

Depression and Emotional Reactivity: Variation Among Asian Americans of East Asian Descent and European Americans

Yulia E. Chentsova-Dutton
Colby College

Joyce P. Chu
University of California, San Francisco

Jeanne L. Tsai
Stanford University

Jonathan Rottenberg
University of South Florida

James J. Gross and Ian H. Gotlib
Stanford University

Studies of Western samples (e.g., European Americans [EAs]) suggest that depressed individuals tend to show diminished emotional reactivity (J. G. Gehricke & A. J. Fridlund, 2002; G. E. Schwartz, P. L. Fair, P. Salt, M. R. Mandel, & G. L. Klerman, 1976a, 1976b). Do these findings generalize to individuals oriented to other cultures (e.g., East Asian cultures)? The authors compared the emotional reactions (i.e., reports of emotional experience, facial behavior, and physiological reactivity) of depressed and nondepressed EAs and Asian Americans of East Asian descent (AAs) to sad and amusing films. Their results were consistent with previous findings: Depressed EAs showed a pattern of diminished reactivity to the sad film (less crying, less intense reports of sadness) compared with nondepressed participants. In contrast, depressed AAs showed a pattern of heightened emotional reactivity (greater crying) compared with nondepressed participants. Across cultural groups, depressed and nondepressed participants did not differ in their reports of amusement or facial behavior during the amusing film. Physiological reactivity to the film clips did not differ between depressed and control participants for either cultural group. Thus, although depression may influence particular aspects of emotional reactivity across cultures (e.g., crying), the specific direction of this influence may depend on prevailing cultural norms regarding emotional expression.

Keywords: depression, culture, East Asians, emotion, facial expression

Major depressive disorder (MDD) is a pervasive mental disorder that is associated with disability and premature death worldwide (Murray & Lopez, 1997). Although prevalence and expres-

sion of MDD vary considerably across cultures (see Tsai & Chentsova-Dutton, 2002, for a review), surprisingly few studies have examined the effects of depression on emotional functioning across cultures. Instead, most studies of emotional reactivity and depression have been conducted on North American samples of primarily European descent (“European Americans” [EAs]). In this study, we examined whether the influence of depression on emotional reactivity is similar or different across cultural contexts.

Clinical reports describe individuals with MDD as suffering from excesses in the experience and expression of negative emotion, particularly sadness (American Psychiatric Association, 1994). Empirical findings, however, run contrary to these clinical reports: Compared with nondepressed individuals, depressed individuals show and report similar (Rottenberg, Gross, Wilhelm, Najmi, & Gotlib, 2002; Rottenberg, Kasch, Gross, & Gotlib, 2002; Schwartz, Fair, Salt, Mandel, & Klerman, 1976a, 1976b) or diminished (Gehricke & Shapiro, 2000; Renneberg, Heyn, Gebhard, & Bachmann, 2005) reactivity in response to a variety of negative emotion-eliciting stimuli.

The results of clinical reports also suggest that many individuals with MDD suffer from *anhedonia*, or deficits in the experience and expression of positive emotion (American Psychiatric Association, 1994). For example, depressed individuals show less positive

Yulia E. Chentsova-Dutton, Department of Psychology, Colby College; Joyce P. Chu, Department of Psychiatry, University of California, San Francisco; Jeanne L. Tsai, James J. Gross, and Ian H. Gotlib, Department of Psychology, Stanford University; Jonathan Rottenberg, Department of Psychology, University of South Florida.

This study was funded by National Institute of Mental Health (NIMH) Grant MH59259, awarded to Ian H. Gotlib; NIMH Grant MH581477, awarded to James Gross; and an NIMH predoctoral fellowship in affective science, awarded to Jonathan Rottenberg. Preparation of the manuscript was funded by the National Association for Research on Schizophrenia and Depression Young Investigator Award, awarded to Jeanne L. Tsai. We thank Adrine Biuckians, Jessica Bernstein, Megan McCarthy, Rebecca McNeill, and Kate Reilly for their assistance on the project and Hazel Markus, Culture Co-Lab, and Sumie Okazaki for their helpful comments on earlier versions of the article.

Correspondence concerning this article should be addressed to Yulia E. Chentsova-Dutton, Mayflower Hill Drive, Waterville, ME 04905; or to Jeanne L. Tsai, Department of Psychology, Stanford University, Building 420, Stanford, CA 94305. E-mail: ycdutton@colby.edu or jtsai@psych.stanford.edu

facial behavior than do nondepressed individuals when interviewed about their physical and mental health (Ellgring, 1989). Indeed, influential theories of depression suggest that depression results from lowered activity of the appetitive system (Gray, 1994; Hamburg, 1998; Meehl, 1975). Empirical findings corroborate these theories of depression and observations: Compared with non-depressed individuals, depressed individuals show diminished reactivity in response to a variety of positive emotion-eliciting stimuli, including imagery (Berenbaum, 1992; Gehricke & Fridlund, 2002; Schwartz et al., 1976a, 1976b; Tremeau et al., 2005), slides (Allen, Trinder, & Brennan, 1999; Sloan, Strauss, Quirk, & Sajatovic, 1997) and emotional films (Rottenberg, Kasch, et al., 2002; Renneberg et al., 2005).

Taken together, the results of these studies suggest that depression may be associated with unaltered or diminished emotional reactivity during negative emotional events and with diminished reactivity during positive emotional events. One hypothesis (the diminished reactivity hypothesis) would predict that these findings would hold across cultural groups. Is it true? Because most of the studies described above focus on European American samples, it is unclear whether the association between depression and unaltered or diminished emotional reactivity generalizes beyond Western, and particularly European American, cultural contexts.¹ In European American cultural contexts, optimal social functioning is associated with resisting group norms when they interfere with pursuing personal goals (Markus & Kitayama, 1991). Thus, individuals are encouraged to assert their preferences and goals by openly expressing their emotions (Bellah, Madsen, Sullivan, Swindler, & Tipton, 1985; Wierzbicka, 1992, 1999). It is possible that the diminished reactivity associated with depression may occur only in the context of cultural norms of open emotional expression. Depression may reduce individuals' attention to or concern with abiding by cultural norms regarding emotional experience and expression; as a result, depressed individuals may react emotionally in ways that are inconsistent with or even the opposite of what is expected of them. If this is the case, depression should be associated with different patterns of emotional reactivity in contexts that have different cultural norms regarding optimal emotional experience and expression. For instance, depression should be associated with heightened emotional reactivity in cultures that emphasize emotional moderation and control (the cultural norm hypothesis).

In contrast to European American culture, East Asian cultures emphasize emotional moderation and control (Bond, 1991; Gross, Richards, & John, 2006; Russell & Yik, 1996). These norms are reflected in reports of emotional experience as well as in facial expressions of emotions. For example, compared with EAs, Asian Americans of East Asian descent (AAs) report less intense positive and negative emotional experiences (Eid & Diener, 2001) and smile less intensely and frequently while reliving positive emotional events (Tsai, Chentsova-Dutton, Freire-Bebeau, & Przymus, 2002) and discussing emotional topics with their romantic partners (Tsai, Levenson, & McCoy, 2006).

