

## **Cultural Experiences, Social Ties, and Stress: Focusing on the HPA Axis**

*Shu-wen Wang and Belinda Campos*

Human beings are social animals, existing in webs of interpersonal connections that shape their experiences and influence their physical and mental health. Relatedness, or feeling belongingness or connectedness with others, has been described as a basic psychological need (Ryan & Deci, 2000), and social relationships across multiple contexts have been examined in terms of their impact on social, psychological, and physiological functioning. The sensitivity of the hypothalamic-pituitary-adrenal (HPA) axis, and its end product cortisol, to social experiences makes it an ideal biomarker for studying cultural influences on interpersonal processes and stress physiology. This is especially true since the norms, beliefs, and practices surrounding social behavior are shaped by the cultural context in which they are embedded, with implications for health and well-being (Soto, Chentsova-Dutton, & Lee, 2013). This chapter will review the state of the literature examining how culture – broadly defined as shared systems of values, norms, behaviors, and products that shape the mind and the brain in a cycle of mutual constitution (Markus & Kitayama, 1991, 2010; Ryder, Ban, & Chentsova-Dutton, 2011) – modulates the connection between social experiences, emotion regulation, and the HPA axis. We also extend recommendations for the field on how better to tap the potential in studying the cultural shaping of socio-emotional experiences and their links with the HPA axis.

## **The HPA Axis and the “Stress Hormone” Cortisol**

The HPA axis is one of the body’s key stress regulatory systems, whose activation culminates in the release of the hormone cortisol (Lovallo & Thomas, 2000). When the brain detects a threat or a challenge, or is otherwise under stress, the hypothalamus produces corticotropin-releasing hormone (CRH), which triggers the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary, which stimulates the adrenal cortex to secrete glucocorticoids, primarily cortisol in humans, into the bloodstream. Glucocorticoids play an inhibitory role that signals the body to shut down the stress response. This cascade of effects comprises a system that supports a wide range of normal physiological functions, such as helping the body to maintain homeostasis, growth, and reproductive function, and is also involved in regulating other vital systems, including the immune and cardiovascular systems (Lovallo & Thomas, 2000; Sapolsky, Romero, & Munck, 2000; Saxbe, 2008).

The HPA axis has attracted particular interest amongst researchers because of its role as a “mobilizer” of energy resources to meet the short-term metabolic demands of stress and the health implications of system dysregulation. HPA-axis dysregulation, whether through chronic hyperactivity or hyporeactivity, is associated with a host of negative health effects, including hypertension, cardiovascular disease, dysregulations in inflammatory and immune processes, and deficits in cognitive and emotional functioning (Sapolsky et al., 2000). The allostatic-load model (McEwen, 1998) posits that repeated stressful experiences can lead to an accumulation of physiological “hits” that cause wear and tear on the body’s self-regulatory systems. Dysregulation of the HPA axis is considered to be an indicator of allostatic load resulting from chronic overactivation of the stress system (McEwen, 1998). Thus, cortisol – as the hormonal end product of the HPA axis – has attracted substantial attention as a biomarker for subjective and objective stress, and as a potential mediator between stressful experiences and physical health outcomes (Saxbe, 2008).

### **The HPA Axis and Its Sensitivity to Social Experience**

Researchers have wondered whether the HPA axis is more sensitive to certain kinds of stressful experiences. The answer is a definite yes. A meta-analysis of 208 laboratory studies of acute psychological stressors concluded that tasks containing social-evaluative threat (i.e., an important aspect of the self is or could be negatively judged by others), especially

under uncontrollable conditions (when participants feel they cannot escape negative consequences), were associated with the largest cortisol changes (Dickerson & Kemeny, 2004). Evidence from naturalistic daily studies on social experiences also shows that indicators of poorer relationship quality are linked with dysregulated cortisol functioning (Adam & Gunnar, 2001; Barnett, Steptoe, & Gareis, 2005; Slatcher, Robles, Repetti, & Fellows, 2010). While negative social experiences, such as social evaluation or conflict, may be studied as sources of threat or stress, there is also a large literature showing that positive social experiences – such as social support – can have a range of direct beneficial effects, as well as protecting against the deleterious effects that stress can have on health and well-being (Cohen, 2004; Hennessy, Kaiser, & Sachser, 2009; Seeman, 1996; Taylor, 2007). For example, greater perceptions of overall support (Abercrombie, Giese-Davis, Sephton, Epel, Turner-Cobb, & Spiegel, 2004; Sjögren, Leanderson, & Kristenson, 2006) and higher ratings of relationship satisfaction (Saxbe, Repetti, & Nishina, 2008; Vedhara, Tuinstra, Miles, Sanderman, & Ranchor, 2006) predict more favorable diurnal cortisol rhythms, with further evidence that being in a more satisfying relationship (Saxbe et al., 2008) and perceiving (Burton, Bonanno, & Hatzenbuehler, 2014) or actually receiving (Ditzen, Hoppmann, & Klumb, 2008; Kirschbaum, Klauer, Filipp, & Hellhammer, 1995) more social support reduces cortisol responding to stressors, in the form of both acute reactivity to laboratory stressors and diurnal cortisol slopes.

### **Cortisol Parameters**

While several parameters are used in cortisol studies, we highlight two general approaches in this review. First, short-term cortisol reactivity in response to acute laboratory stressors permits the study of stress responding in a controlled setting where the nature of the stressor is clearly identifiable (Dickerson & Kemeny, 2004). The cortisol reactivity variable is typically calculated as a change score between a baseline measure and a post-stressor measure of cortisol, and cortisol recovery variables can similarly be calculated with subsequent assessment timepoints after the stressor. One of the most widely used and best-researched laboratory stressor paradigms is the Trier Social Stress Test (TSST; Frisch, Hausser, & Mojzisch, 2015; Kirschbaum, Pirke, & Hellhammer, 1993), which involves mental arithmetic and speech tasks in front of an unresponsive audience (i.e., under social-evaluative threat), a situation that has reliably been shown to trigger cortisol and psychological stress responses (Dickerson &

Kemeny, 2004). Research employing the TSST has examined how specific social variables buffer the neuroendocrine stress reaction in response to social-evaluative threat (Frisch et al., 2015). In this line of questioning the cortisol response to the TSST is the main dependent variable, as researchers examine the kinds of factors (e.g., sex, culture, social support, personality) that moderate the stress–cortisol association.

Second, basal cortisol rhythms provide a naturalistic perspective on HPA-axis functioning in everyday life. Cortisol is released in a diurnal rhythm, peaking within the first hour of awakening, declining steeply over the morning hours, and then gradually tapering off in the afternoon and evening before reaching its night-time low (Saxbe, 2008). According to the allostatic load model (McEwen, 1998), steeper diurnal slopes represent more favorable HPA-axis functioning, and blunted or flattened diurnal slopes, typically due to a sustained elevation in cortisol, reflect dysregulated HPA-axis functioning linked with chronic stress (Miller, Chen, & Zhou, 2007; Saxbe, 2008). Consequently, steeper diurnal slopes are generally associated with better psychosocial functioning, whereas flatter slopes are linked with poorer relationship functioning, and worse mental and physical health (see, e.g., Bhattacharyya, Molloy, & Steptoe, 2008; Miller et al., 2007; Sephton, Sapolsky, Kraemer, & Spiegel, 2000; Sjögren, et al., 2006). Researchers sometimes focus just on the cortisol awakening response (CAR), the rapid rise shown by salivary cortisol within the first 30–45 minutes after waking (Pruessner, Kirschbaum, & Hellhammer, 1995). According to the “boost hypothesis” (Adam, Hawkley, Kudielka, & Cacioppo, 2006), the CAR signals an adaptive effort to cope with the day’s anticipated challenges; thus, a larger-than-average or a smaller-than-average CAR may reflect poor adaptation to chronic stress (Saxbe, 2008). Researchers also sometimes derive an area-under-the-curve (AUC) parameter based on multiple timepoints of daily cortisol levels that reflects the total amount of daily circulating cortisol (Saxbe, 2008). These various cortisol parameters provide different glimpses into the naturally occurring associations between chronic levels of stress and basal cortisol profiles, as well as moderating factors that influence those links. The selection of the parameter impacts what “view” of that process is obtained.

