

# When Your Smile Fades Away: Cultural Differences in Sensitivity to the Disappearance of Smiles

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## Abstract

The high sensitivity and need to adjust to others' expectations may make Japanese, compared to Americans, more anxious in interpersonal contexts and especially more vigilant to signs of disapproval (such as the disappearance of happiness from another's face) but not to other signs (such as the disappearance of sadness). By using a morph movie paradigm, the authors investigated the cultural differences in sensitivity to the disappearance of facial expressions. Participants watched happy to neutral movies and sad to neutral movies and judged the point at which the emotional expressions had disappeared. As predicted, Japanese judged the offset of happiness faster than did Americans, whereas no cultural difference was found in the judgment for the offset of sadness. Moreover, attachment-related anxiety, which was higher in Japanese than Americans, predicted the disappearance of happiness.

## Keywords

culture, disappearance of smile, adjustment, attachment-related anxiety

East Asian children are socialized to adjust their behavior in situ to correspond to the expectations of others and so maintain emotionally balanced social interactions (Azuma, 1994). More so than European American adults, East Asian adults self-report that they use adjustment to expectations in this way (Morling, Kitayama, & Miyamoto, 2002). In the present research, we ask whether the values that underlie the different uses of adjustment to maintain harmony show themselves more subtly in the ways in which individuals from the two cultures monitor facial expression of emotion. Specifically, East Asian individuals, as compared to European American individuals, may be more vigilant to the disappearance of smiles from the face, a dynamic cue that signals a diversion from expectations. The present research tested this hypothesis by using the "morph movie" paradigm (Fraleigh, Niedenthal, Marks, Brumbaugh, & Vicary, 2006; Niedenthal, Halberstadt, Margolin, & Innes-Ker, 2000). We also examined the hypothesis that sensitivity to the disappearance of smiles from the face increases as a function of attachment-related anxiety, which also differs cross-culturally.

## Cultural Differences in Sensitivity to the Disappearance of Happiness and Sadness

The construction of identity has been characterized as being relatively independent and separate from other people in

Western cultural contexts and more interdependent and connected with others in Eastern cultural contexts (Markus & Kitayama, 1991). These culturally different views of the self can be viewed as being associated with practices of exerting personal control to influence events versus adjusting to expectations to influence events. Control and efficacy are emphasized as a way to maintain the independent view of self in Western cultures, whereas adjustment and connectedness are often emphasized as a way to maintain the interdependent view of self in East Asian cultures (Weisz, Rothbaum, & Blackburn, 1984). Indeed, the study by Morling and colleagues (2002) showed that Americans were likely to report that they had influenced the surrounding people or events more recently, whereas Japanese were likely to report they had adjusted themselves to the surrounding people or events more recently.

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For East Asians, when others' positive approval disappears, this can indicate that their behavior is so inappropriate in the social context that they must now correct their behavior to be in line with expectations. By consequence, they may be highly vigilant to nonverbal signs that they are falling short of others' expectations or undermining social harmony. The gradual disappearance of a smile is an example of a dynamic cue that indicates that expectations have been violated. East Asians may be particularly vigilant to signs of the disappearance of a smile. In contrast, the disappearance of others' negative expressions (e.g., sadness) will not pose a threat to social relationships and will thus not require East Asians to adjust their behavior. We thus expected that East Asians detect the disappearance of others' smile expressions with greater efficiency than do European Americans, who tend to use adjustment to expectations less as a way to manage social interactions. Yet, cultural differences may be negligible in detecting the disappearance of others' negative expressions.

### Attachment Style as a Potential Mediator of Cultural Differences

Findings showing that East Asians emphasize adjustment and accommodation suggest that they may experience relatively more anxiety in interpersonal contexts. Consistent with this idea, Asian Americans scored significantly higher than did European Americans on a self-report measure of social anxiety (Norasakkunkit & Kalick, 2002; Okazaki, 1997). In addition, indirect evidence suggests that there are cultural differences in attachment styles of children to their mothers. For example, Takahashi (1986) was unable to measure the attachment styles of Japanese children by using the "strange situation paradigm" (Ainsworth, Blehar, Waters, & Wall, 1978), which was developed in the United States, because the experimental situation in which children are separated from their mothers was so stressful for the Japanese children that many were unable to stop crying and could therefore not complete the study. The crying behavior shown by Japanese children can be interpreted as "anxiety attachment" based on the standard of the American culture, although the behaviors seem to be normal to Japanese (see also Van Ijzendoorn & Sagi, 1999). Therefore, Japanese may score higher in attachment-related anxiety than European Americans, and these culturally different degrees of attachment-related anxiety may relate to their sensitivity to changes in positive expressions.

