

Emotion Regulation: The Interplay of Culture and Genes

Heejung S. Kim* and Joni Y. Sasaki

University of California, Santa Barbara

Abstract

Given the mounting empirical evidence to support both the cultural and biological shaping of emotional processes, there is a clear need to integrate these determinants of emotional processes. Much in the same vein as these efforts, in our research on gene-culture interactions, we have examined how cultural and biological factors jointly influence emotion regulation. The present paper specifically aims to present research considering both cultural and genetic factors as two interacting influences that shape emotion regulation. A series of studies conducted to test the gene-culture interaction involving OXTR rs53576 consistently show that individuals with the variant that is associated with socio-emotional sensitivity tend to utilize culturally normative forms of emotion regulation more than those without it. These findings underscore the importance of considering the interplay between socio-cultural and genetic factors that shape social behaviors.

Socially appropriate experiences of emotion often require regulation. Imagine, for instance, that you just received a big promotion at work and are excited to share the news with your best friend. However, before you tell her the good news of your promotion, she confides in you the bad news that she was recently fired. In this situation, emotion regulation will likely ensue in multiple ways: your experience of joy may be dampened, your expression of positive emotion to your friend may be suppressed, and your friend may attempt to talk about her distress in order to make herself feel better. Emotion regulation, defined as “how we try to influence which emotions we have, when we have them, and how we experience or express these emotions” (Gross, 2008, p. 497), not only has a functional, biological basis but also is shaped by the larger socio-cultural context in which it occurs.

Indeed, people’s participation in their culture shapes crucial psychological tendencies and processes (Fiske, Kitayama, Markus, & Nisbett, 1998; Shweder, 1995), including the emotions they tend to generate (De Leersnyder, Mesquita, & Kim, 2011; Kitayama, Mesquita, & Karasawa, 2006; Mesquita, 2003; Tsai, Knutson, & Fung, 2006) and the way they subsequently regulate their own emotions (Gross & John, 1998, 2003) and the emotions of others, as in social support interactions (Kim, Sherman, & Taylor, 2008). Given the mounting empirical evidence to support both the cultural and biological shaping of emotional processes in general (see Levenson, Soto, & Pole, 2007 for review), there is a clear need to integrate these determinants of emotional regulation specifically. Yet, relatively little research has examined how these two factors might interact to mutually constrain the influence of each other. Thus, in our research, we have examined the interaction between biological factors at the level of genes and social factors in the cultural context as potential determinants of emotion regulation. The present paper specifically aims to present a series of investigations considering both cultural and genetic factors as interacting influences that shape emotion regulation. With this aim, we first review previous research findings on how socio-cultural factors influence emotion regulation

processes, and then we describe our studies examining the interplay between genetic and cultural factors in shaping these processes.

Socio-cultural Influences on Emotion Regulation

Emotions are typically considered to be experiences within the individual that arise as combinatory results of physiology, cognitive appraisal, and behavior (Butler, 2011; Lewis, 2005; Taylor, Welch, Kim, & Sherman, 2007), and thus, emotion regulation has also generally been considered a private affair. Emotional events, however, often take place in social contexts (Frijda & Mesquita, 1994; Keltner & Haidt, 1999, 2001; Keltner, Haidt, & Shiota, 2006; Keltner & Kring, 1998), and the way individuals regulate their emotions is crucial for successful navigation through the social world (Campos, Campos, & Barrett, 1989; Keltner & Haidt, 1999, 2001; see also Ekman, 1992; Lazarus, 1991). Therefore, the cultural shaping of emotion regulation processes may occur at both the individual and interpersonal level.

Emotion regulation is involved in many key aspects of emotional processes, from the antecedents of emotional experience to the response or expression of emotion (Gross, 1998, 2002; Gross & John, 2003) and can have important implications for psychological and biological health outcomes (Gross & John, 2003). Emotion suppression—the process of regulating one's emotional response by trying not to show it—for example, is a response-focused regulation strategy that can lead to a number of negative outcomes, including deficits in memory and increased physiological reactivity (Gross & Levenson, 1993; Richards & Gross, 1999, 2000), as well as lower quality social interactions and relationship satisfaction (Butler et al., 2003; Srivastava, Tamir, McGonigal, John, & Gross, 2009; e.g., in married couples: Levenson & Gottman, 1985). On the other hand, cognitive reappraisal—regulating one's emotional experience by thinking differently about a situation—is an antecedent-focused regulation strategy that generally tends to be associated with positive outcomes (Gross, 1998), including increased task performance and enthusiasm (Leroy, Grégoire, Magen, Gross, & Mikolajczak, 2012), decreased subjective distress and physiological reactivity (similar to acceptance strategies; Wolgast, Lundh, & Viborg, 2011), and higher quality social interactions and well-being (Gross & John, 2003).