These studies, however, focus on nondepressed samples. Despite the wide interest in how culture influences the expression of depression (Kirmayer, 2001; Marsella & Yamada, 2000), no studies have compared the emotional reactivity of EA depressed individuals with depressed individuals who are exposed to cultures other than mainstream European American culture. If cultural

norms influence how depression affects emotional reactivity (the cultural norm hypothesis), depressed AAs should show increases in facial behavior and reported intensity of emotional experience compared with nondepressed AAs. In contrast, depressed EAs should show decreases in facial behavior and reported intensity of emotional experience compared with nondepressed EAs. On the other hand, if depression influences emotional reactivity similarly across cultural contexts, both depressed EA and AA individuals should show diminished emotional reactivity compared with their nondepressed counterparts (diminished reactivity hypothesis). In this case, cultural norms regarding emotions may shape the intra- or interpersonal consequences of diminished emotional reactivity.

Because cultural norms function to regulate social relations, and physiological arousal is less socially visible than reports of emotional experience or facial expression, physiological reactivity may have less direct social consequences than the other components of emotion (Tsai & Levenson, 1997). In support of this notion, previous studies have found few cultural differences in physiological reactivity (Tsai et al., 2002; Tsai & Levenson, 1997; Tsai, Levenson, & McCoy, 2006). Hence, we expected greater cultural differences in reports of emotional experience and facial expressive behavior than in physiological reactivity.

To test these hypotheses, we compared the emotional reactions of depressed and nondepressed EAs and AAs to sad and amusing film clips.

Method

Participants

Thirty EAs (15 depressed and 15 nondepressed) and 26 AAs (12 depressed and 14 nondepressed) English-speaking adults between the ages of 18 and 60 years participated in the study. Participants were recruited through advertisements and flyers and through referrals from two outpatient psychiatry clinics. AAs represented a variety of East Asian cultures (Chinese, 42.3%; Korean, 23.1%; Japanese, 15.4%; Southeast Asian, 7.7%; and mixed East Asian background, such as Chinese-Korean, 11.5%). Studies have indicated that individuals from these East Asian backgrounds hold similar cultural values regarding emotional moderation (Kim, Yang, Atkinson, Wolfe, & Hong, 2001). We included both overseas-born and U.S.-born AAs in our study. Approximately half of depressed ($n = 5$, 41.7%) and nondepressed ($n = 8$, 57.1%) AA participants were born overseas, with a mean length of time in the United States of 13.73 years ($SD = 12.65$). Extant research suggests that AAs' endorsement of cultural values does not depend on generation status (Kim, Atkinson, & Yang, 1999; Kim et al., 2001). EAs identified themselves as White/Caucasian. There were no significant main effects or interactions involving diagnostic or cultural group on gender composition, age, or education. Demographic characteristics of participants are presented in Table 1.

¹ Whereas the term *culture* is typically used to describe systems of meanings, values, and customs shared by members of a particular culture, the term *ethnicity* is typically used to characterize a discrete group of individuals "in terms of common nationality, culture and language" (Betancourt & Lopez, 1993, p. 631). We chose to use the term *culture* rather than *ethnicity* because AAs share similar cultural norms and beliefs rather than common language or nationality (McLaughlin & Braun, 1998).

Table 1
Sample Characteristics

Variable	Depressed		Nondepressed	
	EA	AA	EA	AA
Demographics				
% female	66.70 _a	75.00 _a	86.70 _a	64.30 _a
Age (years)	28.73 (8.37) _a	26.83 (9.11) _a	32.07 (9.85) _a	26.31 (4.94) _a
Education level (years) ^a	6.13 (1.51) _a	6.09 (1.81) _a	6.33 (1.45) _a	6.62 (1.56) _a
Years spent in the United States (n = 11)	—	14.83 (8.56) _a	—	6.90 (6.59) _a
Acculturation (SL-ASIA, n = 23)	—	2.91 (0.56) _a	—	3.00 (0.69) _a
Depressive symptoms				
Depression severity (BDI)**	24.93 (6.39) _a	23.33 (8.34) _a	2.60 (3.33) _b	3.00 (2.83) _b
Length of depression (months)	16.14 (33.73) _a	8.58 (8.46) _a	—	—
Treatment status				
% undergoing treatment	57.10 _a	50.00 _a	—	—
% on psychotropic medications	53.30 _a	33.30 _a	—	—
No. of medications	0.67 (0.72) _a	0.42 (0.67) _a	—	—

Note. Except where indicated otherwise, values given are means (with standard deviations in parentheses). Means and percentages with the same subscript are not significantly different at $p < .05$. EA = European Americans; AA = Asian Americans of East Asian descent; SL-ASIA = The Suinn-Lew Asian Self-Identity Acculturation Scale; BDI = Beck Depression Inventory score.

^a Measured on a 1–8 scale, with higher scores indicating higher levels of education (a score of 6.5 is equivalent to part college).

** $p < .01$.

Clinical Assessment

All participants were interviewed with the Structured Clinical Interview for *DSM-IV* (SCID-IV; First, Gibbon, Spitzer, & Williams, 1997). To be classified as depressed, participants were required to meet criteria of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)*; American Psychiatric Association, 1994) for current MDD. To be classified as nondepressed, participants were required to report no lifetime history of any Axis I disorder. No participants reported a lifetime history of panic disorder, social phobia, mania, hypomania, and psychotic symptoms, or a history of generalized anxiety disorder or alcohol or substance abuse or dependence in the past 6 months. Interviewers were advanced psychology graduate students and postbaccalaureate research assistants, all of whom were trained in the use of the SCID-IV.² Interviewers also determined the length of the current depressive episode (in months) for each depressed participant. To assess severity of depression, we had participants complete the Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979). As expected, across cultural groups, depressed participants were characterized by lower levels of global functioning ($M = 51.56$, $SD = 8.09$) than were nondepressed participants ($M = 86.91$, $SD = 4.46$), $F(1, 37) = 185.13$, $p < .01$; $\eta_p^2 = .84$.³ Similarly, across cultural groups, depressed participants reported higher levels of depressive symptoms as measured by the BDI ($M = 24.35$, $SD = 7.33$) than did nondepressed participants ($M = 2.86$; $SD = 3.09$), $F(1, 52) = 202.41$, $p < .01$; $\eta_p^2 = .80$. As illustrated in Table 1, two-way analyses of variance (ANOVAs; Diagnostic Group [depressed, nondepressed] \times Cultural Group [EA, AA]) yielded no significant differences between cultural groups and no Cultural \times Diagnostic Group interactions in severity of depression or length of the current depressive episode.

Participants' treatment status was also assessed (see Table 1). Less than one half (12 participants, 46.2%) of depressed participants were taking psychotropic medications, including antidepressants (e.g., selective serotonin reuptake inhibitors [SSRIs])—4

participants, 15.4%), anticonvulsants (1 participant, 3.8%), and benzodiazepines (2 participants, 7.7%). The proportion of depressed participants undergoing treatment and taking psychotropic medications and the average number of psychotropic medications did not differ for EAs and AAs. There were no main effects of treatment status and no Cultural Group \times Treatment Status interactions for any aspects of emotional reactivity during the film clips.