## **The Broad Reach of Culture and Ethnicity: Key Constructs and Why Culture Matters**

Culture and ethnicity are central to shaping social experience, including the social experiences to which the HPA axis system is responsive. Among

laypeople and researchers alike, there is often confusion over the degree to which culture and ethnicity are distinct, overlapping, or interchangeable constructs. Although the answer may depend on the specific context in question, culture and ethnicity are best thought of as distinct constructs that can have overlap. Culture includes the knowledge acquired through social learning that equips an individual to proficiently navigate the rules, norms, and expectations of their society (Dressler, 2004; Heine, 2012). Ethnicity is one's membership in a coherent social group that shares a name and often, but not always, language, food and celebration traditions, and historical memories. Members of ethnic groups often share socially learned worldviews that reflect real or perceived common culture. For this reason, ethnicity captures elements of culture, and thus is frequently used by researchers as a surrogate for culture. However, the use of demographic variables, such as ethnicity and associated pan-ethnic labels, as sole proxies for culture has been criticized by scholars who note problems, such as construct validity and assumptions of homogeneity within groups (DiPietro & Bursik, 2012; Priem, Lyon, & Dess, 1999). Thus, culture variables and measures of cultural constructs that aim to promote an understanding of experience, worldview, or belief are often considered to have greater utility than group membership.

One of the powerful roles that culture plays in human life is in shaping the social environment that people experience. Cultural practices, actions that reflect agreed-upon social knowledge, are embedded in every aspect of our social environments. For example, in some cultures people share physical space with others: they may co-sleep with their infants and live in households that include parents, children and extended family members (e.g., Campos & Kim, in press; Markus & Kitayama, 1991). In other cultures, people may prepare separate bedrooms for their infants before they are born and prefer nuclear family households. In either context, people typically feel that their own practices are normal and desirable ways to organize their lives. Engaging in these practices further reinforces those beliefs. Overall, our expectations of how people *should* be are cultural, and reflect, shape, and reinforce socially learned views of what is valued and normal. In turn, these expectations become the map that guides our social interactions, the emotions we feel, our relationship experiences and our responses to stressors.

Cultural psychology has produced two prominent theoretical frameworks that have been used to examine the cultural influences on social ties and emotion process that are relevant to social functioning. The first of these, individualism–collectivism, describes a cultural orientation broadly characteristic of a group of people that is reflected in a pattern of shared

attitudes, beliefs, norms, and values (Hofstede, 1980; Schweder & Bourne, 1984; Triandis, 1995). While individualistic cultures define the self as independent and autonomous, with personal goals taking priority over the goals of collectives, collectivistic cultures view the self as one aspect of a larger social unit in which personal goals are subordinated to the goals of the larger group. Similarly, the second cultural framework of independent–interdependent construals of the self (that is, how an individual views the self or how the self is subjectively organized; Markus & Kitayama, 1991, 2010) also depicts two divergent approaches to understanding human social relationships. Independent self-construals represent the self as distinct, autonomous and self-contained, motivated primarily to express and assert its own internal attributes (i.e., attitudes, traits, and preferences), which are considered unique and fixed. Interdependent self-construals, on the other hand, interpret the self primarily as a participant in a larger social unit. While the “self in relation to specific others” also has internal attributes, these attributes are thought to be context-dependent, and thus subject to regulation in the service of adjusting and accommodating to others (Markus & Kitayama, 1991: 227). Thus, the individualism–collectivism and independence–interdependence constructs reflect human variation in the degree to which people see themselves as being *separate* from or *connected* with others. While researchers have often worked on the broad assumption from early studies (e.g., Hofstede, 1980) that individualism characterizes Western, English-speaking, industrialized cultures (e.g., the US, Canada, the UK, Australia) and collectivism characterizes the remaining majority of the world’s population, the distinctions are sometimes murky and there is great nuance and complexity in the individualism–collectivism literature. Scholars have called for a conceptual refinement of individualism–collectivism that allows for a more dynamic and developmentally informed view of those constructs that uses better measurement methods (Causadias, 2013), and indeed, while ethnic minority groups in the US are often broadly painted as collectivistic, a meta-analysis of cross-national and within-US differences has found that ethnic minority groups are not uniformly more collectivistic than European-American majority groups, and nor are European Americans necessarily more individualistic than all ethnic minorities (Oyserman, Coon, & Kimmelmeier, 2002).

Nevertheless, it is this separateness-or-connection distinction that arguably most shapes social ties, and subsequently their links with the HPA axis. Emotion regulation processes, particularly as they pertain to how emotions are perceived and regulated in social settings, are also germane to social functioning. The primacy of family and social relationships

is reflected in their various incarnations across different cultural groups. Differentially termed *familism* (among Latinos), *communalism* (among African Americans and Caribbean Blacks), and *filial piety* (among Asians), these constructs have been found to load onto a common collectivistic factor that prioritizes social relations (Schwartz, Weisskirch et al., 2010). Indeed, the importance given to the social unit versus the individual as the primary organizing factor for psychological processes governs human social behavior in nuanced and multifaceted ways. This cascade of cultural effects on social processes can lead to profound differences in health outcomes. For example, the associations of familism (or familialism) with greater social support and lower stress were significantly stronger among pregnant Latinas than among pregnant European Americans, and this greater social support predicted higher infant birth weight specifically for the children of foreign-born Latinas, a group for whom familism is very highly endorsed (Campos et al., 2008).

Although we may speak about normative individualistic and collectivistic cultural scripts for social ties and behavior, recognition is growing of the diversity and nuance in those scripts even within their larger cultural frameworks. Campos and Kim (in press) describe culture as a multilevel construct that captures broad distinctions at the most fundamental level (e.g., individualism–collectivism), then branches out into more precise components applied in differing constellations (or *cultural packages*) that are specific to certain cultural contexts. For example, Campos and Kim delineate two distinct forms of collectivism that govern East Asian and Latino cultural contexts: *harmony collectivism* in East Asian cultures – a priority on preventing potential social ruptures and conflict and preserving social harmony through the control of emotion expression and behavior – and *convivial collectivism* in Latino cultures, in which interdependent relationships are established through positive emotion expression, warmth, and polite behavior, which contribute to smooth and pleasant social interaction. Relatedly, research on Eastern Europeans has identified a form of *practical interdependence* in which face concerns and social harmony are de-emphasized, but mutual responsibility for solving problems is heightened (Chentsova-Dutton & Vaughn, 2012; Michailova & Hutchings, 2006). In this context, problem-focused advice giving is interpreted as very supportive, regardless of whether the advice was solicited (versus unsolicited or imposed), a finding that differs from the negative effects of threat to personal autonomy conferred by unsolicited support in European-American samples (Chentsova-Dutton, 2012; Chentsova-Dutton & Vaughn, 2012). Thus, even within cultural contexts broadly construed as collectivistic,

different cultural packages shape the values, beliefs, and social practices that determine what specific kinds of social interactions are experienced as positive and helpful in particular cultural settings.