However, the process of emotion regulation and its implications are highly dependent on contextual standards for what is appropriate to feel and express, and thus, the larger cultural context can provide guidelines or expectations about social interactions that consequently affect the way people regulate their emotions. East Asian versus North American cultures, for example, tend to emphasize different values regarding interpersonal relationships such that people from East Asian cultures tend to value relatedness and harmony with others, whereas people from North American cultures tend to value independence and personal goals (Markus & Kitayama, 1991; Triandis, 1989). Given that certain assertions of individual feelings may cause social disruptions and compromise consideration for others (Butler, Lee, & Gross, 2009; Kim & Sherman, 2007), emotion suppression tends to be a more common emotion regulation strategy among Asians (Gross & John, 1998, 2003; Matsumoto et al., 2008; Tsai & Levenson, 1997), and moreover, the psychological effects of emotion suppression appear to be less debilitating for people who hold Asian values more strongly compared to people who do not (Butler, Lee, & Gross, 2007). On the other hand, given that the expression of thoughts and feelings tends to be valued among North Americans as a sign of independence, they are less likely to suppress their emotions than Asians. In fact, expression can also be an affirmation that one's thoughts or feelings are valid for North Americans (Kim & Sherman, 2007).

Consequently, emotional expression brings considerably greater psychological benefit for European Americans than Asian Americans (Butler et al., 2009; Knowles, Wearing, & Campos, 2011).

In interpersonal contexts, people often tend to put a good deal of effort into regulating the emotions of their close other (Diamond & Aspinwall, 2003), and the ability to modulate positive and negative emotional experiences and expressions in accordance with another person tends to predict healthy, satisfying relationships (Diamond & Fagundes, 2012; Gable, Reis, Impett, & Asher, 2004; Lopes, Salovey, Côté, & Beers, 2005; Lopes, Salovey, & Straus, 2003; Lopes et al., 2004, 2011). One important interpersonal process in which emotion regulation plays a role is the transaction of social support. Some researchers have theorized that social support transactions may be effective to the extent that the person providing support is able to adequately regulate another person's negative emotions (Lakey & Orehek, 2011), and put this way, emotion regulation may be understood as a mechanism through which social support occurs (Marroquín, 2011). Although the most consistently beneficial form of social support is perceived social support (Wethington & Kessler, 1986), enacted social support can also be useful in regulating one's distress, as long as support provision is responsive (e.g., Feeney, 2004; Maisel & Gable, 2009). Emotion regulation may come into play, especially in relation to emotion suppression because explicit social support seeking requires disclosure and expression about distress with the goal of influencing how one experiences emotional events. Consistent with findings that emotion regulation between individuals can have important benefits (e.g., Lopes et al., 2004, 2011), social support appears to be one of the most widely and successfully used ways of coping with feelings of distress (Cohen & Wills, 1985; Seeman, 1996; Thoits, 1995).

Yet, the way people seek and provide social support differs by culture, and these differences in support transactions are consistent with some of the known cultural differences in emotion regulation (Sherman, Kim, & Taylor, 2009). For example, compared to European Americans, East Asians are less likely to disclose distress and ask for support, and explicitly asking for support is in fact an added stressor due to concerns about negatively impacting their relationships (Kim et al., 2008; Taylor et al., 2007). East Asians tend to utilize and are less stressed by implicit forms of support that do not involve explicitly talking about one's distress than European Americans (Taylor et al., 2007), which mirrors the finding regarding cultural differences in the cost and benefit of emotion suppression and expression.

