; van Der Schalk et al., 2011). For both databases, facial expressions were created based on the facial action coding system (FACS; Ekman et al., 2002). Because of the nature of the databases (static photographs of facial expressions in TFEID and movie clips of dynamic facial expressions in ADFES), static facial expressions of anger, fear, low-intensity happiness, high-intensity happiness, and neutral were chosen for each Asian actor, and video clips of dynamic expressions changing from neutral to anger, fear, and happiness were chosen for each White actor.

To match the perceived intensity of emotional expressions of the Asian and White actors, we conducted a pilot study with 20 White Dutch ($M_{age}$ = 23.71; 6 men) and 20 Asian Chinese ($M_{age}$ = 27.60; 12 men) participants to select the frame of each ADFES 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 seconds) 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 on the left side. 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. In total, each participant completed 32 trials (4 actor pairs × 4 emotions [anger, fear, low-intensity smiles, high-intensity smiles] × 2 initial positions of the slider bar) in a random order.[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 S1). Therefore, the average frame across all participants was used to select the final stimulus for each White actor – resulting in sets of Asian and White facial expressions matched in terms of both activated action units (AUs; Ekman et al., 2002) and perceived intensity.

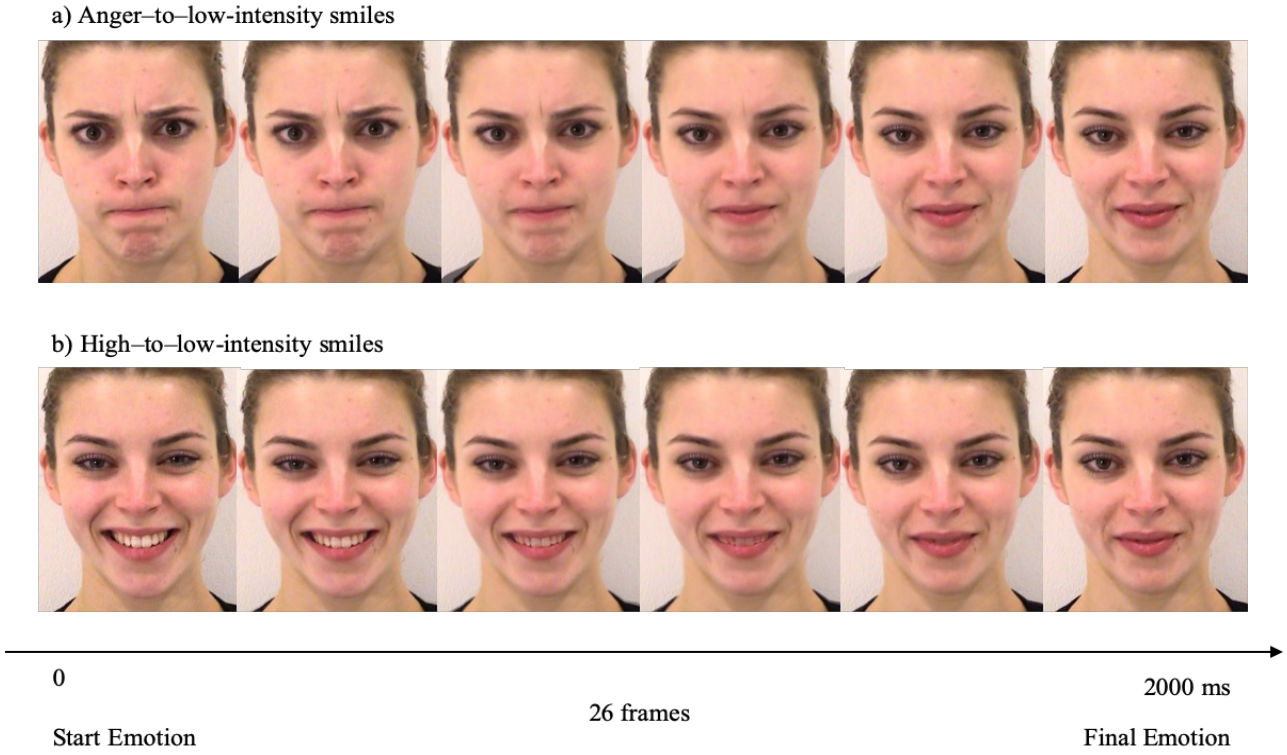
To examine whether the final facial stimuli were perceived similarly by Easterners and Westerners, we conducted a pilot study with 84 Asian Chinese ($M_{age}$ = 20.46; 43 women) and 69 White Canadian ($M_{age}$ = 21.62; 43 women) participants. These participants were asked to judge the perceived positivity ("*How positive does the person feel?*") and negativity ("*How negative does the person feel?*") of the five expressions (high-intensity smiles, low-intensity smiles, anger, fear, and neutral) from all eight actors. These measures were the same as in the main study. In accordance with the main analysis, a composite score was computed by taking the mean of both positivity and negativity (reverse-scored) items. We conducted a 5 (Emotion: Neutral, Anger, Fear, Low-intensity smiles, High-intensity smiles) × 2 (Target Ethnicity: Asian, White) × 2 (Participant Culture: Chinese, Canadian) mixed-design ANOVA on these composite scores, with Emotion and Target Ethnicity as within-subjects variables, and Participant Culture as a between-subjects variable. The results yielded no significant main effect of Participant Culture (see Table S2). However, the interaction of Participant Culture and Emotion was significant. To decompose this interaction, simple effect analyses related to each Emotion were conducted. Chinese and Canadian participants did not differ in their valence judgments of neutral, fear, low-intensity smiles, and high-intensity smile

expressions (see Table S3). The only cultural difference found in ratings was related to anger, with Chinese participants rating anger as more positive than Canadian participants; we return to this point in the General Discussion. In sum, the pilot study demonstrated that Easterners and Westerners showed similar valence ratings of the static emotional expressions, with the exception of anger. Therefore, if larger contrast effects are found for Easterners as compared to Westerners, the results would be unlikely to be due to cultural differences in the perception of constituent static facial expressions. Instead, larger contrast effects for Easterners as compared to Westerners would be likely to reflect a stronger impact of temporal emotional contexts on Eastern as compared to Western perceivers.

We then used Fantamorph5 (http://www.fantamorph.com) to produce expressions that transitioned from one emotion to another emotion for each actor (see Figure 1 for an illustration; examples of the stimuli are available at https://osf.io/96rb5/?view_only=3d6d634de77f48539c282dad9121939a). Each morph consisted of 26 frames and was presented at the speed of 30 frames per second. This rate has been shown to adequately reflect natural changes in facial expressions (Ambadar et al., 2005; Sato & Yoshikawa, 2004). Based on the unfolding of natural emotional expressions, the exposure time of the first frame (start emotion) and last frame (final emotion) were extended to 600 ms (Hoffmann et al., 2010). Each clip thus lasted for 2000 ms. We used this methodology to create 16 clips (8 actors × 2 start emotions [anger, high-intensity smiles] × 1 final emotion [low-intensity smiles]) for Experiment 1, and 48 clips (8 actors × 3 start emotions [anger, fear, neutral] × 2 final expressions [low-intensity smiles, high-intensity smiles]) for Experiment 2.

**Figure 1**

*Examples of Facial Expressions Changing from (a) Anger to Low-intensity Smiles and (b) High-intensity Smiles to Low-intensity Smiles*



## Experiment 1

In Experiment 1, Chinese and Canadian participants were presented with Asian and White faces depicting emotional expressions changing from anger to low-intensity smiles or from high-intensity smiles to low-intensity smiles. The variation in start emotions allowed us to compare the effects of start emotions that differed in valence from the final emotion on the perceived valence of final emotional expressions. We expected a contrast effect in which low-intensity smiles would be perceived as more positive when preceded by expressions of anger than when preceded by high-intensity smiles, and moreover, that this effect would be more pronounced in Chinese than Canadian participants.

### Methods

#### *Participants and Design*

To maximize power, we used a 2 (Start Emotion: Anger, High-intensity smiles) × 2 (Target Ethnicity: Asian, White) × 2 (Participant Culture: Chinese, Canadian) mixed design, with the first two factors varying within subjects, and only Participant Culture as a between-subject factor (Maxwell & Delaney, 2004). Based on the sample sizes of other studies in this domain (Ishii et al., 2011; for a review, see Masuda, 2017), we sought to recruit 100 White Canadian and 100 Chinese participants. It was decided a priori to stop data collection at the end of the day on which we approached 100 participants (Simmons et al., 2013). The final sample consisted of 103 White Canadian participants ($M_{age}$ = 19.74, $SD$ = 2.78; 55 men) from a university in the province of Ontario in Canada and 97 Chinese participants ($M_{age}$ = 20.45, $SD$ = 1.36; 50 men) from a university in the province of Guizhou in China. Canadian participants received course credit and Chinese participants received approximately US $1.50 (¥10) for participation. A sensitivity analysis using G*Power (Faul et al., 2007) showed that our final sample could detect effects of $f$ = .200 ($\eta_p^2$ = .038) for the critical Start Emotion × Participant Culture interaction (power = .80, $\alpha$ = .05).

***Stimuli and Procedure***

All measures, manipulations, and exclusions are reported below. The stimuli consisted of 16 clips of emotional transitions described in the pilot study, with eight actors (four Asian and four White) showing facial expressions changing from anger to low-intensity smiles and from high-intensity smiles to low-intensity smiles. The experiment was run in the laboratory with a custom-written PsychoPy program (Psychophysics software in Python; Peirce, 2007) on Windows 7 computers.

After participants provided informed consent, they proceeded to the study. Each trial started with a fixation cross displayed in the center of the screen for 500 ms, followed by a clip portraying an emotional transition for 2000 ms. Participants were seated approximately 60 cm from the screen, and the photographs subtended 8° × 12° of their visual angle. Immediately following the clip, participants judged the valence of the *final expression* in terms of positivity ("*How positive does the person feel at the end of the clip?*") or negativity ("*How negative does the person feel at the end of the clip?*").[2] Compared to judging the intensity of happiness, looking at judgments on the valence dimension allows us to use two different types of ratings (here, positivity and negativity ratings), which could increase the power of the study by collecting repeated measurements. By contrast, if judgments on specific emotion categories were used, it would have been difficult to find both positive (e.g., happy) and negative (e.g., angry) words that fit all dynamic stimuli across experiments (e.g., judging on the intensity of anger is not so relevant when viewing emotional changes that does not involve anger at all). Participants were instructed to provide their response by moving a slider ranging from 0 (*not at all*) to 100 (*extremely*). The order of faces and judgments (positive versus negative) was randomized for each participant. Participants completed 4 practice trials, followed by 32 trials (16 clips × 2 judgments) divided into two blocks. Instructions were presented in English for the Canadian participants and translated into

Mandarin for the Chinese participants by means of a standard translation/back-translation procedure.

**Results and Discussion**

We reverse-scored the negativity question and computed a composite score by taking the mean of both positivity and negativity items. Higher scores indicated greater perceived positivity. We conducted a 2 (Start Emotion: Anger, High-intensity smiles) × 2 (Target Ethnicity: Asian, White) × 2 (Participant Culture: Chinese, Canadian) mixed-design ANOVA on the composite scores, with Start Emotion and Target Ethnicity as within-subjects variables and Participant Culture as a between-subjects variable.[3] See Table 1 for a complete overview of effects.

**Table 1**

*Participant Culture × Start Emotion × Target Ethnicity × Target Gender Mixed-Design Analysis of Variance for Perceived Positivity of Smiles in Experiment 1*

| Effect | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|
| Participant Culture (P) | 14.33 | (1,198) | **< .001** | 0.067 |
| Start Emotion (E) | 192.03 | (1,198) | **< .001** | 0.492 |
| Target Ethnicity (T) | 5.59 | (1,198) | **.019** | 0.027 |
| P × E | 5.52 | (1,198) | **.020** | 0.027 |
| P × T | 9.74 | (1,198) | **.002** | 0.047 |
| E × T | 0.23 | (1,198) | .633 | 0.001 |
| P × E × T | < 0.01 | (1,198) | .953 | < .001 |

*Note.* The perceived positivity of smiles was computed by taking the mean of both positivity and negativity (reversed-scored) items. Statistically significant results are shown in bold.

The main effects of Participant Culture, $F(1, 198) = 14.33$, $p < .001$, $\eta_p^2 = .067$, 90% CI [.022, .130], and Target Ethnicity, $F(1, 198) = 5.59$, $p = .019$, $\eta_p^2 = .027$, 90% CI [.002, .075], were significant. Canadian participants ($M = 62.40$, $SD = 7.00$) perceived smiles as more positive than Chinese participants ($M = 58.51$, $SD = 7.54$), and smiles of White targets ($M = 61.13$, $SD = 8.64$) were perceived as more positive than smiles of Asian targets ($M = 59.90$, $SD = 8.30$). Furthermore, the main effect of Start Emotion was significant, $F(1,$

198) = 192.03, $p < .001$, $\eta_p^2 = .492$, 90% CI [.412, .557]. The results reflect the predicted contrast effect, with low-intensity smiles being perceived as more positive when preceded by anger expressions ($M = 67.37$, $SD = 10.58$) than high-intensity smiles ($M = 53.66$, $SD = 10.10$).