## **Culture and the HPA Axis**

There is a limited, but quickly growing, body of work that examines the links between various aspects or operationalizations of culture and the HPA axis.

### **Acculturation**

One of the few areas in which the links of cultural processes with HPA axis activity have been studied is in the context of people who are adapting from one cultural context to another. This process of adaptation, termed acculturation, has long been thought to have implications for health (e.g., Schwartz, Unger, Zamboanga, & Szapocznik, 2010), and more recently for physiological processes implicated in health (Mangold, Mintz, Javors, & Marino, 2012; Nicholson, Miller, Schwertz, & Sorokin, 2013). At least two studies have examined the extent to which the acculturative process itself is a stressor that may lead to the dysregulation of the HPA axis. For example, Mangold and colleagues (2012) examined the association of US acculturation, measured by self-reported comfort with the English language and with English-language music, books, and television, as well as with English-speaking European-American friends, with the cortisol awakening response (CAR). They found that a higher level of acculturation to the US was associated with an attenuated CAR in a sample of Mexican-descent adults (18–38 age range). The CAR was most strongly attenuated among the participants who were both highly US-accultured and high in neuroticism, a personality trait characterized by sensitivity to stress. Similarly, Nicholson and colleagues (2013) examined the association of US acculturation, as indexed by comfort with the English language, in a sample of husbands and wives (44–78 age range) who had migrated to the US from the former Soviet Union. Unlike Mangold and colleagues (2012), Nicholson and colleagues (2013) found no association of acculturation with the CAR. However, Nicholson and colleagues (2013) did find that higher US acculturation was associated with higher levels of daily circulating cortisol (area-under-the-curve derived from four samples taken on one weekday) in women but not in men.



## **Ethnicity**

Because ethnicity is often used by researchers as a surrogate for culture, the link of ethnicity with HPA-axis activity may have implications for cultural variation. At least three studies have sought to examine ethnic variation in diurnal cortisol (Cohen et al., 2006; DeSantis et al., 2007; Karlamangla, Friedman, Seeman, Stawksi, & Almeida, 2013). The study by DeSantis and colleagues (2007) sampled young people of African-American, Latino-American, Asian-American, European-American, and multiracial backgrounds (16–18 age range) and found that African-American and Latino-American youth, but not Asian-American youth, had flatter slopes across their waking days than their European-American counterparts. This pattern is consistent with that found for the African-American samples of the other two studies (Cohen et al., 2006; Karlamangla et al., 2013), but the sample in DeSantis and colleagues (2007) was more diverse. However, scholars should be cautious about interpreting these findings as indicative of cultural processes. Culture and ethnicity can overlap, but when a particular feature of culture is not specifically measured ethnic variation may reflect other processes. These include culture- or ethnicity-related intergroup processes (stereotype threat, marginalized ethnic identities) or societal and structural inequalities that adversely affect ethnic minorities, which are addressed in other chapters of this book (e.g., chapter 9, Doan and Evans on culture and poverty, and chapter 12, Ong, Deshpande, and Williams on the neurobiology of microaggressions). Indeed, other studies have found that the cortisol output of the HPA axis is responsive to the quality of intergroup interactions (Page-Gould, Mendoza-Denton, Alegre, & Siy, 2010; Page-Gould, Mendoza-Denton, & Tropp, 2008). Moreover, a key goal of studies that examine ethnic variation in diurnal cortisol rhythms has been to identify physiological pathways that might explain racial disparities in health outcomes.

### **“Other” Forms of Culture**

Importantly, however, culture is not constrained by ethnicity, and many forms of culture (e.g., religion, social class, regional cultures within a nation) are quite separate from ethnicity. Some of the work in this area has also found associations with the HPA axis. For example, research on a “culture of honor” in the American South has found that Southerners react with more angry emotion and elevated levels of cortisol and testosterone than Northerners in response to perceived insults and slights from a

research confederate in a laboratory setting (Cohen, Nisbett, Bowdle, & Schwarz, 1996). Socioeconomic status research has found that when a university's mission statement emphasized norms more consistent with the independent values reflected in the middle class (e.g., participating in independent research, expressing ideas and opinions) than with the interdependent values found in the working class (e.g., participating in collaborative research, connecting with students and faculty), first-generation students experienced greater increases in cortisol and showed more negative emotions during speeches they were asked to give about their college goals (Stephens, Townsend, Markus, & Phillips, 2012).

### **Cultural Shaping of the Links between Social Ties and the HPA Axis**

Most of the work on the cultural shaping of social ties has focused on social support as an interpersonal process, in which the provider communicates to the recipient that he or she is valued, cared for, and part of a reciprocal relationship (Cobb, 1976; Cohen & Wills, 1985). While research has widely documented the many relational and health benefits of social support (Cohen, 2004; Cohen & Wills, 1985; Seeman, 1996; Taylor, 2007), including links with steeper diurnal cortisol slopes and reduced reactivity to acute stressors (e.g., Abercrombie et al., 2004; Burton et al., 2014; Ditzen et al., 2008; Kirschbaum et al., 1995; Sjögren et al., 2006), a quickly growing body of research has now uncovered extensive cultural variation in the degree, nature, and effectiveness of the support that is preferentially used in different cultural settings (see Kim, Sherman, & Taylor, 2008, for a review). This includes cultural differences in whether social support is even viewed as a desired form of coping (Burlison & Mortenson, 2003; Mortenson, 2006; Taylor et al., 2004), the frequency, likelihood, and effectiveness of support use (Kim, Sherman, Ko, & Taylor, 2006; Taylor et al., 2004; Wang, Shih, Hu, Louie, & Lau, 2010), and the kinds of relationships that are preferentially accessed for support (Chang, Chen, & Alegria, 2014; Wang et al., 2010; Wang & Lau, 2015). Across studies, the cultural disincentive to mobilize support has been found for East Asian/Asian-American groups, who use support less and perceive support to be less helpful than do their European-American counterparts, a finding that has been attributed to relationship concerns such as group harmony (Chang, 2015; Kim et al., 2006; Taylor et al., 2004; Wang et al., 2010).

Fewer studies have directly examined cultural patterns in the association between social ties and cortisol activity. Some of these studies have

utilized the Trier Social Stress Test (TSST) to elicit a stress reaction in the laboratory (e.g., Wang & Lau, 2015). Much of the research is predicated on the notion of *cultural fit*, which posits that a match between an individual's own personal attitudes and behaviors and those of the culture in which they are embedded is linked with health and well-being (Soto et al., 2013). The primary assumption in this experimental research is that better cultural fit with an experimental condition mitigates an acute cortisol response to a stressor, but poorer fit is linked with greater cortisol reactivity. Other studies take the approach of using correlational designs to examine specific cultural moderator variables that are thought to modulate the association between support activation and stress responding (e.g., Holland, Thompson, Tzuang, & Gallagher-Thompson, 2010). The few studies that investigate cultural differences in the association between social experiences and cortisol activity are reviewed below and summarized in Table 13.1.