Acculturation Assessment

The Suinn-Lew Asian Self-Identity Acculturation Scale (SL-ASIA; Suinn, Ahuna, & Khoo, 1992) was completed by the AA participants.⁴ In their responses to this instrument, AAs showed a moderate level of acculturation to American culture ($M = 2.96$, $SD = 0.63$, on a scale from 1 = low to 5 = high acculturation), reflecting bicultural orientation (Suinn, n.d.). Additionally, AA participants reported higher endorsement of East Asian ($M = 4.00$, $SD = 1.04$) than American ($M = 2.96$, $SD = 0.88$) cultural values, $F(1, 21) = 13.15$, $p < .01$; $\eta_p^2 = .39$. Finally, AAs reported high levels of social fit (i.e., feeling that they fit in) with both East Asians ($M = 3.74$, $SD = 0.96$) and Americans ($M = 3.70$, $SD = 0.88$), $F(1, 21) = 0.02$, *ns*. This pattern of results

² Two independent raters blind to depression status evaluated 15 randomly selected audiotapes of SCID interviews. Ratings of these independent raters matched the diagnoses made by the original interviewers ($\kappa = 1.00$).

³ We report partial eta squared, η_p^2 , as a measure of effect size. The value of eta squared depends on the number and magnitude of other effects in the model. For that reason, partial eta squared is considered a practical alternative to eta squared (Tabachnick & Fidell, 1989).

⁴ Because of an oversight, only 23 out of 26 AAs completed the SL-ASIA inventory. Dropping 3 participants who did not fill out SL-ASIA from the analyses did not result in an altered pattern of findings.

characterizes this sample of AAs as bicultural. None of the AAs who filled out the SL-ASIA were highly oriented to American culture across acculturation domains (i.e., behavioral acculturation, values, social fit, and ethnic identity). Depressed and nondepressed AAs did not differ in any aspects of acculturation, proportion born overseas, or length of stay in the United States.

Film-Viewing Task

Participants watched three films. The neutral film (180 s) depicted natural scenery. It provided a baseline against which to compare the effects of the two emotion-eliciting films. The amusing film (120 s) portrayed slapstick comedy by Rowan Atkinson (*Mr. Bean*). The neutral and amusing films were developed for this study using the criteria outlined by Gross and Levenson (1995; see Rottenberg, Ray, & Gross, in press). The neutral film elicited minimal reports of positive or negative emotions, and the amusing film elicited strong and specific reports of amusement and interest. The sad film (170 s) was an excerpt from the film *The Champ*, portraying a young grieving boy. It has been found to reliably elicit reports of sadness in EAs and AAs (Gross & Levenson, 1995). All films were presented in English and depicted Western protagonists. A small percentage of participants reported having previously seen the amusing (12.5%) and sad (9.1%) film clips. There were no significant main effects or interactions involving diagnostic group or cultural group on the likelihood of having seen the films previously. Controlling for these variables did not change our results.

Procedure

Upon arrival, participants were positioned in a chair in a laboratory room by themselves. Participants completed an emotion inventory (see below) and viewed the film clips. Each of these films was preceded by a 1-min resting baseline in order to minimize carryover effects. The order of the neutral, amusing, and sad clips was not counterbalanced; the neutral film was always shown first, the sad film second, and the amusing film last. This order of film presentation was chosen to increase the likelihood that participants would leave the experiment in a positive emotional state. A similar method has been used in a number of previous studies of emotional reactivity (e.g., Kring, Kerr, Smith, & Neale, 1993; Tsai, Levenson, & Carstensen, 2000).

Dependent Measures

Facial behavior. Remotely controlled video cameras recorded participants' facial behavior. Facial behavior was coded using Gross and Levenson's (1993) Emotional Expressive Behavior Coding System (EEB). Coders viewed videotapes and identified expressive behaviors in real time. Several types of rating scales are used in EEB. Amusement and sadness behaviors were rated for each period on a 7-point (0–6) composite scale, taking into account intensity, duration, and frequency of facial behavior. *Amusement* was defined by smiling and laughing. *Sadness* was defined by behaviors such as tear buildup, upturning of the inner eyebrow, quivering of the chin or mouth, widening of the nostrils, and heightened blink rate. *Crying* was coded on a dichotomous scale

(present or absent) when participants displayed tears in at least one eye, usually in the context of other sadness behavior.

Procedures for establishing EEB reliability are described in greater detail by Rottenberg, Kasch, et al. (2002). Six undergraduate coders blind to the study hypotheses, to the films, and to the diagnostic status of participants scored facial behavior that occurred during neutral, sad, and amusing films. Each coder completed a 10-week EEB training program prior to scoring. This training included both didactic and practical components, based on Ekman and Friesen's (1978) description of prototypes of facial emotional behavior. Each videotape was coded by at least two coders. In cases of disagreements, ratings of the coders were averaged. The interrater reliability was acceptable for amusement (intraclass $r = .82-.89$ across films) and for sadness (intraclass $r = .51-.71$ [for the neutral film and the sad and amusing films, respectively]). The interrater agreement was moderate (Fleiss, 1981) for crying ($\kappa = .67$) during the sad film (crying did not occur during the other films).

Reported intensity of emotional experience. An inventory consisting of 20 emotion terms was administered after each film. For each of the emotion terms, participants used a 9-point rating scale (0 = none, 8 = an extreme amount) to indicate the greatest amount of emotion experienced during the films. The emotions that significantly differentiated the neutral from the emotional films and that were reported at moderate to high levels of intensity (mean level of reported emotions higher than 3 on a 0–8 scale) were selected for data analysis on the basis of criteria outlined by Rottenberg et al. (in press). The amusing film clip, as intended, primarily elicited reports of interest and amusement. Therefore, we formed a two-item composite of these emotion terms to measure reports of positive emotions ($\alpha = .68-.92$ across film clips). The sad film, as intended, primarily elicited pronounced and specific increases in reports of sadness. Thus, a single-item report of sadness was used to measure reports of negative emotion. The remaining emotion terms were administered as fillers.

Physiological measures. A system consisting of a Pentium computer, Data Translation 3001 PCI 12-bit analog-to-digital converter, and SA Instruments 12-channel bioamplifiers was used to obtain continuous recording of participants' physiological reactions. Signals were sampled at 400 Hz. Data were reduced with custom laboratory software (Wilhelm, Grossman, & Roth, 1999). Although a variety of measures were obtained, we selected indices of cardiac (heart rate), vascular (finger temperature), electrodermal (skin conductance response), and respiratory (respiratory rate) reactivity because they sample systems known to be important in emotional reactivity (Boiten, Frijda, & Wientjes, 1994; Levenson, 2003). To measure heart rate, we placed Beckman miniature electrodes in a bipolar configuration on opposite sides of the chest. Heart rate was calculated as the interval between successive R waves in the electrocardiogram (measured in ms) and was converted to instantaneous heart rate after editing of R–R interval outliers that were due to movement artifacts or ectopic myocardial activity. To measure finger temperature, we attached a thermistor to the palmar surface of the distal phalange of the fourth finger of the nondominant hand. Finger temperature was measured in degrees Fahrenheit. To measure skin conductance response rate, we attached Beckman electrodes to the palmar surface of the proximal phalanges of the first and the second fingers of the nondominant hand. A constant-voltage device passed a small voltage between

the electrodes, and changes in skin conductance level from a zero-slope baseline exceeding 0.02μ Siemens were detected and recorded. To measure respiratory rate, we placed two Resptrace bands around the upper thorax and abdomen of the participant. An inductive plethysmography system (Ambulatory Monitoring) was used to detect respiratory rate. Physiological data were reduced offline. Data reduction software interfaced with recorded binary data files to extract segments of raw data and produce waveform transformations, feature detection, and graphic display for each channel. All segments were examined for artifacts. Artifacts were removed and period averages were calculated for each film.