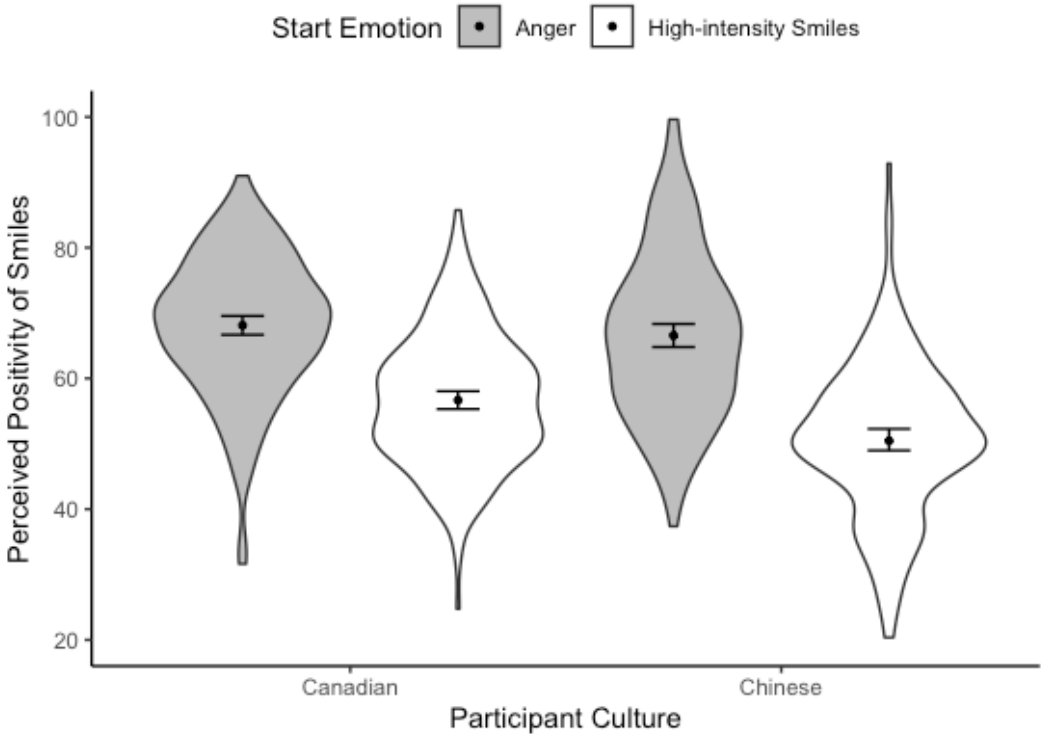
Importantly, this effect was qualified by the expected Start Emotion by Participant Culture two-way interaction, $F(1, 198) = 5.52$, $p = .020$, $\eta_p^2 = .027$, 90% CI [.002, .074]. Because our primary predictions were related to the size of the contrast effects relating to start emotions within each culture, this interaction was decomposed by Participant Culture (see Figure 2). For Chinese participants, low-intensity smiles were perceived as more positive when preceded by anger ($M = 66.57$, $SD = 11.31$) than high-intensity smiles ($M = 50.45$, $SD = 10.41$), $t(96) = 10.13$, $p < .001$, Cohen's $d = 1.03$, 95% CI [0.78, 1.27]. For Canadian participants, low-intensity smiles were also perceived as more positive when preceded by anger ($M = 68.12$, $SD = 9.82$) than high-intensity smiles ($M = 56.68$, $SD = 8.83$), $t(102) = 9.40$, $p < .001$, Cohen's $d = 0.93$, 95% CI [0.69, 1.16]. As expected based on the significant two-way interaction between Start Emotion and Participant Culture, an independent *t*-test indicated that the difference score related to ratings of anger–to–low-intensity smiles and high-intensity smiles–to–low-intensity smiles for Chinese participants ($M_{diff} = 16.12$, $SD = 15.67$), was larger than the difference score for ratings of anger–to–low-intensity smiles and high-intensity smiles–to–low-intensity smiles for Canadian participants ($M_{diff} = 11.44$, $SD = 12.35$), $t(198) = 2.35$, $p = .020$, Cohen's $d = .33$, 95% CI [.053, .611]. These findings suggest that, as predicted, Chinese participants showed larger contrast effects than Canadian participants.

The results of Experiment 1 provide initial support for our prediction that perceptions of smiles are more influenced by preceding emotional expressions for Chinese as compared to Canadian perceivers. In particular, low-intensity smiles were perceived as more positive

when preceded by anger expressions than when preceded by high-intensity smiles and this difference was larger for Chinese than Canadian participants.

**Figure 2**

*Perceived Positivity of Low-intensity Smiles as a Function of Start Emotion and Participant Culture in Experiment 1*




*Note.* The violin plot shows the full distribution of the data, with the width of the outlined area representing the proportion of the data located there. The points indicate the mean and error bars indicate 95% confidence intervals.

## Experiment 2

The goal of Experiment 2 was to examine whether the findings in Experiment 1 replicate and generalize to other emotional transitions and other populations. In particular, in addition to the clips showing emotional expressions changing from anger to low-intensity smiles used in the first study, we employed clips containing another start emotion, fear, which is high in arousal and negative in valence, as well as a neutral expression. Furthermore,

we included clips depicting an alternative final expression, a high-intensity smile. The stimuli in Experiment 2, therefore, included clips in which anger, fear, and neutral expressions changed to low- and high- intensity smiles. The inclusion of these additional clips not only allowed us to rule out the possibility that the effects observed in Experiment 1 would be specific to the start expression of anger or to the final expression of low-intensity smiles but it also increased the statistical power to detect the hypothesized effects by augmenting the number and variability of stimuli (Westfall et al., 2014). To examine whether this pattern of findings would extend to other Western and Eastern populations, in Experiment 2, we recruited participants from the Netherlands and a different region of China.

As in Experiment 1, we predicted larger contrast effects in the perception of smiles when preceded by negative expressions than by non-negative expressions. Specifically, we expected that both low- and high-intensity smiles would be perceived as more positive when preceded by expressions of anger or fear than by neutral expressions. Moreover, we predicted that Easterners would show larger contrast effects than Westerners and that this pattern of results would be found regardless of the intensity of the final smile.

## Methods

### *Participants and Design*

To maximize power, we utilized a 2 (Final Smile Intensity: Low, High) × 3 (Start Emotion: Anger, Fear, Neutral) × 2 (Target Ethnicity: Asian, White) × 2 (Participant Culture: Chinese, Dutch) mixed design with all factors being within-subject except Participant Culture. We recruited 82 White Dutch participants ($M_{age}$ = 23.02, *SD* = 4.65; 59 women) from a university in the province of North Holland in the Netherlands and 93 Chinese participants ($M_{age}$ = 18.76, *SD* = 1.54; 37 women) from a university in the province of Zhejiang in China. Dutch participants received either course credit or US $5.50 (€5) and Chinese participants received approximately US $2.50 (¥15) for participation. A sensitivity analysis using

G*Power (Faul et al., 2007) showed that our final sample could detect effects of $f = .168$ ($\eta_p^2 = .027$) for the critical Start Emotion × Participant Culture interaction (power = .80, $\alpha = .05$).

### *Stimuli and Procedure*

All measures, manipulations, and exclusions are reported below. The stimuli consisted of 48 clips of emotional transitions as described in the Pilot Study, with eight actors (four Asian and four White) showing facial expressions changing from anger, fear, and neutral to low- or high- intensity smiles. As in Experiment 1, participants completed 4 practice trials followed by 96 trials (48 clips × 2 evaluative judgments) divided into two blocks. Instructions were written in English and translated into Chinese (Mandarin) and Dutch by means of a standard translation/back-translation procedure.

### Results and Discussion

As in Experiment 1, we first reverse-scored the negativity question and computed a composite score by taking the mean of both positivity and negativity items. Higher scores indicated greater perceived positive feelings. We conducted a 2 (Final Smile Intensity: Low, High) × 3 (Start Emotion: Anger, Fear, Neutral) × 2 (Target Ethnicity: Asian, White) × 2 (Participant Culture: Chinese, Dutch) mixed-design ANOVA on the composite scores. Final Smile Intensity, Start Emotion, and Target Ethnicity were within-subject variables, and Participant Culture was a between-subject variable. See Table 2 for a complete overview of effects.

**Table 2**

*Participant Culture × Start Emotion × Final Smile Intensity × Target Ethnicity Mixed-Design Analysis of Variance for Perceived Positivity of Smiles in Experiment 2*

| Effect | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|
| Participant Culture (P) | 61.01 | (1,173) | **< .001** | 0.261 |
| Start Emotion (E) | 19.49 | (2,346) | **< .001** | 0.101 |
| Final Smile Intensity (I) | 366.57 | (1,173) | **< .001** | 0.679 |
| Target Ethnicity (T) | 51.02 | (1,173) | **< .001** | 0.228 |
| P × E | 6.81 | (2,346) | **.001** | 0.038 |
| P × I | 0.01 | (1,173) | .935 | < .001 |
| P × T | 3.15 | (1,173) | .078 | 0.018 |
| E × I | 0.79 | (2,346) | .454 | 0.005 |
| E × T | 11.09 | (2,346) | **< .001** | 0.060 |
| I × T | 4.82 | (1,173) | **.029** | 0.027 |
| P × E × I | 2.47 | (2,346) | .086 | 0.014 |
| P × E × T | 2.78 | (2,346) | .063 | 0.016 |
| P × I × T | 1.82 | (1,173) | .179 | 0.010 |
| E × I × T | 11.93 | (2,346) | **< .001** | 0.065 |
| P × E × I × T | 0.21 | (2,346) | .814 | 0.001 |

*Note.* The perceived positivity of smiles was computed by taking the mean of both positivity and negativity (reversed-scored) items. Statistically significant results are shown in bold.

The main effects of Participant Culture, $F(1, 173) = 61.01$, $p < .001$, $\eta_p^2 = .261$, 90% CI [.171, .344], Target Ethnicity, $F(1, 173) = 51.02$, $p < .001$, $\eta_p^2 = .228$, 90% CI [.142, .311], and Final Smile Intensity, $F(1, 173) = 366.57$, $p < .001$, $\eta_p^2 = .679$, 90% CI [.616, .725], were significant. Dutch participants ($M = 67.96$, $SD = 8.09$) perceived smiles as more positive than Chinese participants ($M = 58.84$, $SD = 7.35$), smiles of White targets ($M = 64.45$, $SD = 8.73$) were perceived as more positive than smiles of Asian targets ($M = 61.78$, $SD = 9.78$), and high-intensity smiles ($M = 70.36$, $SD = 10.51$) were perceived as more positive than low-intensity smiles ($M = 55.87$, $SD = 9.95$). Furthermore, the predicted main effect of Start Emotion was significant, $F(2,346) = 19.49$, $p < .001$, $\eta_p^2 = .101$, 90% CI [.054, .150]. The pattern of results once again reflected a contrast effect in which smiles were perceived as more positive when preceded by angry expressions ($M = 64.22$, $SD = 9.15$) than

neutral expressions ($M$ = 61.48, $SD$ = 10.43), $M_{diff}$ = 2.74, $t(174) = 5.81$, $p < .001$, Cohen's $d$ = 0.44, 95% CI [0.28, 0.59]. Likewise, smiles were perceived as more positive when preceded by expressions of fear ($M$ = 63.65, $SD$ = 9.12) than neutral expressions ($M$ = 61.48, $SD$ = 10.43), $M_{diff}$ = 2.17, $t(174) = 4.12$, $p < .001$, Cohen's $d$ = 0.31, 95% CI [0.16, 0.46]. As expected, there was no difference in perceived positivity of final smiles when preceded by angry versus fearful expressions, $M_{diff}$ = 0.57, $t(174) = 1.65$, $p = .100$, Cohen's $d$ = 0.12, 95% CI [-0.02, 0.27].

Importantly, the hypothesized Start Emotion by Participant Culture two-way interaction was significant, $F(2, 346) = 6.81$, $p = .001$, $\eta_p^2 = .038$, 90% CI [.010, .073]. In accordance with Experiment 1, the Start Emotion by Participant Culture interaction was decomposed by Participant Culture (see Figure 3). For Chinese participants, the effect of Start Emotion was significant, $F(2, 184) = 19.84$, $p < .001$, $\eta_p^2 = .177$, 90% CI [.096, .253]. Specifically, Chinese participants perceived smiles to be more positive when they were preceded by angry expressions ($M$ = 60.33, $SD$ = 8.04) than neutral expressions ($M$ = 56.32, $SD$ = 9.05), $t(92) = 5.45$, $p < .001$, Cohen's $d$ = 0.57, 95% CI [0.34, 0.78]. Likewise, they perceived smiles to be more positive when they were preceded by expressions of fear ($M$ = 59.88, $SD$ = 7.81) than neutral expressions ($M$ = 56.32, $SD$ = 9.05), $t(92) = 4.31$, $p < .001$, Cohen's $d$ = 0.37, 95% CI [0.16, 0.58]. As expected, there was no difference between the positivity ratings of final smiles preceded by anger versus fear, $t(92) = 0.91$, $p = .363$, Cohen's $d$ = 0.09, 95% CI [-0.11, 0.30].