Taken together, empirical evidence supports the idea that the process of emotion regulation takes place in socio-cultural contexts, and contextually prevalent forms of regulation seem to be outcomes of specific and intricately intertwined social and cultural expectations and goals. At the same time, emotional experiences and regulation of those emotions may have some biological basis. Much research has investigated, for instance, physiological (e.g., Gross, 1998; Butler et al., 2009), neuroendocrine (e.g., Taylor et al., 2007), and neurological (e.g., Ochsner, Bunge, Gross, & Gabrieli, 2002) responses in order to understand some of the antecedents, consequences, and mechanisms of emotion regulation. Adding to this body of literature, we have investigated how genes, together with culture, may have implications for the process of emotion regulation.

Gene-Culture Interaction on Emotion Regulation

Studies from quantitative and molecular genetics show that many psychological and behavioral tendencies have at least some genetic basis (e.g., Kessler, Kendler, Heath,

Neale, & Eaves, 1992; Plomin, Owen, & McGuffin, 1994). For instance, a twin study shows that perception of social support availability may be influenced by genetic factors (Kessler et al., 1992), and studies focusing on target genes find that a range of psychological tendencies, such as empathic accuracy and stress reactivity (Rodrigues, Saslow, Garcia, John, & Keltner, 2009), optimism and self esteem (Saphire-Bernstein, Way, Kim, Sherman, & Taylor, 2011), and pro-social behavior (Bachner-Melman et al., 2005), may also have genetic influences.

It is also known that there are ethnic differences in the distribution of genotypes of many polymorphisms that seem to be associated with psychological tendencies, such as serotonin transporter promoter gene (5-HTTLPR), dopamine receptor gene (DRD4), and oxytocin receptor gene (OXTR *rs53576*) (e.g., Chang, Kidd, Livak, Pakstis, & Kidd, 1996; Gelernter, Kranzler, & Cubells, 1997; Kim et al., 2010a). The combination of these two points may lead to the question regarding how genetic factors relate to many cultural differences observed in previous cultural psychological findings comparing different ethnic groups.

One theoretical approach to understanding the relationship between genes and culture is dual inheritance theory (also known as gene-culture coevolution; Cavalli-Sforza & Feldman, 1981; Chiao & Blizinsky, 2009; Lumsden & Wilson, 1981; Boyd & Richerson, 1985) that posits that cultural tendencies evolve and affect the environments in which genetic selection occurs. That is, cultural patterns are adaptations for social and physical environments, which in turn evolve and alter these environments in which genetic selection operates (Boyd & Richerson, 1985; Lumsden & Wilson, 1981). One empirical demonstration of the theory shows that the cultural value of collectivism that enhances one's connection to a social network is correlated with population prevalence of a variant of 5-HTTLPR that is associated with greater risk of psychopathology, such as depression (Chiao & Blizinsky, 2009). And increased degree of collectivism, in turn, is associated with lower prevalence of anxiety and mood disorder. In other words, it supports the idea that collectivism may serve as a cultural buffer for groups that are genetically susceptible to psychopathology.

The Gene-Culture Interaction Model

While dual-inheritance theory attempts to explain the macro-level evolutionary processes involving culture and genes, it does not address the process in which genetic and cultural factors interact to shape psychological tendencies and behaviors at the individual level. Thus, we propose the gene-culture interaction model as a way to address the individual level processes. The model builds on the gene-environment interaction framework that theorizes that genetic influences may be moderated by environmental input, and thus, particular psychological and behavioral outcomes of genetic predisposition may occur only under specific environments and experiences (Caspi et al., 2002, 2003). In other words, some people may be more genetically predisposed to be sensitive to environmental influences than others. A seminal study by Caspi et al. (2003) illustrates the interaction empirically. The study shows that carrying the risk allele (S) of 5-HTTLPR increases the likelihood of depression only when it is coupled with higher incidences of life stressors (although controversies exist based on meta-analytic evidence, e.g., Risch et al., 2009; but see also Karg, Burmeister, Shedden, & Sen, 2011; Uher & McGuffin, 2010). Other similar patterns of gene-environment interactions have been observed with other genes, such as DRD4 (Bakermans-Kranenburg, van IJzendoorn, Pijlman, Mesman, & Juffer, 2008; Sasaki et al., in press), and monoamine oxidase-A (MAOA) (Caspi et al., 2002;

Kim-Cohen et al., 2006). Taken together, these results suggest that there is some genetic basis for the susceptibility to environmental influence (Belsky et al., 2009; Obradovic & Boyce, 2009; Way & Taylor, 2010).

