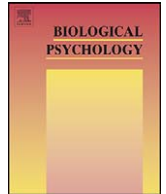




Contents lists available at ScienceDirect

Biological Psychology

journal homepage: www.elsevier.com/locate/biopsycho

Cultural context moderates the relationship between emotion control values and cardiovascular challenge versus threat responses

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ARTICLE INFO

Article history:

Received 11 February 2009

Accepted 21 September 2009

Available online 26 September 2009

Keywords:

Emotion

Cultural differences

Values

Cardiovascular threat versus challenge

ABSTRACT

Cultural context affects people's values regarding emotions, as well as their experiential and behavioral but not autonomic physiological responses to emotional situations. Little research, however, has examined how cultural context influences the *relationships* among values and emotional responding. Specifically, depending on their cultural context, individuals' values about emotion control (ECV; the extent to which they value emotion control) may have differing meanings, and as such, be associated with differing responses in emotional situations. We examined this possibility by testing the effect of two cultural contexts (28 female Asian-American (AA) versus 28 female European-American (EA) undergraduate students) on the associations between individuals' ECV and emotional responding (experiential, behavioral, and cardiovascular) to a relatively neutral film clip and a laboratory anger provocation. In the AA group, greater ECV were associated with reduced anger experience and behavior, and a challenge pattern of cardiovascular responding. In the EA group, greater ECV were associated with reduced anger behavior but not anger experience, and a threat pattern of cardiovascular responding. These results are consistent with the notion that individuals' values about emotion are associated with different meanings in different cultural contexts, and in turn, with different emotional and cardiovascular responses.

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1. Introduction

How do people's cultural contexts shape their emotional responses? Emerging evidence suggests that culture affects the values that people hold about emotions as well as their experiential and behavioral responses to emotional situations. For instance, two cultural contexts that have frequently been compared – relatively interdependent Asian contexts versus relatively independent European contexts – differ such that in Asian cultural contexts emotion control (i.e., decreasing emotional experiences and behaviors) is valued more than in European cultural contexts, especially with respect to socially disengaging emotions (e.g., pride, anger; cf. Eid and Diener, 2001; Ekman and Friesen, 1969; Kitayama et al., 2006; Klineberg, 1938; Markus and Kitayama, 1991; Matsumoto, 1993; Potter, 1988; Russell and Yik, 1996; Wu and Tseng, 1985). In turn, people from Asian cultural contexts, as compared to European cultural contexts, often report experiencing lesser emotion and behave less emotionally in emotional situations (Mesquita and Karasawa, 2002; Tsai et al.,

2002; Tsai and Levenson, 1997). However, autonomic physiological differences have generally not been observed between these two cultural groups (cf. Levenson et al., 2007). These and similar findings lead to the conclusion that cultural context affects values about emotions as well as some – but not all – components of emotional responding.

Despite this progress in our understanding, research leaves open a number of important questions. One crucial lacuna lies in the fact that most research has examined main effects of cultural context on emotional responding. In addition to such main effects, cultural context might affect the relationships among components of emotional responding in important ways (e.g., Kitayama, 2002). In particular, values about emotions – on which individuals within cultures show robust and consistent differences – may be associated with different meanings in different cultural contexts. These differences in meaning, in turn, should lead to different associations between emotion-related values and emotional responding across cultural groups.

Specifically, in Asian cultural contexts, emotion control is highly and relatively unambiguously valued, and in turn affords individuals frequent opportunities to “practice” emotion control (Eid and Diener, 2001; Klineberg, 1938; Markus and Kitayama, 1991; Matsumoto, 1993; Potter, 1988; Russell and Yik, 1996; Wu and Tseng, 1985). In this context, then, highly valuing emotion

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Table 1
Summary of hypothesized interactive effect of ethnic background and individuals' emotion control values (ECV) on evaluative patterns and associated emotional and cardiovascular responses during emotional episodes.

Ethnic background	Cultural context	Correlates of greater individuals' emotion control values (ECV) during emotional episodes		
		Evaluative patterns	Emotional responses indicative of ...	Cardiovascular response patterns indicative of ...
Asian-American (AA)	Relatively unambiguous endorsement of emotion control; more frequent affordance of episodes of emotion control	Low ambiguity; low effort; high perceived self-regulatory abilities	More effective emotion control	Challenge
European-American (EA)	More ambiguous endorsement of emotion control; competing values; less frequent affordance of episodes of emotion control	High ambiguity; high effort; low perceived self-regulatory abilities	Less effective emotion control	Threat

control at the individual level would be culturally consonant and associated with effective control of emotional responding in emotional situations as well as with a cardiovascular response pattern indicative of low ambiguity, low effort, and high ability (see Table 1, Row 1). In contrast, while emotion control is also often valued in European cultural contexts, it is more ambiguous because emotion expression is sometimes seen as an important function of being "authentic" and asserting one's self (Eid and Diener, 2001; Hochschild, 1983; Kim and Sherman, 2007; Markus and Kitayama, 1991). In this context, then, highly valuing emotion control at the individual level would sometimes bring the individual into conflict with prevailing norms and should thus be associated with less effective control of the emotional response in emotional situations as well as with a cardiovascular response pattern indicative of greater ambiguity, greater effort, and lower ability (see Table 1, Row 2).

The present research examined these hypotheses by considering the moderating effect of EA versus AA ethnic backgrounds on the associations between individuals' emotion control values (ECV; the extent to which someone believes that emotions ought to be controlled) and emotion responding. To provide context, we will review the literature on the main effects of these two cultural contexts on emotional responding before we turn to the present study. We focus on Asian versus European cultural groups because these groups, either residing in Asia and Europe or as part of a larger US-American context (then referred to as Asian-American and European-American), have yielded the largest body of research and because they differ clearly on factors relevant to emotions (e.g., independent versus interdependence notions of self, emotional display rules; cf. Hofstede, 1980; Markus and Kitayama, 1991; Matsumoto et al., 1998; Triandis, 1994).

1.1. Differences in emotional responding in EA versus AA cultural contexts

Following Kroeber and Kluckholm (1952), we define culture as "explicit and implicit patterns of historically derived and selected ideas and their embodiment in institutions, practices, and artifacts" (Kroeber and Kluckholm, 1952, p. 357). This definition does not entail that all people from one cultural context will behave and think alike. Rather, they are expected to show some similarities in values and psychological functions to the extent that they engage in particular cultural contexts. In addition, as the present analysis supports, individual and cultural values can interact in important ways (e.g., Kitayama et al., 2006). Cultural context can be operationalized as ethnic background, because ethnicity often covaries with particular cultural ideas and practices (Matsumoto, 1993; Oyserman et al., 2002). Ideally, one would directly measure the cultural ideas and practices that make up a particular cultural context and that are the presumed active ingredient in the effects of culture (cf. Kitayama, 2002). However, because this is often difficult or even impossible, we and others use ethnicity as a shortcut to infer differences in cultural context

(Butler et al., 2007; Kim et al., 2006; Matsumoto, 1993; Tsai et al., 2006). Consistent with this decision, we refer to cultural context when we refer to culture as our construct of interest, and ethnicity when we refer specifically to our operationalization of culture as ethnic group.

