

**Cultural Variations in the Self and Underlying Neural Mechanisms:
Implications for Cognition, Emotion, and Motivation**

by

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CHAPTER I

Introduction

Understanding the power of situations in shaping basic human processes has been central to social psychological research. A variety of situations have been examined, ranging from the mere or imagined presence of others (Allport, 1985; Rigdon, Ishii, Watabe, & Kitayama, 2009), to group dynamics (Billig & Tajfel, 1973; Lewin, 1952), to macro-factors such as socioeconomic status (Kraus, Côté, & Keltner, 2010; Stephens, Markus, & Townsend, 2007) and physical environment (Miyamoto, Nisbett, & Masuda, 2006). In this dissertation, I focus on one potent social factor, culture, which has received much scholarly attention for the last two decades. Culture is an integral part of virtually all psychological phenomena. It is built into most behavioral and psychological processes, from our everyday attentional habits (e.g., which TV ads to watch), to our emotional experiences (e.g., when I feel happy), to our decision-making processes (e.g., which restaurant to go for dinner). In the present work, I examine how cultural environments shape basic human processes such as cognition, emotion, and motivation by comparing Western and East Asian cultures.

All cultural regions are comprised of a unique constellation of daily practices, public artifacts, and folk beliefs that foster the development of distinct psychological tendencies. Evidence is growing that the influence of culture can be understood in terms

of culturally shared models of the self as independent (dominant in Western cultures) or interdependent (dominant in East Asian cultures) (Markus & Kitayama, 1991, 2010; Park & Kitayama, in press). The last two decades of cultural psychological research have documented cultural variations in psychological tendencies in cognition, emotion, and motivation, depending on each culture's relative emphasis on independence or interdependence. For example, the cultural model of the self as independent (vs. interdependent) involves cognitive processes such as dispositional (vs. situational) attribution (Morris & Peng, 1994) and focused (vs. holistic) attention (Masuda & Nisbett, 2001). It is also likely to give rise to distinct emotional processes such as the experience of socially disengaging (vs. engaging) emotions (Kitayama, Mesquita, & Karasawa, 2006) and personal (vs. social) forms of happiness (Uchida & Kitayama, 2009), as well as motivational processes such as personally (vs. socially) oriented motivation (Na & Kitayama, 2012) and self-enhancement (vs. self-criticism) (Heine, Lehman, Markus, & Kitayama, 1999).

In the present work, I aim to extend the current literature of cross-cultural psychology in two important directions. First, previous work provides much evidence on the psychological consequences of independent or interdependent self-construal, but it leaves several important questions unanswered. I seek to add to this literature by focusing particularly on three classes of questions, each of which deals with the cognitive, emotional, or motivational processes associated with independence vs. interdependence. My second aim is to examine the neural basis underlying cultural variation. Much research in this field has used traditional methods of social psychology, such as behavioral measurement, in order to understand cultural differences in high-level

phenomena including attitudes, emotional experiences, and motivation. However, in order to understand the mechanisms through which these cultural differences emerge, it is essential to examine more basic-level processes, such as how quickly and automatically cultural modulation takes place. Neuroscience investigations allow researchers to examine how culture influences the psychological mechanism and structure of individuals, through rapid and concurrent observation of the neural processes underlying them. Thus, by adopting a neurophysiological measure (i.e., event-related brain potentials; ERP), I explore the neural basis of cultural variation in motivational processes.

Models of the Self as Independent and Interdependent

The present work rests on the hypothesis that cultures vary in the nature of the self they sanction. In Western cultures, including U.S. society, independence of the self is highly sanctioned. The self is regarded as a relatively autonomous, self-sufficient entity that is independent from its surrounding interpersonal context (Triandis, 1989). As such, individuals in these cultures are likely to define themselves in terms of internal attributes such as preferences, attitudes, and goals. The self is thus affirmed when these internal attributes are realized and evaluated as positive. This model of the self is illustrated in Figure 1.1-A.

Conversely, in many non-Western cultures, especially East Asian cultures, a greater premium is placed on interdependence of the self with others. The fundamental sense of Asian selfhood is embedded in social relations. As such, individuals in these cultures are likely to define themselves in terms of relational attributes such as social roles, status, and rank. As a consequence, the self is affirmed when people are assured

that they are meeting social roles, norms, and expectations of others. This model of the self is illustrated in Figure 1.1-B.

Evidence for this theoretical framework is derived from many different sources. For example, Cousins (1989; see also, Brewer & Yuki, 2007) asked both European American and Asian participants to describe themselves by completing twenty statements starting with “I am...” (Twenty Statement Test; Kuhn & McPartland, 1954). Consistent with the model of the self as independent, European Americans tended to describe themselves in terms of abstract personal attributes that were detached from social contexts or social relations (e.g., I am outgoing). In contrast, consistent with the model of the self as interdependent, Asians tended to describe themselves in terms of their relational attributes or social roles (e.g., I am the second daughter in my family). A recent investigation (Zhu, Zhang, Fan, & Han, 2007) revealed that there is a neurophysiological root to cultural differences in the structure of the self. These researchers found that the brain region known to be involved in self-processing (medial prefrontal cortex, mPFC; Craik et al., 1999; Kelley et al., 2002) showed equally strong activation when Chinese participants thought about and elaborated on their mothers vs. the self, suggesting that significant others are incorporated into the definition of the self. In contrast, for Westerners, mPFC received activation only when they thought about themselves, but not when they thought about their mothers, suggesting that Westerners have distinctive neural representations of the self and close others.

To the extent that individuals actively engage in their culture, which emphasizes either independence or interdependence, this can shape a variety of psychological tendencies. Consistent with this general proposition, the last two decades of research in

cultural psychology have documented numerous cross-cultural differences in basic psychological processes. This dissertation focuses on three such processes – cognition, emotion, and motivation. In this introduction, I will summarize the overall East-West cultural differences that have been identified, and then introduce the research questions that I have explored in an effort to extend the current findings in each domain.

Culture and Cognition

One of the most studied areas in cultural psychology is cultural variation in cognitive styles, such as attentional processes and social perception. Since Western cultures place strong emphasis on personal goals and desires, individuals are likely to allocate attention primarily to objects and events closely relevant to their goals and desires. This process may, in turn, foster the development of focused attention. In contrast, since Asian cultures more strongly emphasize social embeddedness and social relations, Asians are likely to allocate attention more broadly to the outer social world. As a consequence, their attention may eventually become holistic. In support of this analysis, it has been amply demonstrated that people in Western cultures tend to allocate their attention to focal objects in lieu of situational contexts, while those in Asian cultures tend to be more holistic, extending their attention to situational contexts (Kitayama, Duffy, Kawamura, & Larsen, 2003; Nisbett & Masuda, 2003).

A similar cultural variation has been documented in the domain of social perception in which a person is considered a focal object embedded in a larger social scene. It may be anticipated that independent people are likely to attend to a person more as a figural object, while paying relatively scant attention to the context. In contrast, it may also be anticipated that interdependent people extend their attention to the whole

context. Consistent with this prediction, European Americans show a greater tendency to explain another person's behavior based primarily on that person's dispositions, while discounting available situational factors (called fundamental attribution error; FAE, Ross, 1977). However, this bias is much weaker among Asians, who tend to attend more holistically to situational constraints on the focal behavior (Choi & Nisbett, 1998; Masuda & Kitayama, 2004; Na & Kitayama, 2011).

While studies have shed some significant light on how culture influences the way we think, this line of research is largely limited to basic cognitive processes such as attention or reasoning. Many other cognitive processes hold the potential for meaningful cross-cultural comparisons. *Implicit attitude toward cultural values* is one such topic. While it has been understudied by cultural psychologists, implicit attitude has received a great deal of scholarly attention over the last decade in other domains in social psychology (Greenwald, Poehlman, Uhlmann, & Banaji, 2009). Thus, Chapter II examines whether people differ in their implicit attitudes toward their levels of independence or interdependence across cultures (Study 1). Specifically, I examined whether European Americans value independence more and interdependence less compared to Japanese, when their implicit value endorsements are assessed in a modified implicit association test (IAT) paradigm.

Culture and Emotion

Emotion is another important domain where substantial cultural variation has been observed. Depending on whether a given culture emphasizes a model of the self as independent or interdependent, people of that culture tend to experience distinct emotions varying in the degree of social engagement. In all cultures, people experience positive

emotions when they succeed in important life tasks, and negative emotions when they fail in the tasks. But, the types of positive or negative emotions people feel may differ as a function of the nature of tasks that are sanctioned in the culture. In Western cultures, people can be assured of positive characteristics of the personal self when independent tasks (e.g., personal achievement) are realized. Achieving independent goals then may give rise to the experience of socially disengaging positive emotions such as pride or confidence. Conversely, when they fail in achieving these goals, they are likely to experience socially disengaging negative emotions such as frustration and anger. In contrast, actualizing interdependent goals is more strongly emphasized in Asian cultures. When interdependent goals (e.g., satisfying social expectation) are achieved, people can be assured of their belongingness in social relations, which in turn may lead them to experience socially engaging positive emotions such as communal feelings or feelings of closeness to others. Conversely, when people fail in these tasks, they are likely to feel socially engaging negative emotions such as shame and guilt. In support of this analysis, Kitayama and colleagues found that European Americans tend to experience disengaging (vs. engaging) emotions more in their daily lives, while the reverse pattern is true for Asians (Kitayama et al., 2006; Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009).

The experience of engaging (vs. disengaging) emotions also influences the nature of happiness across cultures. If people habitually seek to realize either independent or interdependent goals, they may feel happy or satisfied when the corresponding goals are achieved. As expected, the happiness of Americans is more accurately predicted by the experience of disengaging positive emotions, whereas the happiness of Japanese is best

explained by the experience of engaging positive emotions (Kitayama et al., 2006; 2009; see also Uchida & Kitayama, 2009 for similar findings).

In Chapter III, I seek to extend the current literature on culture and emotion by exploring two research questions that have received little scholarly attention to date. In Study 2, I examined whether cultural groups differ in anger expression, and if so, how its influence interacts with other macro-social conditions, such as social status. Anger is a basic emotion, which is presumed to be observed in all cultures (Izard, 1977; Spielberger, Jacobs, Russell, & Crane, 1983). But, specific functions of anger may differ across cultures, depending on the normative expectation of independence or interdependence in a given culture. I focus on two prominent functions of anger – anger as vented frustration and anger as dominance display, which may be differentially normative across cultures (i.e., U.S. vs. Japan). Specifically, I tested whether anger expression increases or decreases as a function of social status, depending on the salience or prominence of each of the two functions of anger in each culture.

Study 3 examined whether the linkage between receipt of social support and physical and mental health is moderated by culture. Previous work provides inconsistent results regarding the relationship between social support and health. While some studies report strong positive relationships between the two (Lakey & Orehek, 2011; Uchino, Cacioppo, & Kiecolt-Glaser, 1996 for reviews), other studies suggest that support offers little benefit to health (see Bolger & Amarel, 2007 for a review). I suggest that the linkage between perceived support and health status of the support recipient is moderated by multiple factors that serve to highlight or conceal the emotional costs of receiving social support, including culture. I hypothesize that the association between perceived

support and health would be more strongly evident among Asians who are from a support-approving cultural context. I also consider personality (i.e., neuroticism) and situational factors (i.e., stress) as additional influences that jointly moderate the social support-health link with culture.

Culture and Motivation

The culturally divergent models of the self as independent or interdependent are also likely to give rise to corresponding variations in motivational processes. A seemingly identical behavioral pattern (i.e., performing a task or making a choice) is likely to have different psychological meanings and is thus likely to be guided by very different psychological mechanisms across cultures. The present work focuses on two notable themes of research that pertain to motivational processes: self-serving bias and social evaluative threat.

With his famous publication of *Leviathan*, Thomas Hobbes (1651) argued that self-interest is the cardinal human motive. Since then, the idea that humans are predominantly self-interested has been central not only to neo-classic economics (Smith, 1759), but also to other influential theories of human behavior (Campbell, 1975; Greenwald, 1980). One potent psychological manifestation of the pursuit of self-interest is self-serving bias. It has been convincingly demonstrated that people are motivated to maintain positive self-views and to maximize self-interest in many different ways (Dunning, Meyerowitz, & Holzberg, 1989; Langer, 1975; Miller & Ross, 1975). Although self-serving bias is often regarded as universal, recent investigations report substantial cross-cultural variations. European Americans, who are expected to affirm their self-identity by developing the positivity of the personal self that is separated from

others, tend to show stronger self-serving bias than Asians, who are expected to affirm their self-identity by maintaining harmonious social relations and conforming to social expectations (e.g., Heine, Lehman, Markus, & Kitayama, 1999).

Another notable demonstration of cultural variation is social evaluative threat and its implications for the motivational process. Social belongingness is a fundamental human motive (Baumeister & Leary, 1995; Bowlby, 1988). Therefore, people are sometimes highly vigilant of potential social evaluative threats. But, not all individuals are equally sensitive to social evaluative threats. Asians, who tend to define themselves based primarily on social evaluations such as honor and face, are known to be more sensitive to social evaluative threats than European Americans, who tend to define themselves in reference to their internal attributes (Kim & Markman, 2006). Under social evaluative threats, people tend to monitor their actions more closely and enhance their motivation to perform better on a task at hand. Consistent with this prediction, Asians show enhanced motivation to work harder on a task when the situation involves social evaluative threats (e.g., Na & Kitayama, 2012). Similarly, Asians show increased motivation to justify their choice in public (i.e., in the presence of social eyes), while they are exposed to a social cue signaling a potential negative evaluation held by others, while European Americans do not justify their choice under the same condition (Kitayama, Snibbe, Markus, & Suzuki, 2004).

Although current evidence clearly suggests that cultural differences in self-serving bias and social evaluative threat exist, the neural mechanisms underlying these phenomena are still unexplored. It is essential to analyze brain pathways to broaden our understanding of cultural moderation in two important ways. First, neuroscience

investigations enable researchers to examine the mechanisms underlying cross-cultural variation. For example, an exploration of the neural basis of self-serving bias could reveal whether self-enhancing motivation stems from conscious self-presentational goals to present the self in a favorable light (Schlenker, 1980), or it has an even deeper neurophysiological root, in which the pertinent brain mechanisms underlying self-serving bias are recruited automatically and unconsciously (Berridge, 2012).

Second, neuroscience investigations can reveal how quickly and automatically cultural modulation takes place. Unlike traditional behavioral measures, which rely on observation of downstream outcomes of hypothesized psychological processes (e.g., response time), neuroscience measures, such as event-related potentials (ERPs, which have extremely high time resolution), enable researchers to assess neural processes more rapidly and concurrently. For example, in studies by Kitayama and colleagues (2004) reviewed above, choice justification is used as an indicator of motivational significance of decisions. Although promising, these measures of motivational significance are distal and indirect, which are likely to be influenced by a host of different variables (Harmon-Jones, Amodio, & Harmon-Jones, 2009). To understand psychological mechanisms more clearly, it is therefore desirable to assess the change in psychological processes on-line in the brain.

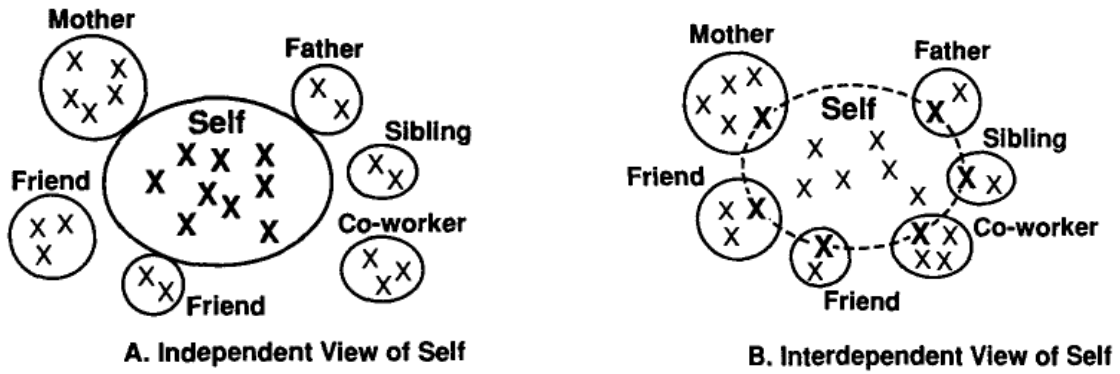
To this end, in Chapter IV, I examined cultural modulation in the motivational processes involved in self-serving bias and social evaluative threat by using a neuroscience measure. In particular, I assessed error-related negativity (ERN), an ERP component contingent on error commission (Falkenstein, Hohnsbein, Hoormann, & Blanke, 1991; Gehring, Goss, Coles, Meyer, & Donchin, 1993), as a neurophysiological

index of motivational significance involved in self-serving bias (Study 4) and social evaluative threat (Study 5).

Overview of the Present Work

In this dissertation, I aim to extend the current literature of cultural psychology by exploring how the culturally divergent model of the self as independent vs. interdependent influences three arrays of psychological tendencies in broad socio-cultural contexts. It also seeks to identify the brain mechanisms upon which these psychological operations are based. In particular, Chapter II examines cultural variations in implicit attitudes by comparing European American and Japanese participants' implicit value endorsement of independence and interdependence using a modified implicit association task (IAT) paradigm (Study 1). Chapter III includes two studies examining cultural variations in emotional processes. I examined whether the linkage between anger expression and social status is moderated by culture (Study 2), and whether the beneficial effects of perceived social support on health is contingent on factors that highlight or conceal the emotional costs associated with receiving supporting, including culture (Study 3). Chapter IV explores the neural bases of cultural variation in motivational processes in two studies. Study 4 examined cultural variation in the neural correlate of the motivational force toward the pursuit of self-interest. Study 5 tested whether cultural groups differ in the neural signaling of social evaluative threat and how this threat response influences task motivation. Finally, in Chapter V, the main findings of Chapters II, III, and IV are summarized. I also discuss the implications of the findings and propose future research directions.

Figure 1.1 Conceptual representation of the self adapted from Markus and Kitayama (1991).



CHAPTER II¹

Culture and Cognition

One central theme in the last two decades of cultural psychological research is that as compared with Asians, European Americans are more independently oriented (or less interdependently oriented) (Kitayama & Uskul, 2011; Markus & Kitayama, 1991, 2010). Evidence for this cultural difference is especially strong when implicit psychological tendencies of independence (vs. interdependence) are tested (Kitayama et al., 2009). These tendencies of independence (vs. interdependence) involve dispositional (vs. situational) attribution (Morris & Peng, 1994), focused (vs. holistic) attention (Masuda & Nisbett, 2001), personal (vs. social) form of happiness (Uchida & Kitayama, 2009), as well as personally (vs. socially) oriented motivation (Na & Kitayama, 2012). Although much of this cross-cultural evidence is based on behavioral indicators such as judgment, response time, and task performance, an increasing volume of work has documented conceptually equivalent cultural variations with neural indicators (e.g., Na & Kitayama, 2011; Zhu et al., 2008; see Kitayama & Park, 2010, for a review). One important shortcoming of this literature, however, is that none of the existing measures assess implicit attitudes toward independence (vs. interdependence).

Implicit attitudes have been investigated extensively over the last decade in social

¹ This chapter is co-authored with Yukiko Uchida and Shinobu Kitayama.

psychology (Greenwald et al., 2009). By implicit attitudes, we mean a set of evaluative associations one has with an attitudinal object or concept at issue. Thus, one could be said to have positive implicit attitudes toward independence if the person has more positive (rather than negative) associations with independence. These associations need not be conscious and, yet, have been shown to influence various behaviors in many different domains including racial prejudice (Greenwald, McGhee, & Schwartz, 1998) and attitudes toward smoking (Andrews, Hampson, Greenwald, Gordon, & Widdop, 2010) or HIV (Neumann, Hulslenbeck, & Seibt, 2004). Given the increasing volume of research on implicit attitudes in many other domains of research (Greenwald et al., 2002), we believe that it is a major oversight on the part of cultural psychologists that the afore-mentioned cultural difference in independence and interdependence has never been tested with an implicit attitude measure such as implicit association test (IAT). The primary aim of the current work was to fill this gap in empirical knowledge.

Cultural Task Analysis

In theorizing on cultural variation in independence and interdependence, Kitayama and colleagues (Kitayama & Imada, 2010; Kitayama et al., 2009) have hypothesized that cultures provide various means to achieve their cultural mandates. European American cultures, for example, offer a number of behavioral routines, conventions, scripts, or tasks (e.g., self-expression, leaving home, financial autonomy) that help one to achieve independence of the self. These behavioral routines are called *cultural tasks*. Each individual member will necessarily use some of these cultural tasks to realize the culture's mandate of independence. Some people may proactively choose and adopt some of the tasks as their own and incorporate them into their personal or

social identity, whereas some others may be more passive, merely performing what they are required to do to be a good member of their culture. Regardless of their level of involvement or volitional choice they exercise, however, individuals are likely to adopt only a subset of tasks that are available in their culture, not only because it is impossible to seriously perform all of them, but also because any one of the tasks is likely to be sufficient to meet the culture's requirement to be independent.

Some cultural tasks of independence may require individuals to hold on to a belief of the self as internally motivated. Such a belief may give rise to a dispositional cognitive bias in attribution (Choi, Nisbett, & Norenzayan, 1999; Na & Kitayama, 2011). Other cultural tasks may necessitate focused, task-oriented attention (Kitayama et al., 2003; Masuda & Nisbett, 2001) and, yet, others may lead individuals to emphasize personal (vs. social) forms of happiness (Oishi & Diener, 2001; Uchida & Kitayama, 2009). The exact nature or form of independence any one particular person might acquire is likely to vary depending on which tasks are available in the person's environment as well as which of the available ones he or she adopts as his or her own means for achieving the cultural mandate of independence. However, as a cultural group, European Americans may be expected to be strongly independent.