In an early study that adopted the TSST, Taylor, Welch, Kim, and Sherman (2007) examined cultural differences between European Americans and Asian Americans in cortisol and negative mood reactivity. Participants engaged in writing tasks that activated either implicit support (i.e., they were asked to reflect on valued social groups and their importance without disclosure of a problem), explicit support (i.e., they were asked to disclose a problem via a direct request for help), or no support. Researchers hypothesized that explicit support – the common operationalization of support – is a better cultural fit for individualistic cultures that foster independence, assertion, and self-expression in drawing upon relationships to get one's needs met, whereas implicit support presents a better cultural match for collectivistic cultures that encourage interdependence and the preservation of group harmony over personal needs (Taylor et al., 2007). Indeed, smaller cortisol and negative mood changes were found for European Americans activating explicit (rather than implicit) support, whereas Asian Americans experienced the protective benefits of implicit (versus explicit) support (Taylor et al., 2007).

Wang and Lau (2015) also examined cultural fit by investigating whether perceptions that relationships were characterized by mutual or non-mutual support could mitigate some of the stressfulness of explicit support activation. They reasoned that mutual support, characterized by the interdependent sharing of help and comfort between relationship partners, presented a better cultural fit for East Asians/Asian Americans by offsetting fears of disrupting group harmony and imposing a disproportional burden on relationships, whereas the mutuality or non-mutuality of support should not have as much influence on the experiences of European

**Table 13.1** Key published studies that examine culture, social ties and the HPA axis

Citation	Sample	Method/design	Key findings
<p>Campos et al. (2014), Study 2 (drawn from same dataset as Campos, et al. (under review))</p>	<p>37 Latinas and 22 non-Latina females</p>	<p>Examined neuroticism as a moderator on the between-subject associations between culture and stress responses to the Trier Social Stress Test. Nine salivary cortisol samples were taken over 90 minutes.</p>	<p>Neuroticism was generally associated with more blunted cortisol responding, but neuroticism predicted less blunted cortisol responding in Latinas than in non-Latinas.</p>
<p>Holland et al. (2010)</p>	<p>47 female Chinese-American caregivers of older dementia patients</p>	<p>The outcome variable includes cortisol responding over 90 minutes. Examined the associations of different sociocultural variables (belief in traditional Asian values, depression, perceived self-efficacy, coping strategies) with diurnal cortisol slopes. Three salivary cortisol samples (wake, 5pm, 9pm) collected on each of two days. The outcome variable includes diurnal cortisol slope.</p>	<p>Belief in traditional Asian values was the only variable found to buffer the effects of stress; caregivers who endorsed higher levels of traditional Asian values showed steeper diurnal cortisol slopes.</p>

Campos et al. (under review) (drawn from same dataset as Campos et al. (2014))	50 Latino males and females and 35 non-Latino males and females	Examined mediation and moderation with familism and perceived support in the between-subject associations between culture and stress responses to the Trier Social Stress Test. Nine salivary cortisol samples were taken over 90 minutes. The outcome variable includes cortisol responding over 90 minutes.	Familism buffered cortisol responding through its association with perceived support for Latinos (but not for non-Latinos).
Mangold et al. (2012)	59 Mexican-American males and females	Examined the association of acculturation and neuroticism on the cortisol awakening response. Four salivary cortisol samples were taken at awakening and 30, 45 and 60 minutes after awakening.	Higher US acculturation was associated with an attenuated CAR. Higher US acculturation and high neuroticism in interaction were associated with an attenuated CAR.
Nicholson et al. (2013)	68 husbands and 69 wives who had emigrated to the US from the former Soviet Union	Examined AUC derived from four salivary cortisol samples (wake, 40 minutes after wake, before lunch, before dinner) taken on one weekday.	There was no association of acculturation with the CAR. However, higher US acculturation was associated with higher levels of daily circulating cortisol in women but not in men.

(continued)

**Table 13.1** (Continued)

Citation	Sample	Method/design	Key findings
Taylor et al. (2007)	41 Asian/Asian-American males and females, and 40 European-American males and females	<p>Examined implicit and explicit support.</p> <p>2 (cultural groups) × 3 (social-support conditions) between-subject design using the Trier Social Stress Test.</p> <p>Three salivary cortisol samples were taken over 45 minutes.</p> <p>The dependent variables include cortisol reactivity, heart rate, blood pressure and psychological stress.</p>	<p>Asians/Asian Americans showed lower cortisol and psychological distress responses in the implicit support condition, whereas European Americans showed lower cortisol and psychological distress responses in the explicit support condition.</p>
Wang & Lau (2015)	41 Asian/Asian-American males and females, and 41 European-American males and females	<p>Examined mutual and non-mutual support.</p> <p>2 (cultural groups) × 2 (social-support conditions) between-subject design using the Trier Social Stress Test.</p> <p>Two salivary cortisol samples were taken at baseline and post stressor.</p> <p>The dependent variables include cortisol reactivity, psychological distress (negative mood) and observed anxious behavior.</p>	<p>Asians/Asian Americans in the mutual support condition showed lower cortisol, negative mood, and observed anxious-behavior responses, whereas European Americans showed either no difference or a beneficial response in the non-mutual support condition.</p>

Americans who are socialized to freely draw on their networks for help. Consistent findings across cortisol, negative mood, and behavioral indicators of stress reactivity supported this hypothesis, showing smaller amounts of reactivity for East Asians/Asian Americans in the mutual versus non-mutual support condition, but no differences for European Americans.

Studies have also moved beyond imaginal activations of social support in the laboratory via writing tasks to examining how different modes of social support in real-life friendship dyads may impact stress reactivity processes. Guan and colleagues (under review) investigated the effects of different formats of support (face-to-face, computer-mediated, or no support) on stress reactivity processes, using an ethnically diverse sample of young adult females; they found that self-reported independence, but not interdependence, moderated the effect of support format on cortisol reactivity. Specifically, those higher on independence had smaller cortisol reactivity scores for both formats of support, face-to-face and computer-mediated, than for no support, which indicates that holding an independent – but not interdependent – self-construal helped participants reap additional benefit from both explicit support contexts.

Whereas the previous studies examined cultural fit by using experimental designs to manipulate support conditions as an independent variable, other studies have examined culturally rooted variables that moderate general stress reactivity to the TSST in diverse samples. A study by Campos and colleagues (2014) examined the role of neuroticism, a dispositional sensitivity to stress or negative affect associated with blunted diurnal cortisol slopes (Lahey, 2009), in stress reactivity processes in the laboratory as well as in support perceptions outside of the laboratory. Using a sample of European-American, East-Asian, and Latina females, the multi-study paper first established that Latinas's perceived support did not vary by neuroticism, whereas European Americans and East Asians felt less supported if they were high on neuroticism. The examination of cortisol reactivity and prolonged recovery over time from the TSST acts as an individual-difference variable indicative of diurnal cortisol rhythms, which differs from a focus on short-term reactivity. Those results revealed that while higher neuroticism generally predicted a more blunted cortisol response, a significant interaction with cultural group indicated that neuroticism predicted less blunted cortisol reactivity and recovery in Latinas than in non-Latinas. The authors suggest that the Latino context – with an emphasis on interdependence, close physical proximity, social support and positive emotionality – may mitigate the costs of neuroticism (Campos

et al., 2014). In another study that targeted familism as the cultural moderator, results showed that familism buffered cortisol responses to the TSST, via its association with perceived support, in US Latinos, but not in those of Asian or European background (Campos, Yim, & Busse, under review). Thus, a worthwhile future direction in research would be the examination of how specific cultural values such as familism may facilitate relationship processes in ways that help shield people from the effects of stress on the HPA axis.