For Dutch participants, the effect of Start Emotion was marginally significant, $F(2, 162) = 3.00$, $p = .052$, $\eta_p^2 = .036$, 90% CI [.000, .086]. Specifically, Dutch participants perceived smiles as more positive when preceded by expressions of anger ($M$ = 68.63, $SD$ = 8.32) than neutral expressions ($M$ = 67.33, $SD$ = 8.68), $t(81) = 2.48$, $p = .015$, Cohen's $d$ = 0.21, 95% CI [0.05, 0.49]. However, no difference in positivity ratings was found between

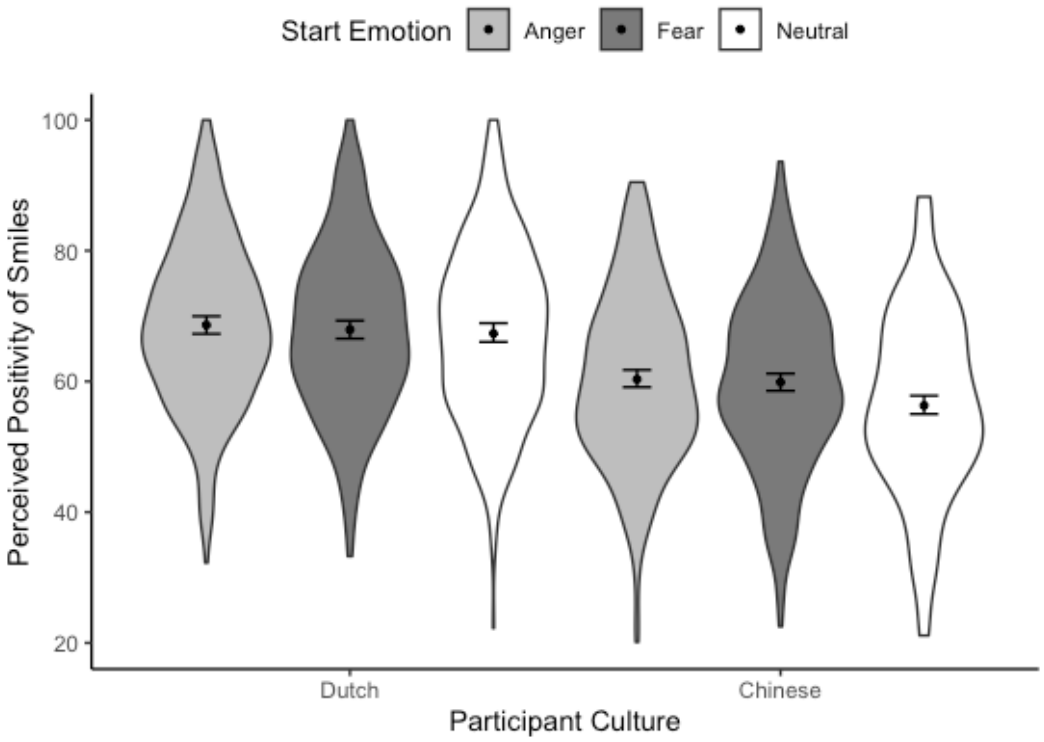
final smiles preceded by expressions of fear ($M$ = 67.92, $SD$ = 8.65) compared to neutral expressions ($M$ = 67.33, $SD$ = 8.68), $t(81) = 1.02$, $p = .310$, Cohen's $d = 0.11$, 95% CI [-0.10, 0.33]. There was also no difference between the positivity ratings of final smiles preceded by anger versus fear, $t(81) = 1.45$, $p = .150$, Cohen's $d = 0.16$, 95% CI [-0.06, 0.38].

As expected based on the significant two-way interaction between Start Emotion and Participant Culture, an independent *t*-test indicated that the difference score related to ratings of anger–to–smiles and neutral–to–smiles for Chinese participants ($M_{diff}$ = 4.01, $SD$ = 7.09), was larger than the difference score for ratings of anger–to–smiles and neutral–to–smiles for Dutch participants ($M_{diff}$ = 1.29, $SD$ = 4.73), $t(173) = 2.94$, $p = .004$, Cohen's $d = .45$, 95% CI [.144, .745]; an independent *t*-test indicated that the difference score related to ratings of fear–to–smiles and neutral–to–smiles for Chinese participants ($M_{diff}$ = 3.57, $SD$ = 7.98), was also larger than the difference score for ratings of fear–to–smiles and neutral–to–smiles for Dutch participants ($M_{diff}$ = 0.59, $SD$ = 5.21), $t(173) = 2.88$, $p = .004$, Cohen's $d = .44$, 95% CI [.135, .736].

Together, the current pattern of results conceptually replicates the findings in Experiment 1 by showing that Chinese participants exhibited significantly larger contrast effects than Dutch participants when judging the positivity of smiles preceded by facial expressions of negative emotions (anger and fear) versus neutral expressions. In particular, although Dutch participants perceived both high- and low-intensity smiles as more positive when they were preceded by expressions of anger and fear than neutral expressions, this effect was smaller than that for Chinese participants. Together, these findings provide further support for the hypothesized accentuated effect of temporal emotional contexts for Eastern as compared to Western perceivers.

**Figure 3**

*Perceived Positivity of Smiles as a Function of Start Emotion and Participant Culture in Experiment 2*




*Note.* The violin plot shows the full distribution of the data, with the width of the outlined area representing the proportion of the data located there. The points indicate the mean and error bars indicate 95% confidence intervals.

## General Discussion

Across two experiments, we found evidence of cultural differences in the influence of temporal emotional context on emotion judgments. Specifically, participants from two different regions of China showed larger differences in the perceived positivity of smiles preceded by different emotional expressions than did Canadian and Dutch participants. These results provide an important extension to the existing literature on East-West differences in perceptions of emotions. Although previous research has shown that concurrent contexts differentially influence attributions, evaluations, and emotion judgements of perceivers from

Eastern and Western cultures (Ishii et al., 2003; Kitayama & Ishii, 2002; Kitayama et al., 2003; Masuda et al., 2008; Masuda & Nisbett, 2001; Masuda & Kitayama, 2004), little is known about how culture interacts with temporal changes in facial expressions to shape emotion perception. The present work provides the first evidence for cultural differences in affective judgements as a function of preceding expressions, that is, Easterners' judgments of smiles are more strongly influenced by preceding facial expressions than Westerners' judgements.

Consistent with previous research that has shown contrast effects in which start emotions can shift the perceived valence of the final emotions in the opposite direction (Jellema et al., 2011; Palumbo & Jellema, 2013), our results demonstrate cultural differences in the extent to which this shift occurs. Specifically, in Experiment 1, when low-intensity smiles were preceded by anger expressions they were perceived as more positive than when they were preceded by high-intensity smiles, and this difference was larger for Easterners than for Westerners. Similarly, in Experiment 2, when low- as well as high-intensity smiles were preceded by expressions of anger or fear they were perceived as more positive than when preceded by neutral expressions, and these differences were again more pronounced for Easterners than Westerners. Together, these findings indicate that when judging others' current emotional states, Easterners take past emotional contexts into account to a greater extent than Westerners.

It is noteworthy that the current pattern of results cannot be accounted for by cultural differences in perceptions of constituent facial expressions. In contrast to previous research (Beaupré & Hess, 2005; Jack et al., 2009) that has examined accuracy in emotion recognition,the focus of the current research is on valence judgments of facial expressions. Although Easterners may be less accurate than Westerners in recognizing certain emotional facial expressions, our pilot study provided evidence that Easterners and Westerners did not

differ in their affective judgments of any of the constituent static facial expressions except anger. Notably, anger was perceived as more positive by Chinese than Canadian participants. However, this difference cannot explain the observed pattern of results. If the observed cultural differences in the perception of emotional transitions were due to cultural differences in the perception of the constituent static expressions, then larger differences in the positivity ratings between start emotions (anger vs. high-intensity smiles in Experiment 1; anger/fear vs. neutral in Experiment 2) in Westerners would result in the final smiles being perceived as more rather than less different compared to Easterners. Thus, if anything, the differential perceptions of static facial expressions of anger indicate a more conservative test of our hypothesis and underline the importance of cultural differences in attending to preceding facial expressions.

Although beyond the scope of the current study aims, we suggest four possible theoretical explanations to account for the contrast effects that occurred when judging transitions of facial expressions. First, the contrast effects could be viewed from the general framework of context effects in evaluative judgments (Bless & Schwarz, 2010). Information that is used in forming a representation of the target results in assimilation effects, whereas information that is excluded from forming a representation of the target results in contrast effects. For example, including positive features in the representation of the target results in a more positive representation and hence a more positive judgment, whereas excluding positive features results in less positive judgment. How information is used depends on a variety of factors that include similarity between context and target stimuli (Herr et al., 1982; Hsu & Wu, 2019) and sequential or simultaneous presentation formats (Wedell et al., 1986). In the present research, it is possible that the dissimilarities between the start and final emotions, as well as the sequential presentation of the emotional stimuli both contribute to the observed contrast effects. Second, the contrast effects might be aftereffects induced by adaptation (Hsu

& Young, 2004; Webster et al., 2004; Xu et al., 2008). A period of prolonged constant stimulation of an adapting stimulus (e.g., an angry face) makes it appear less extreme in its character (less angry), and as a result, a new test stimulus afterwards appears to have opposite characteristics (more happy). Third, the contrast effects might be caused by representational momentum, with observer's memory for the final location of a moving target being displaced along the direction of target motion (see Hubbard, 2005, for a review). In the present studies, the change on the valence dimension (e.g., from negative to positive) might make participants displace the intensity of the final expression further along the changing trajectory (e.g., more positive). Finally, the contrast effects may reflect observers' (unintentional) anticipation of the actor's future emotional state based on the immediate perceptual history (Jellema et al., 2011; Palumbo & Jellema, 2013). For instance, in the present research, when viewing an actor's expression changing from anger to low-intensity smiles, the observer may anticipate that the change will continue in the direction of becoming more positive, and thus judge the final expression as more positive.

These four processes are not necessarily mutually exclusive. Two or more of them could co-exist to account for the current pattern of results. Palumbo and Jellema (2013) demonstrated that the contrast effects in the perception of transitions of emotional expressions were more likely to be caused by emotional anticipation than adaptation or representational momentum, however, they did not provide direct evidence for an emotional anticipation account. Therefore, systematic comparisons will be needed in future research to establish the contributions of these potential mechanisms to contrast effects for judgments of transitions of facial expressions.

The goal of the current research was not to compare these various underlying mechanisms, but to investigate whether contrast effects in responses to sequentially presented facial emotional expressions are moderated by culture. The core finding of our study, that

Eastern participants exhibited a greater contrast effect than Western participants, speaks to this key question. Still, our finding allows for some speculation with regard to possible underlying mechanisms. There are accounts arguing that culture tends to play a more pronounced role in top-down processes than bottom-up processes (Senzaki et al., 2014). If this is the case, the differing magnitudes of contrast effects observed in Eastern and Western participants would be more likely due to emotional anticipation (more reflective of top-down processes) than adaptation or representational momentum (more reflective of bottom-up processes). Moreover, our findings are consistent with research showing that Easterners are more likely than Westerners to attend to, and be influenced by, information pertaining to the past and future (for a review, see Gao, 2016). But why might Easterners be more likely than Westerners to incorporate information from the temporal context? Previous research has established that Easterners tend to be more holistic, attend to the entire field, and explain events with reference to the current context, whereas Westerners tend to be analytical, attend primarily to attributes of the focal object, and detach events from their current context (Kitayama et al., 2003; Masuda et al., 2008; Masuda & Nisbett, 2001; Masuda & Kitayama, 2004; Nisbett et al., 2001). Our data indicates that Easterners' tendency towards holistic processing may also apply to the integration of temporal emotional contexts, at least in the perception of facial expressions. Because cultural differences in social orientation and cognition are not always reducible to individual differences (Na et al., 2010), it is challenging to establish individual associations between holistic/analytic cognition and magnitudes of contrast effects. However, further research with more countries that vary in the dimension of holistic/analytical cognition could allow for tests of its influence on the integration of temporal emotional contexts.

Cultural differences in attentional tendencies may also impact eye-movement scan patterns when observing transitions of facial expressions. There is some evidence that when

presented with static facial expressions, Easterners attend more to the eyes and Westerners' attention is distributed evenly across the face (Jack et al., 2009). It is not clear, however, how these visual patterns of attention would map onto the current emotional transitions (from neutral or negative emotions to smiles), which tend to encompass changes in muscle activation around both the mouth and the eyes. Future research is therefore recommended to investigate whether Easterners and Westerners attend to different facial features differently when viewing emotional transitions and how this process impacts the perception of final emotions.