One important point of debate in scientists' understanding of emotions has been whether emotions are primarily biological and universal or primarily cultural and context specific (Darwin, 1872/1998; Ekman, 1992; Izard, 1992; Lutz, 1988; Russell, 1994). This question concerns not just the basic nature of emotions, but also has important practical implications for how people can and should alter their emotions. More recently, the scientific discourse on cultural influences on emotions has shifted in favor of a more nuanced one, which asks *which components* of emotional response are shaped by cultural factors rather than *whether* such influences take place (cf. Feldman Barrett, 2006; Hinton, 1999; Levenson et al., 2007; Matsumoto, 1993; Mesquita, 2003; Scherer and Wallbott, 1994; Tsai et al., 2006).

One of the main frameworks for understanding cultural differences is the distinction of interdependent versus independent understanding of the self (Hofstede, 1980; Markus and Kitayama, 1991; Matsumoto et al., 1998; Mesquita and Karasawa, 2002; Schwartz, 1992; Triandis, 1994). According to this distinction, people in Asian and AA cultural contexts tend to think about themselves relative to members of an in-group ("interdependent"). Because group concerns relatively outweigh individual concerns in interdependent Asian cultural contexts, individual emotion control is valued, especially with respect to negative and socially disengaging emotions (Ekman and Friesen, 1969; Kim and Markus, 2002; Kitayama et al., 2006; Markus and Kitayama, 1991; Potter, 1988; Tsai et al., 2006; Wu and Tseng, 1985). For example, Klineberg (1938) reports that Chinese participants generally describe emotions as dangerous, value emotional moderation, and emphasize social harmony over individuals' expression of emotions. AAs rate the expression of negative emotions and emotion expression as less appropriate than do EAs (Matsumoto, 1993), and AAs are more likely to report suppressing emotional expression than are EAs (Gross and John, 2003; Triandis, 1994).

Relative to such interdependent cultural contexts, individuals engaged in European and EA cultural contexts tend to conceive of themselves as an independent entity, even with respect to an in-group. In EA contexts, emotions and their expression are seen as signs of psychological health and the individual's authenticity (Bellah et al., 1985; Lasch, 1979; Marshall, 1972; Suh et al., 1998; Tavris, 1984). People in EA contexts tend to value emotional expressiveness, especially of positive and self-focused emotions, because it allows individuals to assert themselves and experience themselves as unique and bounded (Kim and Sherman, 2007; Matsumoto, 1990). Naturally, all these effects vary across specific emotions (e.g., Eid and Diener, 2001; Matsumoto, 1993). For example, differences between Asian and European cultural groups can be reversed for socially engaging emotions (e.g., friendly feelings, guilt), with Asian participants valuing and experiencing a

greater degree of such emotions (Kitayama et al., 2006). However, there appear to be some values common to emotions in general as well (Klineberg, 1938; Markus and Kitayama, 1991; Matsumoto, 1993; Potter, 1988; Russell and Yik, 1996; Wu and Tseng, 1985).

If cultural differences exist for values about emotion, do individuals from Asian versus European cultural contexts differ in their actual responses to emotional situations? When approaching this question, it is important to keep in mind that emotional responses are not monolithic. Rather, various aspects of the emotional response – experiential, behavioral, and physiological – are subject to different determinants and are thus not necessarily redundant with one another (cf. Levenson et al., 2007; Mauss et al., 2005; Mesquita and Frijda, 1992). This means that when asking whether cultural context affects emotional responding, one needs to consider different components of emotional responding separately.

Overall, research suggests that EA and AA individuals differ in emotional experience and behavior in the hypothesized direction. Le et al. (2002) showed that Asian and AA participants reported greater difficulty identifying and communicating emotions than EA participants. In a study of online ratings of emotional experiences, Mesquita and Karasawa (2002) showed that Japanese and Japanese American participants reported experiencing less pleasant emotions than European-American participants. In a similar study, Scollon et al. (2004) found that EA participants reported feeling more pride, affection, joy, and happiness (positive or self-focused emotions) but less guilt (a socially engaging emotion) than AA and Japanese participants when providing online ratings of their momentary emotions.

Research that examined emotional responding in standardized laboratory settings has generally provided evidence supportive of the hypothesis that EA and AA individuals differ in magnitude of emotional experience or behavior. A study comparing Chinese-American and European-American dating couples' responses to conflict conversations yielded differences in positive emotional experience (Tsai and Levenson, 1997). Soto et al. (2005) compared Chinese-American and Mexican-American participants' experiential, behavioral, and physiological responses to startling blasts of noise. Chinese-American participants, as compared to Mexican-American participants (a cultural context that relatively values emotion expression), reported experiencing less emotion. These studies support the notion that overall, EA and AA individuals differ in terms of emotional experience and behavior.

One notable pattern is that even in studies that identified differences in emotional experience or behavior, groups did not differ in terms of autonomic physiological responses (e.g. Soto et al., 2005; Tsai and Levenson, 1997). This observation has led to the hypothesis that cultural values about emotion might shape individuals' self-regulatory goals, which in turn should lead to differences in emotional responses, but *only to the extent* that a particular response is accessible to self-regulation (Levenson et al., 2007). Because experience and behavior may be more accessible to self-regulation than autonomic physiological responses (e.g., it seems to be easier to instruct people to change their emotional experiences and behaviors than their physiological responses; Gross, 1998) we would expect cultural values to influence experience and behavior more than autonomic physiological responses. However, while available data are consistent with this model, it has not yet been directly or completely examined.

A second qualification to the notion that Asian versus European cultural contexts affect emotional responses comes from the fact that some studies have failed to identify consistent cultural differences in *any* response component. For instance, when comparing Hmong-Americans and European-Americans during recall of emotional events (Tsai et al., 2002), differences were only found in non-Duchenne (“social”) smiles, but not in other

emotional behaviors, emotional experience, or physiological responses. In a study comparing Mexican-, Chinese-, European-, and African-American participants' experiential, behavioral, and physiological responses to emotional film clips, Roberts and Levenson (2006) found greater responses for the European-American and the African-American groups but only for emotional behavior in response to film clips that depicted actors of matched ethnicity. When collapsing across different types of film clips, there were no differences between Chinese-American and European-American participants. Some studies have found no cultural differences at all. For instance, Oishi (2002) identified no group differences between Asian-American and European-American participants in their online reports of emotional experiences. Likewise, in a study of Chinese-American and European-American participants' responses to emotional film clips, Tsai et al. (2000a) found no group differences in experiential, behavioral, or physiological responding.