The common thread of the aforementioned studies is the examination of short-term HPA-axis reactivity to acute stressors in the laboratory using the TSST. While diurnal cortisol studies have identified ethnic differences in cortisol slopes, they typically do not directly test cultural factors as mediating variables in the ethnicity–cortisol relationship. An exception comes from a growing literature on caregiver experiences and their links with subjective as well as objective health and well-being. Most of this work has shown that caregivers, like other chronically stressed groups, show more elevated and blunted diurnal cortisol slopes (Gallagher-Thompson et al., 2006; Kim & Knight, 2008), although this is not the case for all groups: Kenyan Luo elders caring for orphaned grandchildren do not show this association (Ice, Sadruddin, Vagedes, Yogo, & Juma, 2012). Caregiving presents a particularly interesting context since it is an intimate social process characterized by great emotional, psychological and physical demands, but its experience is also greatly shaped by cultural justifications for caregiving. In a study on Chinese-American female caregivers of older dementia patients, Holland and colleagues (2010) demonstrated that strong endorsement of traditional Asian values, which include the Confucian tradition of filial piety or children's responsibility to care for parents, was correlated not only with less depression and greater caregiving self-efficacy, but also with a steeper diurnal cortisol slope pattern. Thus, cultural beliefs that prioritize relational roles and responsibilities may be protective for the burdens and demands of caregiving on the psychology and physiology of the caregiver.

## **Conclusions and Future Directions**

The literature covered above sprawls across several disparate areas, and includes few papers that converge at the core juncture of culture, social experience, and the HPA axis. We believe that this area is on the verge of tremendous growth, noting that most of those select papers were



published in just the last few years and that other projects are currently in progress. These studies build on the strengths of their primary areas, but also bridge across to related areas, both theoretically and methodologically, to shed new light on the complex interplay of culture, relationships and physiological functioning.

Cultural research has articulated, or presumed, broad individualistic–collectivistic or independent–interdependent cultural differences in psychological and health processes, which have generally manifested as examinations of East–West differences. As the state of the science develops and attention turns to better understanding the nuanced “cultural packages” that comprise different forms of collectivism and even individualism (Campos & Kim, *in press*), the field will become increasingly sophisticated in its understanding of how specific processes are shaped by certain cultural factors that apply for particular people. And as this operationalization of “culture” becomes more and more refined, the identification and assessment of candidate physiological systems, and the specific parameters used to measure those systems, will become more adept and targeted.

As researchers delve more deeply into the cultural shaping of HPA-axis functioning, emotion regulation will need to be better studied. The emotion regulation strategies that people employ in coping with stressful events influence cortisol reactivity (Lam, Dickerson, Zoccola, & Zaldivar, 2009). Culture is central to shaping how emotions are regulated, including preferences for experiencing certain kinds of emotions, for seeking situations that are congruent with preferred emotions, and for managing emotions when coping with stress (e.g., Mesquita, 2001; Ruby, Falk, Heine, & Villa, 2012; Safdar et al., 2009; Soto, Levenson, & Ebling, 2005; Su, Tsai, & Lai, *under review*; Tsai, 2007; Tsai, Chiang, & Lau, 2015). It also shapes the extent to which everyday social interactions are experienced as either emotionally positive or as posing threats to the self that are emotionally negative. For example, Campos, Keltner, Beck, Gonzaga, and John (2007) found that teasing, an everyday social practice that benefits relational bonds at the expense of the self, is more threatening to European Americans than to Asian Americans. Similarly, there is cultural variation in the extent to which people benefit from expressing their negative emotions, including in the context of trauma (Butler, Lee, & Gross, 2007; Knowles, Wearing, & Campos, 2011; Soto, Perez, Kim, Lee, & Minnick, 2011). These variations, which shape the emotions that people experience in their everyday social interactions and in their responses to highly stressful or traumatic events, may have implications for HPA-axis activation.

We have focused this chapter on the HPA axis because it is a key system for understanding the connection between social experience and physiological processes. Of course, other systems closely linked to the HPA axis – such as the immune system – are also well suited to illuminating how culture and social experience intersect to affect health. For example, a study examining the links between social ties and proinflammatory cytokine interleukin-6 (IL-6) found that social strain was linked with higher levels of IL-6 for European Americans, but not for Asian Americans, whereas perceiving more supportive friendships was marginally associated with elevated levels of IL-6 for Asian Americans, but not for European Americans (Chiang, Saphire-Bernstein, Kim, Sherman, & Taylor, 2013). These findings dovetail with the culture and cortisol research, which indicates that the aspects of relationships that present poor cultural fit for a certain group take a coordinated toll on the immune and stress-regulatory systems.

However, the HPA axis, with its sensitivity to social experiences in particular, is ideally suited for research on culture, social ties and health. Yet there is much that remains unknown, and potential that remains untapped, in this area. Studies examining short-term reactivity to laboratory stressors, such as the TSST, which activates social-evaluative threat, provide a close-up view of stress reactivity in a controlled environment, whereas research that investigates diurnal cortisol profiles illuminates the effects of chronic stress burden on HPA-axis functioning. There is especially a lack of research into cultural influences on diurnal cortisol profiles and their sensitivity to everyday social experiences; this relationship is an understudied (compared with reactions to acute stressors in the laboratory) but key component of understanding health processes (Repetti, Wang, & Saxbe, 2011). A logical next step would be to draw on the strengths of both approaches to better understand the cultural shaping of naturalistic stress reactivity, that is, momentary reactivity to acute stressors that take place in everyday contexts. Additionally, studies have yet to venture beyond the level of the individual to directly measure dyadic processes. Naturalistic observational research has demonstrated that everyday stressors can shape social behaviors (Wang & Repetti, 2014; Wang, Repetti, & Campos, 2011), yet the operationalization of the social variables in the studies reviewed here has relied upon self-reports or imaginal manipulations of social support. Research that directly observed interpersonal process as it relates to HPA-axis activity, for example by using laboratory observation of social support behavior coupled with ambulatory measurement of diurnal cortisol rhythms, would provide a much-needed perspective on how enacted behaviors are associated with stress physiology. Given the growing body of work on

co-regulation of the HPA-axis in couples (Saxbe & Repetti, 2010), dyadic analyses that look at partner associations are potentially fruitful areas for future work.

While the burgeoning work in this area has predominantly treated culture or cultural group as the primary moderator in the link between social experiences and health, much can be learned by taking approaches that emphasize multiple moderation. We encourage further targeted exploration of specific cultural values (e.g., familism, harmony values) that move beyond broad independence–interdependence or individualism–collectivism strokes, and extend beyond the immediate sociocultural environment to examine how other factors, such as those that vary between individuals (e.g., neuroticism in Campos et al., 2014), all converge and interact to shape culture, social ties, and HPA-axis processes. A focus on mediation analyses to identify the mechanisms by which culture works (e.g., familism and perceived support; Campos et al., under review) would also advance the field.

In closing, we encourage future research to home in on the study of cultural experiences, social ties, and the HPA axis. As research methods for studying cortisol – both in its collection and assay and in the statistical modeling of different cortisol parameters – become more advanced, accessible and convenient, and as the theory behind the influence of culture on social ties becomes increasingly nuanced, rich, and varied, the time is ripe to capitalize on this unique stress biomarker to illuminate the role of the long arm of culture in modulating how social experiences “get under the skin.”