Because the present research focused on emotional expressions that changed from negative to positive emotions, it remains to be seen whether a similar pattern of results would occur for changes from positive to negative emotions. For example, would anger be perceived as more negative when preceded by a smile than when preceded by a neutral expression? And if so, would this effect be larger for Easterners than for Westerners? Furthermore, we have only investigated the impact of a limited number of negative start emotions (fear and anger) on perceptions of final emotions. Would a similar effect be found for other negative start emotions such as disgust or sadness? Although the present results provide consistent evidence that preceding emotional expressions influence the perception of subsequent smiles more for Easterners than for Westerners, we recommend that future research examines a larger range of start and final emotions.

Another avenue for future research would be to examine whether East-West differences exist in the perception of the start emotions. In addition to making perceptual judgments of the final emotions, we recommend investigating whether and how final emotions influence participants retrospectively interpret the start emotions. Would assimilation or contrast effects occur in this process and would this influence be stronger for Easterners than Westerners?

Finally, in addition to the perception of facial expressions, future researchers might consider investigating whether Easterners' tendency towards integrating temporal contextual information also occurs in other domains such as emotional experiences, trait attributions, decision making, and person perception. For example, Kirkland and Cunningham (2012) suggested that a mildly positive affective state can be construed as pleasant or aversive, depending on whether it follows a worse or better state, respectively. If emotions are indeed partly determined by the interaction of one's current affective state and previous affective state, would culture influence this process? Moreover, although some studies have shown cultural differences in memorizing and thinking about the past, the present, and the future, a further avenue for future research would be to examine how Easterners' and Westerners' perceptions of a person (or object) differ when provided with information about the person's (or object's) past or future.

## Conclusion

The present research provides the first evidence that Easterners show larger differentiation in the perceived valence of smiles preceded by different emotional expressions than Westerners. Extending previous work on cultural differences related to the impact of concurrent contexts on a host of processes (Kitayama et al., 2003; Masuda & Nisbett, 2001; Masuda & Kitayama, 2004), including emotion perception (Ishii et al., 2003; Kitayama & Ishii, 2002; Masuda et al., 2008; Tanaka et al., 2010), these results suggest that Easterners are also more likely than Westerners to incorporate information from temporal emotional contexts. Although more cross-cultural research in other domains of person perception is warranted, the present research represents an important first step toward a better understanding of the divergent effects of temporal contexts on emotion perception across Eastern and Western cultures.

## References

Ambadar, Z., Schooler, J. W., & Cohn, J. F. (2005). Deciphering the enigmatic face: The importance of facial dynamics in interpreting subtle facial expressions. *Psychological Science*, *16*(5), 403-410. https://doi.org/10.1111/j.0956-7976.2005.01548.x

Aviezer, H., Hassin, R. R., Ryan, J., Grady, C., Susskind, J., Anderson, A., Moscovitch, M., & Bentin, S. (2008). Angry, disgusted, or afraid? Studies on the malleability of emotion perception. *Psychological Science*, *19*(7), 724-732. https://doi.org/10.1111/j.1467-9280.2008.02148.x

Bless, H., & Schwarz, N. (2010). Mental construal and the emergence of assimilation and contrast effects: The inclusion/exclusion model. In *Advances in experimental social psychology* (Vol. 42, pp. 319-373). Academic Press.

Calvo, M. G., Gutiérrez-García, A., Fernández-Martín, A., & Nummenmaa, L. (2014). Recognition of facial expressions of emotion is related to their frequency in everyday life. *Journal of Nonverbal Behavior*, *38*(4), 549-567. https://doi.10.1007/s10919-014-0191-3

Carroll, J. M., & Russell, J. A. (1996). Do facial expressions signal specific emotions? Judging emotion from the face in context. *Journal of Personality and Social Psychology*, *70*(2), 205. https://doi.org/10.1037/0022-3514.70.2.205

Chen, L. F., & Yen, Y. S. (2007). Taiwanese Facial Expression Image Database. Brain Mapping Laboratory. Institute of Brain Science, National Yang-Ming University, Taipei, Taiwan.

De Gelder, B. (2006). Towards the neurobiology of emotional body language. *Nature Reviews Neuroscience*, *7*(3), 242-249. https://doi.org/10.1038/nrn1872

Ekman, P. (1972). Universals and cultural differences in facial expressions of emotion. In J. Cole (Ed.), *Nebraska symposium on motivation* (Vol. 19, pp. 207–283). University of Nebraska Press.

Ekman, P. (2003). Darwin, deception, and facial expression. *Annals of the New York Academy of Sciences*, *1000*(1), 205-221. https://doi.10.1196/annals.1280.010

Ekman, P., Friesen, W. V., & Hager, J. (2002). Emotional facial action coding system. Manual and investigators guide. CD-ROM.

Elfenbein, H. A., & Ambady, N. (2002). On the universality and cultural specificity of emotion recognition: a meta-analysis. *Psychological Bulletin, 128*(2), 203-235. https://doi.org/10.1037/0033-2909.128.2.203

Fabes, R. A., & Martin, C. L. (1991). Gender and age stereotypes of emotionality. *Personality and Social Psychology Bulletin, 17*(5), 532-540. https://doi.org/10.1177/0146167291175008

Fang, X., Van Kleef, G. A., & Sauter, D. A. (2018). Person perception from changing emotional expressions: primacy, recency, or averaging effect?. *Cognition and Emotion*, *32*(8), 1597-1610. https://doi.org/10.1080/02699931.2018.1432476

Fang, X., Sauter, D. A., & Van Kleef, G. A. (2019). Unmasking smiles: the influence of culture and intensity on interpretations of smiling expressions. *Journal of Cultural Cognitive Science*, 1-16. https://doi.org/10.1007/s41809-019-00053-1

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175-191. https://doi.org/10.3758/BF03193146

Freeman, J. B., & Ambady, N. (2011). When two become one: Temporally dynamic integration of the face and voice. *Journal of Experimental Social Psychology*, *47*(1), 259-263. https://doi.org/10.1016/j.jesp.2010.08.018

Gable, S. L., Gonzaga, G. C., & Strachman, A. (2006). Will you be there for me when things go right? Supportive responses to positive event disclosures. *Journal of Personality and Social Psychology*, *91*(5), 904-917. https://doi.10.1037/0022-3514.91.5.904

Gable, S. L., Reis, H. T., Impett, E. A., & Asher, E. R. (2004). What do you do when things go right? The intrapersonal and interpersonal benefits of sharing positive events. *Journal of Personality and Social Psychology*, *87*(2), 228-245. https://doi.org/10.1037/0022-3514.87.2.228

Gao, X. (2016). Cultural differences between East Asian and North American in temporal orientation. *Review of General Psychology*, *20*(1), 118-127. https://doi.org/10.1037/gpr0000070

Gudykunst, W. B., Matsumoto, Y., Ting-Toomey, S., Nishida, T., Kim, K., & Heyman, S. (1996). The influence of cultural individualism-collectivism, self construals, and individual values on communication styles across cultures. *Human Communication Research*, *22*, 510-543. https://doi.org/10.1111/j.1468-2958.1996.tb00377.x

Guo, T., Ji, L. J., Spina, R., & Zhang, Z. (2012). Culture, temporal focus, and values of the past and the future. *Personality and Social Psychology Bulletin, 38*(8), 1030-1040. https://doi.org/10.1177/0146167212443895

Hess, U., Beaupré, M. G., & Cheung, N. (2002). Who to whom and why–cultural differences and similarities in the function of smiles. In M. H. Abel (Ed.), *An empirical reflection on the smile* (pp. 187–216). The Edwin Mellen Press.

Hoffmann, H., Traue, H. C., Bachmayr, F., & Kessler, H. (2010). Perceived realism of dynamic facial expressions of emotion: Optimal durations for the presentation of emotional onsets and offsets. *Cognition and Emotion*, *24*(8), 1369-1376. https://doi.org/10.1080/02699930903417855

Hsu, S. M., & Young, A. (2004). Adaptation effects in facial expression recognition. *Visual Cognition, 11*(7), 871-899. https://doi.org/10.1080/13506280444000030

Hubbard, T. L. (2005). Representational momentum and related displacements in spatial memory: A review of the findings. *Psychonomic Bulletin & Review*, *12*(5), 822-851. https://doi.org/10.3758/BF03196775

Ishii, K., Reyes, J. A., & Kitayama, S. (2003). Spontaneous attention to word content versus emotional tone: Differences among three cultures. *Psychological Science*, *14*(1), 39-46. https://doi.org/10.1111/1467-9280.01416

Ishii, K., Miyamoto, Y., Mayama, K., & Niedenthal, P. M. (2011). When your smile fades away: Cultural differences in sensitivity to the disappearance of smiles. *Social Psychological and Personality Science*, *2*(5), 516-522. https://doi.org/10.1177/1948550611399153

Jack, R. E., Blais, C., Scheepers, C., Schyns, P. G., & Caldara, R. (2009). Cultural confusions show that facial expressions are not universal. *Current Biology, 19*(18), 1543-1548. https://doi.org/10.1016/j.cub.2009.07.051

Jellema, T., Pecchinenda, A., Palumbo, L., & Tan, E. G. (2011). Biases in the perception and affective valence of neutral facial expressions induced by the immediate perceptual history. *Visual Cognition, 19*(5), 616-634. https://doi.org/10.1080/13506285.2011.569775

Ji, L. J., Guo, T., Zhang, Z., & Messervey, D. (2009). Looking into the past: Cultural differences in perception and representation of past information. *Journal of Personality and Social Psychology*, *96*(4), 761-769. https://doi.org/10.1037/a0014498

Ji, L. J., Peng, K., & Nisbett, R. E. (2000). Culture, control, and perception of relationships in the environment. *Journal of Personality and Social Psychology*, *78*(5), 943-955. https://doi.10.I037//0O22-3514.78.S.943

Kitayama, S., Duffy, S., Kawamura, T., & Larsen, J. T. (2003). Perceiving an object and its context in different cultures: A cultural look at new look. *Psychological Science*, *14*(3), 201-206. https://doi.org/10.1111/1467-9280.02432

Kitayama, S., & Ishii, K. (2002). Word and voice: Spontaneous attention to emotional utterances in two languages. *Cognition and Emotion*, *16*(1), 29-59. https://doi.abs/10.1080/0269993943000121

Kittler, M. G., Rygl, D., & Mackinnon, A. (2011). Special Review Article: Beyond culture or beyond control? Reviewing the use of Hall's high-/low-context concept. *International Journal of Cross Cultural Management*, *11*, 63-82. https://doi.org/10.1177/1470595811398797

Krumhuber, E. G., Kappas, A., & Manstead, A. S. (2013). Effects of dynamic aspects of facial expressions: A review. *Emotion Review*, *5*(1), 41-46. https://doi.org/10.1177/1754073912451349

Manstead, A. S. R., Wagner, H. L., & MacDonald, C. J. (1983). A contrast effect in judgments of own emotional state. *Motivation and Emotion*, *7*(3), 279-290. https://doi.org/10.1007/BF00991678

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*(2), 224-253. https://doi.10.1037/0033-295X.98.2.224

Markus, H. R., & Kitayama, S. (1994). A collective fear of the collective: Implications for selves and theories of selves. *Personality and Social Psychology Bulletin*, *20*(5), 568-579. https://doi.org/10.1177/0146167294205013

Masuda, T. (2017). Culture and attention: Recent empirical findings and new directions in cultural psychology. *Social and Personality Psychology Compass*, *11*(12), e12363. https://doi.org/10.1111/spc3.12363

Masuda, T., Ellsworth, P. C., Mesquita, B., Leu, J., Tanida, S., & van de Veerdonk, E. (2008). Placing the face in context: Cultural differences in the perception of facial emotion. *Journal of Personality and Social Psychology*, *94*(3), 365-381. https://doi.org/10.1037/0022-3514.94.3.365

Masuda, T., & Kitayama, S. (2004). Perceiver-induced constraint and attitude attribution in Japan and the US: A case for the cultural dependence of the correspondence bias. *Journal of Experimental Social Psychology*, *40*(3), 409-416. https://doi.org/10.1016/j.jesp.2003.08.004

Masuda, T., & Nisbett, R. E. (2001). Attending holistically versus analytically: Comparing the context sensitivity of Japanese and Americans. *Journal of Personality and Social Psychology*, *81*(5), 922-934. https://doi.10.1037//0022-35I4.81.5.922

Masuda, T., & Nisbett, R. E. (2006). Culture and change blindness. *Cognitive Science, 30*(2), 381-399. https://doi.org/10.1207/s15516709cog0000_63

Masuda, T., Wang, H., Ishii, K., & Ito, K. (2012). Do surrounding figures' emotions affect judgment of the target figure's emotion? Comparing the eye-movement patterns of European Canadians, Asian Canadians, Asian international students, and Japanese. *Frontiers in Integrative Neuroscience*, *6*, 72. https://doi.org/10.3389/fnint.2012.00072

Matsumoto, D., & Kudoh, T. (1993). American-Japanese cultural differences in attributions of personality based on smiles. *Journal of Nonverbal Behavior*, *17*(4), 231-243. https://doi.10.1007/BF00987239

Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data: a model comparison perspective* (2nd ed). Lawrence Erlbaum Associates.