How can these null findings be reconciled with the findings that suggest that cultural context affects emotional experience and behavior? One compelling hypothesis is that emotional context matters. The conditions under which studies found cultural differences included dating couples' responses to conflict conversations (Tsai and Levenson, 1997), acoustic startle (Soto et al., 2005), and film clips with ethnically matched actors (Roberts and Levenson, 2006). In other words, personally relevant, interpersonal, intense, and naturalistic situations might be particularly conducive to revealing cultural differences in emotional experience and behavior, while less personally or culturally relevant, non-social, and emotionally less evocative situations might be less conducive to finding such differences. Even under ideal circumstances, however, no differences in physiological responses appear to emerge.

1.2. Cultural context as a moderator of associations between individuals' values and emotional responding

Despite the recent progress in our understanding of the relationships between cultural context, emotion-related values, and emotions, a number of important questions remain. Crucially, the research we reviewed above is representative in that it generally focuses on main effects of cultural groups on emotional responding. In addition to such main effects, culture can affect the *relationships among components* of emotional responding (e.g., Kitayama et al., 2006; Matsumoto et al., 2008; Mesquita and Karasawa, 2002). Culture serves as an organizing context that provides meaning for individuals' values. As such, individuals' values regarding emotion control may be associated with different meanings in different cultural contexts.

More specifically, as we reviewed above, in Asian cultural contexts, emotion control is highly and relatively unambiguously valued. Accordingly, then, individuals in AA contexts who highly value emotion control should perceive high congruity with their cultural context and receive more frequent opportunity to “practice” and automatize emotion control (see Table 1, Row 1). In turn, when they find themselves in a situation that requires emotion control, they should evaluate it as relatively unambiguous, requiring little effort, and perceive their emotion regulatory abilities to be high. This evaluative pattern in the context of situations that require a cognitive or behavioral response has been referred to as a challenge response (cf. Mendes, 2009; Tomaka and Blascovich, 1994) because it entails active motivated responding and confidence in one's potential to cope with the demands of the situation. In terms of emotional responses, we would expect to observe responses indicative of relatively effective emotion control (decreases in multiple domains of emotional responding). In addition, we would expect to observe cardiovascular responses

associated with the challenge evaluative pattern (greater cardiac output, greater left ventricular contractility, and lower total peripheral resistance; Mendes et al., 2002, 2007; Seery et al., 2004; Tomaka et al., 1993).

In contrast, in EA cultural contexts, emotion control is more ambiguous and on average less valued because it conflicts with this values endorsing individual self-expression and authenticity (Table 1, Row 2). In this context, then, individuals who highly value emotion control may perceive lower congruity with their cultural context and receive less frequent opportunity to “practice” and automatize emotion control. In turn, when they find themselves in a situation that requires emotion control, they should evaluate the situation as more ambiguous, requiring greater effort, and evaluate their own regulatory abilities less confidently than AA participants with high ECV. This evaluative pattern in the context of situations that require a cognitive or behavioral response has been referred to as a threat response (cf. Mendes, 2009; Tomaka and Blascovich, 1994), because it entails less active motivated responding and less confidence in one’s potential to cope with the demands of the situation. In turn, we would expect to observe emotional responses indicative of relatively less effective emotion control. In terms of cardiovascular responding, we would expect to observe greater vascular responding, which has been shown to accompany threat evaluations (lower cardiac output, lower left ventricular contractility, and greater total peripheral resistance; Mendes, 2009; Mendes et al., 2002, 2007; Seery et al., 2004; Tomaka et al., 1993).

Two studies provide some indirect support for these expectations. Mendes et al. (2003) found that in Western-culture same-sex dyads, emotion control during an interaction was associated with a cardiovascular threat response. Similarly, Butler et al. (2007, 2009) found that in EA female dyads, open emotion expression during a conversation was associated with lower blood pressure and favorable social outcomes, while in AA female dyads, emotion expression was associated with marginally higher blood pressure and less favorable social outcomes.

In sum, these considerations suggest that the meaning (and hence the psychological and physiological impact) of individuals’ ECV differs by cultural context. In AA individuals, ECV should be associated with effective emotion control and a challenge pattern, while in EA, ECV should be associated with less effective emotion control and a threat pattern. Importantly, because existing research has focused predominantly on mean differences across cultural groups, hypotheses regarding differing associations among values and emotional responses have not yet been fully evaluated.

1.3. The present research

The present research examined this hypothesis by testing the moderating effects of cultural context on the associations among emotion control values and emotion responding. To do so, we biswas previously collected data (Mauss et al., in press). In contrast to the present analyses, the prior analyses examined group effects of AA and EA on mean levels of responding to an anger provocation and the mediating role of ECV in these group effects.

We examined female Asian-American (AA) and female European-American (EA) participants for two reasons. First, Asian and European cultural contexts allow for relatively clear predictions because they clearly differ in values about emotions, and because much past research has focused on these contexts. An additional advantage of examining AA and EA participants, rather than participants residing in Asia or Europe, is that the confounding influence of factors such as language or familiarity with Western psychology is minimized. Thus, these groups (relative to Asians and Europeans residing in Asia and Europe, respectively) allow for

a conservative test of our hypotheses. To ensure that the two groups differed in cultural orientation despite currently living in the US (i.e., that our comparison was not too conservative), we ascertained that AA participants were less orientated to European-American culture than EA participants.

Emotion control values were assessed with a questionnaire that has been shown to differentiate EA and AA participants (Mauss et al., in press). We note that this measure captures general values regarding emotion and is not focused on values regarding the particular components of emotional responses (e.g., experience or behavior) or specific emotions (e.g., anger or happiness). While cultures vary on these more specific values as well (cf. Kitayama et al., 2006; Matsumoto et al., 1998), they also appear to vary with respect to general ideas about emotion (e.g., emotions are dangerous versus functional; Klineberg, 1938; Markus and Kitayama, 1991; Matsumoto, 1993; Russell and Yik, 1996). The measure of ECV captures such a general cultural idea.