Results

To test the cultural norm and diminished reactivity hypotheses, we conducted two-way univariate ANOVAs for continuous variables (i.e., reported sadness and amusement) and logistic regression analyses for categorical variables (i.e., crying).⁵ Diagnostic group (depressed, nondepressed) and cultural group (EA, AA) were treated as between-participants factors.⁶ To control for group differences during the neutral film baseline, we calculated the change scores for sad and amusing films for all continuous variables by subtracting the mean level of each index of emotional reactivity during the neutral film clip from the mean level of emotional reactivity during the sad or amusing film clips.

Neutral Film

To assess the emotional effects of the sad and amusing film clips, we first examined the effects of simply watching a neutral film clip.

Facial expressive behavior. Because the neutral film elicited minimal facial behavior, we examined occurrence rather than frequency of facial behavior for this film. Crying did not occur during the neutral film. The strength of association between the occurrence of categorically coded facial behavior, cultural group, and diagnostic group was tested using logistic regression. There were no significant main effects of diagnostic group or cultural group and no interaction for amusement and sadness behavior.

Reports of emotional experience. During the neutral film clip, depressed participants reported experiencing both lower levels of positive emotions ($M = 1.56$, $SD = 1.03$), $F(1, 52) = 4.12$, $p < .05$; $\eta_p^2 = .07$, and higher levels of sadness ($M = 2.56$, $SD = 2.42$), $F(1, 52) = 24.42$, $p < .01$; $\eta_p^2 = .32$, than did nondepressed participants (positive emotions: $M = 2.31$, $SD = 1.59$; sadness: $M = 0.24$, $SD = 0.64$). There were no significant main effects or interactions involving cultural group on reports of emotional experience during the neutral film.

Physiological reactivity. There were no significant main effects or interactions involving cultural or diagnostic groups for any indices of physiological reactivity during the neutral film.

In summary, we found evidence of baseline differences between depressed and nondepressed participants in reports of emotional experience. These findings are consistent with the notion that individuals with MDD report more intense negative emotions during neutral tasks (Rottenberg, Gross, & Gotlib, 2005; Rottenberg, Kasch, et al., 2002; Schwartz et al., 1976b).

Sad Film

Facial expressive behavior. A two-way ANOVA (Diagnostic Group [depressed, nondepressed] \times Cultural Group [EA, AA]) conducted on change scores in sadness and amusement behaviors during the sad film yielded no significant main effects or interactions involving diagnostic or cultural groups. However, multiple logistic regression conducted on occurrence of crying indicated that there was a significant Diagnostic \times Cultural Group interaction, Wald $\chi^2(1, N = 56) = 4.28$, $p < .05$. The pattern of observable crying was consistent with the cultural norm hypothesis: Odds ratios (ORs) for crying indicated that whereas depression among EAs was associated with a decreased likelihood of crying (OR = .34), depression among AAs was associated with increased likelihood of crying (OR = 6.50; see Figure 1, top).

Reports of emotional experience. Also consistent with the cultural norm hypothesis was the result of a two-way (Diagnostic Group \times Cultural Group) ANOVA conducted on change scores in reports of sadness, which yielded a significant interaction of diagnostic and cultural groups, $F(1, 52) = 6.93$, $p < .05$; $\eta_p^2 = .12$. Post hoc least significant difference multiple comparisons revealed that whereas depressed EAs ($M = 2.40$, $SD = 2.59$) reported lower change scores in reported levels of sadness than did nondepressed EAs ($M = 4.47$, $SD = 2.47$), depressed AAs ($M = 4.17$, $SD = 2.08$) reported nonsignificantly greater change scores in reported levels of sadness than did nondepressed AAs ($M = 2.86$, $SD = 2.32$; see Figure 1, bottom). There were no significant main effects or interactions involving diagnostic group or cultural group for change scores in reports of positive emotions experienced during the sad film.

Physiological reactivity. There were no significant cultural or diagnostic group main effects and no interactions for indices of physiological reactivity for the sad film.

Depression severity and emotional reactivity. If cultural norms influence how depression affects emotional reactivity, we would expect cultural group to moderate the association between severity of depressive symptoms and emotional reactivity. However, if depression influences emotional reactivity similarly regardless of cultural context, then severity of depressive symptoms should be associated with diminished emotional reactivity for both EA and AA individuals.

We examined the relation between severity of depressive symptoms and all indices of emotional reactivity during the sad film using linear regression analyses for continuous variables and logistic regression for the binary variable of crying. We found that the BDI scores of the participants predicted change scores in reported sadness, $F(1, 54) = 10.19$, $p < .01$, but did not predict changes in any other indices of emotional reactivity. That is, during the sad film, participants who showed higher levels of depressive symptoms were more likely to report increases in experienced sadness relative to the neutral film. We then con-

⁵ Controlling for the baseline levels of emotional reactivity did not alter the reported findings.

⁶ Preliminary analyses included gender as an additional between-participants factor. Because gender did not interact with diagnostic or cultural group for measures of emotional reactivity, we collapsed across gender in subsequent analyses.

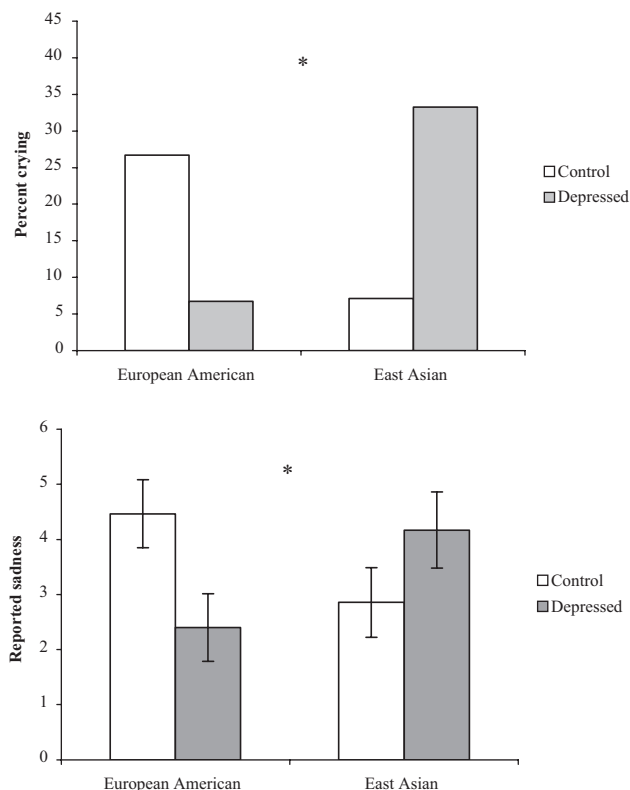


Figure 1. Percentages of participants showing crying (top) and change scores in reports of sadness (bottom) during the sad film clip. Error bars represent standard errors. * $p < .05$.

ducted hierarchical regression analyses to examine whether cultural group moderated these associations. We found that cultural group did moderate the relation between the BDI symptoms and reports of sadness, indicating that the regression slope was significant for AAs but not for EAs (see Table 2).