Miyamoto, Y. (2013). Culture and analytic versus holistic cognition: Toward multilevel analyses of cultural influences. *Advances in Experimental Social Psychology*, *47*, 131–188. https://doi.org/10.1016/B978-0-12-407236-7.00003-6

Miyamoto, Y., & Kitayama, S. (2002). Cultural variation in correspondence bias: The critical role of attitude diagnosticity of socially constrained behavior. *Journal of Personality and Social Psychology*, *83*(5), 1239-1248. https://doi.org/10.1037/0022-3514.83.5.1239

Na, J., Grossmann, I., Varnum, M. E., Kitayama, S., Gonzalez, R., & Nisbett, R. E. (2010). Cultural differences are not always reducible to individual differences. *Proceedings of the National Academy of Sciences, 107*(14), 6192-6197. https://doi.org/10.1073/pnas.1001911107

Niedenthal, P. M., & Brauer, M. (2012). Social functionality of human emotion. *Annual Review of Psychology*, *63*, 259-285. https://doi.10.1146/annurev.psych.121208.131605

Niedenthal, P. M., Mermillod, M., Maringer, M., & Hess, U. (2010). The Simulation of Smiles (SIMS) model: Embodied simulation and the meaning of facial expression. *Behavioral and Brain Sciences*, *33*(6), 417-480. https://doi.10.1017/S0140525X10000865

Nisbett, R. E., & Masuda, T. (2003). Culture and point of view. *Proceedings of the National Academy of Sciences*, *100*(19), 11163-11170. https://doi.org/10.1073/pnas.1934527100

Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review*, *108*(2), 291-230. https://doi.org/10.1037/0033-295X.108.2.291

Palumbo, L., & Jellema, T. (2013). Beyond face value: does involuntary emotional anticipation shape the perception of dynamic facial expressions?. *PloS one, 8*(2), e56003. https://doi.org/10.1371/journal.pone.0056003

Plant, E. A., Hyde, J. S., Keltner, D., & Devine, P. G. (2000). The gender stereotyping of emotions. *Psychology of Women Quarterly, 24*(1), 81-92. https://doi.org/10.1111/j.1471-6402.2000.tb01024.x

Russell, J. A., & Fehr, B. (1987). Relativity in the perception of emotion in facial expressions. *Journal of Experimental Psychology: General*, *116*(3), 223-237. https://doi.org/10.1037/0096-3445.116.3.223

Russell, J. A., & Lanius, U. F. (1984). Adaptation level and the affective appraisal of environments. *Journal of Environmental Psychology*, *4*(2), 119-135. https://doi.org/10.1016/S0272-4944(84)80029-8

Rychlowska, M., Jack, R. E., Garrod, O. G. B., Schyns, P. G., Martin, J. D., & Niedenthal, P. M. (2017). Functional smiles: Tools for love, sympathy, and war. *Psychological Science*, *28*(9), 1259–1270. https://doi.10.1177/0956797617706082

Rychlowska, M., Miyamoto, Y., Matsumoto, D., Hess, U., Gilboa-Schechtman, E., Kamble, S., Muluk, H., Masuda, T., & Niedenthal, P. M. (2015). Heterogeneity of long-history migration explains cultural differences in reports of emotional expressivity and the functions of smiles. *Proceedings of the National Academy of Sciences*, *112*(19), E2429-E2436. https://doi.org/10.1073/pnas.1413661112

Sacharin, V., Sander, D., & Scherer, K. R. (2012). The perception of changing emotion expressions. *Cognition and Emotion*, *26*(7), 1273-1300. https://doi.org/10.1080/02699931.2012.656583

Sato, W., & Yoshikawa, S. (2004). The dynamic aspects of emotional facial expressions. *Cognition and Emotion*, *18*(5), 701-710. https://doi.org/10.1080/02699930341000176

Sauter, D. (2010). More than happy: The need for disentangling positive emotions. *Current Directions in Psychological Science*, *19*(1), 36-40. https://doi.org/10.1177/0963721409359290

Senzaki, S., Masuda, T., & Ishii, K. (2014). When is perception top-down and when is it not? Culture, narrative, and attention. *Cognitive Science*, *38*(7), 1493-1506. https://doi.org/10.1111/cogs.12118

Simmons J. P., Nelson L. D., Simonsohn U. (2013). Life after p-hacking. Meeting of the Society for Personality and Social Psychology, New Orleans, LA, 17-19 January 2013. http://ssrn.com/abstract=2205186 or http://dx.doi.org/10.2139/ssrn.220518

Stanley, J. T., Zhang, X., Fung, H. H., & Isaacowitz, D. M. (2013). Cultural differences in gaze and emotion recognition: Americans contrast more than Chinese. *Emotion*, *13*(1), 36-46. https://doi.org/10.1037/a0029209

Sun, J. K. (2010). Deciphering the Chinese smile: The importance of facial expressions in linguistic communication. *Cross-sections, 6*, 105-120. https://eview.anu.edu.au/cross-sections/vol6/pdf/whole.pdf#page=121

Tanaka, A., Koizumi, A., Imai, H., Hiramatsu, S., Hiramoto, E., & de Gelder, B. (2010). I feel your voice: Cultural differences in the multisensory perception of emotion. *Psychological Science*, *21*(9), 1259-1262. https://doi.org/10.1177/0956797610380698

Van Kleef, G. A. (2009). How emotions regulate social life: The emotions as social information (EASI) model. *Current Directions in Psychological Science*, *18*(3), 184-188. https://doi.org/10.1111/j.1467-8721.2009.01633.x

Van der Schalk, J., Hawk, S. T., Fischer, A. H., & Doosje, B. (2011). Moving faces, looking places: validation of the Amsterdam Dynamic Facial Expression Set (ADFES). *Emotion*, *11*(4), 907-920. https://doi.org/10.1037/a0023853

Varnum, M. E., Grossmann, I., Kitayama, S., & Nisbett, R. E. (2010). The origin of cultural differences in cognition: The social orientation hypothesis. *Current Directions in Psychological Science*, *19*(1), 9-13. https://doi.org/10.1177/0963721409359301

Webster, M. A., Kaping, D., Mizokami, Y., & Duhamel, P. (2004). Adaptation to natural facial categories. *Nature, 428*(6982), 557-561. https://doi.org/10.1038/nature02420

Westfall, J., Kenny, D. A., & Judd, C. M. (2014). Statistical power and optimal design in experiments in which samples of participants respond to samples of stimuli. *Journal of Experimental Psychology: General*, *143*(5), 2020-2045. https://doi.org/10.1037/xge0000014

Xu, H., Dayan, P., Lipkin, R. M., & Qian, N. (2008). Adaptation across the cortical hierarchy: Low-level curve adaptation affects high-level facial-expression judgments. *Journal of Neuroscience, 28*(13), 3374-3383. https://doi.org/10.1523/JNEUROSCI.0182-08.2008

Yoshikawa, S., & Sato, W. (2008). Dynamic facial expressions of emotion induce representational momentum. Cognitive, Affective, & Behavioral Neuroscience, 8(1), 25-31. https://doi.org/10.3758/CABN.8.1.25

## 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.

[2] In addition to valence judgements, exploratory measures related to perceived authenticity and politeness were also included in Experiments 1 and 2. Details about these measures and results can be found in the Supplementary Materials.

[3] Given that previous work has shown that gender-based emotion stereotypes might influence the interpretation of emotional behavior (e.g., Fabes & Martin, 1991; Plant et al., 2000), we also conducted mixed-design ANOVAs including Target Gender. This factor qualified the predicted Start Emotion by Participant Culture two-way interaction in Experiment 1 but not Experiment 2. Consistent with our predictions, a larger contrast effect was found for Eastern compared to Western participants for all conditions across both experiments except one (White female targets in Experiment 1). Specifically, the difference score related to anger–to–low-intensity smiles and high-intensity smiles–to–low-intensity smiles displayed by White female targets did not differ between Chinese and Canadian participants. Because the effects involving Target Gender were not consistent across experiments and the pattern of results regarding the main hypotheses remained largely the same, we report these analyses in the Supplementary Material. There we also report results of linear mixed effects models for both experiments, which yielded similar conclusions (see Supplementary Tables S10 and S11 for details).

## Supplementary Materials

### Table S1

*Chinese and Dutch Participants' Selected Frames for Each Dutch Model's Expression*

| Dutch Model | Participant Culture | *M* | *SD* | *t* | *p* |
|---|---|---|---|---|---|
| f01_anger | Chinese | 58.08 | 30.03 | 0.83 | .410 |
| | Dutch | 50.90 | 24.08 | | |
| f04_anger | Chinese | 64.93 | 32.14 | -0.71 | .485 |
| | Dutch | 71.63 | 27.78 | | |
| m04_anger | Chinese | 80.15 | 30.08 | -0.57 | .575 |
| | Dutch | 85.28 | 27.18 | | |
| m06_anger | Chinese | 55.08 | 15.03 | -2.11 | .043 |
| | Dutch | 67.33 | 21.26 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | f01_fear | Chinese | 95.35 | 21.54 | 1.23 | .227 |
| | | Dutch | 85.98 | 26.45 | | |
| | f04_fear | Chinese | 63.10 | 34.52 | 0.06 | .956 |
| | | Dutch | 62.53 | 31.25 | | |
| | m04_fea | Chinese | 58.03 | 31.69 | -1.33 | .091 |
| r | | Dutch | 72.00 | 34.66 | | |
| | m06_fea | Chinese | 61.10 | 27.06 | -1.28 | .209 |
| r | | Dutch | 72.05 | 27.10 | | |
| | f01_joy | Chinese | 93.63 | 34.95 | -0.74 | .463 |
| | | Dutch | 102.00 | 36.48 | | |
| | f04_joy | Chinese | 95.20 | 20.84 | -2.23 | .032 |
| | | Dutch | 111.88 | 26.21 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | m04_joy | Chinese | 88.60 | 25.43 | -1.97 | .057 |
| | | Dutch | 105.78 | 29.66 | | |
| | m06_joy | Chinese | 85.13 | 24.30 | -1.34 | .189 |
| | | Dutch | 95.50 | 24.72 | | |
| | f01_lowjoy | Chinese | 36.05 | 8.55 | -0.61 | .546 |
| | | Dutch | 37.73 | 8.85 | | |
| | f04_lowjoy | Chinese | 48.78 | 7.82 | -0.28 | .781 |
| | | Dutch | 49.48 | 7.98 | | |
| | m04_lowjoy | Chinese | 36.03 | 12.75 | -0.38 | .707 |
| | | Dutch | 37.40 | 10.10 | | |
| | m06_lowjoy | Chinese | 34.98 | 5.01 | -1.37 | .185 |
| | | Dutch | 41.65 | 21.20 | | |

*Notes.* The lowest p value of independent t-tests between Chinese and Dutch participants among all 16 comparisons was .032, which failed to reach the significance threshold after Bonferroni correction for multiple comparisons.

**Table S2**

*Participant Culture × Static Emotion (High-intensity smiles, Low-intensity smiles, Anger, Fear, Neutral) × Target* Ethnicity *Mixed-Design Analysis of Variance on Positivity Ratings*

| Effect | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|
| Participant Culture (P) | 2.20 | (1,151) | 0.140 | 0.014 |
| Emotion (E) | 622.71 | (4,604) | **< .001** | 0.805 |
| Target Ethnicity (T) | 64.47 | (1,151) | **< .001** | 0.299 |
| P × E | 6.33 | (4,604) | **0.005** | 0.040 |
| P × T | 1.84 | (1,151) | 0.177 | 0.012 |
| E × T | 44.78 | (4,604) | **< .001** | 0.229 |
| P × E × T | 1.80 | (4,604) | 0.129 | 0.012 |

*Note.* The positivity ratings were computed by taking the mean of both positivity and negativity (reversed-scored) items. Statistically significant results are shown in bold.

**Table S3**

*Chinese and Canadian Participants' Positivity Ratings for Static Emotional Expressions*

| Emotion | Participant Culture | *M* | *SD* | *t* | *p* |
|---|---|---|---|---|---|
| High-intensity smiles | Chinese | 78.05 | 13.57 | -2.08 | .039 |
| | Canadian | 82.79 | 14.57 | | |
| Low-intensity smiles | Chinese | 76.40 | 9.67 | -1.40 | .164 |
| | Canadian | 79.68 | 10.52 | | |
| Anger | Chinese | 30.32 | 11.36 | 4.14 | < .001 |
| | Canadian | 22.16 | 13.05 | | |
| Fear | Chinese | 29.02 | 12.38 | 0.74 | .462 |
| | Canadian | 27.52 | 12.71 | | |
| Neutral | Chinese | 40.32 | 8.99 | 1.84 | .068 |

| | | | | |
|---|---|---|---|---|
| | Canadian | 3 | 9. | |
| | | 7.58 | 42 | |

*Note.* The positivity ratings were computed by taking the mean of both positivity and negativity (reversed-scored) items; the only cultural difference that passed the significance threshold after Bonferroni correction for multiple comparisons ($\alpha = .05/4$) was the cultural difference on positivity ratings of anger.