Likewise, Asian cultures provide a number of cultural tasks, behavioral routines or scripts that help one to achieve interdependence (e.g., filial piety, social harmony, financial interdependence). Any one individual performs a subset of these tasks to realize the culture's mandate of the self as interdependent. Some cultural tasks may require the individual to be highly sensitive to contextual or relational cues (Ishii, Reyes, & Kitayama, 2003). Others may emphasize social (vs. personal) forms of happiness (Uchida

& Kitayama, 2009). As is true in the independent culture, the exact nature of the interdependence individuals eventually acquire may depend on the specific tasks they adopt among those that are available in their environments, either actively or passively, to realize the cultural mandate of interdependence. However, as a cultural group, Asians may be expected to be strongly interdependent.

Available Evidence

Individuals engage in their selected cultural tasks during socialization, which begins at an early age and continues throughout their lives. This repeated engagement in specific cultural tasks is likely to shape individuals' psychological habits or spontaneous tendencies (i.e., how they spontaneously feel, think, and act) in a way that is congruent with the cultural norm of independence or interdependence. The resulting independent or interdependent psychological tendencies will become habitual (Wood & Neal, 2007), or even automatic (Bargh & Ferguson, 2000). We call these tendencies *implicit* because they stem from behavioral propensities that are consistent with a model of the self as independent (vs. interdependent) and, yet, they are not always linked to the self in any explicitly recognized or acknowledged fashion. In other words, these tendencies are likely to be detached from the ideas of independence or interdependence at the level of conscious reflection (Kitayama, 2002).

As a first systematic test of cultural task analysis, Kitayama et al. (2009) examined five implicit psychological tendencies of independence (vs. interdependence), namely, dispositional bias in causal attribution, focused (vs. holistic) attention, salience of disengaging (vs. engaging) emotions, form of happiness as personal (vs. social), and the larger symbolic self. In these implicit measures, European Americans were

substantially more independent than Japanese. The researchers also included the Singelis (1994) scale of independent (vs. interdependent) self-construal. This measure is said to be explicit because it is based on one's conscious evaluation of his or her ideas of independence and interdependence. Curiously, the Singelis measure did not show any predicted cultural difference. If anything, it indicated that European Americans were more interdependent than Japanese – a pattern that is consistent with a meta-analysis by Oyserman and colleagues (2002).

Present Work

Although the Kitayama et al. (2009) study is important in demonstrating systematic cultural variation in various implicit (but not explicit) measures, there is one limitation. It did not include a task that assesses one's implicit endorsement of independence and interdependence. Given the Kitayama et al. (2009) study, it would seem reasonable to hypothesize that as compared to Asians, European Americans implicitly value independence more and value interdependence less. Moreover, this may be true even when explicit value endorsement shows otherwise (Greenwald & Banaji, 1995). The primary goal of the present work, then, was to address this question by developing an implicit association test (IAT) of independence vs. interdependence. The IAT is the most commonly used implicit measures of individual attitudes.

A subsidiary goal of the current work was to test additional measures of both implicit and explicit independence (vs. interdependence) in an attempt to replicate the Kitayama et al. (2009) study. This study showed that Americans were more independent (or less interdependent) than Japanese primarily in implicit measures. They also found no statistical coherence among the implicit indicators of independence (vs.

interdependence). More recently, Na and colleagues (2010) tested an age-heterogeneous group of European Americans and similarly found that there is no coherence among implicit measures of independence and interdependence; but this study did not include non-European American data. Given the fact that the Kitayama et al. (2009) study is the only one available that tested several indicators of independence or interdependence simultaneously within a cross-cultural design, the lack of coherence among implicit independence vs. interdependence in the presence of systematic cross-cultural differences needs to be replicated.

Method

Participants

Fifty-seven European American (41 women; $M_{age} = 19.25$, $SD_{age} = 1.15$) and sixty Japanese (25 women; $M_{age} = 19.25$, $SD_{age} = 1.04$) college students participated in the study. American participants received \$7 and Japanese participants received 700 yen in exchange for their participation.

Materials

We used six tasks to measure independence (vs. interdependence). Four were measures of implicit independence: 1) Implicit association test (IAT), 2) Self-description task, 3) Salience of disengaging (vs. engaging) emotions, and 4) Form of happiness as personal (vs. social). The remaining two tasks were measures of explicit beliefs about independence: 5) Self-construal scale and 6) Semantic differential scale. All materials were originally created in English, and translated into Japanese by one of the authors, who was bilingual in Japanese and English. To ensure semantic equivalence, back-translation by another bilingual was used.

Implicit Measures

Implicit association test. We assessed implicit evaluative associations for independence (vs. interdependence) by modifying the standard IAT paradigm (Greenwald et al., 1998). We examined the implicit associative strength between target words implying the personal vs. relational self and positive vs. negative valence. The IAT involved simultaneous sorting of stimulus items, representing two target concepts (personal verb and relational verb) and two attributes (positive adjective and negative adjective). Participants were presented with the stimulus words one at a time on a computer screen and asked to categorize them by pressing one of two response keys as quickly and accurately as possible.

We used a standard seven-block procedure (Greenwald et al., 1998; Greenwald, Nosek, & Banaji, 2003). (1) Participants started by discriminating adjectives by pressing the left key for positive adjectives (good, beautiful, clean, healthy, wise) and the right key for negative adjectives (bad, ugly, dirty, sick, foolish). (2) Next, participants categorized the target concepts by pressing the left key for personal verbs (run, read, stand, turn, wear) and the right key for relational verbs (meet, join, ask, visit, help). (3) The third block was a practice block of the first combined categorization task (the personal + positive block), during which participants were asked to press the left key for both personal verbs and positive adjectives, and the right key for both relational verbs and negative adjectives. (4) The fourth block consisted of critical trials of Block 3 (the personal + positive block). (5) Participants then categorized the target concepts again, but with the response keys reversed from Block 2 assignments. (6) The sixth block was a practice block of the second combined categorization task (the relational + positive block), during which

participants classified relational verbs and positive adjectives on the left key and personal verbs and negative adjectives on the right key. (7) The final block consisted of critical trials of Block 6 (the relational + positive block). The order in which participants performed Blocks 3-4 and 6-7 was counterbalanced (see Condition 2, Table 2.1). Each practice block consisted of 20 trials and each critical block consisted of 40 trials. Implicit attitude was defined as the mean difference in response latency between the two critical blocks (Block 4: personal + positive, and Block 7: relational + positive).

We predicted that independently oriented Americans would be better at associating personal verbs with positive adjectives, resulting in shorter response time in the personal + positive block (Block 4) than in the relational + positive block (Block 7). This effect was expected to be weaker or even reversed among interdependently oriented Japanese.

Self-description task. When people describe themselves by completing sentences starting with “I am...” (Twenty Statement Test; Kuhn & McPartland, 1954), European Americans are more likely to list personal attributes and traits (e.g., I am extroverted), while Asians are more likely to refer to social roles and relational identities (e.g., I am a student at the University of Michigan) (Brewer & Yuki, 2007; Cousins, 1989). We examined the relative proportion of personal identities compared to social identities listed by participants as an implicit indicator of independence (vs. interdependence). In a shortened version of the self-description task, participants were asked to complete five sentences describing themselves. Two raters in each culture classified the descriptions as either 1) personal identities, or 2) social identities. The inter-rater reliability was high both in the U.S. ($K = .77$) and in Japan ($K = .78$).

Salience of disengaging (vs. engaging) emotions. The implicit social orientation questionnaire (ISOQ; Kitayama & Park, 2007) was used to assess the relative salience of experiencing socially disengaging emotions versus socially engaging emotions in daily life. Participants were asked to recall 10 mundane social situations (e.g., waiting to be seated at a restaurant) and report how strongly (1 = *not at all*, 6 = *very strongly*) they experienced each of 10 different emotions that varied in social engagement (disengaging vs. engaging) and valence (positive vs. negative). In previous studies (Kitayama et al., 2006, 2009), European Americans experienced disengaging emotions (self-esteem, proud, frustration, anger) more strongly than engaging emotions (close feelings, friendly feelings, shame, guilt). However, the pattern was completely reversed for Japanese. We thus used the relative intensity in experiencing disengaging versus engaging emotions as an index of implicit independence. The index was computed by averaging the intensity ratings across 10 situations for disengaging emotions and engaging emotions separately.

Form of happiness as personal (vs. social). We also used the ISOQ to assess whether happiness was correlated more strongly with disengaging or engaging positive emotions for each individual. Previous studies show that Americans' happiness is better predicted by the relative experience of disengaging vs. engaging positive emotions, whereas Japanese's happiness is better predicted by the experience of engaging vs. disengaging positive emotions (Kitayama et al., 2006, 2009). To assess the extent to which disengaging vs. engaging positive emotions predict happiness, we computed the mean rating scores for happiness, disengaging positive emotion, and engaging positive emotion for each participant separately for each situation. Then, we regressed the happiness score on the relative strength of experiencing disengaging (vs. engaging)

positive emotions (i.e., disengaging positive – engaging positive) for each participant. The standardized regression coefficient was our measure of implicit independence. A higher number indicates that one's happiness is better predicted by the experience of disengaging relative to that of engaging positive emotions.

Explicit Measures

Self-construal scale. As a first explicit measure of independence and interdependence, participants filled out a 20-item self-construal scale. This scale was composed of selected items from both Singelis (1994) and Takata (1999) scales. Our intent was to assess different aspects of independence and interdependence that are covered in the two different, although conceptually related scales. The new scale has 10 independence items (5 from Singelis's scale and 5 from Takata's scale) and 10 interdependence items (4 from Singelis's scale and 6 from Takata's scale). Participants rated the extent to which they agreed to each item (1 = *strongly disagree*, 5 = *strongly agree*), which yielded separate scores for independent self-construal ($\alpha = .79$ and $.71$, for European Americans and for Asians, respectively) and interdependent self-construal ($\alpha = .67$ and $.65$).

Semantic differential scale. Participants' explicit attitudes towards social relationships were assessed with the semantic differential scale. Participants read five target words about social relationships (human relationship, social interaction, human bond, communication, social activities), and rated their attitudes on a 7-point scale between two bipolar adjectives (e.g., from -3: *bad* to +3: *good*). Seven bipolar pairs of adjectives were used as rating domains (bad – good, weak – strong, passive – active, unpleasant – pleasant, cold – warm, tense – relaxed, and uncomfortable – comfortable).

Separately for each target word, we summed the adjective ratings across 7 rating domains. These scores were then averaged across the five target words ($\alpha_s = .88$ and $.75$, for European Americans and for Asians, respectively).

Results

Implicit Association Test (IAT)

We predicted that Americans would show more favorable implicit attitudes toward target words implying the personal self (vs. relational self) than Japanese. Following Greenwald et al. (1998), we only included correct response trials, and excluded trials of which response time was shorter than 300ms from the analysis. One participant's data was lost due to a program malfunction. Additionally, we excluded seven outliers whose response time exceeded 3 standard deviations from the mean, which left 109 participants (54 Americans and 55 Japanese) with analyzable data. RTs from the two IAT blocks were submitted to a 2 Culture (Americans vs. Japanese) x 2 Block (personal + positive block vs. relational + positive block) x 2 Order (personal + positive block first vs. relational + positive block first) ANOVA with culture and order as between-subjects factors and block as a within-subjects factor. As predicted, the interaction between culture and block was statistically significant, $F(1, 105) = 3.85, p = .05, \eta_p^2 = .04$. Americans were significantly faster in the personal + positive block than in the relational + positive block (871.16ms vs. 995.96ms), $F(1, 53) = 7.59, p < .01, \eta_p^2 = .13$, thereby showing that they have stronger evaluative associations between the personal self and positive words than associations between the relational self and positive words. However, Japanese' RT did not differ across the two blocks (771.74ms vs.

816.77ms), $F(1, 54) = 2.32, p > .13$. The block order did not significantly interact with this effect, $F < 1, ns$.

Other Implicit Tendencies

We further examined additional measures of implicit independence to see whether Americans were indeed more independent (or less interdependent) than Japanese as in the Kitayama et al. (2009) study. The findings from the four implicit indicators of independence including the IAT are summarized in Table 2.2.

Self-description task. The proportion of descriptions in each category (personal identities vs. social identities) was submitted to a 2 Culture x 2 Category mixed ANOVA with culture as a between-subjects factor and category as a within-subjects factor. The Culture x Category interaction was significant, $F(1, 115) = 10.91, p < .005, \eta_p^2 = .08$. As expected, Americans listed more descriptions pertaining to personal identities than Japanese (.74 vs. .60), $F(1, 115) = 10.27, p < .005, \eta_p^2 = .08$, while Japanese referred to social identities more than Americans (.40 vs. .25), $F(1, 115) = 11.51, p < .001, \eta_p^2 = .09$.

Salience of disengaging (vs. engaging) emotions. To examine cultural difference in the relative experience of disengaging versus engaging emotions, we performed a 2 Culture (Americans vs. Japanese) x 2 Emotion type (disengaging vs. engaging) ANOVA with culture as a between-subjects factor and emotion type as a within-subjects factor. Main effects of both culture and emotion type were significant, $F(1, 115) = 4.69, p < .05, \eta_p^2 = .04$, and $F(1, 115) = 19.48, p < .001, \eta_p^2 = .15$. These main effects were qualified by the expected 2-way interaction, $F(1, 115) = 13.96, p < .001, \eta_p^2 = .11$. Americans experienced disengaging emotions more strongly than engaging emotions (2.45 vs. 2.12),

$F(1, 56) = 26.67, p < .001, \eta_p^2 = .32$, while Japanese experienced both emotion types equally (2.12 vs. 2.09), $F(1, 59) < 1, ns$.

Form of happiness as personal (vs. social). We then examined the relative extent to which disengaging versus engaging positive emotions predicted happiness. We subtracted the mean intensity score for engaging positive emotions from the corresponding score for disengaging positive emotions to make a relative strength index. Happiness was regressed on this relative strength index (i.e., disengaging positive – engaging positive), and the regression coefficient was compared across two cultural groups. The standardized coefficient was significantly greater for Americans than for Japanese (-.33 vs. -.48), $F(1, 115) = 4.24, p < .05, \eta_p^2 = .04$. This suggests that the extent to which disengaging (vs. engaging) positive emotions predict happiness was significantly greater for Americans than for Japanese.

Explicit Measures

The results so far suggest that Americans were indeed more independent (or less interdependent) than Japanese in all implicit measures. We further tested explicit indicators. The means and standard errors of two explicit measures are summarized in Table 2.3.

Self-construal scale. Consistent with what we observed in implicit measures, Americans were more independent than Japanese (3.78 vs. 3.18), $F(1, 115) = 26.31, p < .005, \eta_p^2 = .19$. The two cultural groups, however, did not differ in their interdependence although there was a slight trend toward Japanese being more interdependent than Americans (3.45 vs. 3.60), $F(1, 115) = 2.66, p > .10$.

Semantic differential scale. One participant did not fill out the questionnaire, and therefore was not included in the analysis. Counter to what would be expected, Americans exhibited more favorable explicit attitudes toward relationships than Japanese did (11.87 vs. 6.77), $F(1, 114) = 30.09, p < .001, \eta_p^2 = .21$.

Correlations Among the Implicit Measures

The findings so far suggest that implicit tendencies clearly differentiate the two cultural groups, while explicit indicators do not. Americans were indeed more independent (or less interdependent) than Japanese when their implicit tendencies were examined. However, cultural difference was either non-significant (as in the interdependent self-construal scale) or was the opposite of what would be expected (as in the semantic differential scale) when explicit indicators of independence were examined.

Next, we examined correlations among the four implicit indicators within each culture. We converted data so that positive scores signified greater independence. Specifically, this includes 1) IAT score (the relational + positive block RT – the personal + positive block RT), 2) the proportion of personal (vs. social) identity descriptions in the self-description test, 3) the experience of disengaging (vs. engaging) emotions, 4) personal (vs. social) happiness. As can be seen in Table 4, the correlations among the measures are close to zero. The mean correlation across the four measures was negligible both for Americans ($r = .07$) and for Japanese ($r = .09$). Out of twelve possible correlations, only one was statistically significant. However, even this significant correlation found among Japanese was not replicated among Americans.

Discussion

The Implicit Association Test (IAT) has been utilized extensively as a primary means to assess implicit cognitions (Greenwald et al., 1998; Greenwald et al., 2009); however, the present study is the first attempt to employ it in cross-cultural research on independence and interdependence. As predicted, we found that Americans hold more favorable implicit attitudes toward independence (vs. interdependence) relative to Japanese. Furthermore, we also found that Americans were relatively more independent (vs. interdependent) than Japanese on three additional implicit measures, thus providing converging evidence for the claim that Americans are more independent and/or less interdependent than Japanese when implicit measures are employed (Kitayama et al., 2009).

In contrast to the implicit measures, the results from two explicit measures of independence and interdependence were inconsistent. First, in the independent vs. interdependent self-construal scale, Americans were more independent than Japanese, whereas the pattern was reversed for interdependence but only non-significantly. Although the pattern is consistent with the notion that Japanese are relatively more interdependent or less independent than Americans, a similar pattern is not always observed (Kitayama et al., 2009; Oyserman et al., 2002). Moreover, in the present study, explicit measures of relational orientation assessed with the semantic differential scale showed a stronger relational tendency for Americans than for Japanese. It is all the more noteworthy that the implicit measures of independence and interdependence show a highly systematic cross-cultural variation.

It is possible that explicit cultural norms can change rapidly in accordance with current social, political, and economic conditions. In contrast, implicit psychological

tendencies are likely to depend more on tacit cultural practices, conventions, and associated meanings and, as a consequence, they may not show such a rapid change. In the post-World War II Japan, highly individualistic norms were brought in from the West, which might have caused substantial changes in explicit norms. Yet, at tacit, implicit levels, a more traditional, community-oriented, interdependent mode of being might have been largely preserved (Toivonen, Norasakkunkit, & Uchida, 2011).

Importantly, as in the Kitayama et al. (2009) and Na et al. (2010) studies, we found little coherence among implicit measures of independence (vs. interdependence). This was the case despite the fact that these measures systematically differentiated the two cultural groups. This lack of coherence among the measures that make up independence or interdependence is consistent with the cultural task analysis. This theoretical framework suggests that individuals use only a (supposedly rather small) subset of available cultural tasks to achieve the mandates of their cultures such as independence and interdependence. Further, we assume that individuals are likely to differ substantially in the specific cultural tasks they adopt to attain that mandate. Because the specific psychological tendencies they eventually acquire will depend upon the specific set of tasks they adopt to achieve their cultural mandate, it would follow that even though cultural groups are different systematically across all aspects of psychological tendencies associated with independence or interdependence, exactly which tendencies are acquired by any given individual will, in effect, be rather random and thus unpredictable without knowing more specific ways in which each individual has become independent or interdependent. That is, the implicit psychological tendencies are

very unlikely to cohere within each culture even though they differentiate different cultures in a systematic fashion.

To illustrate this point, we created profiles of independence (vs. interdependence) for our study participants. First, we created profiles for each cultural group on the basis of the overall group mean of independence vs. interdependence (see Figure 2.1-A for American group and Figure 2.1-B for Japanese group). The four poles stemming from the center of the diagram represent the four implicit tasks we used. All the task scores were first standardized and then marked on a 3-point scale on each pole (-1.5: highly interdependent, +1.5: highly independent). The bold line in each figure reflects participants' scores across the four tasks. As the figures illustrate, the area covered by the bold line is much larger for Americans than for Japanese, suggesting that Americans are more independent than Japanese. Next, we created individual profiles of our study participants based on each participant's scores across the four tasks. Figures 2.1-C and 2.1-E are the sample profiles of two American participants, and Figures 2.1-D and 2.1-F are the sample profiles of two Japanese participants. Although the mean levels of independence were almost the same for the two Americans (0.47 for C and 0.48 for E), they produced very different individual profiles. C's independence is most pronounced in the index of personal (vs. social) happiness, whereas E's independence is largest in the self-description task. A similar difference in profiles is found between the two Japanese. This exercise illustrates that an individual profile of independence (vs. interdependence), which is expected to vary across individuals but to be stable across time, can serve as a meaningful signature of an individual's cultural orientation (see Mischel & Shoda, 1995, for similar discussions).

We are aware that the current analysis would go against a central premise of classical psychometrics, which holds that internal consistency as indicated by statistical coherence (e.g., reliability) is a key feature of any meaningful construct. This issue is beyond the scope of the current investigation. However, it is important to note that this central premise in psychometrics could be challenged at least under certain circumstances in which defining features of a construct vary from one individual to the next depending on a variety of contextual factors. A path-breaking effort addressing this possibility is currently underway in psychometrics (Nesselrode, Gerstorf, Hardy, & Ram, 2007; Nesselrode & Molenaar, 2010). This emerging literature could greatly inform future work on culture and cultural variation in psychological processes, insofar as the cultural task analysis suggests that defining features of independence or interdependence should vary from one person to the next, reflecting each person's idiosyncratic mode of cultural adaptation.

The cultural task analysis suggests that active engagement in selected cultural tasks makes psychological tendencies habitual and implicit; in turn, this may influence underlying brain mechanisms (Schwartz & Begley, 2003). It would be of great interest to determine whether the current findings could be extended to neural indicators of implicit tendencies in general (Kitayama & Park, 2010) and the brain pathways involved in implicit attitudes (e.g., Chee, Sriram, Soon, & Lee, 2000). Further effort along this line will provide an important basis for the emerging field of cultural neuroscience (Kitayama & Uskul, 2011).

Table 2.1 Illustration of the IAT in Study 1

Condition 1	Left Key	Right Key
Block 1 (practice)	Positive adjectives	Negaitve adjectives
Block 2 (practice)	Personal verbs	Relational verbs
Block 3 (practice)	Personal + Positive	Relational + Negative
Block 4 (critical)	Personal + Positive	Relational + Negative
Block 5 (practice)	Relational verbs	Personal verbs
Block 6 (practice)	Relational + Positive	Personal + Negative
Block 7 (critical)	Relational + Positive	Personal + Negative
Condition 2	Left Key	Right Key
Block 1 (practice)	Positive adjectives	Negaitve adjectives
Block 2 (practice)	Relational verbs	Personal verbs
Block 3 (practice)	Relational + Positive	Personal + Negative
Block 4 (critical)	Relational + Positive	Personal + Negative
Block 5 (practice)	Personal verbs	Relational verbs
Block 6 (practice)	Personal + Positive	Relational + Negative
Block 7 (critical)	Personal + Positive	Relational + Negative

Note. Each practice block consisted of 20 trials and each critical block consisted of 40 trials.