## References

- Abercrombie, H. C., Giese-Davis, J., Sephton, S., Epel, E. S., Turner-Cobb, J. M., & Spiegel, D. (2004). Flattened salivary cortisol rhythms in metastatic breast cancer patients. *Psychoneuroendocrinology*, *29*, 1082–1092. doi:10.1016/j.psyneuen.2003.11.003
- Adam, E. K., & Gunnar, M. R. (2001). Relationship functioning and home and work demands predict individual differences in diurnal cortisol patterns in women. *Psychoneuroendocrinology*, *26*, 189–208.
- Adam, E. K., Hawkey, L. C., Kudielka, B. M., & Cacioppo, J. T. (2006). Day-to-day dynamics of experience–cortisol associations in a population-based sample of older adults. *Proceedings of the National Academy of Sciences*, *103*, 17058–17063. doi:10.1073/pnas.0605053103

- Barnett, R. C., Steptoe, A., & Gareis, K. C. (2005). Marital-role quality and stress-related psychobiological indicators. *Annals of Behavioral Medicine, 30*(1), 36–43. doi:10.1207/s15324796abm3001\_5
- Bhattacharyya, M. R., Molloy, G. J., & Steptoe, A. (2008). Depression is associated with flatter cortisol rhythms in patients with coronary artery disease. *Journal of Psychosomatic Research, 65*, 107–113. doi:10.1016/j.jpsychores.2008.03.012
- Burleson, B. R., & Mortenson, S. (2003). Explaining cultural differences in evaluations of emotional support behaviors: Exploring the mediating influences of value systems and interaction goals. *Communication Reports, 15*, 43–55. doi:10.1177/0093650202250873
- Burton, C. L., Bonanno, G. A., & Hatzenbuehler, M. L. (2014). Familiar social support predicts a reduced cortisol response to stress in sexual minority young adults. *Psychoneuroendocrinology, 47*, 241–245. doi:10.1016/j.psyneuen.2014.05.013
- Butler, E. A., Lee, T. L., & Gross, J. J. (2007). Emotion regulation and culture: Are the social consequences of emotion suppression culture-specific? *Emotion, 7*, 30–48. doi:10.1037/1528-3542.7.1.30
- Campos, B., Busse, D., Yim, I. S., Dayan, A., Chevez, L., & Schoebi, D. (2014). Are the costs of neuroticism inevitable? Evidence of attenuated effects in U.S. Latinas. *Cultural Diversity and Ethnic Minority Psychology, 20*(3), 430–440. doi:10.1037/a0035329
- Campos, B., Dunkel Schetter, C., Abdou, C. M., Hobel, C. J., Glynn, L. M., & Sandman, C. A. (2008). Familialism, social support, and stress: Positive implications for pregnant Latinas. *Cultural Diversity and Ethnic Minority Psychology, 14*(2), 155–162. doi:10.1037/1099-9809.14.2.155
- Campos, B., Keltner, D., Beck, J. M., Gonzaga, G. C., & John, O. P. (2007). Culture and teasing: The relational benefits of reduced desire for positive self-differentiation. *Personality and Social Psychology Bulletin, 33*, 3–16. doi:10.1177/0146167206293788
- Campos, B., & Kim, H. S. (in press). Culture, relationships and health: Incorporating the cultural diversity of family and close relationships into our understanding of health. *American Psychologist*.
- Campos, B., Yim, I. S., & Busse, D. (under review). Culture as a pathway to maximizing the stress-buffering role of social support.
- Causadias, J. M. (2013). A roadmap for the integration of culture into developmental psychopathology. *Development and Psychopathology, 25*, 1375–1398. doi:10.1017/S0954579413000679
- Chang, J. (2015). The interplay between collectivism and social support processes among Asian and Latino American college students. *Asian American Journal of Psychology, 6*, 4–14. doi:10.1037/a0035820

- Chang, J., Chen, C.-N., & Alegria, M. (2014). Contextualizing social support: Pathways to help seeking in Latinos, Asian Americans, and Whites. *Journal of Social and Clinical Psychology, 22*, 1–13. doi:10.1521/jscp.2014.33.1.1
- Chentsova-Dutton, Y. (2012). Butting in versus being a friend: Cultural differences and similarities in the evaluation of imposed social support. *Journal of Social Psychology, 152*(4), 493–509. doi:10.1080/00224545.2011.642025
- Chentsova-Dutton, Y., & Vaughn, A. (2012). Let me tell you what to do: Cultural differences in advice-giving. *Journal of Cross-Cultural Psychology, 43*(5), 687–703. doi:10.1177/0022022111402343
- Chiang, J., Saphire-Bernstein, S., Kim, H. S., Sherman, D. K., & Taylor, S. E. (2013). Cultural differences in the link between supportive relationships and proinflammatory cytokines. *Social Psychological and Personality Science, 4*, 511–520. doi:10.1177/1948550612467831
- Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine, 38*, 300–314. doi:10.1097/00006842-197609000-00003
- Cohen, D., Nisbett, R. E., Bowdle, B. E., & Schwarz, N. (1996). Insult, aggression, and the Southern culture of honor: An experimental ethnography. *Journal of Personality and Social Psychology, 70*, 945–960. doi:10.1037/0022-3514.70.5.945
- Cohen, S. (2004). Social relationships and health. *American Psychologist, 59*, 676–684. doi:10.1037/0003-066X.59.8.676
- Cohen, S., Schwartz, J. E., Epel, E., Kirschbaum, C., Sidney, S., & Seeman, T. (2006). Socioeconomic status, race, and diurnal cortisol decline in the Coronary Artery Risk Development in Young Adults (CARDIA) Study. *Psychosomatic Medicine, 68*, 41–50. doi:10.1097/01.psy.0000195967.51768.ea
- Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*, 310–357. doi:10.1037/0033-2909.98.2.310
- DeSantis, A. S., Adam, E. K., Doane, L. D., Mineka, S., Zinbarg, R. E., & Craske, M. G. (2007). Racial/ethnic differences in cortisol diurnal rhythms in a community sample of adolescents. *Journal of Adolescent Health, 41*, 3–13. doi:10.1016/j.jadohealth.2007.03.006
- Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130*(3), 355–391. doi:10.1037/0033-2909.130.3.355
- DiPietro, S. M., & Bursik, R. J. (2012). Studies of the new immigration: The new dangers of pan-ethnic classifications. *Annals of the American Academy of Political and Social Science, 641*, 247–267. doi:10.1177/0002716211431687