**Mixed-design ANOVAs involving Target Gender in Experiment 1**

In Experiment 1, we conducted a 2 (Start Emotion: Anger, High-intensity smiles) × 2 (Target Ethnicity: Asian, White) × 2 (Target Gender: Female, Male) × 2 (Participant Culture: Chinese, Canadian) mixed-design ANOVA on the composite scores, with Start Emotion, Target Gender, and Target Ethnicity as within-subjects variables, and Participant Culture as a between-subjects variable. See Table S4 for a complete overview of effects.

The main effects of Participant Culture, $F(1, 198) = 14.33$, $p < .001$, $\eta_p^2 = .067$, 90% CI [.022, .130], Target Ethnicity, $F(1, 198) = 5.59$, $p = .019$, $\eta_p^2 = .027$, 90% CI [.002, .075], and Target Gender, $F(1, 198) = 9.73$, $p = .002$, $\eta_p^2 = .047$, 90% CI [.002, .075], were significant. Canadian participants ($M = 62.40$, $SD = 7.00$) perceived smiles as more positive than Chinese participants ($M = 58.51$, $SD = 7.54$), smiles of White targets ($M = 61.13$, $SD = 8.64$) were perceived as more positive than smiles of Asian targets ($M = 59.90$, $SD = 8.30$), and smiles of male targets ($M = 61.32$, $SD = 7.76$) were perceived as more positive than smiles of female targets ($M = 59.71$, $SD = 8.94$). Furthermore, the main effect of Start Emotion was significant, $F(1, 198) = 192.03$, $p < .001$, $\eta_p^2 = .492$, 90% CI [.412, .557]. The results reflect the predicted contrast effect, with low-intensity smiles being perceived as more positive when preceded by anger expressions ($M = 67.37$, $SD = 10.58$) than high-intensity smiles ($M = 53.66$, $SD = 10.10$).

Importantly, the predicted two-way interaction of Start Emotion and Participant Culture was significant, $F(1, 198) = 5.52$, $p = .020$, $\eta_p^2 = .027$, 90% CI [.002, .074]. Additionally, two higher-order interactions involving Start Emotion and Participants — the three-way interaction of Start Emotion × Participant Culture × Target Gender, $F(1, 198) = 7.01$, $p = .009$, $\eta_p^2 = .034$, 90% CI [.002, .075], and the four-way interaction of Start Emotion × Participant Culture × Target Ethnicity × Target Gender, $F(1, 198) = 11.63$, $p = .001$, $\eta_p^2$

= .055, 90% CI [.002, .075] — were also significant. We thus start from the highest order interaction, which was decomposed by Target Ethnicity.

For Asian targets, the predicted two-way interaction of Start Emotion and Participant Culture was significant, $F(1, 198) = 5.26$, $p = .023$, $\eta_p^2 = .026$, 90% CI [.002, .072], and it was not qualified by the three-way interaction of Start Emotion, Participant Culture, and Target Gender, $F(1, 198) = 0.28$, $p = .595$, $\eta_p^2 = .001$, 90% CI [.000, .022]. The difference between the two start emotions of Asian targets was significantly larger for Chinese participants ($M_{\text{Anger}} = 64.98$, $SD = 12.13$; $M_{\textit{High-intensity}\ \text{smiles}} = 49.05$, $SD = 11.46$), $t(96) = 9.93$, $p < .001$, $d = 1.01$, 95% CI [0.76, 1.25], relative to Canadian participants ($M_{\text{Anger}} = 68.21$, $SD = 9.92$; $M_{\textit{High-intensity}\ \text{smiles}} = 57.00$, $SD = 9.15$), $t(102) = 8.57$, $p < .001$, $d = 0.84$, 95% CI [0.62, 1.07], see Figure S1.

For White targets, the two-way interaction of Start Emotion and Participant Culture was also significant, $F(1, 198) = 4.08$, $p = .045$, $\eta_p^2 = .020$, 90% CI [.000, .063], but it was qualified by the three-way interaction of Start Emotion, Participant Culture, and Target Gender, $F(1, 198) = 20.23$, $p < .001$, $\eta_p^2 = .093$, 90% CI [.038, .160]. Decomposing this three-way interaction by Target Gender revealed that the predicted Start Emotion by Participant Culture interaction was significant for White male targets, $F(1, 198) = 15.40$, $p < .001$, $\eta_p^2 = .072$, 90% CI [.025, .135], but not for White female targets, $F(1, 198) = 0.06$, $p = .810$, $\eta_p^2 < .001$, 90% CI [.000, .013]. As predicted, the difference between the two start emotions of White male targets was significantly larger for Chinese participants ($M_{\text{Anger}} = 72.06$, $SD = 14.30$; $M_{\textit{High-intensity}\ \text{smiles}} = 49.79$, $SD = 13.36$), $t(96) = 10.97$, $p < .001$, $d = 1.11$, 95% CI [0.86, 1.37], relative to Canadian participants ($M_{\text{Anger}} = 68.36$, $SD = 12.00$; $M_{\textit{High-intensity}\ \text{smiles}} = 55.97$, $SD = 11.54$), $t(102) = 8.17$, $p < .001$, $d = .81$, 95% CI [0.58, 1.03], see Figure S1.

**Table S4**

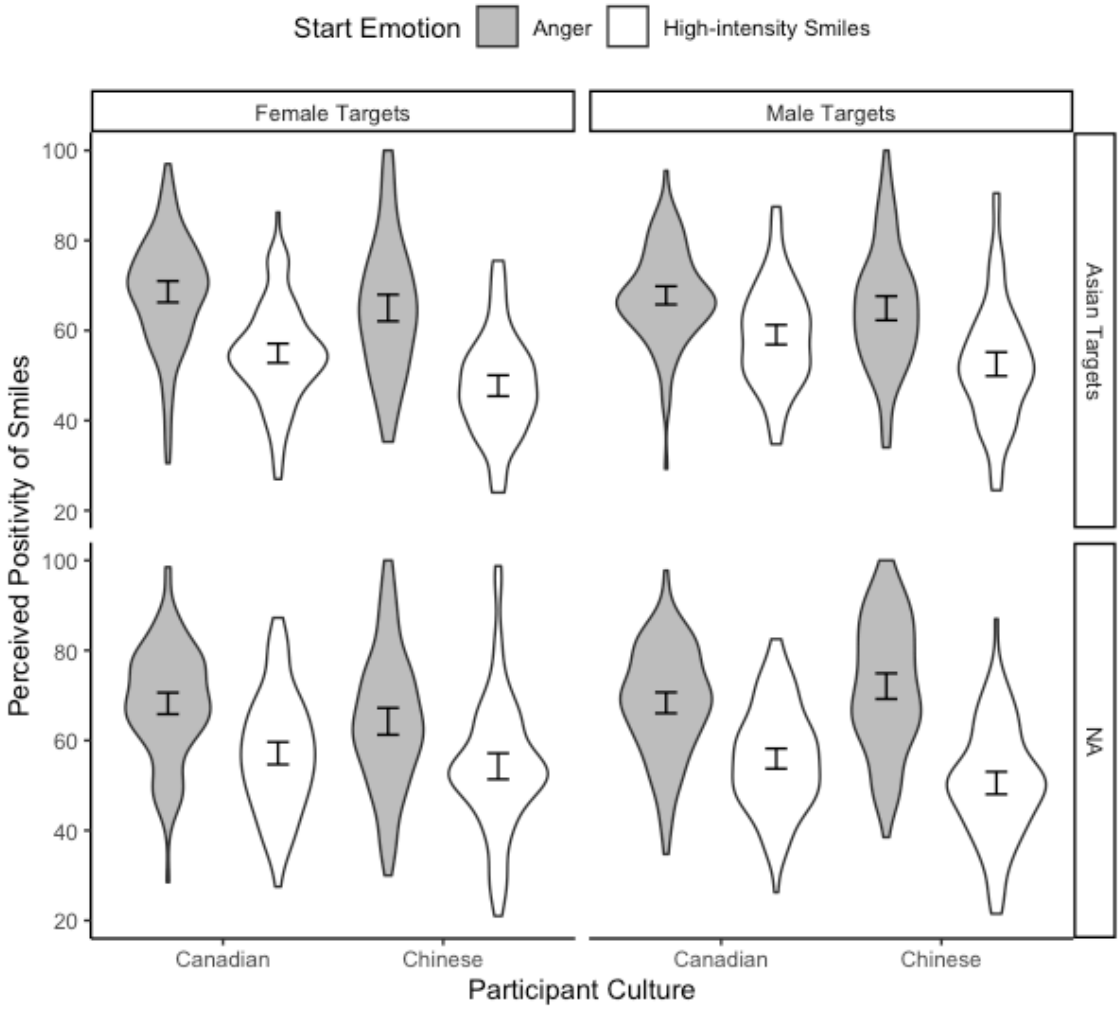
*Participant Culture × Start Emotion × Target Ethnicity × Target Gender Mixed-Design Analysis of Variance for Perceived Positivity of Smiles in Experiment 1*

| Effect | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|
| Participant | 14.33 | (1,198) | **< .001** | 0.067 |
| Start Emotion (E) | 192.03 | (1,198) | **< .001** | 0.492 |
| Target Ethnicity | 5.59 | (1,198) | **.019** | 0.027 |
| Target Gender | 9.73 | (1,198) | **.002** | 0.047 |
| P × E | 5.52 | (1,198) | **.020** | 0.027 |
| P × T | 9.74 | (1,198) | **.002** | 0.047 |
| P × G | 2.54 | (1,198) | .113 | 0.013 |
| E × T | 0.23 | (1,198) | .633 | 0.001 |
| E × G | 0.40 | (1,198) | .530 | 0.002 |
| T × G | 2.31 | (1,198) | .131 | 0.012 |
| P × E × T | < 0.01 | (1,198) | .953 | < .001 |
| P × E × G | 7.01 | (1,198) | **.009** | 0.034 |
| P × T × G | 0.06 | (1,198) | .803 | < .001 |
| E × T × G | 49.83 | (1,198) | **< .001** | 0.201 |
| P × E × T × G | 11.63 | (1,198) | **.001** | 0.055 |

*Note.* The perceived positivity of smiles was computed by taking the mean of both positivity and negativity (reversed-scored) items. Statistically significant results are shown in bold.

**Figure S1**

*Perceived Positivity of Low-intensity Smiles as a Function of Start Emotion, Participant Culture, Target Ethnicity, and Target Gender in Experiment 1*




*Note.* The violin plot outlines illustrate kernel probability density, and so the width of the colored area represents the proportion of the data located there. Error bars represent 95% confidence intervals of the mean.

**Mixed-design ANOVAs involving Target Gender in Experiment 2**

As in Experiment 1, we conducted a 2 (Final Smile Intensity: Low, High) × 3 (Start Emotion: Anger, Fear, Neutral) × 2 (Target Ethnicity: Asian, White) × 2 (Target Gender: Female, Male) × 2 (Participant Culture: Chinese, Dutch) mixed-design ANOVA on the composite scores. Final Smile Intensity, Start Emotion, Target Ethnicity, and Target Gender were within-subject variables, and Participant Culture was a between-subject variable. See Table S5 for a complete overview of effects.

The main effects of Participant Culture, $F(1, 173) = 61.01$, $p < .001$, $\eta_p^2 = .261$, 90% CI [.171, .344], Target Ethnicity, $F(1, 173) = 51.02$, $p < .001$, $\eta_p^2 = .228$, 90% CI [.142, .311], Target Gender, $F(1, 173) = 13.39$, $p < .001$, $\eta_p^2 = .072$, 90% CI [.142, .311], and Final Smile Intensity, $F(1, 173) = 366.57$, $p < .001$, $\eta_p^2 = .679$, 90% CI [.616, .725], were significant. Dutch participants ($M = 67.96$, $SD = 8.09$) perceived smiles as more positive than Chinese participants ($M = 58.84$, $SD = 7.35$), smiles of White targets ($M = 64.45$, $SD = 8.73$) were perceived as more positive than smiles of Asian targets ($M = 61.78$, $SD = 9.78$), smiles of male targets ($M = 63.78$, $SD = 8.62$) were perceived as more positive than smiles of female targets ($M = 62.45$, $SD = 9.83$), and high-intensity smiles ($M = 70.36$, $SD = 10.51$) were perceived as more positive than low-intensity smiles ($M = 55.87$, $SD = 9.95$). Furthermore, the predicted main effect of Start Emotion was significant, $F(2,346) = 19.49$, $p < .001$, $\eta_p^2 = .101$, 90% CI [.054, .150]. The pattern of results once again reflected a contrast effect in which smiles were perceived as more positive when preceded by angry expressions ($M = 64.22$, $SD = 9.15$) than neutral expressions ($M = 61.48$, $SD = 10.43$), $M_{diff} = 2.74$, $t(174) = 5.81$, $p < .001$, Cohen's $d = 0.44$, 95% CI [0.28, 0.59]. Likewise, smiles were perceived as more positive when preceded by expressions of fear ($M = 63.65$, $SD = 9.12$) than neutral expressions ($M = 61.48$, $SD = 10.43$), $M_{diff} = 2.17$, $t(174) = 4.12$, $p < .001$, Cohen's $d = 0.31$, 95% CI [0.16, 0.46]. As expected, there was no difference in perceived positivity of final

smiles when preceded by angry versus fearful expressions, $M_{diff} = 0.57$, $t(174) = 1.65$, $p = .100$, Cohen's $d = 0.12$, 95% CI [-0.02, 0.27].