Table 2.2 Means and standard errors for the four implicit tasks in Study 1

Tasks	Implicit indicators	Americans		Japanese	
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Implicit association test	Personal + positive block RT	871.16	23.72	771.74	23.51
	Relational + positive block RT	995.96	29.40	816.77	29.13
Self-description task	Personal identities	0.74	0.03	0.60	0.03
	Social identities	0.25	0.03	0.40	0.03
Salience of disengaging (vs. engaging) emotions	Experience of disengaging emotions	2.45	0.08	2.12	0.07
	Experience of engaging emotions	2.12	0.06	2.09	0.05
Form of happiness as personal (vs. social)	Standardized coefficient (DEP - EP)	-0.33	0.05	-0.48	0.05

Note. DEP = Disengaging positive emotions; EP = Engaging positive emotions.

Table 2.3 Means and standard errors for the four explicit tasks in Study 1

Tasks	Explicit indicators	Americans		Japanese	
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Self-construal scale	Independence	3.78	0.09	3.18	0.08
	Interdependence	3.45	0.07	3.60	0.07
Semantic differential scale	Attitudes toward relationship	11.87	0.66	6.77	0.65

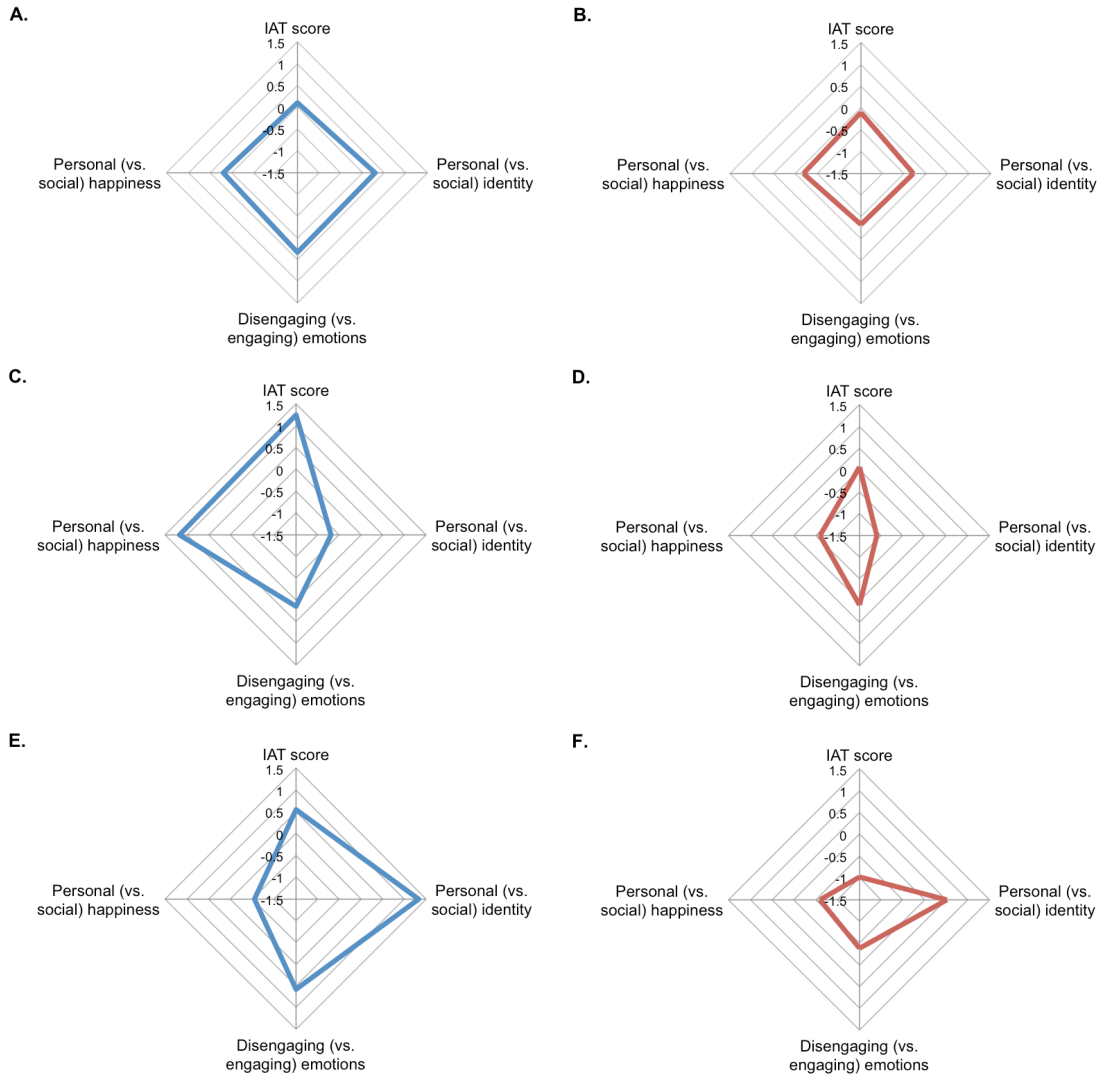
Table 2.4 Correlations among the four implicit measures (IAT score, personal vs. social self-descriptions, salience of disengaging vs. engaging emotions, and form of happiness as personal vs. social) of independence and interdependence for Americans (top) and for Japanese (down) in Study 1

Americans	1	2	3	4
1. IAT score		0.22	0.05	-0.01
2. Personal vs. social self-descriptions			-0.11	0.19
3. Salience of disengaging vs. engaging emotions				0.11
4. Form of happiness as personal vs. social				
Japanese	1	2	3	4
1. IAT score		-0.02	0.30 *	-0.10
2. Personal vs. social self-descriptions			0.16	0.17
3. Salience of disengaging vs. engaging emotions				0.05
4. Form of happiness as personal vs. social				

Note. 57 Americans except for the IAT score ($N = 54$), and 60 Japanese except for the IAT score ($N = 55$). On all measures, higher numbers represent a stronger orientation toward independence vs. interdependence. For example, the IAT score was computed by subtracting the RT for the personal + positive block from that for the relational + positive block. The higher number indicates a strong preference for the personal self over the relational self.

* $p < .05$.

Figure 2.1 Profiles of independence (vs. interdependence) for American group (A) and Japanese group (B) in Study 1. Figures C and E are individual profiles for two American participants and Figures D and F are individual profiles for two Japanese participants.



CHAPTER III¹

Culture and Emotion

Chapter III addresses two research questions to extend the current literature on culture and emotion. Study 2 examined whether the linkage between anger expression and social status is moderated by culture, depending on the extent to which a specific function of anger (anger as vented frustration or anger as dominance display) is emphasized in each culture. Study 3 examined the linkage between perceived social support and health, with an emphasis on several moderating factors, including culture, situational context, and personality, which are hypothesized to highlight or conceal emotional costs associated with receiving support. The predictions in both Study 2 and Study 3 were tested in a large-scale cross-cultural survey of American and Japanese adults.

Study 2: Two Faces of Anger:

Culture Moderates the Linkage Between Social Status and Anger Expression

People sometimes become angry when they are frustrated. By expressing anger, they vent their frustration (e.g., Berkowitz, 1989). Some other times, however, people become angry when their social status is threatened. By expressing anger, they display

¹ Study 2 is co-authored with Shinobu Kitayama. Study 3 is co-authored with Shinobu Kitayama, Mayumi Karasawa, Katherine Curhan, Hazel R. Markus, Norito Kawakami, Yuri Miyamoto, Gayle D. Love, Christopher L. Coe, and Carol Ryff and was published in the *Journal of Health Psychology* in 2012.

their dominance and power (Goffman, 1967). These two aspects of anger have so far been discussed in separate literatures. However, insofar as both of them are likely to be integral parts of this emotion, they may have to be taken into account together to fully understand how anger functions in different socio-cultural contexts.

In the present work, we will explore the possibility that the two aspects of anger expression are more or less salient depending on culture. Specifically, we suggest that the function of anger as vented frustration is relatively more salient in independent cultures, where pursuit of personal goals is primary and self-defining and, as a consequence, a blockage of these goals is likely to entail important negative emotional consequences including anger expression. In contrast, the function of anger as dominance display is likely to be relatively more salient in interdependent cultures, where a sense of belonging to an ingroup and the relative ranking in it are primary and self-defining and, as a consequence, maintenance of one's position within the ingroup hierarchy entails important emotional consequences. We used large-scale matched surveys that were recently conducted in the U.S. (an independent culture) and Japan (an interdependent culture) and tested the hypothesis that Americans tend to vent their frustration by expressing anger, while Japanese tend to display and protect their dominance and power by doing so.

Two Faces of Anger: Venting Frustration and Dominance Display

There is a broad consensus that one prominent function of anger expression is to vent frustration. Frustration is a commonly observed emotional response following a blockage of goal attainment (Harmon-Jones, Peterson, & Harmon-Jones, 2010; Mikula, Scherer, & Athenstaedt, 1998). According to the frustration-aggression hypothesis, the

frustration that is experienced will increase the readiness toward anger expression and aggression (Dollard, Miller, Doob, Mowrer, & Sears, 1939; Spector, 1975). Since the pioneering work of Dollard et al. (1939), the link between frustration and anger expression has been supported by numerous studies. Although some modifications have since been proposed (e.g., Berkowitz, 1989, 1993; Dill & Anderson, 1995), the basic thesis that frustration plays an integral role in eliciting anger remains widely accepted.

One unique piece of evidence for the frustration-aggression hypothesis comes from population differences in anger propensities. If anger were expressed to vent frustration, individuals in lower social status would display it more, insofar as they would find it harder to fulfill their goals and desires, thereby experiencing frustration more. In support of this analysis, previous studies showed that people with lower socioeconomic positions are more likely to show aggressive and delinquent behaviors (Brownfield, 1986; Elliot & Ageton, 1980), express hostility more often (Barefoot et al., 1991), and commit violent crimes such as homicide more compared to their higher-class counterparts (Blau & Blau, 1982; Crutchfield, 1989; Parker, 1989). Although violence differs from anger in many aspects and, in fact, some forms of violence do not necessarily implicate anger (Averill, 1982), this evidence is suggestive of the possibility that anger expression might be more prevalent among those with lower social status (Henry, 2009).

Another notable line of work on anger focuses on lay knowledge associated with this emotion. Researchers have pointed out that anger and dominance are closely linked in beliefs lay people have about this emotion (Averill, 1982; Goffman, 1967; Hess, Blairy, & Kleck, 2000). When semantic associations of anger are tested, it often comes out as a highly dominant emotion, which is pitted against submissive emotions such as

compassion, shyness, and sympathy (e.g., Conway, DiFazio, & Mayman, 1999; Tiedens, Ellsworth, & Mesquita, 2000). Similarly, appraisal theories of emotion posit that power potential is a crucial element of anger (e.g., Frijda, 1986; Scherer, 1999). Moreover, facial expressions of anger are perceived as signaling dominance (Hareli, Shomrat, & Hess, 2009; Hess et al., 2000; Knutson, 1996; Tiedens et al., 2000). As may also be expected, people sometimes use anger as an intimidation strategy (Clark, Pataki, & Carver, 1996; Jones & Pittman, 1982). This body of work suggests that anger sometimes functions as a marker of dominance, power, and high social ranking or status. Indeed, social perceivers judge another person's anger as more legitimate if this person is powerful and is high in status (LaFrance & Hecht, 1999; Maybury, 1997; Shields, 2000).

If anger were expressed to display dominance, power and high ranking, it might be anticipated that anger expression would increase as a function of social status. The aforementioned evidence linking anger expression to lower social status (which provided support for the frustration-aggression hypothesis) appears to contradict this prediction. However, the observations on the negative link between anger expression and social status come nearly entirely from Western societies and cultures. Thus, it remains possible that the linkage between social status and anger expression might be reversed in other cultures. Such a reversal might be anticipated if the dominance display function of anger were culturally elaborated more than its function of venting frustration.

Culture and Anger Expression

In the present paper, we argue that the relative prominence or salience of the two disparate functions of anger expression varies across cultures. We assume that both of these functions of anger expression are widely recognized and operative in all cultures.

At the same time, however, we also suggest that depending on the overarching model of the self as independent or interdependent that is sanctioned in a given cultural context, one or the other aspect of anger expression is more salient. If anger is expressed primarily to vent frustration, then anger will be expressed more by those with lower social status; but if anger is expressed primarily to express dominance and power, then it will be expressed more by those with higher social status.

It has been proposed that cultures vary in the nature of the self that is sanctioned (Kitayama & Uskul, 2011; Markus & Kitayama, 1991, 2010). In Western cultures, including U.S. society, independence of the self is highly sanctioned. Individuals in these cultures therefore show a strong commitment to their personal goals. Achieving one's personal goals is held to be highly self-defining and central to what is meant as a person in these cultures, insofar as it is the cornerstone of culturally scripted tasks of independence (Kitayama et al., 2009). For example, Uchida and Kitayama (2009) find that among European Americans, there is a close perceived link between personal achievement and general hedonic experiences such as joy, excitement, relaxation, and positive forward-looking attitudes. Relatively speaking, one's embeddedness in social groups and his or her standing in these groups are less important in defining the self. It would follow, then, that within the U.S. cultural context, anger expression is much more likely to function as a means for venting one's frustration rather than for displaying one's dominance, power, or social status.

In contrast, East Asian cultures place a greater premium on social relations and interdependence of the self with others. Individuals in these cultures therefore show a strong commitment to the belongingness to their groups. Being part of an important

group or relationship is highly self-defining and central to the very definition of personhood in these cultures, insofar as it is the key element of culturally scripted tasks of interdependence (Kitayama et al., 2009). In the aforementioned work, Uchida and Kitayama (2009) find that unlike Americans, Japanese perceive a close link between social harmony or social embeddedness and general hedonic experiences of joy, forward-looking attitudes, and the like. To the extent that hierarchy is an inherent part of any given group – especially in cultures, like Japan, that are considered to be high in the value placed on societal hierarchy (Hofstede, 1980), one’s place or relative status in the reference group is likely to be highly self-defining. Relatively speaking, personal achievement and, thus by extension, one’s personal goals are less important in defining the self. It would then follow that in Japanese cultural context, anger expression is much more likely to function as a means for displaying one’s dominance and social status rather than for venting his or her frustration.

Present Study

In the present work, we tested the degree to which the linkage between anger expression and social status might be moderated by culture. In independent cultural contexts such as the U.S., one’s personal goals and desires are seen as self-defining and, as a consequence, the aspect of anger as vented frustration is likely to be highly salient. We therefore anticipated that among Americans, there would be a negative relationship between social status and anger expression, such that anger would be expressed more frequently among those with low (vs. high) social status. In contrast, in interdependent cultural contexts such as Japan, one’s sense of belonging to a group or relationship in general and his or her standing within it in particular is much more self-defining and, as a

consequence, the aspect of anger as dominance display may play a much more prominent role. We thus hypothesized that among Japanese, there would be a positive relationship between social status and anger expression, such that anger would be expressed more frequently among those with high (vs. low) social status.

In testing our predictions, we followed previous work (e.g., Ritscher, Warner, Johnson, & Dohrenwend, 2001) and used both educational attainment and occupational prestige to yield an indicator of social status. Social class markers such as educational attainment and job prestige may be considered objective in the sense that they are consensual and socially verifiable. While these objective social status markers are quite significant in predicting a variety of outcome variables including health, mortality and wellbeing, recent work suggests that above and beyond one's objective social standing, a subjective assessment of the self's relative rank within his or her own community has additional effects (Adler, Epel, Castellazzo, & Ickovics, 2000; Cohen et al., 2008; Demakakos, Nazroo, Breeze, & Marmot, 2008). The subjective social status is typically assessed by asking participants to indicate their standing in their own community by checking a location on a vertical ladder that signifies varying ranks (Goodman et al., 2001).

If anger is expressed to vent frustration, it will be responsive primarily to one's feeling of frustration, which is likely to be linked more to one's subjective assessment of how well or poor-off he or she is in one's community. We therefore anticipated that the negative link between social status and anger expression, predicted for Americans, would be found primarily for the perceived standing measure of social status. If, however, anger is expressed to display status and dominance, it may rely primarily on consensually

agreed-upon markers of social status such as education and occupational prestige – markers of social status that are socially consensual and, thus, more objective rather than subjective. We therefore anticipated that the positive link between social status and anger expression, predicted for Japanese, would be found primarily for the composite social class indicator of educational attainment and occupational prestige.

Method

Participants

American data were obtained from the second wave of the MIDUS (Midlife in the U.S.) national study. The respondents were 1,255 adults (aged 34-84) who were randomly surveyed via phone, and then agreed to participate in an additional overnight hospital assessment session, during which they completed a written survey packet (with a 71% retention rate). As a companion survey in Japan, residents in the Tokyo metropolitan area were randomly contacted to complete the self-administered questionnaire packet, which was developed based on the MIDUS survey. The final sample in MIDJA (Midlife Health in Japan) consisted of 1,027 adults (aged 30-79), with a response rate of 56.2%. Respondents of two cultural groups were matched on age (Americans: $M = 54.52$, $SD = 11.72$ vs. Japanese: $M = 54.36$, $SD = 14.15$), gender (female: 57.8 vs. 50.8%), marital status (married: 64.6 vs. 69.1%), and mean educational level (two-year of college or vocational degree vs. one-year of college).

Measures

Objective social status. Socioeconomic status was measured by two indicators: education and occupation. Participants' level of educational attainment (1 = *8th grade, junior high school*, 7 = *attended or graduate from graduate school*), and current

occupational status (1 = *manual, blue-collar, or service*, 3 = *managerial or professional*) were standardized and averaged within culture to yield a single indicator of objective social status.

Subjective social status. Following prior research (e.g., Adler et al., 2000; Curhan et al., 2012), participants were presented with a picture of a ladder, which have 10 rungs (1 = *lowest*, 10 = *highest*; Goodman et al., 2001), and asked to choose the rung on the ladder on which they feel they stand to indicate their relative standing in their “own community.” What this community might be was left open so that each participant could choose the one that made best sense for him or herself.

Anger expression. Spielberger’s anger expression inventory (1986) was used to assess the frequency of anger is expressed, suppressed or controlled. This scale is composed of three subscales: Anger-out (8 items), Anger-in (8-items) and Anger-control (4 items). The anger-out subscale assesses how often (1 = *almost never*, 4 = *almost always*) people express angry feelings through verbally or physically aggressive behaviors when they feel furious and angry (e.g., I slam doors, I say nasty things). The anger-in subscale measures the extent to which anger is held in or suppressed (e.g., I withdraw from people, I keep things in). Finally, the third component, the anger-control subscale measures the extent to which people attempt to control the expression of anger (e.g., I control my temper, I keep my cool). Since our analysis focuses on overt expression of anger, the data from the anger-out subscale was used in our primary analysis ($\alpha = .77$ and $.80$ for Americans and Japanese, respectively). Descriptive statistics and intercorrelations for our key variables are summarized in Table 3.1.

Control variables. We controlled for several personality variables that could potentially confound the relationship between social status and anger expression. Specifically, previous work shows that anger expression is negatively related to agreeableness (Marshall, Wortman, Vickers, Kusulas, & Hervig, 1994; Martin & Watson, 1997) and conscientiousness (Öfke ve Öfke et al., 2012), while positively related to extraversion (King & Emmons, 1990; Öfke ve Öfke et al., 2012). Each personality trait was assessed by self-ratings of four pertinent personality adjectives: agreeableness (e.g., helpful, warm), conscientiousness (e.g., organized, responsible), and extraversion (e.g., outgoing, lively). Participants rated how much each of the adjectives describes them (1 = *not at all*, 4 = *a lot*) (Rossi, 2001; agreeableness, α s = .87 and .82 for Americans and Japanese, respectively, conscientiousness α s = .57 and .61, extraversion, α s = .83 and .78).

Results

Hierarchical regressions examined whether the relationship between social status and anger expression would be moderated by culture. In Step 1, we entered demographic variables (age and gender), as well as the control personality variables (agreeableness, conscientiousness, and extraversion). In Step 2, three variables germane to our hypothesis, that is, culture, objective social status, and subjective social status were entered. Finally, Step 3 involved two two-way interactions between culture and each of the two social status indicators. To address possible multicollinearity, centered scores were used to compute interaction terms (Cohen & Cohen, 1983; Cronbach, 1987).

Anger Expression and Social Status

Consistent with previous cross-cultural research (Matsumoto, Takeuchi, Andayani, Kouznetsova, & Krupp, 1998; Matsumoto, Yoo, Hirayama, & Petrova, 2005), Americans reported more expressed anger than did Japanese participants, $b = -.79$, $t(2189) = -5.79$, $p < .001$. There was no gender effect, $b = .18$, $t < 1.26$, *ns*. Consistent with prior work (Schieman, 1999; Spielberger, Gerard, & Rosario, 1983), anger expression became less frequent as a function of age, $b = -.06$, $t = -10.28$, $p < .001$. In addition, consistent with prior work, anger expression was negatively related to agreeableness and conscientiousness, $b = -.52$, $t = -3.22$, $p = .001$, and $b = -.90$, $t = -5.82$, $p < .001$, respectively, while related positively to extraversion, $b = .77$, $t = 5.38$, $p < .001$.

Our primary prediction was that anger expression should either increase or decrease as a function of social status depending on culture. A negative link between the two variables was predicted for Americans. Moreover, this relationship was expected to be evident for subjective social status. As predicted, there was a significant negative relation between the anger expression and subjective social status among Americans, after controlling for all relevant variables, $b = -.32$, $t(2189)^1 = -8.68$, $p < .001$. As shown in Fig. 3.1-A, this relationship was negligible among Japanese, $b < .01$, $t < 1$, *ns*. The interaction between subjective social status and culture, implied by this pattern, approached statistical significance, $b = .13$, $t(2189) = 1.81$, $p = .07$.