- Ditzen, B., Hoppmann, C., & Klumb, P. (2008). Positive couple interactions and daily cortisol: On the stress-protecting role of intimacy. *Psychosomatic Medicine*, *70*, 883–889. doi:10.1097/PSY.0b013e318185c4fc
- Dressler, W. W. (2004). Culture and the risk of disease. *British Medical Bulletin*, *69*, 21–31. doi:10.1093/bmb/ldh020
- Frisch, J. U., Hausser, J. A., & Mojzisch, A. (2015). The Trier Social Stress Test as a paradigm to study how people respond to threat in social interactions. *Frontiers in Psychology*, *6*, 1–15. doi:10.3389/fpsyg.2015.00014
- Gallagher-Thompson, D., Shurgot, G. R., Rider, K., Gray, H. L., McKibbin, C. L., Kraemer, H. C., ... & Thompson, L. W. (2006). Ethnicity, stress, and cortisol function in Hispanic and non-Hispanic white women: A preliminary study of family dementia caregivers and noncaregivers. *American Journal of Geriatric Psychiatry*, *14*(4), 334–342. doi:10.1097/01.JGP.0000206485.73618.87
- Guan, S.-S. A., Chiang, J., Sherman, L. E., Nguyen, J., Tsui, Y., & Robles, T. F. (under review). Culture moderates the effect of social support across communication contexts in young adult females.
- Heine, S. J. (2012). *Cultural psychology* (2nd ed.). New York: W. W. Norton & Company.
- Hennessy, M. B., Kaiser, S., & Sachser, N. (2009). Social buffering of the stress response: Diversity, mechanisms, and functions. *Frontiers in Neuroendocrinology*, *30*, 470–482. doi:10.1016/j.yfrne.2009.06.001
- Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. London: Sage.
- Holland, J. M., Thompson, L. W., Tzuang, M., & Gallagher-Thompson, D. (2010). Psychosocial factors among Chinese American women dementia caregivers and their association with salivary cortisol: Results of an exploratory study. *Ageing International*, *35*, 109–127. doi:10.1007/s12126-010-9057-0
- Ice, G. H., Sadruddin, A. F. A., Vagedes, A., Yogo, J., & Juma, E. (2012). Stress associated with caregiving: An examination of the stress process model among Kenyan Luo elders. *Social Science and Medicine*, *74*, 2020–2027. doi:10.1016/j.socscimed.2012.02.018
- Karlamangla, A. S., Friedman, E. M., Seeman, T. E., Stawski, R. S., & Almeida, D. M. (2013). Daytime trajectories of cortisol: Demographic and socioeconomic differences – findings from the National Study of Daily Experiences. *Psychoneuroendocrinology*, *38*(11), 2585–2597. doi:10.1016/j.psyneuen.2013.06.010
- Kim, H. S., Sherman, D. K., Ko, D., & Taylor, S. E. (2006). Pursuit of comfort and pursuit of harmony: Culture, relationships, and social support seeking.

- Personality and Social Psychology Bulletin*, 32, 1595–1607. doi:10.1177/0146167206291991
- Kim, H. S., Sherman, D. K., & Taylor, S. E. (2008). Culture and social support. *American Psychologist*, 63, 518–526. doi:10.1037/0003-066X
- Kim, J.-H., & Knight, B. G. (2008). Effects of caregiver status, coping styles, and social support on the physical health of Korean American caregivers. *The Gerontologist*, 48, 287–299. doi:10.1093/geront/48.3.287
- Kirschbaum, C., Klauer, T., Filipp, S.-H., & Hellhammer, D. H. (1995). Sex-specific effects of social support on cortisol and subjective responses to acute psychological stress. *Psychosomatic Medicine*, 57, 23–31. doi:10.1097/00006842-199501000-00004
- Kirschbaum, C., Pirke, K. M., & Hellhammer, D. H. (1993). The Trier Social Stress Test: A tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology*, 28, 76–81. doi:10.1159/000119004
- Knowles, E., Wearing, J., & Campos, B. (2011). Culture and the health benefits of expressive writing. *Social Psychological and Personality Science*, 2, 408–415. doi:10.1177/1948550610395780
- Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist*, 64, 241–256. doi:10.1037/a0015309
- Lam, S., Dickerson, S. S., Zoccola, P. M., & Zaldivar, F. (2009). Emotion regulation and cortisol reactivity to a social-evaluative speech task. *Psychoneuroendocrinology*, 34, 1355–1362. doi:10.1016/j.psyneuen.2009.04.006
- Lovallo, W. R., & Thomas, T. L. (2000). Stress hormones in psychophysiological research: Emotional, behavioral and cognitive implications. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (pp. 342–367). Cambridge: Cambridge University Press.
- Mangold, D., Mintz, J., Javors, M., & Marino, E. (2012). Neuroticism, acculturation and the cortisol awakening response in Mexican American adults. *Hormones and Behavior*, 61, 23–30. doi:10.1016/j.yhbeh.2011.09.009
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98(2), 224–253. doi:10.1037/0033-295X.98.2.224
- Markus, H. R., & Kitayama, S. (2010). Cultures and selves: A cycle of mutual constitution. *Perspectives on Psychological Science*, 5, 420–430. doi:10.1177/1745691610375557
- McEwen, B. S. (1998). Stress, adaptation, and disease: Allostasis and allostatic load. *Annals of the New York Academy of Sciences*, 840, 33–44. doi:10.1111/j.1749-6632.1998.tb09546.x

- Mesquita, B. (2001). Emotions in collectivist and individualists contexts. *Journal of Personality and Social Psychology, 80*, 68–74. doi:10.1037/0022-3514.80.1.68
- Michailova, S., & Hutchings, K. (2006). National cultural influences on knowledge sharing: A comparison of China and Russia. *Journal of Management Studies, 43*, 383–405. doi:10.1111/j.1467-6486.2006.00595.x
- Miller, G. E., Chen, E., & Zhou, E. S. (2007). If it goes up, must it come down? Chronic stress and the hypothalamic-pituitary-adrenocortical axis in humans. *Psychological Bulletin, 133*(1), 25–45. doi:10.1037/0033-2909.133.1.25
- Mortenson, S. (2006). Cultural differences and similarities in seeking social support as a response to academic failure: A comparison of American and Chinese college students. *Communication Education, 55*, 127–147. doi:10.1080/03634520600565811
- Nicholson, L. M., Miller, A. M., Schwertz, D., & Sorokin, O. (2013). Gender differences in acculturation, stress, and salivary cortisol response among former Soviet immigrants. *Journal of Immigrant and Minority Health, 15*, 540–552. doi:10.1007/s10903-012-9752-x
- Oyserman, D., Coon, H. M., & Kimmelmeier, M. (2002). Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological Bulletin, 128*, 3–72. doi:10.1037/0033-2909.128.1.3
- Page-Gould, E., Mendoza-Denton, R., Alegre, J. M., & Siy, J. O. (2010). Understanding the impact of cross-group friendship on interactions with novel outgroup members. *Journal of Personality and Social Psychology, 98*, 775–793. doi:10.1037/a0017880
- Page-Gould, E., Mendoza-Denton, R., & Tropp, L. (2008). With a little help from my cross-group friend: Reducing anxiety in intergroup contexts through cross-group friendship. *Journal of Personality and Social Psychology, 95*, 1080–1094. doi:10.1037/0022-3514.95.5.1080
- Priem, R. L., Lyon, D. W., & Dess, G. G. (1999). Inherent limitations of demographic proxies in top management team heterogeneity research. *Journal of Management, 25*, 935–953. doi:10.1177/014920639902500607
- Pruessner, J. C., Kirschbaum, C., & Hellhammer, D. (1995). Waking up – the first stressor of the day? Free cortisol levels double within minutes after awakening. *Journal of Psychophysiology, 9*, 365.
- Repetti, R. L., Wang, S., & Saxbe, D. (2011). Adult health in the context of everyday life. *Annals of Behavioral Medicine, 42*(3), 285–293. doi:10.1007/s12160-011-9293-x