Niedenthal and colleagues (2000) developed a morph movie paradigm, which they used to examine the influences of people's emotional states and attachment styles on the processing of facial expression of emotion. In the paradigm, participants see an initial facial expression. Over the course of 100 frames, a movie then depicts gradual changes such that the expression disappears and becomes neutral. The task for the participant is to stop the movie at the point at which they no longer see evidence of the initial expression. The interpretation of a perceived offset earlier versus later in the movie is that greater efficiency allows the perceiver to detect finer-grained

indications that the initial expression has changed. Using the morphing paradigm, we examined whether Japanese tend to perceive the offset of smiles earlier than do Americans and whether the degree of attachment-related anxiety underlies cultural differences in detecting the offset of emotional expression.

### The Present Study

This study sought to examine cultural differences in the efficiency of processing smiles and the role of attachment-related anxiety in this difference. Adopting the morph movie paradigm (Fraleley et al., 2006; Niedenthal et al., 2000), we exposed Americans and Japanese to happy to neutral movies and sad to neutral movies and instructed them to find the offset of the initial facial expression. We expected the Japanese participants to detect the offset of smiles earlier than Americans, and we expected no cultural difference in detecting the offset of sadness (Hypothesis 1). We also measured participants' attachment styles and predicted that Japanese would report a higher level of attachment-related anxiety than would the Americans (Hypothesis 2). Moreover, we predicted that individual differences in attachment-related anxiety would underlie cultural differences in detecting the offset of smiles (Hypothesis 3).

### Method

#### Participants and Procedure

Fifty-three Japanese undergraduates (21 females and 32 males) and 44 American undergraduates (23 females and 21 males) participated in the study. Japanese students who were born and brought up in mainland Japan were recruited in Japan and paid 700 yen (about \$7), whereas American students were recruited in the United States and given course credit for their participation. Participants were tested individually.

They were initially asked to complete a scale to assess attachment orientation (Fraleley et al., 2006) and the Brief Mood Introspection Scale (Mayer & Gaschke, 1988). They then performed the morph movie task. In the task, participants watched morph movies depicting individuals whose facial expressions of either happiness or sadness gradually faded. On each trial, participants were to watch a complete movie once. They were then asked to watch it again and to indicate, by pressing a button, the point at which they thought that the stimulus person was no longer expressing the initial emotion. They were allowed to fine-tune their stopping point by pressing buttons, which made the movie go back and forward one frame at a time. When they were satisfied with their judgments, they pressed a final answer button, at which point they could start the next trial. There were 32 trials, following 2 practice trials. Finally, participants were presented with the 48 pictures they had seen in the morph movie task—16 people  $\times$  3 emotions (happy, sad, and neutral)—and they rated each on 7-point scales based on level of happiness, sadness, disgust, and anger expressed (1 = *not at all*, 7 = *very strongly*). The format



**Figure 1.** Examples of the movies used in the present study (upper: happy to neutral Japanese movie; bottom: sad to neutral Caucasian movie).

was the same as that used in the pretest (see Materials section for details). All the experiment programs were developed on Microsoft Visual Basic 6.