Next, a positive link between social status and anger expression was predicted for Japanese. Moreover, this relationship was expected primarily for objective social status indexed by a composite of educational attainment and occupational prestige. As

¹ Note that the degree of freedom is different between the regression analysis and the mediational analysis. Simple slopes for each cultural group were tested in the regression equation which included two two-way interaction terms between culture and each of who indices of social status. Mediational analysis, however, was based on culture-wise regression analysis.

predicted, the Culture x Objective social status interaction proved significant, $b = .32$, $t(2189) = 2.37$, $p < .05$. The relevant patterns are illustrated in Fig. 3.1-B. As predicted, among Japanese, anger expression increased as a function of objective social status, $b = .37$, $t(2189) = 4.53$, $p < .001$. This effect, however, was completely absent among Americans, $b = .03$, $t < 1$, *ns*.

Is the American Effect Mediated by Frustration?

Our analysis indicates that Americans show a significantly positive relationship between subjective social status and anger expression, which may be due to the venting of frustration through anger expression. That is, lower subjective status would be associated with greater frustration, which in turn would result in more expressed anger. Although any causal explanation is difficult to confirm with correlational data alone, it is at least possible to test whether the other aspects of the data are consistent with this interpretation. We thus tested whether the link from subjective social status to anger expression was mediated by frustration. We used the rating of frustration participants reported to have felt during the past 30 days (1 = *none of the time*, 4 = *all the time*).

We first confirmed that subjective social status was negatively related to both the mediator (i.e., frustration), $b = -.03$, $t(1210) = -2.04$, $p < .05$, and the outcome variable (i.e., anger expression), $b = -.10$, $t(1210) = -1.76$, $p < .08$. Next, we tested whether the effect of subjective social status on anger expression would be attenuated when frustration was included in the model as a joint predictor. The path from subjective social status to anger expression was no longer significant, $b = -.09$, $t(1209) = -1.60$, *ns*, although the effect of frustration on anger expression remained significant, $b = .25$, $t(1209) = 2.77$, $p < .01$. A bootstrapping test confirmed that the mediated path from

subjective social status through frustration to anger expression was statistically significant (95% bias-corrected bootstrapping confidence interval = [-.03, -.01]; see Panel A of Fig. 3.2).

Is the Japanese Effect Mediated by Decision Authority?

Our analysis also indicated a significantly negative relationship between objective social status and anger expression in Japanese participants, because they may manifest dominance and power by expressing anger. That is, high objective social status would foster the expression of anger to display power and protect status. This possible link from objective social status to anger expression was tested in a mediational model. Self-reported rating of authority in decision-making was used to index power and dominance. Participants rated how often (1 = *none of the time*, 4 = *all the time*) they feel that they have decision authority in their work by completing an 8-item scale (Bosma & Marmot, 1997; e.g., have a say in decisions about my work; α s = .87 and .88 for Americans and Japanese, respectively)².

We first observed, as expected, that objective social status was positively related to both decision authority, $b = 1.49$, $t(697) = 5.85$, $p < .001$, and anger expression, $b = .34$, $t(697) = 1.97$, $p < .05$. Next, we found that when both objective social status and decision authority were entered into a regression as predictors, the relationship between objective social status and anger expression became non-significant, $b = .22$, $t(696) = 1.23$, *ns*. In this analysis, the effect of decision authority on anger expression remained significant, $b = .08$, $t(696) = 3.29$, $p < .01$. Confirming this pattern of mediation, the bootstrapping test showed that the mediated path from objective social status through

² 273 Japanese participants who were not employed at the time of data collection were not included in the mediation analysis.

decision authority to anger expression was statistically significant (95% bias-corrected bootstrapping CI = [.04, .24]; see Panel B of Fig. 3.2).

Discussion

Anger as Vented Frustration versus Dominance Display

Concurring with a number of prominent scholars of emotion, Scherer (2001) advocated that there are two distinct faces in anger. Whereas anger sometimes expresses a person's frustration, it may also display his or her social status, power, and dominance. The most important contribution of the present work was to show that both aspects of anger are likely to be real; yet, their salience or significance varies as a function of culture.

In independent cultures such as U.S. society, personal goals and desires are self-defining and, thus, anger resulting from a blockage of these goals and desires becomes more focal. In accordance with this analysis, American adults reported that they expressed anger more if they perceived themselves to be lower ranking within their communities. Furthermore, the effect of subjective social status on anger expression was significantly mediated by the self-report rating of frustration experienced during the past 30 days.

In contrast, in interdependent cultures, such as Japan, personal goals and desires may be tempered by other factors. Instead, it is one's sense of one's belong to a significant relationship and his or her place and status in the relationship that are more self-defining. Thus, anger resulting from display of dominance, power, and status becomes more focal, both collectively elaborated and cognitively salient. In line with this analysis, Japanese adults in our study reported that they expressed anger more if they

were of higher objective social status. Furthermore, consistent with the analysis that higher-status Japanese express anger to display and protect their own status, we found that the perception of decision authority in their roles significantly mediated the link between objective social status and anger expression.

It is unlikely that when their status is threatened, Japanese are simply frustrated, causing them to become angry. First, in interdependent cultural contexts, high social status is unlikely to be a personal goal. Rather, it is a socially ascribed aspect of the self, signifying social recognition and public appraisal rather than personal accomplishment or achievement. Second, consistent with this theoretical argument, Japanese with lower objective status were no higher in the frustration rating as compared to their higher status counterparts.

Social Status: Objective and Subjective

We also highlighted the possibility that how social status operates may vary across cultures. We found that lower-status Americans express anger more because of their relatively low status, *as they themselves perceive it*. It appears that American culture highlights personal and individual aspects of both anger (i.e., vented frustration) and social status (i.e., one's perceived ranking in their own community). In contrast, we found that higher-status Japanese express anger more *because of their consensually acknowledged status*. As much as Americans emphasize more personal aspects of the self, emotion, and social status, Japanese appear to take social or consensual aspects of both anger (i.e., display of dominance and power) and social status (i.e., consensually agreed-upon social class markers) more seriously.

Consistent with this analysis, Curhan and colleagues (2012) have recently observed that wellbeing and perceived health are predicted more strongly by subjective social status for Americans, whereas they are predicted more strongly by objective social status for Japanese. Moreover, previous evidence indicates that direct appraisal of the self (i.e., how *I* think or feel) is more important for Americans, but reflected appraisal of the self (i.e., how *others* might think or feel) is more important for Asians, with a consequence on a variety of social psychological processes (e.g., Cohen, Hoshino-Browne, & Leung, 2007; Kitayama et al., 2004; Na & Kitayama, 2012). More recent work has validated this conclusion with neural evidence (e.g., Ma et al., 2012; Park & Kitayama, 2012). For example, Park and Kitayama (2012) have shown that unlike Americans of European descent, Asians exhibit an especially intensified neural response to an error when the error is perceived as public – that is, when it is committed while the participants are incidentally exposed to a watching face.

Future research should investigate more specific mechanisms – not only psychological and neural, but also sociological and demographic –, which substantiate the cultural differences in the relative emphasis on subjective vs. objective social status. One possibility is that independent societies tend to encourage residential mobility (Oishi, 2010), which in turn form a variety of internally homogeneous ethnic and social class enclaves (Murray, 2012; Putnam, 2000). Given the demographic changes that occurred in U.S. society over the last several decades, many people may assess their social status primarily by social reference within their own internally homogeneous community. Although macroscopic markers of social class, such as educational attainment and occupational prestige, are recognized to be important, once these markers are used to sort

people into different internally homogenous enclaves, they may lose their power to as potently influence psychological processes. It is well documented, however, that residential mobility is far more restricted in Japan than in the U.S. Thus, for Japanese, objective social status markers retain their influence on the subjective experience as well.

Emotion Regulation and Culture: Anger Privilege Across Cultures

Our current findings are consistent with an emerging literature on culture and emotion regulation. Recently, several studies have shown that as compared to Americans of European family backgrounds, Asians place a greater value on suppression and control of emotions (Mauss & Butler, 2010). In fact, Asians reportedly suppress their emotions more frequently (Matsumoto, Yoo, Nakagawa, & Rules, 2008). Moreover, Asians appear to down-regulate their negative emotions more effectively when asked to do so. This is the case in both self-report (Mauss & Butler, 2010) and a neural indicator of emotional processing (Murata, Moser, & Kitayama, in press).

Because emotional experience is a prima-facie element of subjective experience, this set of findings would imply that Americans would be very likely to express what they have in mind. This is exactly what we observed with respect to anger expression. Americans expressed anger more, especially when they are frustrated. Japanese, however, were rather different in this regard. In line with the evidence that Japanese tend to down-regulate their emotions quite well, they reportedly expressed anger much less than Americans did. It was only when their objective social status was sufficiently high that they expressed anger as much as the typical Americans did (Fig. 3.1-B). We may interpret this pattern to suggest that Japanese, especially those with lower objective social status tend to suppress anger. Only when their social status is high enough to permit them

to express their anger, might they release this regulatory effort. In other words, within the Japanese cultural context, high objective social status might function as a cultural permit or authorization to experience and express anger.

Although social norms about emotion expression do exist even in highly individualistic societies like the U.S. (e.g., Ekman, 1972; Ekman & Friesen, 1969), the nature of the rule itself might vary across cultures. One sensible working hypothesis would be that display rules tend to be prohibitive and very specific and circumscribed in the U.S. – arguably the most individualistic culture today. In this culture, emotional expression is normative unless otherwise specified. But, in many other cultures especially in East Asian cultures and even in some of seemingly individualistic European cultures as well, emotional inhibition might turn out to be normative in principle. Given this as a backdrop, display rules might prove to take forms of privilege rather than prohibition. Future work should explore this possibility.

Limitations and Future Directions

One limitation of the current study is that the data were entirely correlational. We believe that this consideration should be weighed against the obvious value of being able to test predictions with empirical data from large-scale random samples of research participants. Moreover, while the conclusion that high social status causally increases anger expression for Japanese may be held with reasonably high confidence, greater caution may be warranted for the conclusion about American participants. On the basis of a reliable negative association between subjective social status and anger expression, we suggested that a reduced sense of social ranking in an in-group society might cause a person to feel frustrated, which in turn results in greater anger expression. This

interpretation must be further tested in future research that manipulates subjective social status in the two cultural settings. Additionally, we should also acknowledge that the current findings were based on self-reported measures of anger expression. Future work would benefit from overt behavioral measures of anger display and expression.

These weaknesses notwithstanding, the current work is the first to integrate the two disparate aspects of anger within a single theoretical framework. This framework was instrumental in deriving our predictions on anger expression among Americans and Japanese who varied in subjective versus objective social status. Our conclusion that culture crucially moderates the linkage between social status and anger expression is important precisely because it highlights a rather surprising degree to which culture may be ingrained into the very core of the biological processes involved in the regulation and control of emotion (Mauss & Butler, 2010; Murata et al., in press). To further our understanding of the mutual influences between the biological and the social and thus to overcome the vicious dichotomy between nature and nurture, the field would benefit from a renewed focus on biological and neural processes as they are shaped and modified by specific aspects of social and cultural processes (Kitayama & Uskul, 2011). This focus has received an increasing emphasis in a recently emerging field of cultural neuroscience (Chiao & Ambady, 2007; Han & Northoff, 2008; Kitayama & Park, 2010). Admittedly, our present work did not address either neural processes or biological markers of anger. However, at a broad conceptual level, our current effort should be regarded as an important initial step in this direction.

**Study 3: Clarifying the Links Between Social Support and Health:
Culture, Stress, and Neuroticism Matter**

The last two decades of research in social and health psychology have established that availability of cohesive social support networks is integral to promoting both physical (Cohen & Wills, 1985; Kiecolt-Glaser & Glaser, 1989; O'Donovan & Hughes, 2008; see Uchino et al., 1996 for a review) and mental health benefits (Brewin, Andrews, & Valentine, 2000; Kafetsios & Sideridis, 2006; see Lakey & Cronin, 2008 for a review; Lakey & Orehek, 2011). Conversely, the absence of such social resources, as typically captured by loneliness (Peplau & Perlman, 1982), presents a substantial health risk (e.g., Cacioppo, Hawkley, & Thisted, 2010; Shiovitz-Ezra & Ayalon, 2010). Given the fundamental significance of social integration in health and wellbeing, it is rather surprising that some recent empirical papers have suggested that perceived support sometimes offers little benefit to health and adjustment. In this literature, by “perceived support” researchers typically mean the perception that one has received various kinds of emotional support such as compassion and encouragement from close others (see Bolger & Amarel, 2007 for a review). Summarizing this literature, Bolger and Amarel (2007) note, “most studies have found null or adverse relations between the receipt of support and adjustment (p. 458).”

Several reasons have been put forth to account for the inconsistent relationships between perceived support and health, such as that perceived support may highlight one's incompetence or lack of efficacy (Bolger & Amarel, 2007), or that support could evoke feelings of indebtedness in the recipient, which in turn may undermine self-esteem or self-efficacy (Gleason, Iida, Bolger, & Shrout, 2003; Newsom, 1999). Social support can also draw one's attention to possible impositions and burdens on the provider of the support (Kim, Sherman, & Taylor, 2008). Still another possibility is that the support

received might not match the needs or expectations of the support recipient (Siewert, Antoniow, Kubiak, & Weber, 2011). Furthermore, reverse causation might be operative: people with poor health might require more support from others (Seidman, Shrout, & Bolger, 2006)

Drawing on these considerations, the present work more systematically examined several factors that can jointly moderate the linkage between perceived support and health status of the support recipient. The overarching framework was guided by a focus on factors that serve to highlight or conceal the emotional costs of receiving social support. We considered three such factors.

First, we anticipated that the emotional costs of perceived support would depend on a person's cultural background. Considerable evidence indicates that cultures vary in the degree to which independence or interdependence is normatively sanctioned and used to organize daily practices and meanings (Kitayama & Uskul, 2011; Markus & Kitayama, 1991, 2010). In Western cultures, including the U.S. society, independence of the self from others is highly sanctioned. In this cultural context, support may be perceived as particularly troubling because it compromises one's sense of independence from others (Uchida, Kitayama, Mesquita, Reyes, & Morling, 2008). In contrast, in East Asian cultures, especially in Japan, Korea, and China, interdependence of the self with others is strongly sanctioned. In this cultural context, support is likely to highlight the culturally endorsed and validated state of interdependence and, as a consequence, may be expected to entail less emotional cost. For example, if friends or family members are willing to provide the support one needs, the person may feel assured that he or she is succeeding in

the task of interdependence. Thus, the support-health linkage would be stronger and more positive for Asian than for American adults.

Our second factor relates to perceived stress on the part of support recipients. Our analysis starts with an observation that, while perceived support is generally more norm-congruous in Asian cultures, it can sometimes be troubling even for Asians. Kim and colleagues (2008) have argued that, especially in Asian, interdependent cultural contexts, recipients of social support sometimes worry that they may be causing troubles for the support-providers. Accordingly, the linkage between perceived support and health might only become positive if Asians are protected from this particular type of worry associated with receiving support. We anticipated that Asians would feel less worry if the support they received was necessary and, thus, its receipt was seen as justified. Miller and Bersoff (1992) found that especially in Asian contexts, interpersonal support is viewed as a moral obligation when there is a need for it. Such a need is obviously present when individuals are facing life difficulties and thus are stressed. It was thus predicted that the positive association between perceived support and health would be most strongly evident among Asians who reported high levels of stress, thereby justifying the support they were receiving.

While Americans may also be concerned when they receive support, the nature of the concern they experience may be very different from the concern Asians experience. Because Americans tend to be more independent rather than interdependent, what they worry about may have less to do with the potential impositions they place on the support providers; instead, they may worry more about the likelihood that the need for support is an indication of their own perceived incompetence or inefficacy (Bolger & Amarel,

2007). Note that while one's own stressful state can be an effective excuse for imposing an inadvertent burden on the support provider and, thus, it can effectively mitigate the interpersonal cost of receipt of support, it is unlikely to mitigate a threat the receipt of support might impose on one's self-efficacy. In other words, the receipt of support, even when confronted with high levels of stressful life events, may still signal a loss of independence and competence. Accordingly, we predicted that the linkage between perceived support and health would be less strongly evident among Americans regardless of their levels of perceived stress.

Third, beyond the influence of cultural norms and life stress, whether social support is beneficial for health may vary depending on individual-level factors. Here, we focused on one particular facet of personality, neuroticism. Evidence is quite strong that neurotic people are attuned to negative emotional information (e.g., Eysenck, 1967; Gray, 1982) because they carry negative interpretive cognitive schemas (e.g., Loo, 1984; Roberts & Kendler, 1999). It would follow, then, that neuroticism would sensitize people to potential costs associated with receipt of social support. We may thus predict that neuroticism will diminish any sustained benefits of support, thereby dampening the strength of the potentially positive relationship between perceived support and health (Karney & Bradbury, 1995). The converse of this logic is that the relationship between perceived support and health would be more positive for those who are relatively low in neuroticism.

For the present analyses, we used a large comparative survey of Japanese and American adults to test the above hypotheses. Our focus was on the statistical association between perceived support and the health status of the recipient of the support. We

expected that the link between perceived support and health would be most evident among Japanese adults (from a support-approving cultural context) who reported high life stress (in a support requiring and seeking situation). Moreover, the perceived support-health link would be more positive for those low (vs. high) in neuroticism (with a support-accepting personality).

Methods

Participants

Demographic, social, psychological and health data were compared from two linked surveys. From the second wave of the Midlife in the U.S. national study (MIDUS), we surveyed 1,054 adults (aged 34-84) who initially had been randomly sampled via phone as part of the full MIDUS sample, and then later volunteered for an additional overnight hospital analysis during which they completed another written questionnaire (representing a 71% retention rate from the first wave). For the parallel study in Japan, randomly selected respondents in the Tokyo metropolitan area within specific age, gender, and city ward categories completed a self-administered questionnaire based on MIDUS that had been translated and back-translated by native speakers. The response rate was 56.2%, yielding a sample of 1,027 adults (aged 30-79). The means and standard deviations (in parentheses) for 3 of our demographic variables were (listing Japanese results first): 1) Age – 54 (14), 55 (12) years; 2) Gender – female 51% (.5), 55% (.5); 3) Marital status – married 69% (.45), 72% (.45). The mean level of educational attainment was at least one-year of college (no degree) in Japan, and a two-year college or vocational degree in the U.S.

Measures

To assess perceived receipt of social support (e.g., caring, appreciation), participants reported the extent to which they received emotional support from their spouse or partner (6 items), other family members (4 items), and friends (4 items) ($\alpha = .86$ and $.88$, for Japanese and Americans, respectively; Schuster, Kessler, & Aseltine, 1990; Walen & Lachman, 2000). For example, participants were asked to indicate how much their friends (family or spouse) really care about them or understand the way they feel about things. Perceived stress was assessed by the 10-item Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983; $\alpha = .76$ and $.86$). Participants rated the degree to which they experienced various forms of stress during the last month. Physical health was assessed by scoring the number of chronic health problems respondents experienced in the past 12 months (maximum of 30, e.g., diabetes). We also assessed perceived health by averaging 3 mutually correlated self-ratings of current health, future health, and control over health ($\alpha = .79$ and $.69$). Neuroticism was assessed by self-ratings of four pertinent personality traits: moody, worrying, nervous, and calm (reverse-coded). Participants rated how much each of the adjectives describes them (1 = *not at all*, 4 = *a lot*) (Rossi, 2001; e.g., moody and nervous; $\alpha = .51$ and $.76$). Although the reliability for Japanese is rather low ($\alpha = .51$), it is likely due to the small number of items used to assess this construct (Schmitt, 1996). Descriptive statistics and intercorrelations for our key variables are summarized in Table 3.2.

In addition, several variables that could potentially confound the support-health linkage were controlled. Subjective social class was controlled because middle (vs. working) class people are more likely to receive support and, simultaneously, they are also likely to be healthier for economic and instrumental reasons that have less to do with

support. Subjective social class standing was measured by asking participants to rank their relative standing in the community by placing themselves on a ladder with respect to where they feel they stand (1 = lowest, 10 = highest; Goodman et al., 2001), as well as to rate the extent to which they feel they have enough money to meet their needs (1 = *not enough*, 3 = *more than enough*). The ratings from these two measures were standardized and averaged within each culture. We also controlled for self-sufficiency (Lachman & Weaver, 1997; α s = .44 and .67), optimism (Scheier & Carver, 1985; α s = .58 and .67), and self-esteem (Rosenberg, 1965; α s = .66 and .78), because these variables are likely to be positively associated with both perceived support and health. To further sharpen our analysis on neuroticism, we controlled for the remaining four of the Big Five personality traits (Rossi, 2001; extraversion, α s = .83 and .78, conscientiousness, α s = .57 and .61, agreeableness, α s = .87 and .82, openness to experience, α s = .84 and .77).

Results

Focusing on three potential moderators of the link between perceived support and health, we formulated four specific predictions. First, we predicted that the association between perceived support and health would be greater for Japanese than for Americans. Second, however, the benefits Japanese would obtain from perceived support were expected to be greater when they were under stress (i.e., when the receipt of support was justified). The support-health association was thus predicted to be especially strong for Japanese under stress. Third, we predicted that there would be no such effect of stress for Americans. In combination, the first three predictions imply an interaction among culture, support, and stress. Fourth, we also anticipated that the positive support-health association predicted for Japanese would be especially pronounced for those who were

low in neuroticism. This prediction implies an interaction among culture, support, and neuroticism.