Building on the idea of susceptibility genes, we proposed the gene-culture interaction model. Most findings examining gene-environment interactions in psychopathology focus on the environment as personal experiences and social resources that vary, typically, in terms of overall quality (e.g., more or less stressful life events, abusive or non-abusive childhood). In our research, we aimed to broaden the notion of environment from personal life environment to culture. Culture is similar to such a conceptualization of the environment in that it provides a context that affords opportunities and constraints for the development of psychological tendencies. Yet, culture differs from such a conceptualization of environment in that culture cannot be described in terms of qualities that have implications for better or worse psychological outcomes.

Culture is a system that provides specific norms, rules and guidelines for how to conduct actions in given situations, and thus, bestows meanings to those actions (Kim & Markus, 1999; Bruner, 1990; Shweder, 1995). Thus, even a similar underlying motivation can lead to drastically different actions and psychological consequences in different cultures (e.g., Heine, Lehman, Markus, & Kitayama, 1999; Kim & Markus, 1999; Mesquita, 2001; Taylor et al., 2007). For example, the similar basic desire for social support could take the form of explicit solicitation of support in the U.S. but take the form of affiliating without disclosure in East Asian cultures (Kim et al., 2008). We theorized that certain genes might shape the susceptibility to environmental input that, in turn, influences the extent to which behaviors may be shaped by cultural factors. As a result, we speculated that psychological susceptibility shaped by these genes could manifest itself in different behavioral phenotypes. In the following empirical examinations of this idea, we focus on the case of an oxytocin receptor gene and its role in shaping emotion regulation processes.

OXTR as the Target Gene

We investigated the cultural and genetic basis of emotional regulation, focusing on an oxytocin receptor gene (OXTR) *rs53576* that has been associated with sociality in a number of different ways. OXTR *rs53576* is a single-nucleotide polymorphism (SNP) of an adenine (A) or guanine (G) in the oxytocin receptor gene, which is localized in a single copy to chromosome 3 of the human genome (Gimpl & Fahrenholz, 2001). Although its neural mechanisms are still unknown, OXTR *rs53576* has been linked to differences in hypothalamic-limbic structure and function among humans (Tost et al., 2010). A few studies have tested the connection between the OXTR gene and social behavior phenotypes; one animal study shows that mice with a null mutation in the OXTR gene tend to be more aggressive (among males), less maternally nurturing (among females), less distressed by social isolation, and have impaired social memory (Takayanagi et al., 2005).

In terms of the behavioral phenotype among humans, carrying the G allele of OXTR *rs53576* is associated with exhibiting more sensitive parenting behavior (Bakermans-Kranenburg et al., 2008), showing greater sensitivity to infant crying (Riem, Pieper, Out, Bakermans-Kranenburg, & van IJzendoorn, 2011), showing more empathic accuracy (Rodrigues et al., 2009), and having greater psychological resources, such as optimism and self-esteem (Saphire-Bernstein et al., 2011) than carrying the A allele. G allele carriers also report being less lonely (Lucht et al., 2009) and have more prosocial temperament (Tost et al., 2010). In addition, manifestations of these different genotypes of OXTR are significantly detectable through brief observations of behavior (Kogan et al., 2011).

Given the association of oxytocin genes with general social and emotional sensitivity, that is, the tendency to accurately detect socio-emotional cues and to engage in actions responsive to situational demands, we used OXTR rs53376 as our target gene in a series of investigations designed to test the interplay of genetic and cultural factors in shaping emotion regulation. We theorized that OXTR is associated with the degree of susceptibility specifically to socio-emotional cues in the environment, and that culturally normative tendencies would be particularly magnified among those who carry the environmental susceptibility variant because these are the people who should be most sensitive to norms in a given culture. The sensitivity could manifest in the form of accuracy of reading other cultural members' affective response to one's action, or efficiency in attending to culturally meaningful channels of affective information. Thus, people with the socio-emotionally sensitive variant of OXTR are theorized to be more accurately attuned to their culture's normative emotional feedback for their social behaviors. In turn, these socio-emotionally sensitive people would be better at modulating their socio-emotional behaviors, including emotion regulation, to fit in their cultural environment better. To test this prediction, we conducted a series of studies focusing on behaviors relevant to emotion regulation that have been shown to differ across cultures, namely emotion suppression, emotional support seeking, and emotional attention.