Importantly, the hypothesized Start Emotion by Participant Culture two-way interaction was significant, $F(2, 346) = 6.81$, $p = .001$, $\eta_p^2 = .038$, 90% CI [.010, .073]. No other higher-order interactions involving Emotion and Participant Culture were significant. In accordance with Experiment 1, the difference between the start emotions (Anger and Fear vs. Neutral) of Asian targets was significantly larger for Chinese participants ($M_{Anger} = 60.33$, $SD = 8.04$; $M_{Fear} = 59.88$, $SD = 7.81$; $M_{Neutral} = 56.32$, $SD = 9.05$), Anger vs. Neutral: $t(92) = 5.45$, $p < .001$, Cohen's $d = 0.57$, 95% CI [0.34, 0.78], Fear vs. Neutral: $t(92) = 4.31$, $p < .001$, Cohen's $d = 0.37$, 95% CI [0.16, 0.58], Anger vs. Fear: $t(92) = 0.91$, $p = .363$, Cohen's $d = 0.09$, 95% CI [-0.11, 0.30], as compared to Dutch participants ($M_{Anger} = 68.63$, $SD = 8.32$; $M_{Fear} = 67.92$, $SD = 8.65$; $M_{Neutral} = 67.33$, $SD = 8.68$), Anger vs. Neutral: $t(81) = 2.48$, $p = .015$, Cohen's $d = 0.21$, 95% CI [0.05, 0.49], Fear vs. Neutral: $t(81) = 1.02$, $p = .310$, Cohen's $d = 0.11$, 95% CI [-0.10, 0.33], Anger vs. Fear: $t(81) = 1.45$, $p = .150$, Cohen's $d = 0.16$, 95% CI [-0.06, 0.38], see Figure S2.

**Table S5**

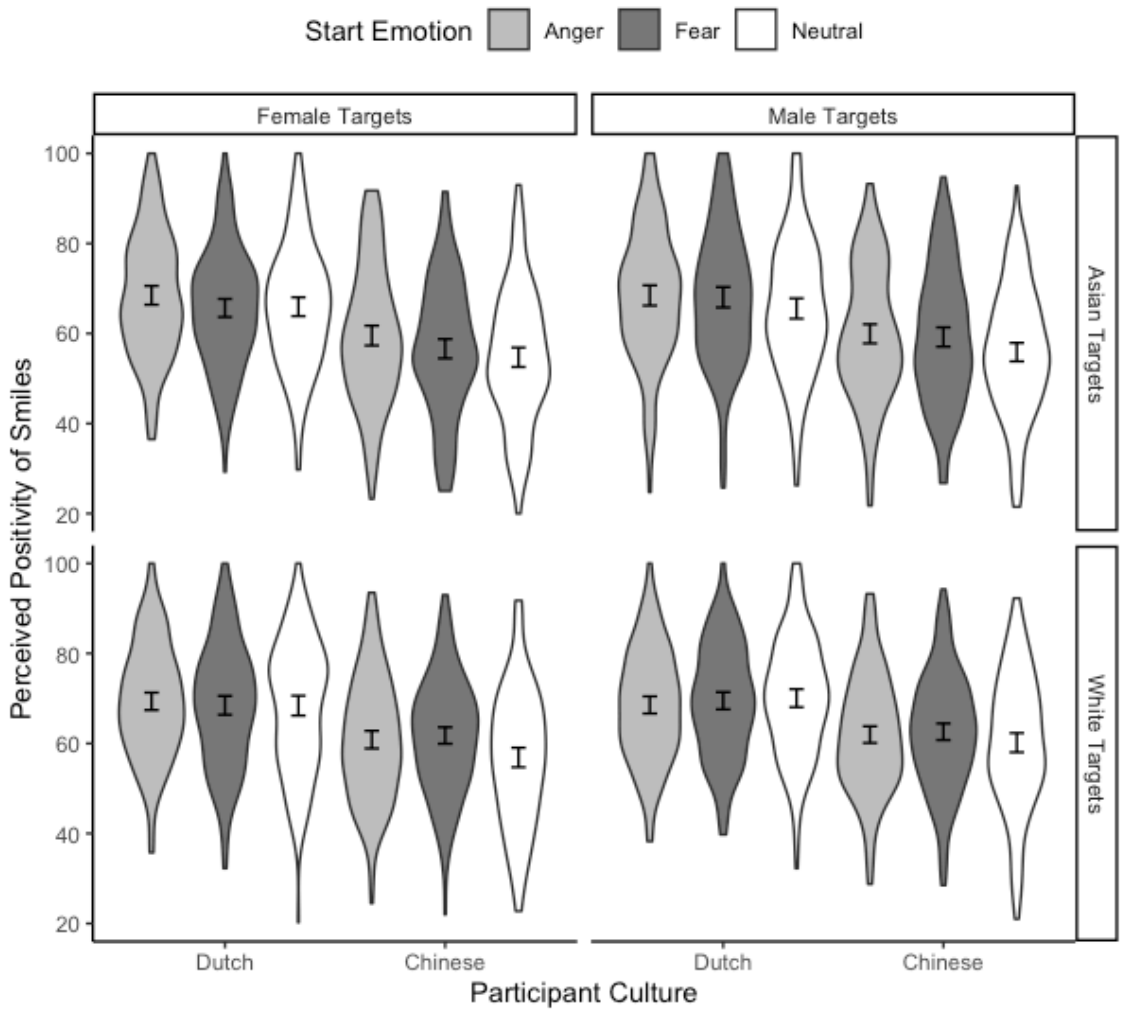
*Participant Culture × Start Emotion × Final Smile Intensity × Target Ethnicity × Target Gender Mixed-Design Analysis of Variance for Perceived Positivity of Smiles in Experiment 2*

| Effect | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|
| Participant | 61.01 | (1,173) | **< .001** | 0.261 |
| Start Emotion (E) | 19.49 | (2,346) | **< .001** | 0.101 |
| Final Smile | 366.57 | (1,173) | **< .001** | 0.679 |
| Target Ethnicity | 51.02 | (1,173) | **< .001** | 0.228 |
| Target Gender | 13.39 | (1,173) | **< .001** | 0.072 |
| P × E | 6.81 | (2,346) | **.001** | 0.038 |
| P × I | 0.01 | (1,173) | .935 | < .001 |
| P × T | 3.15 | (1,173) | .078 | 0.018 |
| P × G | 3.93 | (1,173) | **.049** | 0.022 |
| E × I | 0.79 | (2,346) | .454 | 0.005 |
| E × T | 11.09 | (2,346) | **< .001** | 0.060 |
| E × G | 3.58 | (2,346) | **.029** | 0.020 |
| I × T | 4.82 | (1,173) | **.029** | 0.027 |
| I × G | 9.14 | (1,173) | **.003** | 0.050 |
| T × G | 0.17 | (1,173) | .683 | 0.001 |
| P × E × I | 2.47 | (2,346) | .086 | 0.014 |
| P × E × T | 2.78 | (2,346) | .063 | 0.016 |
| P × E × G | 2.82 | (2,346) | .061 | 0.016 |
| P × I × T | 1.82 | (1,173) | .179 | 0.010 |
| P × I × G | 1.75 | (1,173) | .187 | 0.010 |
| P × T × G | 0.08 | (1,173) | .783 | < .001 |
| E × I × T | 11.93 | (2,346) | **< .001** | 0.065 |
| E × I × G | 0.71 | (2,346) | .491 | 0.004 |
| E × T × G | 8.34 | (2,346) | **< .001** | 0.046 |
| I × T × G | 9.03 | (1,173) | **.003** | 0.050 |
| P × E × I × T | 0.21 | (2,346) | .814 | 0.001 |
| P × E × I × G | 0.15 | (2,346) | .860 | 0.001 |
| P × E × T × G | 0.32 | (2,346) | .727 | 0.002 |
| P × I × T × G | 2.65 | (1,173) | .105 | 0.015 |
| E × I × T × G | 1.47 | (2,346) | .231 | 0.008 |
| P × E × I × T × G | 0.62 | (2,346) | .537 | 0.004 |

*Note.* The perceived positivity of smiles was computed by taking the mean of both positivity and negativity (reversed-scored) items. Statistically significant results are shown in bold.

**Figure S2**

*Perceived Positivity of Smiles as a Function of Start Emotion, Participant Culture, Target Ethnicity, and Target Gender in Experiment 2*




*Note.* The violin plot outlines illustrate kernel probability density, and so the width of the colored area represents the proportion of the data located there. Error bars represent 95% confidence intervals of the mean.

**Measures on Authenticity and Politeness of Final Emotional Expressions**

In addition to valence judgements, exploratory measures related to perceived authenticity ("How authentic is the expression at the end of the clip?") and politeness ("Is the expression at the end of the clip out of politeness?") were also included. We performed the same analysis on the two exploratory measures. For Experiment 1, the results on authenticity ratings were consistent with the pattern of results on positivity ratings, showing a main effect of Start Emotion in which anger–to–low-intensity smiles were perceived as more authentic than high-intensity smiles–to–low-intensity smiles. Furthermore, this effect was qualified by Participant Culture, with differences being larger for Chinese than Canadians. The results on politeness ratings also showed a main effect of Start Emotion in which high-intensity smiles–to–low-intensity smiles were perceived as more polite than anger–to–low-intensity smiles. However, this effect was not qualified by Participant Culture. See Supplementary Table S6 and Table S7 for more details.

The pattern of results of Experiment 2 was consistent with that of Experiment 1. Specifically, a main effect of Start Emotion was found in which smiles preceded by anger or fear were perceived as more authentic than smiles preceded by neutrality. The impact of start emotions on the perceived authenticity of smiles was further qualified by Participant Culture (marginally significant), with differences being larger among Chinese than among Dutch participants. Furthermore, the results related to politeness ratings also demonstrated a main effect of Start Emotion in which smiles preceded by neutrality were perceived as more polite than smiles preceded by anger or fear. Consistent with Experiment 1, however, such

differences were not qualified by Participant Culture. See Supplementary Table S8 and Table S9 for more details.

**Table S6**

*Start Emotion* × *Participant Culture* × *Target* Ethnicity *Mixed-Design Analysis of Variance for Authenticity and Politeness Ratings in Experiment 1*

| Measures | Effect | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|---|
| Authenticity | Start | 16. | (1,19 | **< .0** | .077 |
| | Particip | 2.9 | (1,19 | .086 | .015 |
| | Target | 0.7 | (1,19 | .386 | .004 |
| | E × P | 5.1 | (1,19 | **.024** | .026 |
| | E × T | 0.0 | (1,19 | **.787** | < .0 |
| | P × T | 4.4 | (1,19 | **.037** | .022 |
| | E × P × | 1.7 | (1,19 | .183 | .009 |
| Politeness | Start | 7.0 | (1,19 | **.009** | .034 |
| | Particip | 17. | (1,19 | **< .0** | .080 |
| | Target | 0.9 | (1,19 | .342 | .005 |
| | E × P | 0.2 | (1,19 | .656 | .001 |
| | E × T | 0.1 | (1,19 | .683 | .001 |
| | P × T | 0.2 | (1,19 | .268 | .001 |
| | E × P × | 0.5 | (1,19 | .469 | .003 |

*Note.* Statistically significant results are shown in bold.