A step-wise regression was performed on the reported number of chronic health problems. In Step 1, we entered demographic variables (age, gender, subjective social class), as well as the control personality variables (extraversion, conscientiousness, openness to experience, agreeableness, self-sufficiency, optimism, and self-esteem). In Step 2, four variables germane to our hypotheses and questions, i.e., social support, neuroticism, culture, and perceived stress, were entered. Steps 3 and 4 involved all 2-way interactions and all 3-way interactions among these variables, respectively. In Step 5, we entered the 4-way interaction among them. To address potential statistical issues of multicollinearity, centered scores were used to compute interaction terms (Cohen & Cohen, 1983; Cronbach, 1987). Table 3.3 summarizes findings from the regression.

As predicted, the Support x Stress x Culture interaction proved to be significant, $b = .10$, $t(1989) = 2.84$, $p < .005$. As illustrated in Figure 3.3, the link between perceived support and the number of chronic health problems was significantly negative only for Japanese who reported being under a lot of stress, $b = -.45$, $t(969) = -2.58$, $p < .01$. This association was less evident for Japanese who were not as stressed, $b = .25$, $t(969) = 1.30$, *ns*. The Support x Stress interaction was significant for Japanese, $b = -.06$, $t(969) = -2.89$, $p < .005$. Among Americans, however, the link between perceived support and health was negligible regardless of stress, $ts(1018) < 1$. The Support x Stress interaction was statistically trivial for Americans, $t < 1$.

Second, the predicted interaction among culture, support, and neuroticism did not reach statistical significance, $b = .35$, $t(1989) = 1.23$, $p > .21$. However, the 4-way

interaction involving support, stress, culture, and neuroticism approached statistical significance, $b = -.09$, $t(1989) = -1.83$, $p < .07$. As can be seen in Table 3.4, this 4-way interaction resulted from the fact that the Support x Stress x Culture interaction shown in Figure 3.3 was significant only for low-neuroticism individuals, $b = .14$, $t(1135) = 3.18$, $p < .005$. The support-health link was not significant for either their high-neuroticism counterparts or Americans. The American result did not depend on stress levels or degrees of neuroticism.

We also analyzed the self-assessed health index and found a pattern that corresponded closely to the results for the number of chronic health problems (see Table 3.2). The 4-way interaction was significant, $b = .03$, $t(2002) = 1.94$, $p = .05$. As shown in Table 3, the link between perceived support and self-assessed health was generally negligible, except for the low-neuroticism Japanese who reported relatively high levels of stress, $b = .28$, $t(522) = 2.94$, $p < .005$. This pattern of results replicated the pattern determined for the measure of chronic health conditions.

Discussion

The novel finding here is that perceived support emerged as most beneficial in the context of both support-approving cultural norms (interdependence) and support-requiring situational factors (stressful events). Moreover, this effect appeared to be especially strong for those who have support-accepting personal styles (free from negativism of neuroticism).

Future work should explore the generality of this 4-way interaction we identified. For example, it would be important to replicate the current findings in other independent and interdependent cultures (e.g., Western Europeans vs. Koreans). Above and beyond

this, it will also be informative to examine whether the association between perceived support and health might be modulated by individual differences in independence or interdependence within each culture. Will even Americans show health benefits of perceived support if they are highly interdependent or, conversely, will even Asians show little or no effect of perceived support if they are highly independent?

One limitation of the current study is that it was correlational, which made it impossible to establish causality. However, we controlled for a number of the confounding variables that could produce spurious correlations between perceived support and health. Moreover, our finding is less likely to reflect reverse causality, since healthy people are unlikely to solicit more support from their close companions and care providers than do unhealthy people. We may thus rule out an *a priori* causal link from health status to support as the reason for *positive* associations between support and health. Conversely, one could plausibly argue that support in fact has a causal impact on health, at least for low-neuroticism Japanese who feel they are living with sustained stress.

Nevertheless, in order to establish causality, the present work may be usefully supplemented by studies with experimental manipulations of both support and cultural values. For example, future research should examine whether recall of past experiences of having received support might differentially increase subjective wellbeing of individuals as a function of priming of independence or interdependence. We expect that the recall of previous support experience would increase subjective wellbeing more if interdependence were primed than if independence was primed.

The pattern we found for low-neuroticism Japanese is reminiscent of the classic buffering hypothesis for social support, which holds that social support mitigates negative

health consequences of stress (Cohen, 1992; Lakey & Orehek, 2011). The fact that a clearer pattern emerged for the Japanese, as anticipated by our initial hypotheses (illustrated in Figure 3.3) – at least among those with low propensities toward neuroticism – but *not* for Americans, might suggest that the buffering hypothesis is even more valid in interdependent, rather than independent, cultural contexts.

We should hasten to add that the buffering effect of social support on health surely does occur under certain circumstances for Americans. Evidence suggests that the primary emotional cost of perceived support for Americans is a threat to the positive evaluation of the self as independent and self-efficacious (Bolger & Amarel, 2007). Hence, the buffering effect might be more evident with implicit, rather than explicit support. Likewise, it might also occur if the support highlights one's accomplishment (e.g., reminding both self and others of various stresses associated with a high-profiling job), rather than pointing to her weaknesses. Cross-cultural research along this line will help us develop more efficacious, sensitive, and value-specific interventions to improve the health status of individuals living in varying life circumstances in different cultures and countries.

We started this paper by referring to the body of literature that demonstrates substantial health benefits of social integration (Seidman et al., 2006). To conclude this paper, then, we wish to anchor the current finding to this broader literature. The general conclusion that the link between perceived support (the perception that one has received support) and health is elusive (Bolger & Amarel, 2007) would seem rather surprising and even paradoxical because perceived social support is such a face-valid, prima-facie indicator of social integration. The current work suggests, however, that perceived social

support is a double-edged sword. It offers a much-needed assurance of social integration, while at the same time it entails a variety of emotional costs. Like an insurance policy, then, social support may be most beneficial, enabling one to achieve the peace of mind while living an active life, thereby promoting health and wellbeing, when one has it available at hand without drawing on it.

Table 3.1 Descriptive statistics and intercorrelations for key variables in Study 2

Americans				1	2	3	4	5
	<i>N</i>	<i>M</i>	<i>SD</i>					
1. Objective social status	1254	-0.04	0.92	-	.18 ***	-.01	-.16 ***	.29 ***
2. Subjective social status	1232	6.56	1.81		-	-.11 ***	-.16 ***	.26 ***
3. Anger expression	1251	12.91	3.30			-	.15 ***	-.08 **
4. Frustration	1249	2.35	1.06				-	-.14 ***
5. Decision authority	885	22.27	5.09					-
Japanese				1	2	3	4	5
	<i>N</i>	<i>M</i>	<i>SD</i>					
1. Objective social status	1021	-0.05	0.87	-	.23 ***	.15 ***	.04	.32 ***
2. Subjective social status	989	6.03	2.11		-	-.02	-.13 ***	.31 ***
3. Anger expression	1019	12.17	3.43			-	.26 ***	.13 ***
4. Frustration	1018	1.87	0.86				-	-.02
5. Decision authority	731	19.83	5.42					-

Note. ** $p < .01$, *** $p < .001$.

Table 3.2 Descriptive statistics and intercorrelations for key variables in Study 3

Japanese				1	2	3	4	5
	<i>n</i>	<i>M</i>	<i>SD</i>					
1. Perceived support	1025	2.62	0.50	-	-0.15 ***	-0.12 ***	-0.08 **	0.24 ***
2. Perceived stress	936	4.37	0.78		-	0.21 ***	0.22 ***	-0.15 ***
3. Neuroticism	1023	2.11	0.56			-	0.18 ***	-0.23 ***
4. Chronic health condition	1012	2.30	1.99				-	-0.29 ***
5. Self-assessed health	1027	5.78	1.66					-
Americans				1	2	3	4	5
	<i>n</i>	<i>M</i>	<i>SD</i>					
1. Perceived support	1052	3.48	0.46	-	-0.21 ***	-0.24 ***	-0.10 ***	0.22 ***
2. Perceived stress	1054	4.92	1.10		-	0.12 ***	0.15 ***	-0.09 ***
3. Neuroticism	1050	2.03	0.63			-	0.22 ***	-0.25 ***
4. Chronic health condition	1054	2.30	2.34				-	-0.44 ***
5. Self-assessed health	1054	7.49	1.40					-

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3.3 Unstandardized regression coefficients in predicting number of chronic health problems and self-assessment measure of health as a function of culture, perceived support, perceived stress, and neuroticism in Study 3

Predictors	Number of Chronic Health Problems			Self-Assessment Measure of Health		
	Beta	t-test	R ² increase	Beta	t-test	R ² increase
Gender	0.250	5.271 ***		0.032	2.074 *	
Age	0.034	9.054 ***		-0.005	-4.158 ***	
Subjective social class	-0.200	-3.058 ***		0.072	3.386 ***	
Extraversion	-0.043	-0.409		0.072	2.104 *	
Openness to experience	0.318	2.990 ***	0.569 ****	0.015	0.419	0.340 ***
Conscientiousness	-0.097	-0.888		0.136	3.845 ***	
Agreeableness	0.228	2.048 *		-0.027	-0.739	
Optimism	-0.054	-2.229 *		0.019	2.468 *	
Self-sufficiency	-0.035	-0.583		0.022	1.119	
Self-esteem	-0.017	-1.776 †		0.011	3.582 ***	
Culture	0.211	1.341		0.401	7.854 ***	
Perceived support	0.008	0.052	0.016 ***	0.136	2.684 **	0.043 ***
Perceived stress	0.061	4.414 ***		-0.026	-5.920 ***	
Neuroticism	0.372	2.511 *		-0.095	-1.986 *	
Culture x Perceived support	-0.017	-0.078		-0.125	-1.763 †	
Culture x Perceived stress	-0.034	-1.883 †		0.009	1.498	
Culture x Neuroticism	0.114	0.594	0.001	0.065	1.049	0.004 †
Perceived support x Perceived stress	-0.065	-2.792 ***		0.012	1.637	
Perceived support x Neuroticism	0.349	1.258		-0.093	-1.034	
Perceived stress x Neuroticism	0.029	1.570		-0.007	-1.136	
Culture x Perceived support x Perceived stress	0.096	2.841 ***		-0.014	-1.295	
Culture x Perceived support x Neuroticism	-0.639	-1.760 †	0.002 *	0.138	1.168	0.001
Culture x Perceived stress x Neuroticism	-0.041	-1.679 †		0.013	1.600	
Perceived support x Perceived stress x Neuroticism	0.014	0.392		-0.012	-1.052	
Culture x Perceived support x Perceived stress x Neuroticism	-0.085	-1.825 †	0.001 †	0.029	1.937 *	0.001 *

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3.4 Unstandardized regression coefficients used to predict health status as a function of perceived support as a function of neuroticism, culture and perceived stress in Study 3

		Japanese		Americans	
		High Stress	Low Stress	High Stress	Low Stress
Number of chronic health problems	High neuroticism	-0.24	0.31	0.02	0.13
	Low neuroticism	-0.66 ***	0.25	0.12	-0.66 †
Self-assessed health	High neuroticism	0.14	0.10	0.05	-0.01
	Low neuroticism	0.28 ***	0.08	-0.01	0.07

Note. † $p < .10$, *** $p < .001$.

Figure 3.1 The effects of subjective social status (A) and objective social status (B) on anger expression for Americans (blue line) and Japanese (red line) in Study 2. Americans with lower subjective social status expressed anger more frequently than those with higher subjective social status, while Japanese with higher objective social status expressed anger more frequently than those with lower objective social status. Statistical significance is indicated by asterisks (***) ($p < .001$).

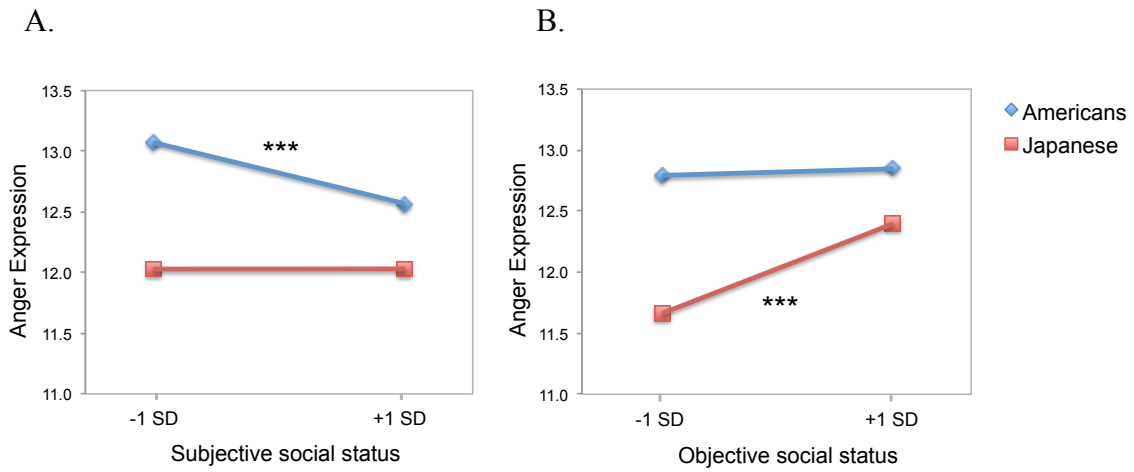
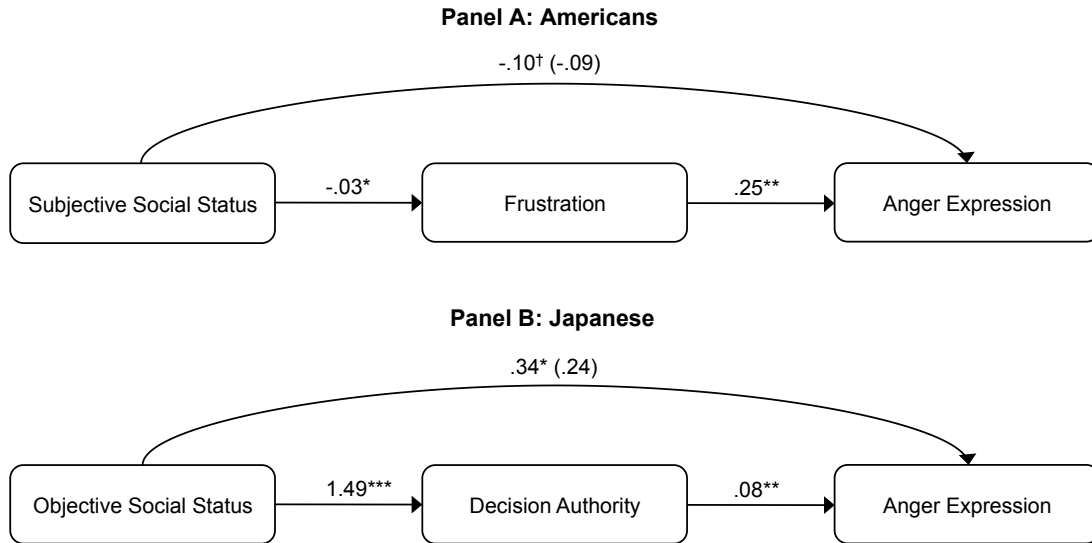
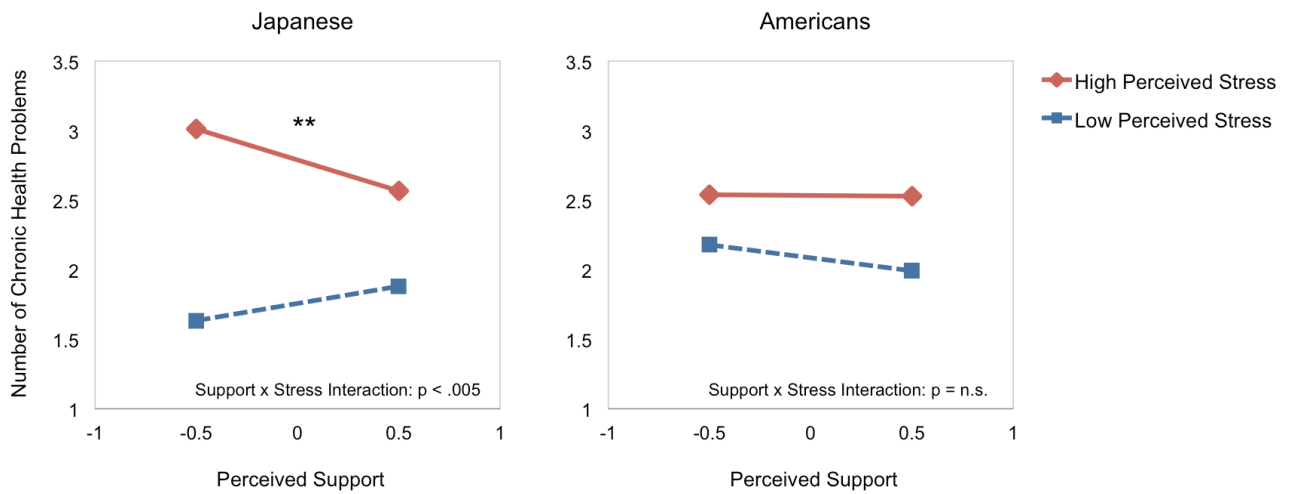


Figure 3.2 Results of path analyses examining the role of frustration (Panel A) and decision authority (Panel B) in mediating the effect of social status and anger expression for Americans ($N = 1218$) and Japanese ($N = 705$), respectively in Study 2. Unstandardized coefficients are shown. The values in parentheses show the relationship between subjective (objective) social status and anger expression and the dependent variables after controlling for frustration (decision authority). The values in square brackets are 95% bias-corrected confidence intervals from a bootstrap test with 2000 replications; the mediation is significant if the confidence interval does not include zero.



Note. $^{\dagger}p < .10$, $*p < .05$, $**p < .01$, $***p < .001$.

Figure 3.3 The 3-way interaction between Support x Stress x Culture with respect to the influence on number of chronic health problems in Study 3. The link between receipt of support and chronic health problems was significant only for Japanese who report being under high stress.



Note. ** $p < .01$.

CHAPTER IV¹

Culture and Motivation

Chapter IV examines the neural processes underlying cultural moderation in motivational processes. It focused on two notable themes of research that pertain to motivational processes: self-serving bias and social evaluative threat. Study 4 identified a neurophysiological signal of the motivational force towards the pursuit of self-interest as an attempt to understand cultural variation in self-serving bias. Study 5 examined a neural response to social evaluative threat elicited by the presence of social eyes, and further explored how such threat influences task motivation of European Americans and Asians. In both studies, error-related negativity (ERN), a negative voltage deflection that occurs in response to error commission in choice response tasks (Falkenstein, Hohnsbein, Hoormann, & Blanke, 1991; Gehring, Goss, Coles, Meyer, & Donchin, 1993) was assessed as a neurophysiological index of motivational significance.

Study 4: Error Related Brain Activity Reveals Self-Centric Motivation:

Culture Matters

Self-interest is considered a fundamental human motive. In fact, many currents of modern Western thought, including theories in both neo-classic economics (Hobbes, 1651; Smith, 1759) and social and behavioral sciences (Campbell, 1975; Greenwald, 1980), are built on this premise. The current work presents evidence that this assumption

¹ Both studies in this chapter (Studies 4 and 5) are co-authored with Shinobu Kitayama.

is ingrained into a basic neural mechanism of error processing. It also shows that the degree to which the neural mechanism is modulated by self-interest is culturally bound.

To illustrate the central significance of self-interest, consider self-serving bias (Langer, 1975; Miller & Ross, 1975). People have a strong tendency to make self-flattering judgments and inferences, as documented in many domains including judgment and decision-making (Langer, 1975), self-perception (Dunning, Meyerowitz, & Holzberg, 1989), and attribution (Miller & Ross, 1975). For example, individuals take credit for their success while blaming external influences for their failure (Miller & Ross, 1975). Likewise, they tend to have unrealistically inflated and optimistic views of themselves (Taylor & Brown, 1988). Self-serving bias is believed to result from motivated reasoning, wherein one's attention, inference, and hypothesis testing are guided by a strong motivational concern for the welfare of the self (Kunda, 1990; Leary, 2007). This drive for the pursuit of self-interest may be called the self-centric motivation (SCM). We may hypothesize that SCM is an important motivational precursor for self-serving bias.

At present, the exact nature of SCM remains uncertain. In particular, whereas SCM might sometimes be derived from a conscious goal to present the self in a favorable light (Schlenker, 1980), it might also have a deeper neurophysiological root. For example, it is conceivable that once the self becomes relevant, neural mechanisms of “wanting” – the mesocorticolimbic system modulating incentive salience (Berridge, 2012) – are recruited automatically and unconsciously. The reward value of achieving a desired outcome may be enhanced as a result. This may explain why people work hard under the conditions of ego-involvement (Greenwald, 1980; Sherif & Cantril, 1947).

If SCM has a deep neurobiological basis, there should be a neuro-cortical marker of this motivation. The primary aim of the current work was to test this idea by examining neural responses involved in error monitoring (error-related negativity; ERN) (Falkenstein et al., 1991; Gehring et al., 1993). The ERN, which originates in the anterior cingulate cortex (ACC; Holroyd, Dien, & Coles, 1998; Miltner, Braun, & Coles, 1997), has been shown to increase as a function of motivational significance associated with the task at hand (Gehring et al., 1993; Hajcak, Moser, Yeung, & Simons, 2005). We therefore tested whether the ERN would be greater when an erroneous response was made in tasks people performed to earn reward points for the self, relative to when such an error was made in tasks they performed to earn reward points for a same-sex friend.

Another important aim of the current work was to examine possible cultural variation in the neural marker of SCM. Over the last two decades, numerous cross-cultural studies have shown that self-serving effects are much weaker among Asians than among European Americans (Heine et al., 1999). For example, self-serving attributions of success and failure appear quite weak in Asia (Kitayama, Takagi, & Matsumoto, 1995) and, likewise, Asians tend to hold more realistic assessments of the self vis-à-vis others (Heine & Lehman, 1995). The attenuation of self-serving bias among Asians might be due to a deliberate self-presentation fostered by the culture's modesty norm. However, if Asians should show an attenuated self-centric effect even in the ERN – a neural activity that is arguably automatic and subconscious (Amodio et al., 2004) – this would suggest potential cross-cultural variability in the primacy of self-interest.