Emotional responding was assessed in the context of a relatively neutral film clip as well as a standardized laboratory anger provocation. We chose a laboratory context because observing emotional responses as they happen in standardized situations, rather than assessing them retrospectively with questionnaires, allows one (a) to minimize biases of retrospective reports, (b) reduce confounds between cultural context and types of emotional situations, and (c) assess multiple components of emotional responding that cannot be assessed with questionnaires (i.e., behavior and physiological responding). The context of an anger provocation was particularly interesting for two reasons. First, our analysis of the research on cultural differences and emotional responding suggests that personally relevant, intense, and naturalistic emotional contexts are optimally suited to detect cultural differences. Second, many cultural contexts, including AA and EA ones, have differentiated and focal norms about the control of anger (Gross et al., 2006; Hochschild, 1983; Stearns and Stearns, 1986), with Asian contexts prescribing overall greater control of anger than European contexts (Kitayama et al., 2006). We included only female participants because norms regarding anger appear to apply particularly strongly to women (Timmers et al., 1998) and to minimize variance due to gender differences.

To assess multiple key components of emotional responses (Frijda, 1988; Gross and Thompson, 2007; Lang, 1979), we measured experiential, behavioral, and physiological responses. Anger experience was assessed with self-reports following the film clip and the anger provocation. Anger behavior was assessed by coding videotapes of the film clip period and the anger provocation. Cardiovascular responses that differentiate challenge and threat patterns were assessed with measures of cardiac output (CO), left-ventricular contractility (VC; pre-ejection period), and total peripheral resistance (TPR) during the film clip and the provocation.

1.4. Hypotheses

Based on our analysis of the literature, we hypothesized that in the AA group, ECV would be associated with effective emotion control, indicated by lesser anger experience and lesser anger behavior, and a challenge pattern of cardiovascular responding. In contrast, we hypothesized that in the EA group, ECV would be associated with less effective emotion control, indicated by no or weaker decreases in anger experience and anger behavior, and a threat pattern of cardiovascular responding.

2. Method

Because the present results are based on a re-analysis of previously collected data, the methods follow those described in Mauss et al. (in press). However, for ease of evaluation, we describe important aspects of the methods here.

2.1. Participants

Fifty-six female undergraduates, 28 from an Asian-American (AA) background and 28 from a European-American (EA) background, participated in this study. AA background was defined as indicating "Asian-American" as one's own ethnic identity, as well as indicating that both parents' ethnic background was East or South-East Asian (e.g., Japanese, Chinese, Vietnamese). EA background was defined as indicating "European-American" as one's own ethnic identity, as well as indicating that both parents' ethnic background was Western, Middle, or Northern European (e.g., British, German, Swedish). All participants spoke English fluently. Fifteen of the AA (54%) and two of the EA participants (7%) were not born in the US. Because age (since it is correlated with status in college) and socioeconomic status (SES) might affect anger responses (e.g., Manstead et al., 1999; Tiedens et al., 2000), the groups were matched by age and SES (p 's > .87). Because all participants were college students and resided in the US, we measured degree of orientation to European-American culture to ensure that AA and EA groups differed in cultural context. As expected, AA participants were less oriented toward EA culture than EA participants ($p < .001$).

Because of technical problems, five participants were not recorded on the video tapes, resulting in missing behavior codes. CO and VC were not obtained for one participant, and TPR was not obtained for two participants.

2.2. Procedure

In the experimental session, which was videotaped, participants were told that the study was concerned with cognitive performance and mood. After physiological sensors were attached, participants watched a relatively neutral 5-min nature film while cardiovascular responses were collected, and then reported on their frustration, annoyance, and anger experience (along with 14 distractor terms). Following Stemmler (1997), participants then performed a tedious counting task designed to induce anger. Apart from a brief introduction at the beginning of the session, all instructions were provided over an intercom from an adjacent room. As part of this task, participants were required during three 1-min periods to count backwards in steps of 7 (for the first two trials) or 13 (for the third trial) from large numbers (e.g., 18,652). The female, EA experimenter interrupted the participant multiple times with scripted remarks on the participant's performance and cooperation and delivered in an increasingly impatient tone of voice. After the first task, participants were instructed that they were "producing artifacts" by "moving their hand" and that they had "to speak more loudly." At the end of the anger provocation, the experimenter said, "Let's just stop here. Just fill out the next section in your questionnaire packet," with an irritated tone that implied that the whole session had not gone properly. The annoying remarks were pre-recorded but appeared to be delivered live over the intercom from an adjacent room, which ensured maximally standardized procedures and reduced experimenter bias. The anger provocation took an average of 8 min.

After the anger provocation, participants completed another emotion experience questionnaire. Sensors were removed, and a funneled debriefing procedure was used to assess the extent to which participants were aware of the true nature of the task (Bargh and Chartrand, 2000). Of the 56 participants, 37 (66%; 15 of them from the AA group) did not report any suspicion, 17 (30%; 12 of them from the AA group) reported some suspicion, and 2 (4%; 1 of them from the AA group) reported strong suspicion. We note that our coding of suspicion was conservative to include even slight suspicion about any aspect of the procedures. For example, we counted as indicating "some suspicion" if a participant agreed, without being more specific, when explicitly asked whether they thought the experimenter behaved strangely. A *Chi-square* test confirmed that the two groups did not differ in distribution of suspicion, $p = .16$. Further, level of suspicion did not predict ECV ($M = 3.5$ for no suspicion, $M = 3.8$ for participants with greater than minimal suspicion, $p = .54$). Secondary analyses were performed using only participants who reported no suspicion, and yielded results comparable to analyses that included participants with some suspicion. Therefore, results presented are based on all participants. Participants returned on average nine days later to a second session during which demographics and individual differences were assessed.

2.3. Measures

2.3.1. Measures of demographics and individual differences

Ethnic background and ECV were assessed in a session separate from the anger provocation [both participant groups returned, on average, nine days ($SD = 5$) after the laboratory session]. Ethnic background was assessed with three questions asking participants to identify their own and each of their parents' ethnic background. ECV were assessed with a six-item scale described in Mauss et al. (in press; $\alpha = .86$ for the AA and $.85$ for the EA group). An example item from that scale is "People in general should control their emotions more." In addition, orientation to European-American culture was assessed with the North American version of the General Ethnicity Questionnaire (GEQ-American version; $\alpha = .82$ for the AA and $.80$ for the EA group; Tsai et al., 2000b). Because participants were all college students, parents' rather than their own socioeconomic status (SES) was

assessed with the Hollingshead index, which combines educational attainment and occupational status (Miller, 1977).

2.3.2. Measures of emotional responding

Measures of emotional responding to the film clip and the laboratory anger provocation included self-reported anger experience, anger behavior, and cardiovascular responding. Anger experience and other emotions were assessed after the film clip and the anger provocation with ratings on 11-point Likert scales, ranging from 0 (*none at all*) to 10 (*extremely*). An anger experience composite was formed using the terms angry, annoyed, and frustrated (film clip: $\alpha = .71$ for the AA group and $.88$ for the EA group; anger provocation: $\alpha = .87$ for the AA group and $.82$ for the EA group).