Emotion suppression

As reviewed earlier, the tendency to suppress emotion as a way to regulate emotion is more common in East Asian cultures than in the U.S. (Gross & John, 2003; Matsumoto et al., 2008; Tsai & Levenson, 1997). Given this cultural difference, we hypothesized that in a culture where emotion suppression is normatively encouraged, those with a genetic predisposition for higher socio-emotional sensitivity would report engaging in greater emotion suppression than people with a genetic predisposition for lower socio-emotional sensitivity. In contrast, in a culture where emotion expression is valued and emotion suppression is normatively discouraged, those with the same genotype would engage in less emotion suppression, thus showing the interaction between culture and OXTR.

We conducted a study (Kim et al., 2011) in which Korean, U.S. born Asian American, and European American participants indicated their tendency to regulate their emotions using suppression and cognitive reappraisal using the emotion regulation questionnaire (ERQ: Gross & John, 2003), and they were genotyped for OXTR. The results showed a clear interaction between culture and OXTR. Americans (Asian Americans and European Americans) with two copies of the G allele (GG genotype; higher socio-emotional sensitivity) reported suppressing emotion significantly less than Americans with two copies of the A allele (AA genotype; lower socio-emotional sensitivity), whereas Koreans showed the exact opposite pattern: those with the GG genotype reported suppressing emotion more than those with the AA genotype. We also found that those with a single copy of both A and G alleles (the AG genotype) fell between the other two genotypes (see Figure 1). We found neither main effects nor an interaction in regard to cognitive reappraisal, which involves an intrapersonal process and has not been shown to differ across cultures in its use (Gross & John, 2003; Matsumoto et al., 2008). This null finding suggests a boundary condition of the gene-culture interaction. The interaction may occur specifically in how people regulate emotions in a culturally normative way within social contexts, rather than implicating general emotion regulation processes.

Although this pattern of results supported theorized predictions, it is important to note that Koreans and Americans differ not only in terms of culture, but also in their genetic

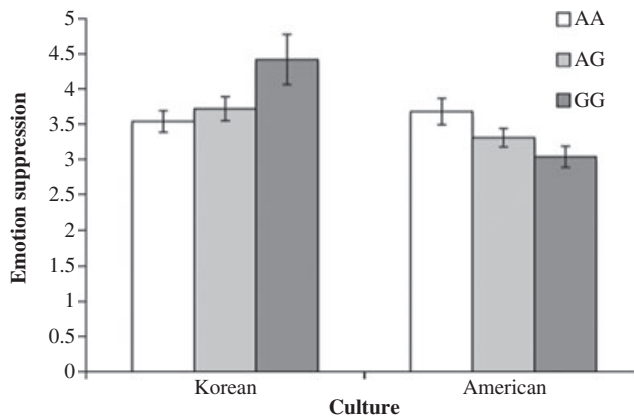


Figure 1 The interaction between culture and OXTR on emotion suppression (from Kim et al., 2011).

make up including genes other than OXTR. This means that gene-gene interaction (Kaufman et al., 2006) is a potential alternative explanation for the present results. That is, the present results may be due to interactions between OXTR and other unmeasured genes that also vary as a function of ethnicity. Thus, in addition to the main analyses, we separated East Asian American participants and European Americans to examine the role of exposures to American culture. The inclusion of U.S. born Asian American participants in the study allowed for triangulation. These analyses were conducted to compare European Americans and Koreans with East Asian Americans. East Asian Americans, who were more culturally “Americanized” but shared a more similar genetic makeup with Koreans should produce a pattern of results more similar to the European Americans than to Koreans, if the found interaction is due to cultural influences. The results indeed show that East Asian Americans’ pattern of association between OXTR and emotion suppression was statistically different from that of Koreans, but did not differ from that of European Americans. This suggests that it is culture moderating the effect of the gene, rather than an additional (unmeasured) gene producing the gene-culture interaction.