To address this issue, we monitored European American and Asian participants' brain activities via electroencephalogram (EEG) while they performed a computer task to

earn reward points for themselves and for their close, same-sex friend. We made two predictions. First, for European Americans, who are likely to be high in SCM, the ERN amplitudes should be larger in the self-condition than in the friend-condition. Second, for Asians, who are likely to be lower in SCM, the ERN amplitude difference between the self- and the friend-conditions would be attenuated.

Methods

Participants

Thirty-nine University of Michigan undergraduates participated in the study (24 females, $M_{\text{age}} = 19.59$, $SD_{\text{age}} = 1.37$). Nineteen were European Americans (14 females, $M_{\text{age}} = 19.47$, $SD_{\text{age}} = 1.31$), and the remaining 20 were Asians (10 females, $M_{\text{age}} = 19.70$, $SD_{\text{age}} = 1.45$). Nine Asian participants were born in China, Korea, or Japan, spending no more than 7 years in the U.S. (4 females, $M_{\text{age}} = 20.56$, $SD_{\text{age}} = 1.33$), and the remaining 11 participants were Asian Americans, who were born in the U.S. (6 females, $M_{\text{age}} = 19.00$, $SD_{\text{age}} = 1.18$). Participants received \$20 or course credit in exchange for their participation. All participants were right-handed and had normal or corrected-to-normal vision. No gender effect was found.

Procedure

Upon arrival at the lab, participants were told that their brain activities would be monitored while performing a simple computer task. They were further told that their goal was to earn as many reward points as possible to receive gifts for both themselves and a close, same sex friend of their own choice. Participants were presented with a list of 15 gift items (e.g., mug, hoodie) and told that they could choose one item for themselves

and another for their friend from the list based on the points they would earn from the computer task.

After the attachment of EEG electrodes, participants were asked to perform a letter version of the flanker task (Eriksen & Eriksen, 1974). The stimuli were presented on a Dell E551c 15 inch CRT monitor using E-Prime software version 1.1 (Psychology Software Tools, Inc.). Participants were instructed to identify a center letter among a set of five letters that were flashed at the center of the screen (HHHHH, SSSSS, HSHHH, or SSHSS). Forty percent of the trials were congruent trials (HHHHH or SSSSS), and the remaining 60 percent were incongruent trials (HSHHH or SSHSS). Each letter sequence occupied 0.4° of visual angle vertically and 2.2° horizontally. Each trial started with a fixation cross that appeared at the center of the screen for 100ms. After a display of a blank screen for 300ms, participants saw one of the four letter sequences, which lasted on the screen for 100ms. They reported the identity of the center letter by pressing one of two response keys on the typing board. The key assignments were counterbalanced across participants. 900ms after each response, the next trial started.

The computer task consisted of a total of 16 blocks, with 60 trials in each block (960 trials in total). Half of the blocks were self-blocks and the remaining half were friend-blocks. Participants were told that their response would be monitored and that correct responses that were faster than a certain pre-designated cut-off in response time would be converted into points. In all blocks, they were encouraged to respond as quickly as possible without sacrificing accuracy. Furthermore, in order to keep the error rate around 10%, whenever the error rate in a given block exceeded (or did not reach) 10%, we encouraged participants to respond more accurately (or faster) in the next block. In

addition, participants were further told that they would have an opportunity to use the points they would earn during the self-blocks and the friend-blocks to choose one gift item each for themselves and another gift for their friends, respectively. The order of the self vs. friend-blocks was counterbalanced across participants, such that half of the participants performed the self-blocks first (i.e., 4 self, 4 friend, 4 self, and 4 friend) and the other half performed the friend-blocks first (i.e., 4 friend, 4 self, 4 friend, and 4 self).

Physiological Recording and Processing

The EEG was recorded with 64 electrodes placed according to the extended International 10/20-System in a nylon cap, and referenced to the left mastoid. The electrooculogram (EOG) was recorded from additional channels at the outer canthi of both eyes and above and below the left eye. EEG and EOG signals were amplified with a band-pass of DC to 100Hz by BioSemi ActiveTwo system, and sampled with 512Hz. All data were re-referenced to the averaged left and right mastoid and then resampled at 256Hz. The data was baseline corrected by using 200ms-100ms pre-response voltage, and corrected for ocular artifacts (Gratton, Coles, & Donchin, 1983). The EEG recordings for incorrect and correct responses were then averaged separately. Trials with amplitudes exceeding $\pm 100\mu\text{V}$ were eliminated from the final averages. The number of error trials included in the analysis after artifact rejection was no different across the cultural groups (European Americans; $M = 60.76$, $SE = 7.07$, Asians; $M = 64.50$, $SE = 6.89$), and/or between the self- and friend-conditions (self-condition; $M = 61.53$, $SE = 5.09$, friend-condition; $M = 63.73$, $SE = 7.49$), $F_s < 1$. The ERN peaked around 35ms after erroneous responses; it was therefore quantified as the mean amplitude between 10ms and 60ms after the erroneous response at the fronto-central midline electrode (FCz).

Post-Experimental Questionnaire

After the flanker task, participants filled out a 24-item Singelis self-construal scale (Singelis, 1994), which yielded separate scores for independent self-construal (e.g., I always try to have my own opinions; α s = .78 and .82, for European Americans and Asians, respectively) and interdependent self-construal (e.g., I avoid having conflicts with members of my group; α s = .54 and .75). The two cultural groups did not differ on the independent self-construal (European Americans: 4.82 vs. Asians: 4.88), $F < 1$, but Asians were marginally more interdependent than European Americans (4.98 vs. 4.64), $F(1, 37) = 3.54, p < .07, \eta_p^2 = .09$. Participants then filled out measures that assessed the quality of the relationship with the friend they chose as a recipient of the gift they earned. The two cultural groups were no different in perceived closeness (IOS; Aron, Aron, & Smollan, 1992) (European Americans: 4.89 vs. Asians: 4.20), length of the relationship (4.26 years vs. 3.45 years), and supportiveness (ISLE; Cohen, Mermelstein, Kamarck, & Hoberman, 1985) (4.46 vs. 4.04), F s $\leq 2.72, p > .10$. Nor did they predict task performance or ERN responses, F s < 1 .

We also included questions designed to assess participants' motivation to perform the task well in both the self-condition and the friend-condition. Participants were asked to indicate how engaged they were when they performed the task in the self-condition and in the friend-condition. Both cultural groups did not differ in the degree of task engagement (European Americans: 4.82 vs. 4.82 for the self-condition and the friend-condition, respectively, Asians; 5.03 vs. 5.08), F s < 1 . Participants also reported that they were equally satisfied with their performance in the two conditions (European Americans: 3.95 vs. 3.84, Asians; 3.08 vs. 3.10), F s ≤ 1 .

Results

A post-experimental questionnaire showed that the friends that European American and Asian participants chose were no different in terms of perceived closeness (4.89 vs. 4.20 for European Americans and Asians, respectively, $F = 2.26, p > .14$), length of relationship (4.26 vs. 3.45, $F < 1$), and perceived supportiveness (4.46 vs. 4.04, $F = 2.72, p > .10$). Participants were also reportedly engaged as strongly in the task of earning points for the self as they were in the task of earning points for the friend (European Americans: 4.82 vs. 4.82, Asians; 5.03 vs. 5.08), $F_s < 1$. We also found little difference in the performance of the flanker task between the self-condition and the friend-condition regardless of the cultural backgrounds of participants (accuracy: 88.77 vs. 88.41 for European Americans and 87.36 vs. 87.23 for Asians; correct trial RTs: 306.93ms vs. 309.08ms for European Americans and 269.25ms vs. 271.22ms for Asians; error trial RTs: 253.40ms vs. 248.56ms for European Americans and 203.17ms vs. 209.29ms for Asians), $F_s < 1$. At the levels of conscious judgment as well as observable behavior, then, both European American and Asian participants appear to have worked as hard for their friends as they did for themselves.

An analysis of the ERN amplitude revealed a remarkably different picture, however. European Americans showed a clear self-centric effect (see Figs. 4.1-A and B). The ERN (relative to CRN)¹ was significantly greater in the self-condition than in the

¹ Although the magnitude of CRN (correct-response negativity) did not vary as a function of either culture or condition, it was somewhat more positive for Asians than for European Americans, (6.46 vs. 4.38), $F(1, 37) = 2.53, p = .12$. To take this difference into account, we analyzed the ERN-CRN difference scores. The analysis on the ERN amplitudes produced similar results. The Culture x Condition interaction proved significant on the ERN amplitudes, $F(1, 31) = 7.34, p < .05, \eta_p^2 = .19$. ERN was significantly larger in the self-condition than in the friend-condition for European Americans (-7.02 vs. -4.42), $F(1, 15) = 9.45, p < .01, \eta_p^2 = .39$. For Asians, the pattern was non-significantly reversed (-3.24 vs. -3.81), $F(1, 16) < 1, ns$.

friend-condition (-12.04 vs. -9.06), $F(1, 15) = 10.93, p < .005, \eta_p^2 = .42$. This pattern demonstrates the existence of SCM, insofar as the same event becomes motivationally more significant, at the neural level, when it implicates the interest of the self vs. other. In contrast, there was no ERN difference between the self-condition and the friend-condition for Asians (-9.79 vs. -10.04), $F(1, 16) < 1$ (see Figs. 4.1-C and D). Thus, consistent with previous cross-cultural work, we found no evidence of SCM among Asians. The Culture x Condition interaction was significant, $F(1, 31) = 9.08, p < .005, \eta_p^2 = .23$. The relevant means are displayed in Fig. 4.2-A.

Previous work suggests that increased ERN is often accompanied by post-error slowing – a prolonged response time on a trial subsequent to commission of an error. Post-error slowing is considered to reflect one’s effort to avoid making a further error on the subsequent trial after an error, commonly assessed by subtracting each participant’s average response time on post-correct trials from the average response time on post-error trials (Holroyd & Coles, 2002). As shown in Fig. 4.2-B, European Americans showed a significant post-error slowing in the self-condition (18.87), $F(1, 15) = 18.69, p < .001, \eta_p^2 = .56$, but not in the friend-condition (5.78), $F = 1.72, p > .20$. In contrast, the post-error slowing for Asians was virtually absent for both self- and friend-conditions (-.89 vs. 1.65), $F_s < 1$. The Culture x Condition interaction was significant, $F(1, 30) = 4.91, p < .05, \eta_p^2 = .14$.

Because interdependent social relations require attention and care paid to others, attention to the personal self that is detached from social relations in general and commitment to the self-interest in particular may be antithetical to interdependence (Markus & Kitayama, 1991). We thus predicted that interdependent self-construal would

negatively predict SCM. Two indices of SCM were obtained by subtracting the self-condition ERN-CRN from the friend-condition ERN-CRN, on the one hand, and the friend-condition post-error slowing from the self-condition post-error slowing, on the other. For both measures, positive scores show greater SCM. These two indices were significantly correlated ($r = .38, p < .05$). Interdependent self-construal was assessed by the Singelis self-construal scale (Singelis, 1994). As expected, Asians were more interdependent than European Americans (4.98 vs. 4.64), although the difference was statistically marginal, $F(1, 37) = 3.54, p < .07, \eta_p^2 = .09$. Of importance, interdependent self-construal was negatively associated with both indices of SCM (ERN-CRN: $r = -.42, p < .01$, post-error slowing; $r = -.35, p < .05$, with the two cultural groups collapsed; see Figs. 4.3-A and B). This was the case even after statistically controlling for culture for the ERN ($r = -.38, p < .05$) although the effect of interdependence on post-error slowing became non-significant once culture was controlled ($r = -.21, ns$).

Discussion

The present work is the first to demonstrate a neural substrate of SCM. For European Americans, an event became motivationally more significant when it was relevant to the interest of the self than when it was relevant to the interest of someone else. As a consequence, they monitored errors in the relevant task more closely (as revealed in the increased magnitude of ERN) and accommodated their behaviors after errors to improve their future performance (as revealed in the increased post-error slowing) in the self-condition. It is noteworthy that we used one's close friend as the relevant other. In fact, our participants reported that they were engaged as much in the task of earning points for their friends as in the task of earning points for the self.

Nevertheless, both ERN and post-error slowing revealed rather striking self-centric effects. Previous work shows that ERN originates from the anterior cingulate cortex and plays a significant role in monitoring errors (Holroyd et al., 1998; Miltner et al., 1997). The fact that the operation of SCM is observed at such a low-level process attests to the primacy and robustness of this motivation. The enhanced motivation linked to the self, demonstrated here, would guide subsequent cognitive processes such as attention, inference, and hypothesis testing to further inflate perceived worthiness of the self (Kunda, 1990). Our analysis, then, implies that SCM is an important precursor of self-serving bias. Future research should directly test this idea by examining whether our ERN-based measure of SCM predicts self-serving bias.

Given the robustness of the self-centric effect observed for European Americans, it is striking to observe no such effect for Asians. This evidence, however, is consistent with an increasing body of cross-cultural work showing that Asians are much less likely than European Americans to show self-serving bias. The finding that the self-centric effect was absent, not only in self-reports, but also in both ERN and post-error slowing, indicates that the absence of self-serving bias among Asians is not due merely to self-presentation. The finding is also consistent with the hypothesis that in Asian cultural contexts, interdependence is emphasized and, as a consequence, significant others are incorporated into the self (Markus & Kitayama, 1991).

European Americans reported that they worked just as hard for their friends as they did for themselves. Yet, this claim was contradicted by our tacit indicators (ERN and post-error slowing), which showed clear self-centric effects. The impartiality these participants claimed in their self-report might be a deliberate social pretention.

Alternatively, the self-report ratings might reflect what our European American participants genuinely believed about their own behaviors and, if so, the conscious awareness regarding their own impartiality might prove to be self-deceptive. This issue deserves further investigation.

Researchers have documented that many psychological findings are limited to people from Western, Industrial, Educated, Rich, and Democratic (or WEIRD) societies (Henrich, Heine, & Norenzayan, 2010). Our finding extends this claim by demonstrating that the primacy of self-interest, widely assumed as universal in the current social and behavioral science literature, must be qualified. Future work should examine alternative principles of motivation to account for various behavioral characteristics that are more evident among non-Western populations.

Study 5: Interdependent Selves Show Face-Induced Facilitation of Error

Processing: Cultural Neuroscience of Self-Threat

Both evolutionary and cultural considerations suggest that humans are highly attuned to their own conspecifics (Tomasello, 1999). This sensitivity is revealed in the fact that an awareness of someone watching the self – or the awareness of social eyes – plays an important role in the regulation of one’s own behaviors (Kitayama et al., 2004; Na & Kitayama, 2011). For example, when exposed to a watching face, individuals become more prosocial (Haley & Fessler, 2005; Rigdon et al., 2009). Because self-regulation in social settings is often facilitated by knowing how others might evaluate the self, it stands to reason that at least for some people, mere exposure to social eyes might be sufficient to automatically evoke a concern about potentially negative social evaluations held by others (Dickerson & Kemeny, 2004; Leary, 1983). Such a concern

(herein called social evaluative threat) may increase vigilance for one's errors on a task at hand. In the current work, we explored this hypothesis by using an electrophysiological signal of error monitoring called error-related negativity (ERN).

There is a general consensus in the literature that social belongingness is a fundamental human motive (Baumeister & Leary, 1995; Bowlby, 1988). Because positive social evaluations imply social acceptance, it should not come as any surprise that these evaluations are integral to psychological well-being (e.g., Baumeister & Leary, 1995; Murray, Griffin, Rose, & Bellavia, 2003). Conversely, when one is socially rejected or negatively evaluated and, thus, one's positive social image is threatened, a variety of adverse psychological and physiological reactions can follow. For example, a social evaluative threat can lead to both a decrease in social self-esteem (Gruenewald, Kemeny, Aziz, & Fahey, 2004) and an increase in physiological stress responses such as cortisol secretion (Dickerson, Mycek, & Zaldivar, 2008) and production of pro-inflammatory cytokines (Kemeny & Gruenewald, 2000). It would seem reasonable, then, that people are sometimes highly vigilant for social evaluative threats that might present themselves. Among many social cues, an image of a watching face may signal a potential threat of this kind, insofar as there is a good chance that the watching person observes and evaluates the self (Haley & Fessler, 2005; Kitayama et al., 2004; Rigdon et al., 2009).

Of course, this is not to say that all individuals are equally sensitive to social evaluative threats posed by a watching face. Previous work suggests that some individuals may be more likely to draw on social evaluations such as "honor" and "face" in defining the self and maintaining positive self-identities. The degree to which one's

self and self-identity is defined relationally, in terms of its belongingness in a meaningful social relationship, is captured by interdependent self-construal (Markus & Kitayama, 1991). People who are high in interdependent self-construal are likely to rely heavily on social evaluations in developing and maintaining their positive self-identities.

Conversely, people with independent self-construals are likely to define the self in terms of their own appraisals of the self rather than relying on evaluations held by others. Thus, it may be anticipated that those with interdependent (vs. independent) self-construal will be more sensitive to social evaluative threats (Kim & Markus, 2006). One important corollary of this analysis is that Asians may be more likely than European Americans to be sensitive to social evaluative threats because the former tend to be more interdependent (and less independent) than the latter (Oyserman et al., 2002; Singelis, 1994).

The degree to which a social evaluative threat is automatically evoked may be captured by a neurophysiological response called error-related negativity (ERN). The ERN refers to a sharp negative voltage deflection that occurs in response to error commission in choice response tasks (Falkenstein et al., 1991; Gehring et al., 1993). The ERN is assumed to index an early, automatic detection of unfavorable outcomes (Botvinick, Cohen, & Carter, 2004), which does not necessarily rely on conscious reflection (Amodio et al., 2004). Although the ERN is typically conceptualized as a marker of cognitive processing of error/conflict detection (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Yeung, Botvinick, & Cohen, 2004), recent findings suggest that it can also reflect affective reactions such as a response to threat (Hajcak, 2012; Weinberg, Riesel, & Hajcak, in press). For example, the magnitude of the ERN is

positively correlated with a defensive startle response after errors, a common reaction to threatening stimuli (Hajcak & Foti, 2008). Moreover, both negative affectivity and behavioral inhibition system (BIS), which are implicated in the sensitivity to threat (Carver & White, 1994; Gray, 1994), are positively correlated with the ERN (Boksem, Tops, Wester, Meijman, & Lorist, 2006; Dikman & Allen, 2000; Luu, Collins, & Tucker, 2000). Importantly, recent work has shown that when negative arousal or threat is mitigated by a misattribution procedure (Inzlicht & Al-Khindi, in press) or priming of religious belief systems (Inzlicht & Tullett, 2010), the ERN is reduced substantially.

In the present work, as a social cue signaling a potential threat to the self, we used an image of a watching face. We presented this image as a priming stimulus on some trials of a flanker task while monitoring participants' brain responses using electroencephalogram (EEG). If face priming were sufficient to automatically evoke a social evaluative threat, thereby increasing vigilance for errors, especially for interdependent people, this should improve performance in the flanker task while increasing the ERN amplitude at the same time. We thus made the following three predictions.

1. Performance of the flanker task should be better in the face priming condition than in the control condition, but this improvement of task performance in the face priming (vs. control) condition should be more pronounced for those higher in interdependent self-construal.
2. The ERN should be larger in magnitude in the face priming condition than in the control condition, but this increase of the ERN in the face priming (vs. control)

condition should be more pronounced for those higher in interdependent self-construal.

3. Asians would be more interdependent than European Americans. It would therefore follow that both the improvement of task performance and the increase of the ERN amplitude in the face priming (vs. control) condition should be more pronounced for Asians than for European Americans.

Method

Participants

Thirty-seven undergraduates at the University of Michigan (18 males, $M_{\text{age}} = 20.81$, $SD_{\text{age}} = 2.39$) participated in the study in exchange for \$30. Nineteen were European Americans (10 males, $M_{\text{age}} = 20.16$, $SD_{\text{age}} = 1.68$), and the remaining eighteen were East Asians (8 males, $M_{\text{age}} = 21.53$, $SD_{\text{age}} = 2.87$). All Asian participants were born in China, Korea, or Japan, spending no more than 9 years in the U.S. All participants were right-handed and had normal or corrected-to-normal vision. No gender effect was found.

Procedure

Upon arrival, participants were told that the study would test brain responses during a cognitive task. Following attachment of EEG electrodes, participants were given an arrowhead version of the Eriksen flanker task (Eriksen & Eriksen, 1974) in a dimly lit, sound attenuated room. Participants were seated approximately 60cm from a 15-inch CRT color monitor.

The flanker task consisted of 30 blocks of 48 trials. Each trial involved the presentation of a priming stimulus, followed by target arrows. The 48 trials within each

block varied in prime type (face, scrambled face, or house, [3]) and arrowhead type (<<<<<<, >>>>>>, <<><<, or >>><>>, [4]), with 4 trials in each of the 12 (= 3 x 4) combinations. The order of the 48 trials was randomized within each block for each participant.

On each trial, participants were first presented with a priming stimulus (see Fig. 4.4-A for sample images) for an average of 90ms (jittered between 70 and 110ms). Each priming stimulus was presented at the center of the screen with a visual angle of 2.2° x 2.2°. The priming stimulus was followed by a fixation cross, which stayed on the screen for an average of 350ms (jittered between 300 and 400ms). The fixation cross was immediately followed by one of the four arrowhead sequences. Each arrowhead sequence occupied 0.4° of visual angle vertically and 2.2° horizontally. It was presented centrally for 100ms in white on black background. Participants were instructed to press one of two designated keys with the left or right index finger in accordance with the direction of the center arrowhead. They were given a maximum of 800ms to respond. 800ms after the response, the next trial started (see Fig. 4.4-B for trial structure). At the end of each block, a feedback screen was displayed. When the accuracy in a given block became higher (lower) than 90%, participants were encouraged to respond faster (more accurately) in the next block.