Two judges blind to the hypotheses of this study coded the videotapes with respect to anger behavior. To obtain an index for anger behavior during the film clip and the anger provocation, they provided four codes: one for the last minute of the film clip and one for each of the three 1-min counting tasks. We used a relatively global coding scheme that captured displays of anger that would be perceptible to untrained observers (cf. Mauss et al., 2004, 2007). However, some of the expressions (e.g., frowns, pursed lips) were derived from validated componential coding schemes (e.g., FACS; Ekman and Friesen, 1978). Coders took into account facially expressed anger (annoyed eye movements such as frowns or eye rolling, angry mouth movements such as pursed lips) and body posture during both the film and the provocation. During the provocation they also considered tone of voice, loudness of voice, and comments (refusing to complete the task, cursing) to arrive at codes of global anger behavior from 1 (*none at all*) to 5 (*extremely angry*). Because participants did not speak while watching the film clip, these latter measures were only obtained for the provocation. The three codes for the provocation were then averaged into one provocation rating. The inter-rater reliability was adequate with intraclass correlations of .75 for the AA and $.86$ for the EA group for the film clip and $.75$ for the AA and $.86$ for the EA group for the anger provocation. Thus, ratings were averaged across the two judges to arrive at one index of anger behavior for the film and one for the anger provocation.

Cardiovascular responding was indexed by ventricular contractility (VC), cardiac output (CO), and total peripheral resistance (TPR) because they are important for differentiating threat from challenge patterns (Mendes et al., 2003; Tomaka et al., 1993). In addition, somatic activity was assessed to control for the effects of body movement on cardiovascular activation. All signals were sampled at 1000 Hz using a Data Translation 3001 PCI 12-bit 16-channel analog-to-digital converter. Customized analysis software (Wilhelm et al., 1999) was applied to physiological data reduction, feature detection, visual inspection, artifact control, and computation of average physiological scores for each participant for the film clip and the anger provocation. To obtain an index of responding during a relatively neutral context, responses across the 5-min film clip were averaged. To obtain an index of responding to the anger provocation, responses during each of the three 1-min counting tasks were averaged.

VC, as indexed by pre-ejection period (with smaller values of pre-ejection period indexing greater VC), was derived from the ECG and the ZCG waves. The ECG signal was obtained using a modified Lead II configuration (right lead on the right side of the torso and the left lead on the left side of the torso below the ribcage, ground on the stomach) and an SA Instruments 12-channel bioamplifier. The ZCG signal was obtained with an HIC-2000 Bio-Impedance Cardiograph (Bio-Impedance Technology, Inc.) using a set of four spot electrodes, applied at the front of the neck above the collar bone, the nape of the neck, the xiphisternal junction, and the lower back (cf. Sramek, 1982). A 4 mA AC 400 kHz current was sent through the two back sensors and transthoracic impedance as well as the first derivative of basal impedance, or the change of impedance over time, were obtained from the two front sensors. Pre-ejection period was identified as the time elapsed between the Q point on the ECG wave (the left ventricle contracting) and the B inflection on the ZCG wave (the aortic valve opening; cf. Sherwood et al., 1990).

CO and TPR were derived from the blood pressure signal, which was obtained from the third finger of the nondominant hand by means of the Finapres 2300 system (Ohmeda, Madison, WI, USA). From this signal, beat-to-beat stroke volume was measured using Wesseling's pulse-contour analysis method (BEATFAST, TNO-Biomedical Instrumentation, Amsterdam). Beat-to-beat MAP (mmHg) was computed as $(\text{systolic blood pressure} + 2 \times \text{diastolic blood pressure})/3$. Heart rate was calculated from the R to R intervals in the ECG. CO (l/min) was calculated as $\text{stroke volume} \times \text{heart rate}$. TPR ($\text{dyne} \times \text{s/cm}^5$) was calculated as $(\text{MAP} \times 80)/\text{CO}$. Somatic activity (A–D units) was measured by a piezo-electric device attached to the participant's chair. This device generates an electrical signal proportional to the participant's overall body movement in any direction, which we used to control for effects of body movement of cardiovascular responding (cf. Obrist et al., 1970).

We note that for the film, anger experience reports and cardiovascular measures were based on the whole 5-min period while anger behavior codes were based only on the last minute of the 5-min period. We opted for this slight discrepancy in time frame because obtaining behavior codes is time intensive and because codes for the remaining minutes of the relatively neutral film would have added little information. We do not anticipate that this discrepancy affected results, because little change in emotional context occurred through the film clip.

3. Results

3.1. Effectiveness of the anger provocation

As reported in Mauss et al. (in press), the anger provocation was successful, such that participants reported experiencing greater anger during the anger provocation ($M = 4.3$, $SD = 2.3$, than during the film clip ($M = 0.9$, $SD = 1.2$). The results also suggest, however, that the “neutral” film clip was not entirely neutral; average reports of anger during the film clip were low but significantly greater than zero ($p < .001$). This may have occurred because the undergraduate participants were receiving class credit and may have felt some annoyance at this course requirement. As such, we conceptualize the film period as a mild annoyance induction rather than as completely neutral. In addition, the provocation induced significant degrees of other negative emotions (sadness: $M = 0.9$, $SD = 1.3$; guilt: $M = 2.0$, $SD = 2.6$; shame: $M = 2.6$, $SD = 2.9$; fear: $M = 3.3$, $SD = 2.4$). However, four pairwise t tests suggested that anger was reported to a greater degree than the other emotions (all p 's $< .001$). This suggests that some degree of specificity was achieved.

3.2. Main effects of ethnic group on ECV and emotional responding

As reported in Mauss et al. (in press), AA participants endorsed ECV to a greater extent than EA participants (AA: $M = 4.3$, $SD = 1.9$; EA: $M = 2.9$, $SD = 1.6$). In addition, AA as compared to EA exhibited lesser anger experience (AA: $M = 3.6$, $SD = 2.4$; EA: $M = 4.9$, $SD = 2.5$) and behavior (AA: $M = 2.20$, $SD = 0.22$; EA: $M = 2.36$, $SD = 0.33$) in response to the anger provocation, while the two groups did not differ in terms of autonomic physiological responding during either the film clip or the provocation.

3.3. Moderation of relationships between ECV and emotional responding by ethnic group

To examine moderating effects of ethnic group on relationships between ECV and emotional responding, we performed separate mixed-model analyses for each dependent variable (anger experience, anger behavior, CO, VC, and TPR) including trial (film clip versus anger provocation) as a repeated measure, the main effects of ECV and ethnic group, and all interactions as fixed predictors. For the cardiovascular outcomes we included somatic activity as a control variable to account for effects of body movement on cardiovascular activation.¹ This resulted in a model with seven predictors for experience and behavior and eight predictors for cardiovascular responding (trial, ECV, ethnic group, all 2-way interactions, the 3-way interaction, and somatic activity as a control variable).² This approach allowed us to assess the interactions of ECV with ethnic group under conditions of mild annoyance and strong anger provocation.