Acculturation level and emotional reactivity. To examine whether the obtained pattern of findings was associated with exposure to cultural norms, we tested whether among depressed and nondepressed AAs levels of acculturation to American culture were correlated with measures of emotional reactivity. We found that levels of acculturation of depressed AAs were significantly associated with the following emotional reactivity change scores—reports of sadness, $r(12) = -.61, p < .05$; sadness behavior, $r(12) = -.60, p < .05$; and heart rates, $r(12) = -.70, p < .05$ —but not with any other indices of emotional reactivity. During the sad film, depressed AAs who were more oriented to the East Asian culture relative to American culture were more likely to show increases in their reports of sadness intensity, sad behavior, and heart rates than their more acculturated depressed counterparts. Levels of acculturation of nondepressed AAs were significantly associated with the following change score measures of emotional reactivity—skin conductance rates, $r(12) = -.69, p < .05$, and respiration rates, $r(12) = .61, p < .05$ —but not with any other indices of emotional reactivity. During the sad film, nondepressed AAs who were more oriented to East Asian culture relative to American culture showed larger increases in skin conductance

and smaller increases in respiration rates than their more acculturated nondepressed counterparts.

In summary, examination of emotional reactivity to the sad film clip provided some support for the cultural norm hypothesis. Depressed EA participants cried less frequently and showed smaller increases in reported sadness, whereas depressed AA participants cried more frequently compared with nondepressed AAs. These findings emerged against the backdrop of similarities in physiological reactivity. In addition, severity of depression had a differential effect on reported sadness in the two cultural groups. Levels of depressive symptoms were associated with greater change scores in the intensity of reported sadness for AAs, but not for EAs. Finally, among depressed AAs, lower levels of acculturation (and higher exposure to East Asian cultural norms) were associated with heightened reports of sadness and facial expression of sadness. Among nondepressed AAs, lower levels of acculturation (and higher exposure to East Asian cultural norms) were associated with larger increases in physiological responding, particularly in skin conductance and respiration rates. We found no evidence in support of the diminished reactivity hypothesis.

Amusing Film

Facial expressive behavior. A two-way (Diagnostic Group \times Cultural Group) ANOVA yielded a main effect of cultural group for change scores in amusement behavior, with EAs ($M = 3.58, SD = 3.13$) showing larger increases in amusement relative to the neutral film clip than did AAs ($M = 1.70, SD = 2.52$), $F(1, 52) = 6.00, p < .05; \eta_p^2 = .10$. Neither the main effect nor the interaction involving diagnostic group was significant. A two-way ANOVA conducted on change scores in sadness behavior during the amusing film yielded no significant main effects and no interactions. These findings do not provide support for either the cultural norm or the diminished reactivity hypotheses.

Reports of emotional experience. There were no significant main effects or interactions involving cultural or diagnostic groups for change scores in reports of positive emotions. A two-way ANOVA yielded a significant main effect of diagnostic group for change scores in reported sadness. Depressed participants ($M = -1.81, SD = 1.94$) reported greater decreases from neutral to

Table 2
Summary of Hierarchical Regression Analysis for Variable Predicting Reported Sadness During the Sad Film Clip

Variable	B	SE	β
Step 1 ^a			
BDI	.09	0.03	.39**
Step 2 ^b			
BDI	.09	0.03	.40**
Cultural group	.28	0.65	.05
Step 3 ^c			
BDI	.03	0.04	.15
Cultural group	.30	0.62	.06
BDI \times Cultural Group	.13	0.05	.38*

Note. BDI = Beck Depression Inventory score.

^a Unadjusted $R^2 = .15, p < .01$. ^b Δ unadjusted $R^2 = .00, ns$. ^c Δ unadjusted $R^2 = .08, p < .05$.

* $p < .05$. ** $p < .01$.

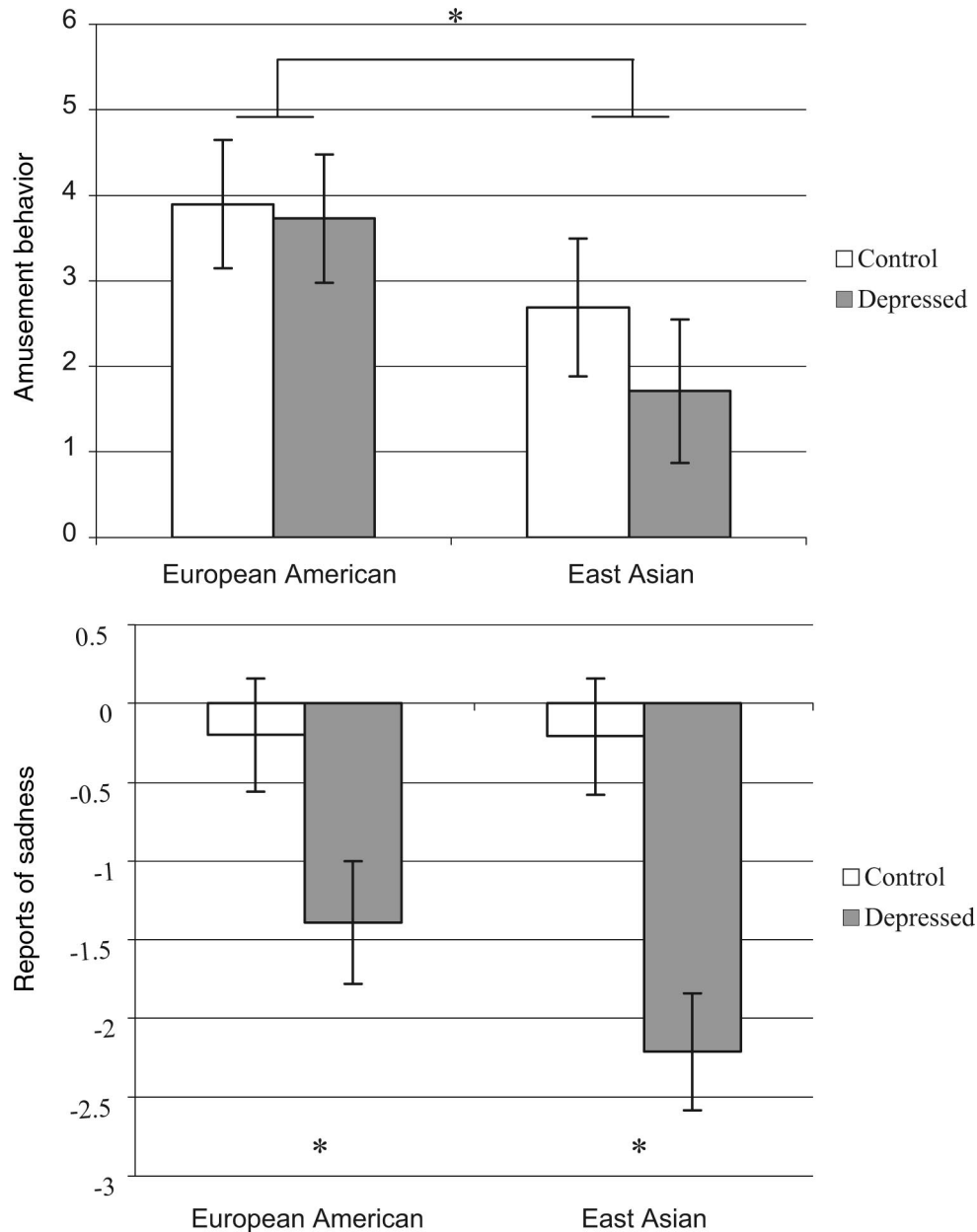


Figure 2. Change scores in levels of amusement behavior (top) and reports of sadness (bottom) during the amusing film clip. Error bars represent standard errors. * $p < .05$.

amusing film clips in reported levels of sadness than did nondepressed participants ($M = -0.21$, $SD = 0.49$), $F(1, 52) = 18.38$, $p < .01$; $\eta_p^2 = .26$ (see Figure 2, bottom). These findings do not support either the cultural norm or the diminished reactivity hypotheses.