Face images were created by FaceGen Modeller 3.3 (Singular Inversions Inc.). To eliminate any effects of in- vs. out-group status of the priming faces, we created race-neutral morphed faces that included 50% Caucasian and 50% Asian faces. We scrambled the morphed face images to create scrambled face images. House images were adopted from Polk, Park, Smith, & Park (2007). The two control conditions (i.e., scrambled face

and house) did not differ significantly in all analyses below; so they were subsequently combined.

Physiological Recording and Processing

The EEG was recorded with 64 electrodes placed according to the extended International 10/20-System in a nylon cap, and referenced to the left mastoid. The electrooculogram (EOG) was recorded from additional channels at the outer canthi of both eyes and above and below the left eye. EEG and EOG signals were amplified with a band-pass of DC to 100Hz by the BioSemi ActiveTwo system, and sampled with 512Hz. All data were re-referenced to the averaged left and right mastoid, and re-sampled at 256Hz. Response-locked ERP was obtained by extracting an epoch beginning 500ms before the response and ending 1000ms after the response. The data was baseline corrected by using 150ms-50ms pre-response voltage. Noisy trials were eliminated², and the EEG was corrected for ocular artifacts (Gratton et al., 1983). A low-pass filter with a half-amplitude cutoff at 30Hz was applied. The EEG recordings for correct and incorrect responses were averaged separately. The ERN was quantified as the mean amplitude between 50ms before and 50ms after the incorrect response at the fronto-central midline electrode (FCz).

Questionnaire Measures

Next, participants filled out a self-construal scale that was composed of selected items from the scales by Singelis (1994) and Takata (1999) (see Table 4.1). The scale yields separate scores for independent self-construal ($\alpha = .79$ and $.67$, for Asians and

² The rejection rate was very low in all conditions (mean rejection rate = 6.44%, median rejection rate = 5.00%), and did not differ between the experimental conditions, $F_s < 1$. The number of error trials included in the analysis of the ERN was also no different across two cultural groups (Asians: $M = 70.94$, $SE = 5.99$, European Americans: $M = 74.00$, $SE = 5.83$), $F(1, 35) < 1$. This also did not significantly interact with prime type, $F < 1$.

European Americans, respectively) and interdependent self-construal ($\alpha = .79$ and $.60$).

We also assessed personality variables that are linked to ERN, including neuroticism (NEO PI-R, Costa & McCrae, 1992; $\alpha = .94$ and $.95$), and self-consciousness (Fenigstein, Scheier, & Buss, 1975), both private ($\alpha = .78$ and $.80$) and public ($\alpha = .60$ and $.78$), and social anxiety ($\alpha = .75$ and $.84$).

Results

Behavioral Data

Overall, the experimental condition had no effect on either accuracy (88.93 and 88.62 in the face priming and the control conditions, respectively) or response time on error trials (273.40ms and 270.93ms, respectively), $F_s < 1$, *ns*, although, on correct trials, response time was shorter in the face priming condition than in the control condition (350.97ms vs. 352.82ms), $F(1, 36) = 11.87$, $p < .01$, $\eta_p^2 = .25$.

Our analysis implies that face priming would pose a social evaluative threat to those with interdependent self-construal. When threatened this way, people would become more vigilant to their errors. To test this analysis, we captured the degree to which face priming improved task performance by subtracting the accuracy in the face priming condition from the accuracy in the control condition to yield a measure of the face priming effect. Positive values indicate an improved performance in the face priming (vs. control) condition. Next, we developed a single index of interdependent self-construal by subtracting independence from interdependence, since the two were negatively correlated ($r = -.59$, $p < .001$). Positive values indicate greater interdependence (vs. independence). One Asian participant was excluded from this analysis because she did not complete the booklet that contained the self-construal scale.

As predicted, the face priming effect on accuracy was significantly correlated with interdependent self-construal ($r = .43, p < .01$). As shown in Fig. 4.5-A, as a function of interdependent self-construal, performance tended to improve in the face priming (vs. control) condition. This is in line with the hypothesis that interdependent individuals are threatened by social eyes and, as a consequence, they become more vigilant for their own errors in the task. The correlation between the face priming effect on accuracy and interdependent self-construal remained significant when trait social anxiety, private and public self-consciousness, and neuroticism were controlled ($r = .38, p < .05$). There was no comparable effect on response time.

As shown in Fig. 4.5-A, the relationship between interdependent self-construal and the face priming effect on accuracy was similar within each cultural group ($r_s = .25$ and $.29$, for Asians and European Americans, respectively), although it was no longer significant when analyzed separately. As predicted by the fact that Asians were significantly more interdependent (vs. independent) than European Americans (0.59 vs. -0.74), $F(1, 34) = 32.68, p < .001, \eta_p^2 = .49$, the face priming effect was significantly greater for Asians than for European Americans (1.00 vs. -0.04), $F(1, 35) = 4.91, p < .05, \eta_p^2 = .12$. Indeed, the face priming effect was significantly positive, indicating that the incidental exposure to a face (vs. control) stimulus improved task performance for Asians, $F(1, 17) = 5.21, p < .05, \eta_p^2 = .23$. This effect was absent for European Americans, $F(1, 18) < 1, ns$.³

Error-Related Negativity

³ The pattern here, showing a cultural influence on interdependence, which in turn leads to the face priming effect on accuracy, implies a mediation of the cultural difference on the face priming effect by interdependence. This interpretation of the data, however, should be espoused with caution because the implied mediation fell short of the conventional level of statistical significance; the 95% bias-corrected bootstrap confidence interval does include zero, $[-.028, .001]$.

When people are threatened during the flanker task and thus become vigilant of their own errors, they may be expected to show an increased neural response to those errors. We thus calculated the degree to which face priming increased the magnitude of ERN by subtracting the face priming condition ERN from the control condition ERN. Positive values indicate larger ERNs in the face priming (vs. control) condition. As Fig. 4.5-B illustrates, the face priming effect on ERN was significantly predicted by interdependent self-construal ($r = .39, p < .05$). As interdependent self-construal increased, the ERN in the face priming (vs. control) condition also increased. This provides support for the hypothesis that interdependent people are threatened by social eyes, which in turn increases neural reactions to errors they make. The correlation between the face priming effect on ERN and interdependent self-construal remained significant when trait social anxiety, private and public self-consciousness, and neuroticism were controlled ($r = .40, p < .05$).

As shown in Fig. 4.5-B, however, when the relationship between interdependent self-construal and the face priming effect on ERN was analyzed separately within each cultural group, it was significant for Asians ($r = .47, p < .05$), but not for European Americans ($r = -.13, ns$). It is not clear why the correlation was negligible for the European American group. One possible reason is that the range of interdependence was relatively narrow for European Americans, which might have made it more difficult to detect the relationship with the face priming effect on ERN. Nevertheless, in support of the proposition that the face priming effect on ERN increases as a function of interdependent self-construal, this effect was significantly larger for Asians than for European Americans (0.70 vs. -0.74), $F(1, 35) = 7.36, p < .01, \eta_p^2 = .17$. Indeed, the face

priming effect was significantly larger than zero for Asians, $F(1, 17) = 4.20, p = .05, \eta_p^2 = .20$. Curiously, this effect was reversed, albeit marginally, for European Americans, $F(1, 18) = 3.36, p = .08, \eta_p^2 = .16$. Pertinent waveforms are displayed in Fig. 4.6. As can be seen, the ERN magnitude was larger in the face priming condition than in the control condition for Asians, but the pattern was reversed for European Americans. Although this reversal was only marginally significant (see above), it became significant once we controlled for the condition difference in accuracy in the analysis of the ERN, $F(1, 17) = 4.96, p < .05, \eta_p^2 = .23$. We will return to this curious reversal effect in Discussion.

As noted above, interdependent self-construal was significantly higher for Asians than for European Americans (0.59 vs. -0.74). Moreover, for Asians we found a robust correlation between self-construal and the face priming effect on ERN. We thus estimated what face priming effect Asians might show if their interdependence score were equal to the average score for the current sample of European Americans (= -0.74). This estimate of face priming effect for Asians (= -1.04) was virtually identical to the mean face priming effect for European Americans (= -0.74), $F < 1$.⁴ This pattern is consistent with the supposition that Asians showed the face priming effect that was opposite of the effect shown by European Americans because they were predominantly more interdependent (vs. independent).

Discussion

Face is a prominently social cue, which can signal that the self is being observed by others. Social observation like this implies social evaluation, which in turn can evoke

⁴ It may be hypothesized that culture influences interdependence, which in turn enhances the face priming effect on ERN. This implied mediation, however, was not significant (95% bias-corrected bootstrap CI, [-.655, 1.812]), because the correlation between interdependence and the face priming effect on ERN was negligible among European Americans.

a social evaluative threat to the self, especially for those who are interdependently oriented. Our work is the first in the literature to test this analysis with both a behavioral measure (task performance) and a neuro-cortical response (error-related negativity or ERN). Both of them are thought to capture an enhanced vigilance for one's errors on a task at hand. To the extent that mere exposure to a watching face is sufficient to evoke a social evaluative threat to the self, task performance should improve and, simultaneously, the ERN should be amplified. We showed, as predicted, that these effects do occur, but importantly they do so only to those who define themselves in interdependent terms.

In the present work, we first assessed the degree to which performance in the flanker task improved in the face priming (relative to control) condition. As expected, the face priming effect on accuracy was significantly correlated with interdependent (vs. independent) self-construal. This correlation remained unchanged when pertinent personality variables such as neuroticism, private and public self-consciousness, and social anxiety were controlled. Second, as also predicted by the hypothesis that Asians are more interdependent than European Americans, we observed that the face priming effect on accuracy was significantly positive for Asians, indicating their improved task performance in the face priming (vs. control) condition. This effect, however, was completely absent for European Americans. Third, when a comparable analysis was carried out on the ERN, the face priming effect was significantly correlated with interdependent (vs. independent) self-construal. This correlation remained statistically significant when the relevant personality variables were controlled. Fourth, as also predicted, the face priming effect was significantly positive for Asians, meaning that face

priming increased Asians' ERN magnitude, relative to control primes. Curiously, this face priming effect on ERN was reversed for European Americans.

Two observations suggest that the reversal of the face priming effect for European Americans must be interpreted with caution. First, no comparable effect was evident in the analysis of accuracy in the task performance, and second the observed reversal of the face priming effect on ERN became statistically significant only when the condition difference in accuracy was statistically controlled. Nevertheless, this effect could indicate that for those with independent selves, social eyes might automatically initiate motivation to counter any evaluation apprehension, supposedly because such apprehension could expose the vulnerability of the self to social evaluations, thus compromising the sense of the self as independent and autonomous. Such defensive mechanisms, if operative, might diminish any vigilance to one's errors on the task at hand. This might explain why an exposure to such eyes reduced the ERN amplitude for European Americans (see Na & Kitayama, 2012 for initial support for this analysis).

In an important study, Hajcak and colleagues (2005) examined effects of social observation on the ERN magnitude. Specifically, in their study, the experimenter stood right next to the participants who performed a flanker task. Furthermore, the participants had been explicitly informed that the experimenter would be evaluating their performance. Thus, evaluation apprehension was explicitly induced. Under this condition, the participants showed a reliably increased ERN relative to a control condition where they performed the task in a private setting. Because the participants who were tested are likely to be predominantly European Americans, we may suggest that even independent selves feel threatened when evaluation apprehension is explicitly activated by a social

observer. What distinguishes interdependent selves from independent selves may lie in the fact that interdependent selves are more sensitive to subtle social cues implying a social evaluative threat, such that they automatically experience evaluation apprehension when they are merely “seen” by others. Consistent with this analysis, Ishii, Kobayashi, and Kitayama (2010) report, also with an ERP as their dependent variable, that interdependent people become especially sensitive to emotional vocal tone (which often conveys interpersonal attitudes; Ambady, Koo, Lee, & Rosenthal, 1996; Zuckerman, Amidon, Bishop, & Pmerantz, 1982) when exposed to schematic faces that would appear “watching” them.

Although the current work focused exclusively on a social evaluative threat experienced by interdependent selves, we do not wish to imply that independent selves are immune from any self-threat. To the contrary, previous work strongly suggests that independent selves tend to experience a strong threat to the self when positive qualities of one’s internal features such as abilities and personality traits are questioned (e.g., Campbell & Sedikides, 1999; Miller & Ross, 1975). Independent selves may well show an increased ERN under such conditions. Another type of threatening situation happens when individuals anticipate to be negatively evaluated by other people because of their membership in a stigmatized group. This state of stereotype threat (Steele, Spencer, & Aronson, 2002) may also produce an increased ERN. Future work addressing these possibilities might demonstrate that the magnitude of the ERN can be taken as a proxy of *threat-in-general* to the self.

Our finding can be located squarely at the intersection of social and cognitive neuroscience and cultural psychology. It therefore contributes to the emerging

interdisciplinary field of cultural neuroscience (Chiao, in press; Han & Northoff, 2008; Kitayama & Park, 2010; Kitayama & Uskul, 2011). Using various ERP components, including P300 (Lewis, Goto, & Kong, 2008) and N400 (Goto, Ando, Huang, Yee, & Lewis, 2010; Ishii et al., 2010), researchers have observed sizable cultural differences in brain responses. So far, however, much of this evidence is confined to contextual processing, with Asians shown to be more holistic in attention, as compared to European Americans. The present work provides novel evidence that the ERN can be used to identify cultural variations in social evaluative threats. Along with other recent ERP studies that show that face processing is modulated by the motivational significance of the face (Grasso, Moser, Dozier, & Simons, 2009), the present work suggests that culture plays a significant role in regulating one's vigilance for social threats from the very beginning of stimulus processing.

Table 4.1 20-item self-construal scale used in Study 4

Independence	
1.	I always try to have my own opinions. (T)
2.	I am comfortable with being singled out for praise or rewards. (S)
3.	The best decisions for me are the ones I made by myself. (T)
4.	In general I make my own decisions. (T)
5.	I act the same way no matter whom I am with. (S)
6.	I am not concerned if my ideas or behavior are different from those of other people. (T)
7.	I always express my opinions clearly. (T)
8.	Being able to take care of myself is a primary concern for me. (T)
9.	I enjoy being unique and different from others in many respects. (S)
10.	I do my own thing, regardless of what others think. (S)
Interdependence	
11.	I am concerned about what people think of me. (T)
12.	In my own personal relationships I am concerned about the other person's status compared to me and the nature of our relationship. (T)
13.	I think it is important to keep good relations among one's acquaintances. (T)
14.	I avoid having conflicts with members of my group. (T)
15.	When my opinion is in conflict with that of another person's, I often accept the other opinion. (T)
16.	I respect people who are modest about themselves. (S)
17.	I will sacrifice my self-interest for the benefit of the group I am in. (S)
18.	I often have the feeling that my relationships with others are more important than my own accomplishment. (S)
19.	I feel my fate is intertwined with the fate of those around me. (S)
20.	Depending on the situation and the people that are present, I will sometimes change my attitude and behavior. (T)

Note. The self-construal scale was composed of selected items from the Singelis self-construal scale (S; 1994) and the Takata's scale (T; 1999). The scale has 10 items measuring independence (4 from the Singelis scale and 6 from the Takata's scale) and 10 items measuring interdependence (4 from the Singelis scale and 6 from the Takata's scale). We added items from the Takata's scale to assess social anxiety that is not covered by items in the Singelis scale.

Figure 4.1 ERN (error-related negativity) and CRN (correct-response negativity) waveforms at FCz (A: European Americans, C: Asians) and topographic maps of the ERN peak (error-correct difference) at 30-40ms after the response (B: European Americans, D: Asians) in Study 4. In the topographic maps, blue colors represent regions of greater negativity. This view shows the top of the head, with the nose pointing upward. The scalp maximum of the ERN occurs at the FCz electrode, indicated by the white cross.

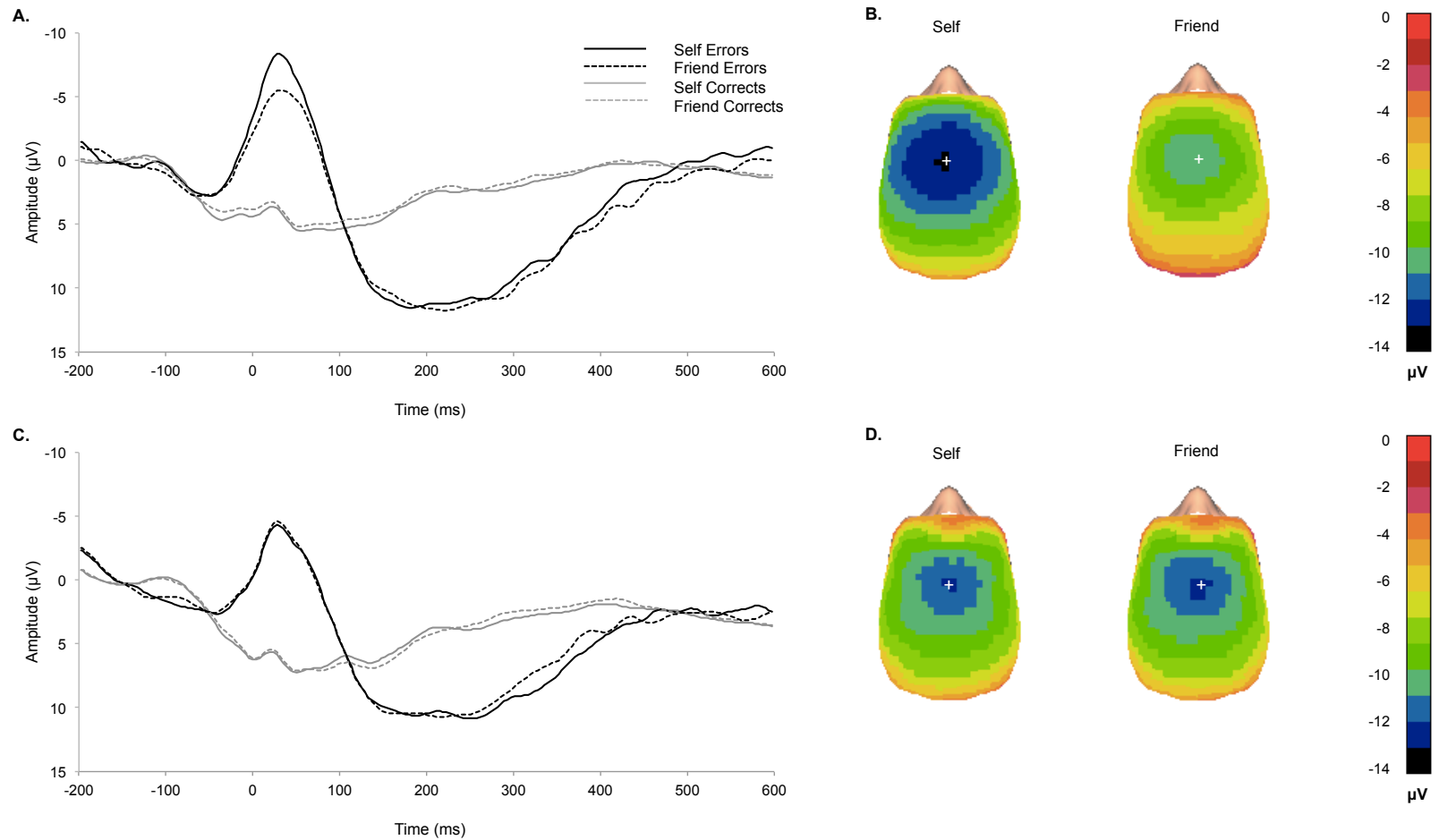


Figure 4.2 ERN-CRN amplitude (A) and post-error slowing (B) in the self-condition and in the friend-condition for European Americans and Asians in Study 4.

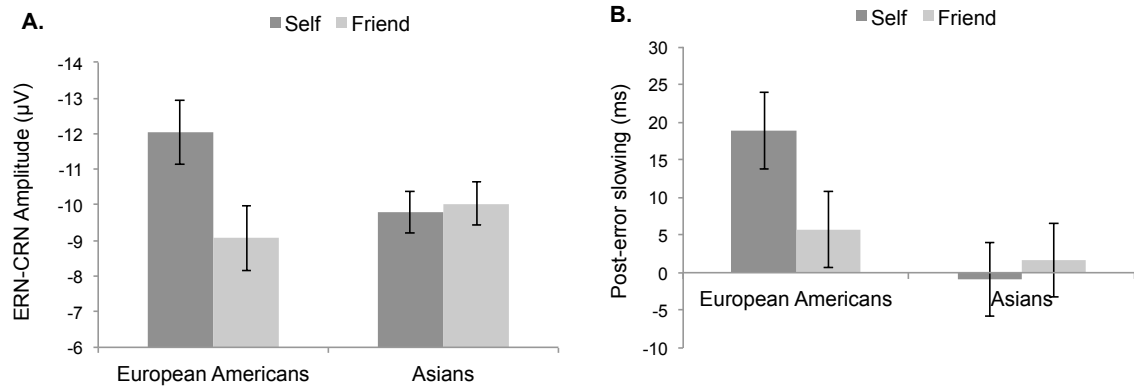


Figure 4.3 The scatterplots with the interdependent self-construal on the X-axis and the self-centric effects (A: ERN-CRN, B: post-error slowing) on the Y-axis in Study 4.