ECV did not interact with ethnic group when predicting anger behavior, nor were there any significant interactions with trial, all F 's(1, 45) < 1.00 , n.s. However, ECV had a significant main effect on

anger behavior, such that participants with greater ECV showed lesser anger behavior during the film clip and the provocation, regardless of ethnic background ($b = -0.04$, $t(65) = -2.15$, $p < .04$).

As shown in Fig. 1A, ECV interacted with ethnic group to predict anger experience, $F(1, 52) = 4.56$, $p < .04$. The three-way interaction of ECV, ethnic group, and trial was not significant, however, $F(1, 87) = 2.70$, n.s., demonstrating that the two-way interaction of ECV and ethnic group was of the same direction and magnitude during the film clip and the anger provocation. Specifically, for AA participants, greater ECV were associated with lower anger experience in both the film clip and the anger provocation ($b = -0.38$, $t(52) = -2.50$, $p < .02$). In contrast, for EA participants, ECV were unrelated to anger experience in both the film clip and the anger provocation ($b = 0.13$, $t(52) = 0.71$, n.s.).

As shown in Fig. 1B–D, ECV and ethnic group interacted in predicting CO, $F(1, 51) = 10.55$, $p < .002$, VC, $F(1, 49) = 5.36$, $p < .03$, and TPR, $F(1, 49) = 13.49$, $p < .0001$. As with anger experience these patterns held across both the film clip and the anger provocation (all interactions with trial were not significant, F 's(1, 83–98) < 0.12 , n.s.). The following results therefore collapsed across trial. Specifically, for AA participants greater ECV were associated with marginally increased CO ($b = 0.21$, $t(48) = 1.57$, $p < .07$), increased VC ($b = 2.59$, $t(47) = 1.94$, $p < .05$) and decreased TPR ($b = -1.52$, $t(50) = -3.18$, $p < .003$). In contrast, for EA participants greater ECV were associated with reduced CO ($b = -0.48$, $t(53) = -2.89$, $p < .005$), were unrelated to VC ($b = -2.54$, $t(50) = -1.43$, n.s.), and were associated with increased TPR ($b = 1.23$, $t(49) = 2.13$, $p < .04$).

4. Discussion

Despite longstanding interest in cultural differences in emotions (Darwin, 1872/1998; Ekman, 1992; Izard, 1992; Lutz, 1988; Mesquita and Frijda, 1992; Russell, 1994), a number of pertinent questions remain. Of particular interest, little research has explored how cultural context might alter the associations among individuals' values about emotions and their emotional responding. This is an important gap because cultural contexts differ in the meanings that they confer to individuals' values, and because individuals differ in important ways in their emotion-related values. As such, cultural context and individuals' values may interact in crucial ways. The present research suggests that this is indeed the case. In the following, we summarize our findings and consider what they suggest for our understanding of cultural influences on emotional responding. We then outline limitations and future directions suggested by the present research.

4.1. Summary of results

As predicted, we found that ethnic background interacted with ECV in affecting individuals' emotional and cardiovascular responses to a mildly anger-inducing situation and an anger provocation. In line with the hypotheses, we found that in the AA group, ECV were associated with reduced anger experience and behavior, and a challenge pattern of cardiovascular responding (marginally greater CO, greater VC, and lower TPR), a pattern consistent with relatively effective emotion control. In European-American participants, ECV were associated with reduced anger behavior but not with anger experience, and a threat pattern of physiological responding (lower CO, no association with VC, and greater TPR), a pattern consistent with less effective emotion control. These relationships held across a relatively neutral film clip and an anger provocation.

One important question is why ethnic background moderated the affective correlates of ECV even in the context of a relatively neutral nature film. One possibility is that participation in the

¹ Results remain comparable when not controlling for somatic movement, with the exception of the effect of ECV on TPR in the EA group, which is only marginal when not controlling for somatic movement.

² The significance tests for each predictor in the full model were based on 87 degrees of freedom, as estimated with the Satterthwaite degrees of freedom for nested models. Although it is difficult to estimate power within a nested model such as this one (see for example Snijders and Bosker, 1999), the degrees of freedom are within the standard guidelines for regression that suggest a minimum of 10 observations (independent pieces of information) per predictor. In addition, Fig. 1 makes it visually clear that substantial 3-way interactions with Trial are not present: the patterns of data are almost identical during the film clip and the anger provocation. Therefore, the lack of significant 3-way interactions is likely not the result of low power.

present study was part of a class requirement, which may have lead to the low but significant levels of anger we observed during the film clip. This suggests that AA participants with low ECV and most EA participants reacted to the film clip with some degree of anger, which was effectively avoided in the AA participants with high ECV. In line with this finding, ECV were associated with lower anger experience as well as a challenge pattern of cardiovascular responding in the AA group but not the EA group even during the film clip. This effect was maintained during the anger provocation, which suggests that the present effects are relatively unspecific across anger intensities.

4.2. Implications for understanding cultural influences on emotion

The present results have at least three implications for emotion theory. First, to fully understand cultural differences in emotions, research needs to not only examine main effects of culture, but also how cultural contexts moderate the associations of various components of emotion responding. For example, with respect to autonomic physiological responses, our review of relevant main effects suggested that generally cultural groups do not differ in terms of their physiological responding to emotional situations. In

the present data as well, no main effects of ethnic background were found on autonomic physiological responding. This has led to the conclusion that cultural context does not affect autonomic physiological responding to emotional situations (Levenson et al., 2007). However, the results from the present analyses suggest that this conclusion is true only when considering main effects of cultural context. In interaction with individuals' ECV, EA versus AA contexts had consistent effects on autonomic physiological responses.