Physiological reactivity. There were no significant main effects or interactions for any indices of physiological reactivity during the amusing film clip.

Depression severity and emotional reactivity. We examined whether the relations between depression severity and indices of emotional reactivity during the amusing film were moderated by

cultural group. Using linear regression analyses, we found that the BDI scores of the participants predicted changes in the intensity of reported sadness ($B = -.06$, $SE B = 0.01$, $\beta = -.59$), $F(1, 54) = 28.47$, $p < .01$, $R^2 = .34$, and finger temperature ($B = .03$, $SE B = 0.02$), $\beta = .27$, $F(1, 54) = 4.31$, $p < .05$, $R^2 = .06$, but not in any other indices of emotional reactivity. That is, participants who showed higher levels of depressive symptoms tended to report smaller increases from the neutral to the amusing film in reported intensity of experienced sadness and greater increases in body temperature. Cultural group did not moderate the relations between the BDI scores and levels of emotional reactivity.

Acculturation level and emotional reactivity. During the amusing film, levels of acculturation were not associated with any measures of emotional reactivity for depressed AAs. Levels of acculturation of nondepressed AAs were significantly associated with skin conductance rates, $r(12) = -.71, p < .05$, and respiration rates, $r(12) = -.58, p < .05$, but not with any other indices of emotional reactivity. Nondepressed AAs who were more oriented to East Asian culture relative to American culture showed larger increases in skin conductance and respiration rates in response to the amusing film than their more acculturated nondepressed counterparts.

In summary, the pattern of emotional reactivity in response to the amusing film clip does not allow us to discriminate between the diminished reactivity and the cultural norm hypotheses. Regardless of diagnostic group, AAs showed less intense amusement than did EAs. These results are consistent with our previous findings that AAs show less intense positive emotions than do EAs (Tsai et al., 2002, 2006). Depressed EAs and AAs reported greater decreases in reported sadness from the neutral to the amusing film clip than did nondepressed AAs. This pattern is likely to be driven by the fact that depressed participants reported higher levels of sadness during the neutral film than did nondepressed participants.

Discussion

In the present study, we examined whether the impact of depression on emotional reactivity differs as a function of cultural norms regarding emotional expression and experience. Although other researchers relying on survey, observational, and ethnographic data have observed that the emotional symptoms of MDD are expressed differently in East Asian than in Western cultures (Chan & Lai, 1993; Kleinman, 1982; Parker, Cheah, & Roy, 2001), to our knowledge, the present study is the first attempt to compare the online emotional reactivity of depressed and nondepressed individuals of European American and East Asian descent using well-controlled affective stimuli and multiple measures of emotional reactivity. In line with an accumulating number of studies (Okazaki, 2002; Simon, VonKorff, Piccinelli, Fullerton, & Ormel, 1999; also see Kirmayer & Young, 1998, for a review), our data call into question the notion that East Asians express depression less directly and in somatic instead of psychological terms.

Our findings suggest that the relationship between MDD and emotional reactivity is characterized by both cultural specificity and differences across types of emotions and components of emotional reaction. The depressed EAs in our study cried less often and showed smaller increases in reported sadness than did the nondepressed EAs. Despite similar levels of depression severity, this pattern was reversed for AAs: The depressed AAs cried more often and tended to report larger increases in sadness than did the nondepressed AAs. Thus, whereas depression was associated with diminished scores on these indices of emotional reactivity among EAs, it was associated with heightened scores among AAs. For depressed AAs, severity of depressive symptoms positively predicted intensity of reported sadness, a relation that did not hold for depressed EAs. We also found that orientation to East Asian culture (and, presumably, higher exposure to East Asian cultural norms to moderate the expression of sadness) was associated with heightened emotional reactivity to the sad film among depressed AAs. Together, these findings provide modest support for the

cultural norm hypothesis—that depression may reduce attention to, or concern with, cultural norms of negative emotional reactivity, resulting in negative emotional reactions that diverge from the prevailing cultural norms regarding emotional experience (display rules) and expression (feeling rules). An alternative explanation of our findings is that deviations from cultural norms contribute to the development or maintenance of major depression. Future studies are needed to explore the possibility that the individuals who experience and express negative emotions in ways that deviate from cultural norms may experience feelings of inadequacy or social sanctions.

There was no evidence for the cultural norm or the diminished reactivity hypotheses in our amusement data, suggesting that depression may reduce the influence of cultural norms for the expression of sadness but not amusement. Because of the use of a fixed presentation order (i.e., sadness first, amusement last), our design might have been vulnerable to the effects of participants' fatigue, which may have limited our ability to detect more nuanced differences in emotional reactivity during the amusing film. Future studies need to examine possible order or fatigue effects on positive emotional reactivity. This pattern also may be due to the fact that cultural norms for sadness are more salient than for amusement. A recent study (Gross et al., 2006) found that both EAs and AAs report regulating negative emotions (and particularly sadness) more frequently than positive emotions (and particularly amusement). Future studies need to examine a number of negative and positive emotions that differ in their level of reported regulation. For example, pride is controlled more than amusement. Thus, examining highly regulated and positive emotions (e.g., pride) would be helpful to determine whether salience of cultural norms accounts for our results.

Despite the lack of support for the two hypotheses during the amusing film, we did detect an intriguing cultural difference. The finding that EAs showed greater increases in positive facial behavior than did AAs is consistent with previous studies of college students (Tsai et al., 2002) and suggests that cultural differences in smiling generalize to depressed individuals.

Also consistent with previous findings (Tsai et al., 2002; Tsai & Levenson, 1997) is that we found no cultural differences in physiological reactivity during the sad or amusing films. Physiological reactivity is a component of emotional reactivity that may be less likely to be targeted by cultural norms regarding emotions because it is less visible than facial behavior and reports of emotional experience and, therefore, may have fewer social consequences (Tsai, 1999). Of interest, we found that among nondepressed AAs, orientation to East Asian culture was associated with greater increases in skin conductance for both the sad and amusing films. This pattern is novel and requires replication. If replicated, it can be interpreted as consistent with the notion that nondepressed AAs moderate their expression of emotions in accordance with cultural norms.