- Ruby, M. B., Falk, C. F., Heine, S. J., & Villa, C. (2012). Not all collectivisms are equal: Opposing preferences for ideal affect between East Asians and Mexicans. *Emotion, 12*, 1206–1209. doi:10.1037/a0029118
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78. doi:10.1037/0003-066X.55.1.68
- Ryder, A. G., Ban, L. M., & Chentsova-Dutton, Y. E. (2011). Towards a cultural–clinical psychology. *Social and Personality Psychology Compass, 5*(12), 960–975. doi:10.1111/j.1751-9004.2011.00404.x
- Safdar, S., Friedlmeier, W., Matsumoto, D., Yoo, S. H., Kwantes, C. T., Kakai, H., & Shigemasu, E. (2009). Variations of emotional display rules within and across cultures: A comparison between Canada, USA, and Japan. *Canadian Journal of Behavioral Science, 41*, 1–10. doi:10.1037/a0014387
- Sapolsky, R. M., Romero, L. M., & Munck, A. U. (2000). How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions. *Endocrine Reviews, 21*, 55–89. doi:10.1210/er.21.1.55
- Saxbe, D. E. (2008). A field (researcher's) guide to cortisol: Tracking HPA axis functioning in everyday life. *Health Psychology Review, 2*, 163–190. doi:10.1080/17437190802530812
- Saxbe, D. E., & Repetti, R. L. (2010). For better or worse? Co-regulation of couples' cortisol levels and mood states. *Journal of Personality and Social Psychology, 98*, 92–103. doi:10.1037/a0016959
- Saxbe, D. E., Repetti, R. L., & Nishina, A. (2008). Marital satisfaction, recovery from work, and diurnal cortisol among men and women. *Health Psychology, 27*(1), 15–25. doi:10.1037/0278-6133.27.1.15
- Schwartz, S. J., Unger, J. B., Zamboanga, B. L., & Szapocznik, J. (2010). Rethinking the concept of acculturation: Implications for theory and research. *American Psychologist, 65*, 237–251. doi:10.1037/a0019330
- Schwartz, S. J., Weisskirch, R. S., Hurley, E. A., Zamboanga, B. L., Park, I. J., Kim, S. Y., ... & Greene, A. D. (2010). Communalism, familism, and filial piety: Are they birds of a collectivist feather? *Cultural Diversity and Ethnic Minority Psychology, 16*, 548–560. doi:10.1037/a0021370
- Seeman, T. E. (1996). Social ties and health: The benefits of social integration. *Annals of Epidemiology, 6*, 442–451. doi:10.1016/S1047-2797(96)00095-6
- Sephton, S. E., Sapolsky, R. M., Kraemer, H. C., & Spiegel, D. (2000). Diurnal cortisol rhythm as a predictor of breast cancer survival. *Journal of National Cancer Institute, 92*, 994–1000. doi:10.1093/jnci/92.12.994
- Shweder, R. A., & Bourne, E. J. (1984). Does the concept of the person vary cross-culturally? In R. A. Shweder & R. A. LeVine (Eds.), *Culture theory:*

- Essays on mind, self, and emotion* (pp. 158–199). Cambridge: Cambridge University Press.
- Sjögren, E., Leanderson, P., & Kristenson, M. (2006). Diurnal saliva cortisol levels and relations to psychosocial factors in a population sample of middle-aged Swedish men and women. *International Journal of Behavioral Medicine, 13*(3), 193–200. doi:10.1207/s15327558ijbm1303\_2
- Slatcher, R. B., Robles, T. F., Repetti, R. L., & Fellows, M. D. (2010). Momentary work worries, marital disclosure, and salivary cortisol among parents of young children. *Psychosomatic Medicine, 72*, 887–896. doi:10.1097/PSY.0b013e3181f60fcc
- Soto, J. A., Chentsova-Dutton, Y., & Lee, E. A. (2013). The role of cultural fit in the connection between health and social relationships. In M. L. Newman and N. A. Roberts (Eds.), *Health and social relationships: The good, the bad, and the complicated* (pp. 189–212) Washington, DC: American Psychological Association.
- Soto, J. A., Levenson, R. W., & Ebling, R. (2005). Cultures of moderation and expression: Emotional experience, behavior, and physiology in Chinese Americans and Mexican Americans. *Emotion, 5*, 154–165. doi:10.1037/1528-3542.5.2.154
- Soto, J. A., Perez, C. R., Kim, Y. H., Lee, E. A., & Minnick, M. R. (2011). Is expressive suppression always associated with poorer psychological functioning? A cross-cultural comparison between European Americans and Hong Kong Chinese. *Emotion, 11*, 1450–1455. doi:10.1037/a0023340
- Stephens, N. M., Townsend, S. S. M., Markus, H. R., & Phillips, L. T. (2012). A cultural mismatch: Independent cultural norms produce greater increases in cortisol and more negative emotions among first-generation college students. *Journal of Experimental Social Psychology, 48*, 1389–1393. doi:10.1016/j.jesp.2012.07.008
- Su, J. C.-Y., Tsai, H.-T., & Lai, W.-S. (under review). When the means justify the end: The role of regulatory fit in emotion regulation.
- Taylor, S. E. (2007). Social support. In H. S. Friedman & R. C. Silver (eds), *Foundations of health psychology* (pp. 145–171). New York: Oxford University Press.
- Taylor, S. E., Sherman, D. K., Kim, H. S., Jarcho, J., Takagi, K., & Dunagan, M. S. (2004). Culture and social support: Who seeks it and why? *Journal of Personality and Social Psychology, 87*, 354–362. doi:10.1037/0022-3514.87.3.354
- Taylor, S. E., Welch, W. T., Kim, H. S., & Sherman, D. K. (2007). Cultural differences in the impact of social support on psychological and biological stress responses. *Psychological Science, 18*, 831–837.

- Triandis, H. C. (1995). *Individualism & collectivism*. Boulder, CO: Westview Press.
- Tsai, J. L. (2007). Ideal affect: Cultural causes and behavioral consequences. *Perspectives on Psychological Science, 2*, 242–259. doi:10.1111/j.1745-6916.2007.00043.x
- Tsai, W., Chiang, J. J., & Lau, A. S. (2015). The effects of self-enhancement and self-improvement on recovery from stress differ across cultural groups. *Social Psychological and Personality Science, 7*, 21–28. doi:10.1177/1948550615598380
- Vedhara, K., Tuinstra, J., Miles, J. N. V., Sanderman, R. B., & Ranchor, A. V. (2006). Psychosocial factors associated with indices of cortisol production in women with breast cancer and controls. *Psychoneuroendocrinology, 31*, 299–311. doi:10.1016/j.psyneuen.2005.08.006
- Wang, S., & Lau, A. S. (2015). Mutual and non-mutual social support: Cultural differences in the psychological, behavioral, and biological effects of support-seeking. *Journal of Cross-Cultural Psychology, 46*(7), 916–929. doi:10.1177/0022022115592967
- Wang, S. W., Shih, J. H., Hu, A. W., Louie, J. Y., & Lau, A. S. (2010). Cultural differences in daily support experiences. *Cultural Diversity and Ethnic Minority Psychology, 16*(3), 413–420. doi:10.1037/a0019885
- Wang, S., & Repetti, R. L. (2014). Psychological well-being and job stress predict marital support behavior: A naturalistic observation study of dual-earner couples in their homes. *Journal of Personality and Social Psychology, 107*(5), 864–878. doi:10.1037/a0037869
- Wang, S., Repetti, R. L., & Campos, B. (2011). Job stress and family social behavior: The moderating role of neuroticism. *Journal of Occupational Health Psychology, 16*(4), 441–456. doi:10.1037/a0025100