**Table S7**

*Ratings of Authenticity and Politeness as a Function of Start Emotion and Participant Culture on smiles in Experiment 1*

| Ratings | Participant Culture | Anger | | High-intensity Smiles | |
|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* |
| Authenticity | Chinese | 60.81 | 12.99 | 53.24 | 14.77 |
| | Canadian | 55.56 | 13.06 | 53.42 | 12.71 |
| Politeness | Chinese | 60.86 | 16.10 | 56.46 | 13.79 |
| | Canadian | 54.07 | 14.09 | 50.94 | 13.87 |

**Table S8**

*Smile Intensity × Start Emotion × Participant Culture × Target Ethnicity Mixed-Design Analysis of Variance for Authenticity and Politeness Ratings in Experiment 2*

| Measure | Effect | *F* | *df* | *p* | $\eta_p^2$ |
|---|---|---|---|---|---|
| Authenticity | Smile | 182. | (1,1 | **< .0** | .51 |
| | Start | 19.3 | (2,3 | **< .0** | .10 |
| | Particip | 9.94 | (1,1 | **.00** | .05 |
| | Target | 61.4 | (1,1 | **< .0** | .26 |
| | I × E | 1.64 | (2,3 | .19 | .00 |
| | I × P | 0.08 | (1,1 | .78 | < .0 |
| | I × T | 2.63 | (1,1 | .10 | .01 |
| | E × P | 2.48 | (2,3 | .08 | .01 |
| | E × T | 1.85 | (2,3 | .15 | .01 |
| | P × T | 1.13 | (1,1 | .29 | .00 |
| | I × E × | 1.81 | (2,3 | .16 | .01 |
| | I × E × | 0.52 | (2,3 | .59 | .00 |
| | I × P × | 1.69 | (1,1 | .19 | .01 |
| | E × P × | 3.20 | (2,3 | **.04** | .01 |
| | I × E × | 2.51 | (2,3 | .08 | .01 |
| Politeness | Smile | 131. | (1,1 | **< .0** | .43 |
| | Start | 36.3 | (2,3 | **< .0** | .17 |
| | Particip | 3.75 | (1,1 | .05 | .02 |
| | Target | 22.8 | (1,1 | **< .0** | .11 |
| | I × E | 0.25 | (2,3 | .77 | .00 |
| | I × P | 13.4 | (1,1 | **< .0** | .07 |
| | I × T | 0.20 | (1,1 | .65 | .00 |
| | E × P | 0.13 | (2,3 | .88 | .00 |
| | E × T | 0.60 | (2,3 | .55 | .00 |
| | P × T | 1.42 | (1,1 | .23 | .00 |
| | I × E × | 0.76 | (2,3 | .47 | .00 |
| | I × E × | 1.74 | (2,3 | .17 | .01 |
| | I × P × | 14.4 | (1,1 | **< .0** | .07 |
| | E × P × | 1.56 | (2,3 | .21 | .00 |
| | I × E × | 3.15 | (2,3 | **.04** | .01 |

*Note.* Statistically significant results are shown in bold.

**Table S9**

*Ratings of Authenticity and Politeness as a Function of Start Emotion and Participant Culture on smiles in Experiment 2*

| Ratings | Participant Culture | Anger | | Fear | | Neutrality | |
|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD |
| Authenticity | Chinese | 2.87 | .42 | 2.64 | .39 | 7.85 | 1.39 |
| | Dutch | 6.30 | 1.00 | 6.00 | 0.29 | 3.83 | 0.08 |
| Politeness | Chinese | 3.45 | .06 | 2.76 | .90 | 8.12 | 0.03 |
| | Dutch | 6.42 | 1.84 | 5.59 | 1.88 | 0.47 | 0.28 |

### Linear Mixed Effects Analyses for Experiments 1 and 2

We used R (version 3.6.0; R Core Team 2017) with the lme4 (version 1.1–21; Bates et al. 2015) to perform a linear mixed effects analysis for positivity ratings (computed by taking the mean of both positivity and negativity (reversed-scored) items). As fixed effects, we entered Start Emotion, Target Ethnicity, Target Gender, Participant Culture, Final Smile Intensity (only for Experiment 2), and their interactions into the model. As random effects, we had intercepts for subjects and actors. The lmerTest package was used for testing significance (version 3.0.1; Kuznetsova et al., 2017). A complete overview of effects can be found in Supplementary Tables S10 and S11.

**Table S10**

*Linear Mixed Effects Analysis for Positivity Ratings in Experiment 1*

| *Predictors* | *Estimates* | *CI* | *p* |
|---|---|---|---|
| (Intercept) | 60.46 | 57.23 – 63.68 | **<0.001** |
| Participant Culture1 | -1.95 | -2.95 – -0.94 | **<0.001** |
| Start Emotion1 | 6.89 | 6.37 – 7.41 | **<0.001** |
| Target Ethnicity1 | -0.64 | -3.75 – 2.47 | 0.685 |
| Target Gender1 | -0.82 | -3.93 – 2.29 | 0.607 |
| Participant Culture1 * Start Emotion1 | 1.17 | 0.65 – 1.69 | **<0.001** |
| Participant Culture1 * Target Ethnicity1 | -0.85 | -1.37 – -0.33 | **0.001** |
| Start emotion1 * Target Ethnicity1 | -0.11 | -0.63 – 0.42 | 0.691 |
| Participant Culture1 * Target Gender1 | -0.42 | -0.94 – 0.10 | 0.117 |
| Start emotion1 * Target Gender1 | -0.14 | -0.66 – 0.39 | 0.610 |
| Target Ethnicity1 * Target Gender1 | -0.37 | -3.48 – 2.74 | 0.816 |
| Participant Culture1 * Start Emotion1 * Target Ethnicity1 | 0.01 | -0.51 – 0.53 | 0.961 |
| Participant Culture1 * Start Emotion1 * Target Gender1 | -0.57 | -1.09 – -0.05 | **0.032** |

| | | | |
|---|---|---|---|
| Participant Culture1 * Target Ethnicity1 * Target Gender1 | 0.06 | -0.46 – 0.58 | 0.820 |
| Start emotion1 * Target Ethnicity1 * Target Gender1 | 1.53 | 1.01 – 2.06 | **<0.001** |
| Participant Culture1 * Start Emotion1 * Target Ethnicity1 * Target Gender1 | 0.74 | 0.22 – 1.26 | **0.005** |

**Random Effects**

| | |
|---|---|
| $\sigma^2$ | 226.27 |
| $\tau_{00\ subject}$ | 38.36 |
| $\tau_{00\ actor}$ | 19.58 |
| ICC | 0.20 |
| $N_{\ subject}$ | 200 |
| $N_{\ actor}$ | 8 |
| Observations | 3200 |
| Marginal $R^2$ / Conditional $R^2$ | 0.168 / 0.338 |

*Note.* The positivity ratings were computed by taking the mean of both positivity and negativity (reversed-scored) items.

**Table S11**

*Linear Mixed Effects Analysis for Positivity Ratings in Experiment 2*

| *Predictors* | *Estimates* | *CI* | *p* |
|---|---|---|---|
| (Intercept) | 63.40 | 61.74 – 65.07 | **<0.001** |
| Participant Culture1 | -4.56 | -5.70 – -3.42 | **<0.001** |
| Start Emotion1 | -1.58 | -1.96 – -1.19 | **<0.001** |
| Start Emotion2 | 1.08 | 0.69 – 1.46 | **<0.001** |
| Final Smile Intensity1 | 7.25 | 6.97 – 7.52 | **<0.001** |
| Target Ethinicity1 | -1.32 | -2.56 – -0.07 | **0.038** |
| Target Gender1 | -0.65 | -1.89 – 0.60 | 0.308 |
| Participant Culture1 * Start Emotion1 | -0.95 | -1.34 – -0.56 | **<0.001** |
| Participant Culture1 * Start Emotion2 | 0.41 | 0.02 – 0.80 | **0.038** |
| Participant Culture1 * Final Smile Intensity1 | 0.03 | -0.24 – 0.30 | 0.825 |
| Start Emotion1 * Final Smile Intensity1 | 0.20 | -0.18 – 0.59 | 0.305 |
| Start Emotion2 * Final Smile Intensity1 | -0.14 | -0.52 – 0.25 | 0.492 |
| Participant Culture1 * Target Ethinicity1 | -0.33 | -0.60 – -0.05 | **0.019** |

| | | | |
|---|---|---|---|
| Start Emotion1 * Target Ethinicity1 | -0.40 | -0.78 – -0.01 | **0.045** |
| Start Emotion2 * Target Ethinicity1 | 0.76 | 0.37 – 1.14 | **<0.001** |
| Final Smile Intensity1 * Target Ethinicity1 | 0.32 | 0.05 – 0.59 | **0.022** |
| Participant Culture1 * Target Gender1 | -0.35 | -0.62 – -0.08 | **0.012** |
| Start Emotion1 * Target Gender1 | -0.16 | -0.55 – 0.22 | 0.407 |
| Start Emotion2 * Target Gender1 | 0.40 | 0.01 – 0.79 | **0.044** |
| Final Smile Intensity1 * Target Gender1 | -0.42 | -0.69 – -0.14 | **0.003** |
| Target Ethinicity1 * Target Gender1 | 0.06 | -1.19 – 1.30 | 0.928 |
| Participant Culture1 * Start Emotion1 * Final Smile Intensity1 | -0.36 | -0.74 – 0.03 | 0.070 |
| Participant Culture1 * Start Emotion2 * Final Smile Intensity1 | 0.24 | -0.15 – 0.62 | 0.228 |
| Participant Culture1 * Start Emotion1 * Target Ethinicity1 | 0.36 | -0.03 – 0.74 | 0.071 |
| Participant Culture1 * Start Emotion2 * Target Ethinicity1 | -0.07 | -0.45 – 0.32 | 0.737 |

| | | | |
|---|---|---|---|
| Participant Culture1 * Final Smile | 0.20 | -0.08 – 0.47 | 0.158 |
| Intensity1 * | | | |
| Target Ethinicity1 | | | |
| Start Emotion1 * Final Smile | -0.71 | -1.10 – -0.32 | **<0.001** |
| Intensity1 * | | | |
| Target Ethinicity1 | | | |
| Start Emotion2 * Final Smile | 0.39 | -0.00 – 0.77 | 0.050 |
| Intensity1 * | | | |
| Target Ethinicity1 | | | |
| Participant Culture1 * Start | -0.30 | -0.68 – 0.09 | 0.133 |
| Emotion1 * | | | |
| Target Gender1 | | | |
| Participant Culture1 * Start | -0.02 | -0.41 – 0.36 | 0.912 |
| Emotion2 * | | | |
| Target Gender1 | | | |
| Participant Culture1 * Final Smile | 0.18 | -0.09 – 0.46 | 0.193 |
| Intensity1 * | | | |
| Target Gender1 | | | |
| Start Emotion1 * Final Smile | -0.08 | -0.47 – 0.31 | 0.681 |
| Intensity1 * | | | |
| Target Gender1 | | | |
| Start Emotion2 * Final Smile | 0.18 | -0.21 – 0.57 | 0.359 |
| Intensity1 * | | | |
| Target Gender1 | | | |

| | | | |
|---|---|---|---|
| culture1 * Target Ethinicity1 * Target Gender1 | 0.04 | -0.23 – 0.31 | 0.781 |
| Start Emotion1 * Target Ethinicity1 * Target Gender1 | 0.56 | 0.17 – 0.95 | **0.005** |
| Start Emotion2 * Target Ethinicity1 * Target Gender1 | -0.08 | -0.47 – 0.31 | 0.680 |
| Final Smile Intensity1 * Target Ethinicity1 * Target Gender1 | -0.39 | -0.66 – -0.12 | **0.005** |
| Participant Culture1 * Start Emotion1 * Final Smile Intensity1 * Target Ethinicity1 | -0.09 | -0.48 – 0.30 | 0.643 |
| Participant Culture1 * Start Emotion2 * Final Smile Intensity1 * Target Ethinicity1 | 0.06 | -0.33 – 0.45 | 0.756 |
| Participant Culture1 * Start Emotion1 * Final Smile Intensity1 * Target Gender1 | -0.08 | -0.47 – 0.30 | 0.674 |
| Participant Culture1 * Start Emotion2 * Final Smile Intensity1 * Target Gender1 | 0.05 | -0.34 – 0.43 | 0.810 |

| | | | |
|---|---|---|---|
| Participant Culture1 * Start Emotion1 * Target Ethinicity1 * Target Gender1 | 0.07 | -0.32 – 0.45 | 0.735 |
| Participant Culture1 * Start Emotion2 * Target Ethinicity1 * Target Gender1 | 0.05 | -0.34 – 0.44 | 0.797 |
| Participant Culture1 * Final Smile Intensity1 * Target Ethinicity1 * Target Gender1 | 0.21 | -0.06 – 0.48 | 0.130 |
| Start Emotion1 * Final Smile Intensity1 * Target Ethinicity1 * Target Gender1 | 0.21 | -0.18 – 0.60 | 0.288 |
| Start Emotion2 * Final Smile Intensity1* Target Ethinicity1 * Target Gender1 | -0.27 | -0.65 – 0.12 | 0.176 |
| Participant Culture1 * Start Emotion1 * Final Smile Intensity1 * Target Ethinicity1 * Target Gender1 | 0.18 | -0.20 – 0.57 | 0.355 |
| Participant Culture1 * Start Emotion2 * Final Smile Intensity1 * Target Ethinicity1 * Target Gender1 | -0.10 | -0.49 – 0.28 | 0.604 |
| **Random Effects** | | | |
| $\sigma^2$ | 162.96 | | |

| | |
|---|---|
| $\tau_{00\ subject}$ | 55.53 |
| $\tau_{00\ actor}$ | 3.06 |
| ICC | 0.26 |
| $N_{subject}$ | 175 |
| $N_{actor}$ | 8 |
| Observations | 8400 |
| Marginal $R^2$ / Conditional $R^2$ | 0.263 / 0.458 |

*Note.* The positivity ratings were computed by taking the mean of both positivity and negativity (reversed-scored) items.