### Materials

**Pictures.** To begin with, we prepared 120 pictures in which 20 Japanese and 20 Caucasians expressed smiles, sadness, and neutral expressions. The Caucasian pictures were adapted from Niedenthal et al. (2000), and the Japanese pictures were prepared to match the Caucasian counterparts. In a pilot test, we showed 10 Japanese and 10 Americans all the pictures and asked them to rate the level of happiness, sadness, disgust, and anger expressed by each face (1 = *not at all*, 7 = *very strongly*). Given these ratings, we selected pictures of 4 females and 4 males from each culture who were perceived to express the designated emotions by both Japanese and American raters. The rated levels of happiness, sadness, disgust, and angry for the selected happy pictures were 6.08, 1.50, 1.37, and 1.29, respectively. The level of happiness was stronger than that of the other three emotions ( $p$  values < .0001). Neither difference in the pattern between ethnicity of the pictures (6.16, 1.58, 1.38, and 1.33 for Japanese pictures; 6.00, 1.43, 1.35, and 1.25 for Caucasian pictures) nor difference in rating for the happy pictures between Japanese and American raters ( $M = 6.01$  vs. 6.15,  $t = 1.66$ ) was found. In the selected sad pictures, the rated levels of happiness, sadness, disgust, and angry were 1.58, 4.82, 3.38, and 2.77, respectively. The level of sadness was stronger than that of the other three emotions ( $p$  values < .0001). There was no difference in the pattern between ethnicity of the pictures (1.57, 4.85, 3.59, and 2.83 for Japanese pictures; 1.59, 4.78, 3.18, and 2.71 for Caucasian pictures), although Japanese raters reported more sadness in the sad faces than did American raters ( $M = 5.19$  vs. 4.44,  $t = 4.13$ ,  $p < .01$ ).

We used a digital morphing program (FantaMorph; <http://www.fantamorph.com/>) to produce 100-frame digital movies

in which either a smile or a sad expression changed to a neutral expression for the same individual's face. We produced 32 movies (4 people  $\times$  2 genders  $\times$  2 ethnicities  $\times$  2 emotions). The image size was 170  $\times$  225 pixels. The length of each movie was 8.33 seconds (i.e., 12 frames per a second). Examples of the movies are shown in Figure 1.

**Measures of attachment orientation.** We used 40 items that Fraley et al. (2006) developed to assess people's attachment orientation across relationships with mother, father, romantic partners, and best friends. Seven of 10 questions for each of the four target people related to avoidant attachment (e.g., "I don't feel comfortable opening up to my mother or a mother-like figure"), whereas the others related to anxious attachment (e.g., "I'm afraid that my mother or a mother-like figure may abandon me"). Participants were asked to indicate the extent to which they agreed with each item on 7-point Likert-type scales (1 = *strongly disagree*, 7 = *strongly agree*). Following Fraley et al., we computed mean scores of avoidant and anxious attachment over the 40 questions by collapsing the types of target. The anxiety and avoidance items had reasonable reliabilities in both Japan ( $\alpha = .87$  and  $.89$ ) and the United States ( $\alpha = .86$  and  $.91$ ).

Because the Fraley et al. scale (2006) was developed to measure attachment anxiety and avoidance mainly in Western cultures, we examined the validity of the scale in Japan by asking a different group of 29 Japanese undergraduates to complete it and the Behavioral Inhibition Scale (BIS; Carver & White, 1994) and the Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1989). BIS is a general measure of trait anxiety; SIAS assesses anxiety in social situations, on which Japanese tend to score higher than Americans (Dinnel, Kleinknecht, & Tanaka-Matsumi, 2002). The anxiety and avoidance items, BIS, and SIAS had reasonable reliabilities ( $\alpha = .88$ ,  $.90$ ,  $.89$ , and  $.88$ ). BIS and SIAS were highly correlated ( $r = .66$ ,  $p < .01$ ). Importantly, the attachment anxiety was significantly positively

correlated with BIS and SIAS ( $r = .39$  and  $.42, p < .05$ ), whereas the attachment avoidance was correlated with neither BIS nor SIAS ( $r = .13$  and  $-.21$ ), suggesting that Fraley and colleagues' anxiety scale is valid in terms of assessing the level of anxiety in Japanese.

**Brief Mood Introspection Scale.** Participants were presented with 16 words that described different feelings or emotions, and they were asked to indicate how much they felt each of them in a 4-point Likert-type format (1 = *definitely do not feel*, 4 = *definitely do feel*). We computed mean scores of happy, content, active, lively, and peppy as happy mood and sad, gloomy, tired, and drowsy as sad mood, following Niedenthal and Setterlund (1994). The happy and sad items had reasonable reliabilities in both Japan ( $\alpha = .88$  and  $.82$ ) and the United States ( $\alpha = .86$  and  $.86$ ).