Limitations and Future Directions

There are several limitations of our study that motivate a number of future research directions. First, future studies would benefit from larger sample sizes and more homogeneous cultural samples. The results we got for crying behavior based on group comparisons did not emerge for analyses examining the associations be-

tween depression severity and emotional reactivity. This inconsistency may have been due to small sample size. In addition, concern about further reducing power to detect differences prevented us from controlling for multiple comparisons. Second, we used a relatively nonsocial and normative task to elicit emotions. Given that emotions are construed as more interpersonal phenomena in East Asian than in European American cultures (Kitayama, Markus, & Kurokawa, 2000; Scherer, Matsumoto, Wallbott, & Kudoh, 1988) and that the effects of depression on emotional reactivity may be particularly pronounced for self-relevant elicitors of emotions (Rottenberg, Joorman, Brozovich, & Gotlib, 2005), future studies could profitably examine cultural differences in emotional reactivity to interpersonal and self-relevant elicitors of emotions, such as idiographic emotional memories or letters from relatives.

Third, we cannot be certain that differences in cultural norms regarding emotional experience and expression mediated the observed differences in emotional reactivity. It will be important in future work, therefore, to measure both exposure to and endorsement of specific cultural norms regarding emotional expression. Finally, in this study we conducted a single cultural contrast and used only two films to elicit sadness and amusement. Future studies of culture and depression should include members of other cultural groups that may be influenced by different norms of emotional expression and should use multiple elicitors of positive and negative emotions. In addition, inclusion of participants with different subtypes of depression would allow researchers to identify symptom clusters associated with altered patterns of emotional reactivity.

These limitations are offset by several strengths of this study. Specifically, previous studies on cultural differences in depression had been limited to survey and ethnographic methods. In this study, we examined the impact of depression on emotional reactivity across two cultural groups (European Americans and Asian Americans of East Asian descent) under controlled laboratory conditions. In addition, this study extends prior research by examining three components of positive and negative emotional reactivity (reports of emotional experience, facial behavior, and physiological reactivity). Our findings suggest that the effects of MDD on reports and expressions of sadness may vary across cultural groups and across components of sadness. If replicated in future studies, these observations of cultural variation in how depression influences sadness may have important implications for how depression is assessed and treated in different cultural contexts. For example, the present findings suggest that despite reporting similar levels of depressive symptoms, depressed AAs report and express more sadness in response to a sad stimulus than do depressed EAs. Future studies will need to examine whether these differences hold for negative emotions reported and shown during clinical assessments. If so, culture-specific assessment criteria for emotional reactivity may be necessary.

In sum, the present findings suggest that the impact of depression on emotional functioning may vary as a function not only of reaction component and emotion, but also of cultural norms regarding emotional expression.

References

- Allen, N. B., Trinder, J., & Brennan, C. (1999). Affective startle modulation in clinical depression: Preliminary findings. *Biological Psychiatry*, *46*, 542–550.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.
- Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy for depression*. New York: Guilford Press.
- Bellah, R. N., Madsen, R., Sullivan, W. M., Swindler, A., & Tipton, S. M. (1985). *Habits of the heart: Individualism and commitment in American life*. New York: Harper & Row.
- Berenbaum, H. (1992). Posed facial expressions of emotion in schizophrenia and depression. *Psychological Medicine*, *22*, 929–937.
- Betancourt, H., & Lopez, S. (1993). The study of culture, ethnicity, and race in American psychology. *American Psychologist*, *48*, 629–637.
- Boiten, F. A., Frijda, N. H., & Wientjes, C. J. (1994). Emotions and respiratory patterns: Review and critical analysis. *International Journal of Psychophysiology*, *17*, 103–128.
- Bond, M. H. (1991). *Beyond the Chinese face*. New York: Oxford University Press.
- Chan, D. W., & Lai, B. (1993). Assessing psychopathology in Chinese psychiatric patients in Hong Kong using the Brief Psychiatric Rating Scale. *Acta Psychiatrica Scandinavica*, *87*, 37–44.
- Eid, M., & Diener, E. (2001). Norms for experiencing emotions in different cultures: Inter- and intranational differences. *Journal of Personality and Social Psychology*, *81*, 869–885.
- Ekman, P., & Friesen, W. V. (1978). *Unmasking the face: A guide to recognizing emotions from facial clues*. Englewood Cliffs, NJ: Prentice Hall.
- Ellgring, H. (1989). *Nonverbal communication in depression*. Cambridge, England: Cambridge University Press.
- First, M. B., Gibbon, M., Spitzer, R. L., & Williams, J. B. W. (1997). *Structured clinical interview for DSM-IV Axis I disorders (SCID-I), user's guide*. Washington, DC: American Psychiatric Press.
- Fleiss, J. L. (1981). *Statistical methods for rates and proportions* (2nd ed.). New York: Wiley.
- Gehricke, J. G., & Fridlund, A. J. (2002). Smiling, frowning, and autonomic activity in mildly depressed and non-depressed men in response to emotional imagery of social contexts. *Perceptual and Motor Skills*, *94*, 141–151.
- Gehricke, J. G., & Shapiro, D. (2000). Reduced facial expression and social context in major depression: Discrepancies between facial muscle activity and self-reported emotion. *Psychiatry Research*, *95*, 157–167.
- Gray, J. A. (1994). Framework for a taxonomy of psychiatric disorders. In S. H. M. van Goozen, N. E. van de Poll, & J. Sergeant (Eds.), *Emotions: Essays of emotion theory* (pp. 29–59). Hillsdale, NJ: Erlbaum.
- Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology*, *64*, 970–986.
- Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition & Emotion*, *9*, 87–108.
- Gross, J. J., Richards, J. M., & John, O. P. (2006). Emotion regulation in everyday life. In D. K. Snyder, J. A. Simpson, & J. N. Hughes (Eds.), *Emotion regulation in families: Pathways to dysfunction and health* (pp. 13–35). Washington, DC: American Psychological Association.
- Hamburg, S. R. (1998). Inherited hypohedonia leads to learned helplessness: A conjecture updated. *Review of General Psychology*, *4*, 384–403.
- Kim, B. S. K., Atkinson, D. R., & Yang, P. H. (1999). The Asian Values Scale: Development, factor analysis, validation, and reliability. *Journal of Counseling Psychology*, *46*, 342–352.
- Kim, B. S. K., Yang, P. H., Atkinson, D. R., Wolfe, M. M., & Hong, S. (2001). Cultural value similarities and differences among Asian American ethnic groups. *Cultural Diversity and Ethnic Minority Psychology*, *7*, 343–361.
- Kirmayer, L. (2001). Cultural variations in the clinical presentation of depression and anxiety: Implications for diagnosis and treatment. *Journal of Clinical Psychiatry*, *62*, 22–28.