A second implication of the present results is that ECV may be associated with different types of emotion regulation in different cultural contexts. As summarized in Table 1, we argue that AA individuals, relative to EA individuals who highly value emotion control, receive more frequent opportunity to “practice” and automatize emotion control (cf. Mauss et al., 2008; Mesquita and Albert, 2007). Therefore, we expected that in a situation that requires emotion control ECV would be associated with relatively more effective emotion control in Asian cultural contexts than in European cultural contexts. Consistent with this notion, we found that for AA participants, ECV were associated with reduced anger experience and behavior, while for EA participants, ECV were associated only with reduced anger behavior. These results are

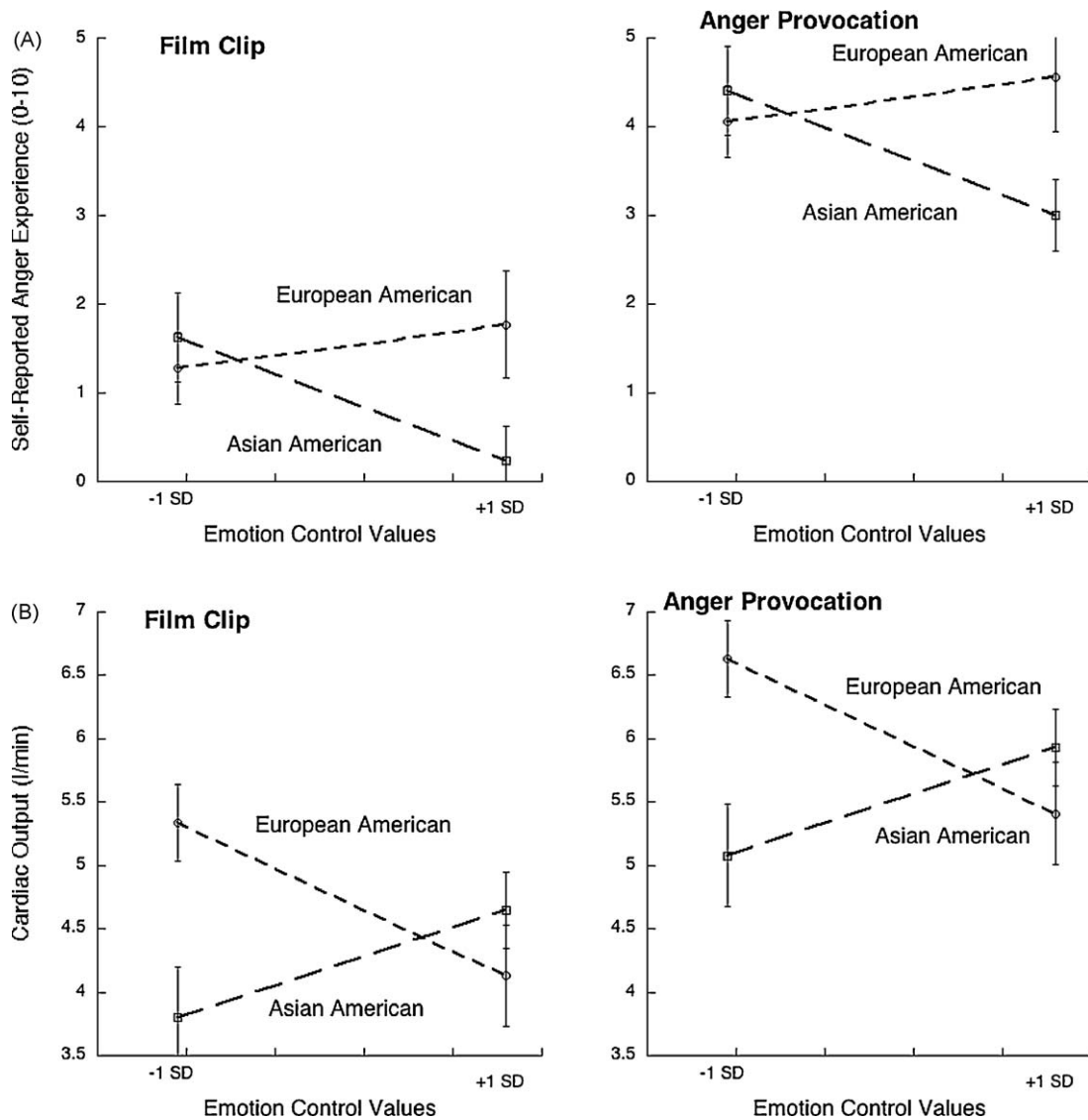


Fig. 1. The interaction of ethnic background (AA versus EA) and individual emotion control values (ECV) on anger experience (Panel A), cardiac output (CO; Panel B), left-ventricular contractility (VC; Panel C), and total peripheral resistance (TPR; Panel D). Values depict mean estimates and standard errors at ± 1 SD for ECV.