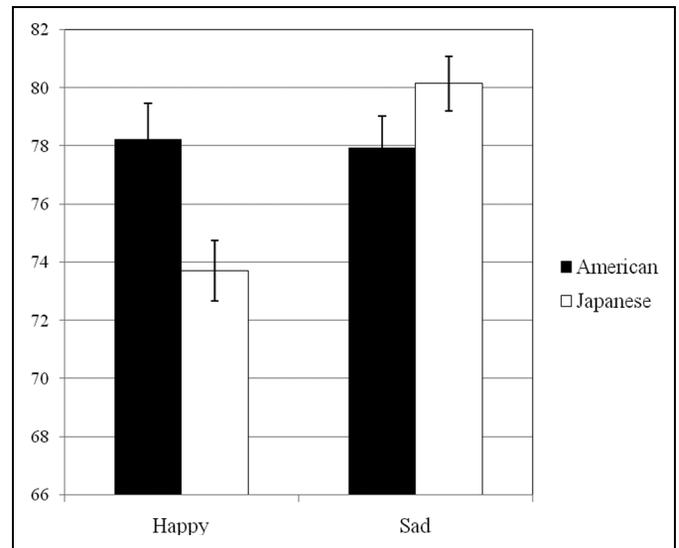
## Results

### Manipulation Check

We first analyzed participants' ratings of the 48 pictures to examine whether there were any cultural differences in the relative intensity of happy and sad expressions compared to neutral ones. We calculated an index of relative intensity of sadness for each face by subtracting the mean rating of sadness for neutral expressions from the mean rating of sadness for sad expressions on the same face in each culture. We also calculated an index of relative intensity of happiness in the same manner. We then computed a  $2 \times 2 \times 2$  analysis of variance on size of the index (Ethnicity of Faces  $\times$  Expression  $\times$  Culture of Participant). The main effect of expression was significant,  $F(1, 28) = 54.32, p < .0001, \eta_p^2 = .66$ , indicating that participants perceived the intensity of happiness to be larger than the intensity of sadness. Importantly, this effect was not qualified by culture of participant ( $p > .20$ ). Thus, there was no cultural difference in terms of perceived intensity of emotional expression for the set of pictures used in the current study.

### Morph Task

Trials on which offset frames were greater than three standard deviations from the mean were eliminated. These constituted 0.84% of the total trials. We then computed relevant means for each participant over faces in each of the four conditions (i.e., expression and ethnicity of face) and performed an analysis of variance on the means with two between-subject variables (culture of participant and gender) and two within-subject variables (expression and ethnicity of face). Consistent with Hypothesis 1, the interaction between culture of participant and expression was significant,  $F(1, 93) = 14.42, p < .001, \eta_p^2 = .13$ . As shown in Figure 2, Japanese judged the offset of smiles as occurring significantly earlier than did Americans ( $M = 73.7$  vs.  $78.2$ ),  $t(93) = 2.18, p < .05$ , by least significant difference test,  $d = .45$ , whereas there was no difference in the offset of sadness between the two cultures ( $M = 80.2$  vs.  $77.5$ ),  $t(93) = 1.07, ns$ . Furthermore, Japanese judged the offset of smiles significantly earlier than they did sad expressions,  $t(93) = 5.37, p < .01, d = 1.11$ ,



**Figure 2.** Means of offset frames of happiness and sadness judged by Americans and Japanese.

whereas the same result was not obtained for Americans, replicating previous findings for Americans in whom emotional state was not manipulated (Niedenthal et al., 2000).