- Kirmayer, L., & Young, A. (1998). Culture and somatization: Clinical, epidemiological, and ethnographic perspectives. *Psychosomatic Medicine*, 60, 420–430.
- Kitayama, S., Markus, H. R., & Kurokawa, M. (2000). Culture, emotion, and well-being: Good feelings in Japan and the United States. *Cognition & Emotion*, 14, 93–124.
- Kleinman, A. (1982). Neurasthenia and depression: A study of somatization and culture in China. *Culture, Medicine, and Psychiatry*, 6, 117–190.
- Kring, A. M., Kerr, S., Smith, D. A., & Neale, J. M. (1993). Flat affect in schizophrenia does not reflect diminished subjective experience of emotion. *Journal of Abnormal Psychology*, 102, 507–517.
- Levenson, R. W. (2003). Blood, sweat, and fears: The autonomic architecture of emotion. In P. Ekman, J. J. Campos, R. J. Davidson, & F. B. M. de Waal (Eds.), *Annals of the New York Academy of Sciences: Vol. 1000. Emotions inside out: 130 years after Darwin's The Expression of the Emotions in Man and Animals* (pp. 348–366). New York: New York Academy of Sciences.
- Markus, H., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98, 224–253.
- Marsella, A. J., & Yamada, A. M. (2000). Culture and mental health: An introduction and overview of foundations, concepts, and issues. In I. Cuéllar & F. A. Paniagua (Eds.), *Handbook of multicultural mental health* (pp. 3–24). London: Academic Press.
- McLaughlin, L., & Braun, K. (1998). Asian and Pacific Islander cultural values: Considerations for health care decision making. *Health and Social Work*, 23, 116–126.
- Meehl, P. (1975). Hedonic capacity: Some conjectures. *Bulletin of the Menninger Clinic*, 39, 295–307.
- Murray, C. J. L., & Lopez, A. D. (1997). Alternative projections of mortality and disability by cause 1990–2020: Global Burden of Disease Study. *Lancet*, 349, 1498–1504.
- Okazaki, S. (2002). Self–other agreement on affective distress scales in Asian Americans and White Americans. *Journal of Counseling Psychology*, 49, 428–437.
- Parker, G., Cheah, Y.-C., & Roy, K. (2001). Do the Chinese somatize depression? A cross-cultural study. *Social Psychiatry & Psychiatric Epidemiology*, 36, 2001.
- Renneberg, B., Heyn, K., Gebhard, R., & Bachmann, S. (2005). Facial expression of emotions in borderline personality disorder and depression. *Journal of Behavior Therapy and Experimental Psychiatry*, 36, 183–196.
- Rottenberg, J., Gross, J. J., & Gotlib, I. (2005). Emotion context insensitivity in major depressive disorder. *Journal of Abnormal Psychology*, 114, 627–639.
- Rottenberg, J., Gross, J. J., Wilhelm, F. H., Najmi, S., & Gotlib, I. H. (2002). Crying threshold and intensity in major depressive disorder. *Journal of Abnormal Psychology*, 111, 302–312.
- Rottenberg, J., Joormann, J., Brozovich, F., & Gotlib, I. H. (2005). Emotional intensity of idiographic sad memories in depression predicts symptom levels one year later. *Emotion*, 5, 238–242.
- Rottenberg, J., Kasch, K. L., Gross, J. J., & Gotlib, I. H. (2002). Sadness and amusement reactivity differentially predict concurrent and prospective functioning in major depressive disorder. *Emotion*, 2, 135–146.
- Rottenberg, J., Ray, R. R., & Gross, J. J. (in press). Emotion elicitation using films. In J. A. Coan & J. J. B. Allen (Eds.), *The handbook of emotion elicitation and assessment*. New York: Oxford University Press.
- Russell, J. A., & Yik, M. S. M. (1996). Emotion among the Chinese. In M. H. Bond (Ed.), *The handbook of Chinese psychology* (pp. 166–188). Hong Kong, China: Oxford University Press.
- Scherer, K. R., Matsumoto, D., Wallbott, H. G., & Kudoh, T. (1988). Emotional experience in cultural context: A comparison between Europe, Japan, and the United States. In K. R. Scherer (Ed.), *Facets of emotion: Recent research* (pp. 5–30). Hillsdale, NJ: Erlbaum.
- Schwartz, G. E., Fair, P. L., Salt, P., Mandel, M. R., & Klerman, G. L. (1976a). Facial expression and imagery in depression: An electromyographic study. *Psychosomatic Medicine*, 38, 337–347.
- Schwartz, G. E., Fair, P. L., Salt, P., Mandel, M. R., & Klerman, G. L. (1976b, April 30). Facial muscle patterning to affective imagery in depressed and non-depressed subjects. *Science*, 192, 489–491.
- Simon, G. E., VonKorff, M., Piccinelli, M., Fullerton, C., & Ormel, J. (1999). An international study of the relation between somatic symptoms and depression. *New England Journal of Medicine*, 341, 1329–1335.
- Sloan, D. M., Strauss, M. E., Quirk, S. W., & Sajatovic, M. (1997). Subjective and expressive emotional responses in depression. *Journal of Affective Disorders*, 46, 135–141.
- Suinn, R. M. (n.d.). *The Suinn–Lew Asian Self-Identity Acculturation scoring guide*. Retrieved August 5, 2006, from http://www.columbia.edu/cu/ssw/projects/pmap/docs/suinn_slasia.pdf.
- Suinn, R. M., Ahuna, C., & Khoo, G. (1992). The Suinn–Lew Asian Self-Identity Acculturation Scale: Concurrent and factorial validation. *Educational and Psychological Measurement*, 52, 1041–1046.
- Tabachnick, B. G., & Fidell, L. S. (1989). *Using multivariate statistics* (2nd ed.). New York: Harper & Row.
- Treméau, F., Malaspina, D., Duval, F., Correa, H., Hager-Budny, M., Coin-Bariou, L., et al. (2005). Facial expressiveness in patients with schizophrenia compared to depressed patients and nonpatient comparison subjects. *American Journal of Psychiatry*, 162, 92–101.
- Tsai, J. L. (1999). Culture. In D. Levinson, J. Ponzetti, & P. Jorgensen (Eds.), *Encyclopedia of human emotion* (pp. 159–166). New York: Macmillan.
- Tsai, J. L., & Chentsova-Dutton, Y. (2002). Understanding depression across cultures. In I. Gotlib & C. Hammen (Eds.), *Handbook of depression* (pp. 467–491). New York: Guilford Press.
- Tsai, J. L., Chentsova-Dutton, Y., Freire-Bebeau, L., & Przymus, D. E. (2002). Emotional expression and physiology in European Americans and Hmong Americans. *Emotion*, 2, 380–397.
- Tsai, J. L., & Levenson, R. W. (1997). Cultural influences of emotional responding: Chinese American and European American dating couples during interpersonal conflict. *Journal of Cross Cultural Psychology*, 28, 600–625.
- Tsai, J. L., Levenson, R. W., & Carstensen, L. L. (2000). Autonomic, expressive, and subjective responses to emotional films in older and younger Chinese American and European American adults. *Psychology and Aging*, 15, 684–693.
- Tsai, J. L., Levenson, R. W., & McCoy, K. (2006). Cultural and temperamental variation in emotional response. *Emotion*, 6, 484–497.
- Wierzbicka, A. (1992). Talking about emotions: Semantics, culture, and cognition. *Cognition & Emotion*, 6, 285–319.
- Wierzbicka, A. (1999). *Emotions across languages and cultures: Diversity and universals*. Cambridge, England: Cambridge University Press.
- Wilhelm, F. H., Grossman, P., & Roth, W. T. (1999). Analysis of cardiovascular regulation. *Biomedical Sciences Instrumentation*, 35, 135–140.

Received May 31, 2006

Revision received March 21, 2007

Accepted March 21, 2007 ■