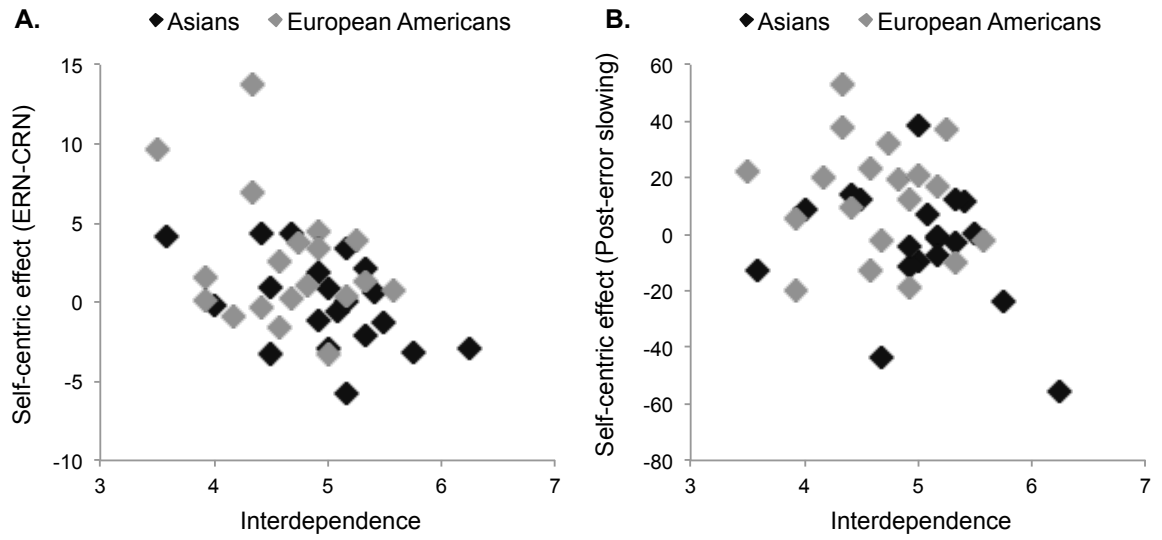


Figure 4.4 (A) Sample face, scrambled face, and house image. (B) Schematic diagram illustrating sample stimuli used in Study 5.

A.



B.

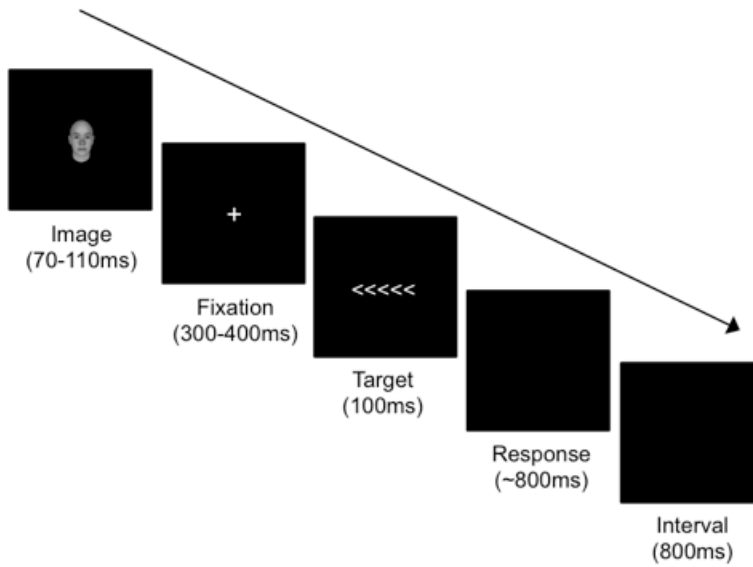


Figure 4.5 The scatterplots with the interdependent (vs. independent) self-construal on the X-axis and the face priming effect (A: accuracy, B: ERN) on the Y-axis in Study 5.

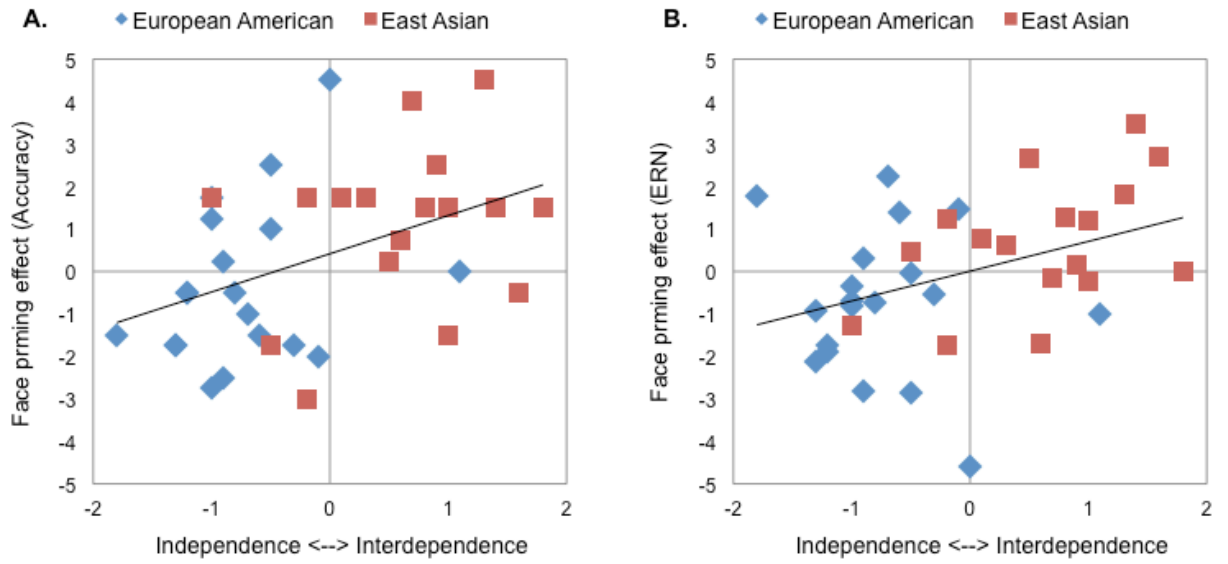
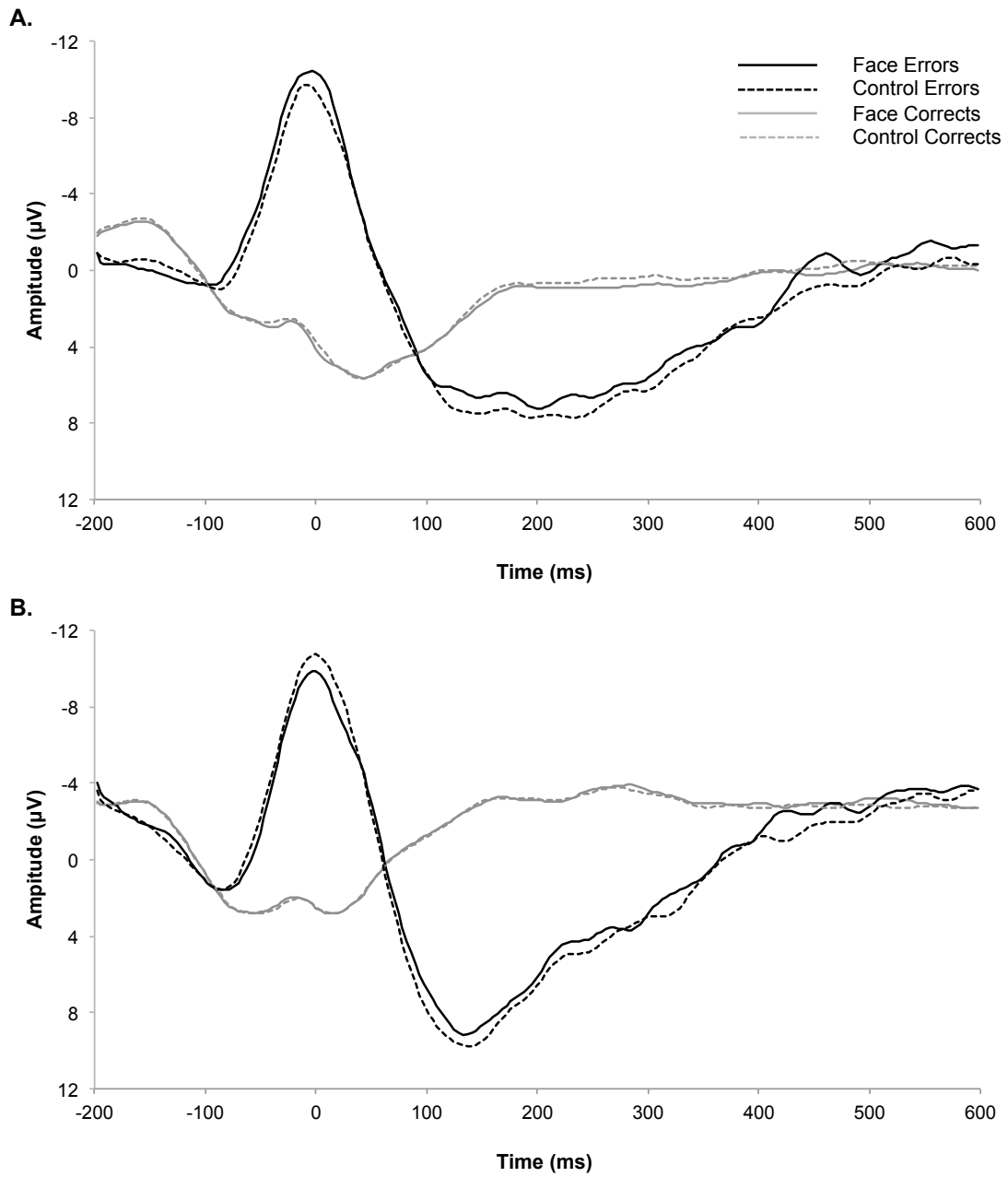


Figure 4.6 ERN (error-related negativity) and CRN (correct-response negativity) waveforms at FCz for East Asians (A) and European Americans (B) in Study 5.



CHAPTER V

Conclusion

Over the last two decades, substantial progress has been made in examining cultural differences in a variety of psychological processes. It has been suggested that these processes are shaped by culturally specific tools, customs and practices, and tasks that are integrated into coherent themes and values such as independence or interdependence (for a review, see Kitayama & Uskul, 2011). This dissertation sought to extend the current literature in cross-cultural psychology by examining the cognitive, emotional, and motivational processes associated with independence or interdependence by comparing Western and East Asian cultures. Furthermore, in order to understand the mechanisms of the interaction between culture and the mind, some neural underpinnings of cultural variations were explored. In pursuing these goals, I used an integrative approach that incorporates methods from multiple levels of analysis, including behavioral tasks (in Chapter II), surveys (in Chapter III), and neuroscience methodology (in Chapter IV).

Chapter II explored cultural differences in implicit attitudes toward independence or interdependence. The Implicit Association Test (IAT) has been utilized extensively as a primary means to assess implicit attitudes (Greenwald et al., 1998; Greenwald et al., 2009). However, it has not yet been employed in research on independence and interdependence. To address this issue, in Study 1, I used a modified IAT to assess

individuals' implicit value endorsement of independence (vs. interdependence). As predicted, Americans held more favorable implicit attitudes toward independence (vs. interdependence) relative to Japanese. Furthermore, Americans were relatively more independent than Japanese on three additional implicit measures. In contrast to the implicit measures, however, the results from two explicit measures of independence and interdependence were anomalous at best. This pattern of data provides converging evidence for the cultural task analysis that cultural difference is especially strong when implicit (vs. explicit) psychological tendencies of independence (vs. interdependence) are tested (Imada & Kitayama, 2009; Kitayama et al., 2009).

In Chapter III, I conducted two studies to test cultural variation in emotional processes. Study 2 examined whether the linkage between social status and anger expression was moderated by culture. In doing so, I focused on two distinct functions of anger. Whereas people sometimes express anger to vent their frustration, they often express it to display their social status, power, and dominance. While both aspects of anger are observed in almost every culture, their salience or significance can vary as a function of culture, depending on the nature of the self (independence vs. interdependence) that is sanctioned in each culture. In independent cultures, where personal goals are self-defining, people may tend to express anger to vent their frustration, while in interdependent cultures, where social hierarchy and roles are self-defining, people may tend to express anger to display dominance and power over others. As one's social standing becomes higher, one is likely to experience frustration less while displaying dominance more. In accordance with this analysis, I found that Americans reportedly expressed anger more frequently when they perceived themselves to be lower

in ranking within their community, while Japanese reportedly expressed anger more frequently when they had higher (vs. lower) objective social status. Furthermore, the effect of social status on anger expression was significantly mediated by self-reported feelings of frustration for Americans and decision authority for Japanese.

Study 3 explored the boundary conditions under which receipt of social support is most beneficial. Bolger and Amarel (2007) surprisingly argued that perceived receipt of social support brings about little benefit to health and adjustment. Study 3 presented a rather nuanced explanation of this issue. American data showed that the association between social support and health was negligible, thereby providing strong evidence for Bolger and Amarel's claim. In contrast, the association between perceived receipt of social support and health and wellbeing was significantly positive among Japanese (from a support-approving culture) under some specific conditions, especially when the person at issue was concurrently experiencing life difficulties (support-requiring situational factor) and relatively low neuroticism (support-accepting personal styles). This supports the argument that the interdependent values of Japan mitigate the emotional costs of receiving support, especially when the person has legitimate reasons for receiving support and is non-neurotic.

Chapter IV sought to explore the neural bases of cultural variation in motivational processes. In particular, Study 4 identified a neural substrate of the motivational force towards self-interest (i.e., self-centric motivation or SCM). Both European American and Asian participants performed a flanker task to increase reward points for themselves or their close friend. European Americans were more strongly motivated to perform the task well when it was relevant to the interest of the self than when it was relevant to the

interest of their friend. As a consequence, in the self-condition, they showed greater neural response to errors (as reflected in the greater ERN amplitude) and used these errors to improve their future performance (as reflected in the greater post-error slowing). It is noteworthy that such strong self-centric effects appeared in the ERN and in post-error slowing (but not in self-report measures), which tend to occur automatically and unconsciously, thereby suggesting the primacy and robustness of the SCM. To the contrary, there was no such effect of self-centric motivation among Asians, consistent with prior cross-cultural work that self-serving biases are much weaker in Asian cultures.

Finally, Study 5 explored a neural substrate of social evaluative threat and its influence on task vigilance. As a trigger of social evaluative threat, I presented an image of a human face while both European American and Asian participants performed a flanker task. Such a face image was hypothesized to evoke a strong social evaluative concern, especially for those who are interdependently oriented. As predicted, interdependent individuals showed enhanced vigilance for their task performance when primed with faces. They monitored their performance more closely (as revealed in the enhanced ERN amplitude) and improved their behavioral task performance (as revealed in higher accuracy) under the social evaluative threat in the face priming condition. Also, as predicted by the hypothesis that Asians are more interdependent than European Americans, the face priming effects were much stronger for Asians than for European Americans on both the ERN and accuracy.

Implications and Future Directions

Taken together, the findings in these studies clearly show that the cultural model of the self as independent or interdependent shapes variations in cognitive (Study 1),

emotional (Studies 2 & 3), and motivational processes (Studies 4 & 5). Cultural differences were pronounced not only in behavioral tendencies and self-reports, but also in neural responses. Next, I discuss important implications stemming from these findings.

Culture and cognition. Chapter II provides support for the cultural task analysis, which suggests that active engagement in selected cultural tasks makes associated psychological tendencies habitual and implicit. This process may, in turn, eventually influence underlying brain mechanisms (Schwartz & Begley, 2003). In fact, recent work on neural plasticity and epigenesis (Gunnar, Morison, Chisholm, & Schuder, 2001; Meaney & Syzf, 2005; Suomi, 1999) has suggested that non-genetic, environmental factors, such as repeated practice for acquiring a certain skill (e.g., abacus use), can lead to dramatic changes in the neural connectivity of the brain or even gene expression. This emerging literature underscores the significance of cultural rituals – repeated engagement in cultural tasks of independence or interdependence – in neural development. Therefore, future research will benefit from exploring whether the Study 1 findings on the behavioral measures of implicit independence (vs. interdependence) extend to the brain pathways involved in implicit attitudes (e.g., Chee, Sriram, Soon, & Lee, 2000).

Study 1 also showed that there is little coherence among implicit measures of independence (vs. interdependence). This finding is consistent with Kitayama et al. (2009) and Na et al. (2010). It also supports the cultural task analysis that individuals differ substantially in the specific cultural tasks they select to attain their cultural mandate, although all the members of one culture share their deep commitment to that mandate. Figure 2.1 illustrates this point by suggesting that individuals develop very distinctive profiles of independence (vs. interdependence) based on the specific cultural tasks they

select and pursue throughout their lives. Such a distinctive individual profile of independence, which is expected to vary across individuals but to be stable across time, can serve as a meaningful signature of the person's cultural orientation (see Mischel & Shoda, 1995, for similar discussions). Future work should add more idiographic approaches to this area of research to investigate the specific profiles of independence or interdependence individuals acquire through socialization and how this cultural acquisition is related to the development of social and personal identities.

Culture and emotion. Study 2 showed that anger expression either increases or decreases as a function of social status across cultures. Although cultural psychologists have become increasingly interested in within-cultural variations such as social status, regional variation, and demographic variables (Grossmann & Varnum, 2011; Kraus et al., 2010; Stephens et al., 2007; Uskul, Kitayama, & Nisbett, 2008; Varnum & Kitayama, 2011), there has been little consideration of whether these factors have similar or different effects across cultures. Study 2 showed that the direction of the relationship between social status and anger expression is moderated significantly by culture, thereby underscoring the importance of the function of social status under the rubric of macro-social conditions such as culture.

Study 2 also demonstrated that there is a substantial cross-cultural difference in the aspect of social status that is most effective in a given culture. Social hierarchy matters for both Americans and Japanese. Anger expression was negatively linked to social status among Americans, while it was positively linked to social status among Japanese. But, the social status-anger expression linkage was particularly strong when social status was assessed with a subjective measure for Americans (e.g., in terms of how

people perceive their relative standing in a community), while the social status-anger expression linkage was more pronounced when social status was assessed with an objective measure for Japanese (e.g., in terms of educational attainment or occupational status) (see also Curhan et al., 2012 for similar observations). This finding is consistent with previous cross-cultural observations demonstrating the importance of subjectivity (vs. objectivity) in Western (vs. Asian) cultures (e.g., Cohen et al., 2007; Suh et al., 1998). Future work should explore the origin of the cultural difference in the relative emphasis on subjective vs. objective social status.

In Study 3, I found that the association between support and health was most strongly evident among Japanese (from a support-approving cultural context), who reported high life stress (in a support justifying situation), especially when they were low in neuroticism. This finding underscores the importance of examining the dynamic interplay among culture, situation, and personality to better understand how socio-cultural environments shape psychological tendencies.

Culture and motivation. Studies 4 and 5 examined research questions at the intersection of cultural psychology and social and affective neuroscience. It has been amply demonstrated that brain processes are shaped by repeated engagement in certain scripted behaviors, cultural tools, or practices (e.g., Dehaene & Cohen, 1995; Dehaene, Spelke, Pinel, Stanescu, & Tsivkin, 1999; Maguire et al., 2000; Tang et al., 2006). It has also become increasingly clear that social-cultural environments mold such experiences, cultural tools, and practices. Despite this, there has been little effort to integrate research on “culture” and “the brain” into both the fields of neuroscience and cultural psychology. As part of this effort, I conducted two ERP studies to explore the neural bases underlying

cultural variation in self-serving bias and social evaluative threat. With ERPs, which have extremely high temporal resolution, I found that cultural modulation was evident in both phenomena in a very early stage of information processing, thereby suggesting the primacy and robustness of cultural modulation. Specifically, I assessed error-related negativity (ERN), which occurs only 50-100ms after an error is made, as an indicator of motivational significance (in Study 4) and threat response (in Study 5). With traditional behavioral measures such as reaction time, recall, or self-report, it is almost impossible to detect these cultural modulations that take place so early in information processing.

In particular, Study 4 suggests the existence of a strong motivational force underlying self-serving bias. Future research can directly test this idea by administering several existing measures of self-serving bias to validate whether the ERN-based marker of self-centric motivation predicts these measures. Another interesting avenue of research would be to examine the long-term consequences of self-centric motivation. Is it healthy to have strong self-centric motivation, especially in the context of close relationships? One interesting way to address this issue would be to examine the consequences of self-centric motivation on marital satisfaction and relational wellbeing among couples.

In Study 5, I reasoned that for those with interdependent selves, social eyes are self-threatening because they evoke social evaluative concerns. Because of the threat, people increase vigilance to their own errors in a task at hand. According to this analysis, the ERN was used as a proxy for perceived self-threat. This of course is not to say that cognitive functions of conflict monitoring and error detection, which are often ascribed to ERN (Botvinick et al, 2001; Yeung et al., 2004), are unimportant. To the contrary, affective and motivational processes are likely to intensify such cognitive functions that

do exist (Hajcak, 2012; Inzlicht & Al-Khindi, in press; Kitayama & Park, 2012; Weinberg et al., in press). Future work should more closely examine interactions between the cognitive and the affective or motivational functions of the ERN to achieve a better understanding of mechanisms underlying error processing.

Summary. Researchers have documented that many psychological findings are limited to people from Western, Industrial, Educated, Rich, and Democratic (or WEIRD) societies (Henrich et al., 2010). This dissertation suggests that there are substantial cross-cultural differences in a variety of psychological tendencies including implicit attitudes, anger expression, benefits of social support, the primacy of self-interest, and sensitivity to social evaluative threat. Most of the findings in this research, however, come from comparisons between American and Asian cultures. Although these comparisons are informative and useful, the field should now be pushed forward in different directions by comparing other cultural groups (e.g., Western Europe vs. South East Asian countries), regions (American West vs. East), socioeconomic groups (education or occupational prestige), or demographic groups (e.g., age or gender).

Concluding Remarks

The present research adopts established theoretical frameworks of cultural psychology as its starting point, but builds on them by testing previously unexplored questions in each of three domains of psychological experiences – cognition, emotion, and motivation. I suggest that the integrative consideration of the effects of culture on these three disparate domains can provide a more complete and nuanced understanding of how culture shapes human psychology. Furthermore, my exploration of the neural bases of cultural variation in motivational processes will be helpful in exploring the nature of

cultural modulation. Is culture no more than a superficial overlay on the human mind, or is it a critical environmental influence that actually changes brain pathways? I hope that my attempt to elucidate the interplay between culture, mind and the brain will provide a useful initial step for this endeavor.

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