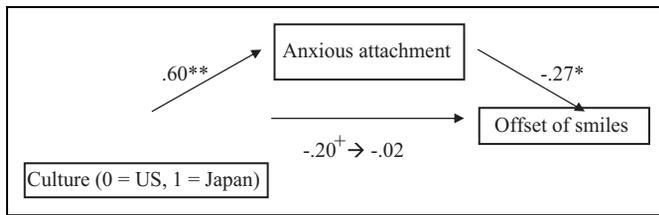
The interaction between culture of participant and ethnicity of face was also significant,  $F(1, 93) = 19.92, p < .0001, \eta_p^2 = .18$ . Americans judged the offset of the emotion earlier for faces of their own group than for ones of their out-group ( $M = 77.1$  vs.  $79.0$ ),  $t(93) = 2.84, p < .01, d = .59$ . This tendency was also found among Japanese ( $M = 76.0$  vs.  $77.9$ ),  $t(93) = 3.13, p < .05, d = .65$ . A three-way interaction including faces' emotions was not significant,  $F < 1$ . These findings suggest that people process expressions displayed by in-group faces with greater efficiency than they do out-group faces, which is consistent with the findings of in-group advantage in recognition of emotional expression (e.g., Elfenbein & Ambady, 2002; Yuki, Maddux, & Masuda, 2007).

### Questionnaires

We performed an analysis of variance on mean scores of each scale with two between-subject variables (culture of participant and gender).<sup>1</sup>

**Attachment.** Japanese showed higher attachment-related anxiety than did Americans ( $M = 3.13$  vs.  $1.83$ ),  $F(1, 94) = 52.72, p < .0001, \eta_p^2 = .36$ , consistent with Hypothesis 2. The same tendency was found in the level of attachment-related avoidance ( $M = 3.37$  vs.  $2.48$ ),  $F(1, 94) = 32.27, p < .0001, \eta_p^2 = .26$ .

**Brief Mood Introspection Scale.** Americans tended to be in a happier mood than Japanese ( $M = 2.85$  vs.  $2.57$ ),  $F(1, 94) = 5.34, p < .05, \eta_p^2 = .05$ . However, Japanese were in a sadder mood than Americans ( $M = 2.59$  vs.  $2.16$ ),  $F(1, 94) = 9.79, p < .005, \eta_p^2 = .09$ .



**Figure 3.** The relation between culture and offset of smiles, mediated by anxious attachment.

<sup>+</sup> $p < .05$ . \* $p < .05$ . \*\* $p < .0001$ .

### Correlations

We computed correlations among the offset of smiles, the offset of sadness, avoidant and anxious attachment, and happy and sad mood, combining the data from Japan and the United States. The offset of smiles was significantly negatively correlated with attachment-related anxiety ( $r = -.28, p < .01$ ), suggesting that highly anxious people tended to judge the offset of smiles faster. Moreover, the offset of smiles was also significantly correlated with happy mood ( $r = .24, p < .05$ ), suggesting that those who were in a happier mood tended to judge the offset of smiles slower (Niedenthal et al., 2000). Furthermore, sad mood was positively correlated with attachment-related anxiety ( $r = .25, p < .05$ ), and happy mood was negatively correlated with attachment-related avoidance ( $r = -.37, p < .01$ ). Except for these correlations, no other correlations were significant. When correlations were computed within each culture, the offset of smiles and attachment-related anxiety were negatively correlated in both cultures, although none of the correlations reached significance because of the small sample sizes (Japan:  $r = -.25, p < .10$ ; United States:  $r = -.18$ ).

### Mediational Analyses

The offset of smiles was first regressed on levels of attachment-related anxiety and avoidance. The offset of smiles was significantly predicted by anxious attachment,  $\beta = -.26, t(93) = -2.26, p < .05$ , but not by avoidant attachment,  $\beta = -.05, ns$ .

We then examined whether the cultural difference in sensitivity to the disappearance of smiles is mediated by level of anxious attachment. As summarized in Figure 3, anxious attachment was a significant mediator of cultural differences in the sensitivity to disappearance of happiness (Sobel  $z = -2.68, p < .01$ ). Culture (0 = United States, 1 = Japan) significantly predicted level of anxious attachment,  $\beta = .60, t(94) = 7.26, p < .0001$ , and level of anxious attachment significantly predicted the offset of smiles,  $\beta = -.27, t(93) = -2.17, p < .05$ . Moreover, the direct path between culture and the disappearance of smiles,  $\beta = -.20, t(95) = -1.96, p = .05$  (before controlling for anxious attachment), became nonsignificant after controlling for anxious attachment,  $\beta = -.02, ns$ . This suggests that once anxious attachment is controlled for, the offset frames of smiles did not vary across cultures, consistent with Hypothesis 3.