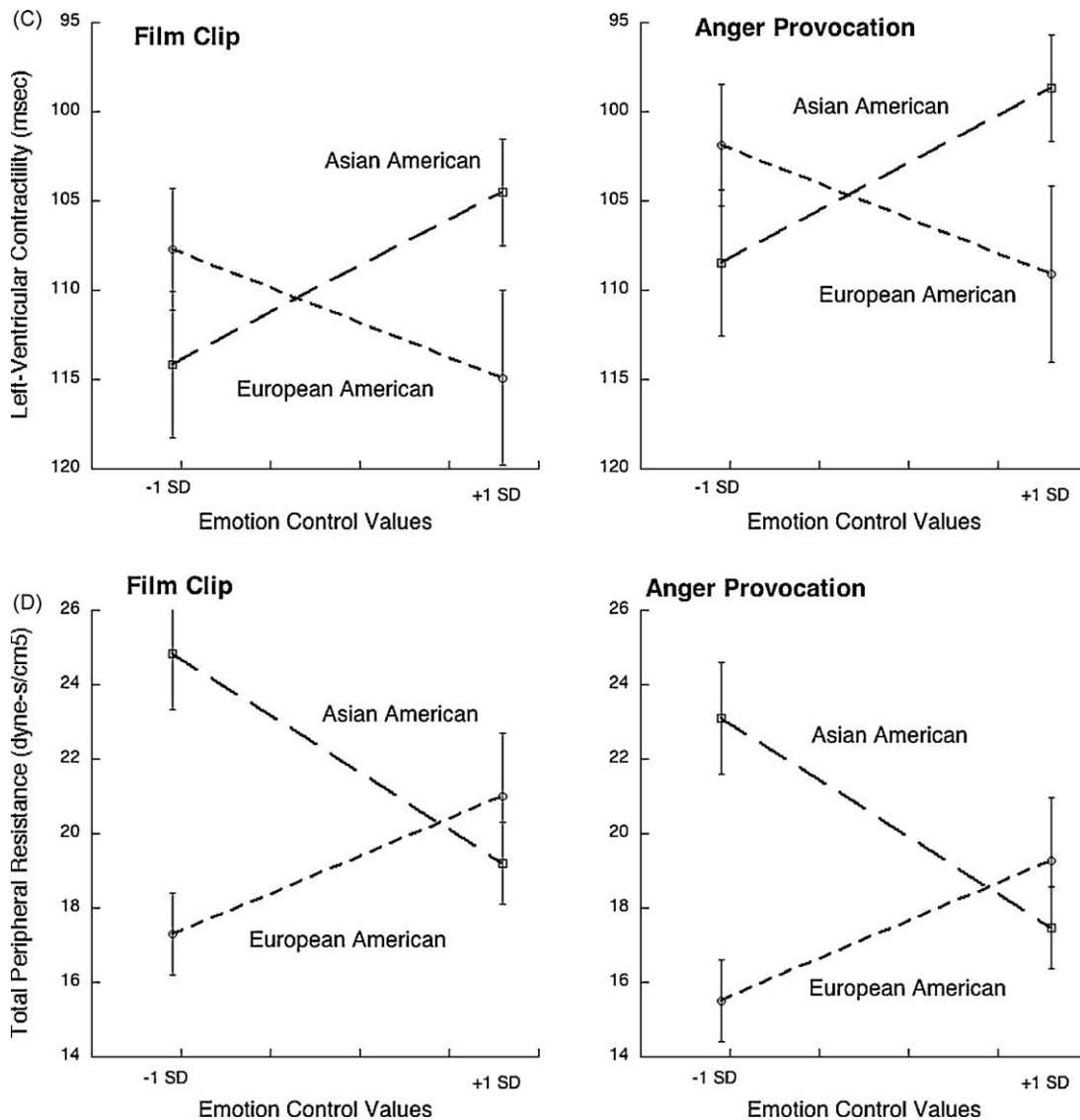


Fig. 1. (Continued).

consistent with the hypothesis that depending on its cultural context, ECV are associated with different emotion regulatory styles.

A third implication of the present findings is that the larger cultural context moderates the psychological impact of individuals' values about emotions (cf. Kitayama et al., 2006). As summarized in Table 1, we argued that ECV should have different meanings in the AA versus EA contexts, because emotion control is relatively unambiguously valued in Asian and Asian-American cultural contexts and is more ambivalent in European and European-American contexts. In AA contexts, we expected greater ECV to be associated with relatively lower ambiguity, lower effort, and greater perceived self-regulatory abilities than in the EA group. These evaluative patterns, in turn, are expected to mediate in the effects of ECV and cultural context on emotional and cardiovascular responding. This interpretation is in line with the fact that in the Asian-American group, ECV were associated with a challenge pattern of cardiovascular responding while in the European-American group, ECV were associated with a threat pattern of cardiovascular responding. Consistent with this interpretation, Butler et al. (2007) showed that the more women held Western-European values, the more emotion suppression was associated

with negative emotion, and the more they exhibited negative affective consequences when instructed to suppress their emotions. Together, these results support that the effects of individuals' values regarding emotions can be quite different depending on cultural context.

One important alternative explanation of our results is that ECV are not associated with more effective emotion control or more beneficial evaluations in AA versus EA participants but rather with different profiles of emotional responding. For example, ECV could be associated with lesser anger but greater sadness, fear, guilt, or shame in AA, which in turn may lead to a pattern of decreased TPR (Funkenstein, 1955; Stemmler, 2004). However, secondary analyses did not support this alternative explanation. Ethnic group and ECV did not interact in predicting fear or sadness (both $F(1, 52) < 1.67$, n.s.). Although guilt and shame both showed marginal interaction effects (guilt: $F(1, 52) = 3.15$, $p < .09$; shame: $F(1, 43) = 2.89$, $p < .10$), these interactions were driven by a pattern similar to, but weaker than, the one we found for anger experience, with a nonsignificant positive association between ECV and guilt/shame for EA and a nonsignificant, negative association between ECV and guilt/shame for AA participants. These findings do not support the alternative hypothesis that differences between AA

and EA participants in associations between ECV and emotional responding are driven by other negative emotions.

4.3. Limitations and future directions

As with any research, ours is not without limitations. First, it is possible that patterns of cardiovascular responses were due to the variables that were not assessed here, such as cardiovascular disease, smoking, exercise habits, body mass, diet, or use of medication. Because participants were college students (and thus likely free of cardiovascular disease) and because our outcome of interest was the correlation between ECV and cardiovascular responding rather than a main effect of group, it is not likely that the present results are due to such confounds. However, future studies should obtain measures of these potential confounds to fully address this concern.

A second limitation is that we focused on female AA and EA participants. Despite the advantages of assessing AA and EA participants (i.e., language and familiarity with psychological contexts are controlled for) it will be of great interest in future studies to investigate whether the present results extend to Asian participants residing in Asia and European participants residing in Europe. Similarly, it will be important to systematically examine participants from a greater range of cultural contexts, age, and socioeconomic groups, as well as men (cf. Chentsova-Dutton and Tsai, 2007; Fischer et al., 2004; Snibbe and Markus, 2005).

A third limitation of the present research lies in our focus on the emotional context of anger. We chose this context because we argued that anger is a particularly evocative and interesting context because it might “pull for” emotion control. However, future studies should explore whether the present results extend to other emotions. Prior research suggests that other negative emotions (e.g., guilt) and positive affect might yield a different pattern of results in that cultural values are applied differentially to different emotions (cf. Eid and Diener, 2001; Kitayama et al., 2006; Matsumoto et al., 1998; Scollon et al., 2004). For example, in Asian contexts, socially engaging emotions such as guilt are more encouraged than in European cultural contexts. In the context of guilt, then, a reverse pattern might be found, with AA participants showing an association between ECV and a threat pattern, and EA participants showing an association between ECV and a challenge pattern. Along similar lines, it will be important to examine whether different patterns are found in completely non-emotional contexts.

A fourth limitation and one that points to particularly interesting future research, is that we were unable to directly test the hypothesized mechanisms underlying the observed effects. We argue that because of differences in cultural context, AA who endorse high ECV might utilize more effective types of emotion control strategies perhaps because their cultural context afforded many opportunities to automatize this behavior (e.g., Mauss et al., 2008; Mesquita and Albert, 2007). In addition, we argue that ECV have different meanings for AA versus EA participants, which lead to challenge versus threat appraisals. Our results are consistent with these hypotheses. However, the present study cannot conclusively confirm this because we did not directly assess what emotion regulatory processes or appraisals participants engaged in during the laboratory tasks. Further exploration of the mechanisms underlying the present effects will be important for developing our understanding of the interactions of cultural context, individual values, and emotional responding.

5. Concluding comment

Despite these limitations, the present research contributes to a more complete understanding of how cultural background relates

to emotional responding by examining how cultural context affects associations among emotion-related processes. Our results are consistent with the idea that individuals' values about emotion are associated with different meanings in different cultural contexts, and in turn, with different emotional responses in experiential, behavioral, and physiological domains. Although much work remains to be done to understand how culture shapes people's emotional lives, the present findings suggest that in addition to comparisons of cultural group averages, some important answers may be found in patterning of responses across various aspects of emotion.

Acknowledgements

We would like to thank Catharine Evers and James J. Gross for their help with the present research.

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