Using structural equation modeling, we examined how well Model 1 fit the data (in which anxious attachment mediates cultural differences in the sensitivity to disappearance of happiness) compared to Model 2 (in which the offset frames of smiles mediates cultural differences in level of anxious attachment). The results indicated that Model 1 ( $\chi^2 = 0.30, p < .59$ , root mean square error of approximation  $< .001$ , normed fit index  $< 1$ ) fit the data well compared to Model 2 ( $\chi^2 = 1.08, p < .30$ , root mean square error of approximation  $< .03$ , normed fit index  $< .99$ ).

### Discussion

Using the morph movie paradigm, we found that Japanese tended to detect the disappearance of smiles expressed on the face with greater perceptual efficiency than did Americans. In contrast, there was no cultural difference in processing sad expression. Consistent with the observation that Japanese are more likely than Americans to adjust themselves to the surrounding people and worry about whether they will receive approval, Japanese showed higher attachment-related anxiety than did Americans. Moreover, we demonstrated that sensitivity to the disappearance of smiles on the face increased as a function of attachment-related anxiety, which differs cross-culturally.

One advantage of the present study is that it utilizes not only an attitudinal self-report measure but also a behavioral response. Although it has been suggested that self-report measures of attitudes sometimes provide results that are dissociated with assumed cultural differences (Oyserman, Coon, & Kimmelmeier, 2002), the present study identifies cultural differences in both self-reported and behavioral measures and shows that the self-reported level of attachment-related anxiety underlies cultural differences in the behavioral measure. The present study thus contributes to an understanding of how the perception of emotions is culturally sanctioned, by addressing a significant association between self-report and behavioral responses.

In future research, the manipulation of relational mind-sets could be induced among Americans to examine the causal relationship between an individual's concern about impairing others' approval and his or her sensitivity to emotional cues. For example, Americans who are temporarily induced to be high in attachment-related anxiety by being reminded of rejection experiences may become more sensitive and vigilant to others' signals of approval. Indeed, one study showed that recalling experience of rejection increased sensitivity to emotional tone of voice in Americans (Pickett, Gardner, & Knowles, 2004), even though Americans in general tend to be less sensitive than Japanese to the affective tone (Ishii, Reyes, & Kitayama, 2003; Kitayama & Ishii, 2002).

To understand the causal relationship between an individual's concern about impairing others' approval and his or her sensitivity to emotional cues, it would be informative to explore the extent to which genetic variations in serotonin transporter polymorphism (5-HTTLPR) contribute to

individual differences in response to the disappearance of smiles. Serotonin is considered a major neurotransmitter involved in emotion regulation. Previous research revealed that, compared to long-allele carriers of the 5-HTTLPR, short-allele carriers are more likely to display greater levels of anxiety (Sen, Burmeister, & Ghosh, 2004) and have disorganized attachment (Caspers et al., 2009). At the same time, collectivistic societies tend to have higher frequency of short-allele carriers of the 5-HTTLPR (Chiao & Blizinsky, 2010). Evidence from these studies suggests that cultural differences in sensitivity to the disappearance of smiles might be partly explained by genetic variations. Such investigations will shed lights on the roles of sociocultural and genetic factors in the processing of emotional cues.

The present study leaves a couple of issues. First, we examined cultural differences in detecting the disappearance of smiles and sadness from the face. It is, however, still unclear whether cultural differences reflecting attachment-related anxiety can be found in the judgment of other positive and negative emotions. Second, the present study showed that Japanese detect the disappearance of smile with greater efficiency than that of Americans, because the disappearance of smile indicates the need to adjust oneself to others' expectations. However, this does not mean that European Americans are not sensitive to different types of emotions. It is possible that European Americans are especially vigilant to the disappearance of certain emotions, which signals a need to exert influence. Future works should focus on addressing these speculations. We believe, however, that the current evidence will be instrumental in achieving a better understanding of the perception of emotions and personality processes in divergent cultural contexts.

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The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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### Note

1. One American participant was excluded because he or she failed to complete the questionnaires.

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