Emotional support seeking

Extending the notion of emotion regulation to a more explicitly interpersonal domain, we examined the roles of culture and OXTR in influencing the use of emotional social support (Kim et al., 2010a). As research reviewed in the previous section shows, culture differs in the norms regarding seeking social support, emotional support in particular, as a means to cope with stress. In this study, we ran another sample of Korean, Korean American, and European American participants who indicated their current distress level along with their use of social support seeking. Results again supported the predictions, showing a very similar pattern of responses to the study on emotion suppression. The relationship between OXTR and emotional support seeking was moderated by both culture and distress level. When they were under high distress, Americans with either the GG or AG (GG/AG) genotypes reported relying on emotional support more than Americans with the AA genotype. In contrast, Koreans with the GG/AG genotypes did not increase support seeking any more than those with the AA genotype.

Taken together, it appears that those who are more genetically prone to be socio-emotionally sensitive seek social support more and suppress emotion less, but only when it is

a culturally sanctioned way of coping (Kim et al., 2010a, 2011). It is also important to note that previously observed cultural differences in emotion regulation were most accentuated among the GG/AG group, those who are theorized to be considerably more susceptible to socio-emotional norms than those with the AA genotype.

Emotional attention as a proxy for socio-emotional sensitivity

These two studies described above speculate on the role of socio-emotional sensitivity as a psychological mechanism for why some individuals are more susceptible to cultural norms than others. Previous research on OXTR supports this notion in that different variants of OXTR have been associated with divergent tendencies with a range of measures that can serve as proxies of socio-emotional sensitivity, such as empathic accuracy (Rodrigues et al., 2009) and parental sensitivity (Bakermans-Kranenburg et al., 2008). One of the measures that allow a more direct examination on the role of socio-emotional sensitivity is the degree to which people from different cultures direct their attention to different aspects of emotional communication. In more independent cultural contexts, verbal content, rather than non-verbal and contextual cues, convey most of the meanings in communications whereas non-verbal and contextual cues convey significantly more meanings in more interdependent cultures (Ambady, Koo, Lee, & Rosenthal, 1996; Hall, 1976; Holtgraves, 1997).

Reflecting this difference in the primary channel of communication, people from different cultures tend to direct their attention to different aspects of speech when they need to gauge others' emotions. For example, studies using the vocal Stroop test showed that Japanese individuals direct their attention to vocal tones of speech more than European Americans, who tend to direct their attention to the content of speech (Ishii, Reyes, & Kitayama, 2003; Kitayama & Ishii, 2002). More specifically, the vocal Stroop test presents a series of single spoken emotion words with differently valenced meanings, uttered in vocal tones that are either congruent or incongruent with the valenced meanings (e.g., the positively valenced word "satisfaction" could be uttered in a positive tone, congruent with its meaning, or in a negative tone, incongruent with its meaning). When participants were instructed to ignore the vocal tones and judge the pleasantness of the word content, Japanese participants tended to be more distracted by vocal tone than American participants, but when they were instructed to ignore the word content and make the same judgment based on the tone, the pattern was opposite (Ishii et al., 2003; Kitayama & Ishii, 2002).

Being competent in this task requires one to be attuned to the culturally normative mode of communication. We inferred from these findings that where individuals direct their attention in order to read others' meanings and intentions is an indication of their socio-emotional sensitivity. Thus, we examined the role of OXTR and culture (Japanese versus Americans) using the vocal Stroop test from previous cultural comparisons (Ishii et al., 2003; Kitayama & Ishii, 2002). Replicating the previous findings described above, the results of this study (Kim, Ishii, Sasaki, Shinada, and Kusumi, 2012) showed that Japanese participants were more distracted by the incongruent vocal tone compared to American participants. More importantly, we also found that this cultural difference was considerably greater among the GG/AG group, who showed a strong attentional bias that is consistent with the normative pattern in their respective cultures. That is, Americans, including both Asian Americans and European Americans, who carry at least one copy of the G allele (i.e., GG/AG) showed virtually no interference from the vocal tone whereas Japanese with the same genotypes showed a strong interference effect. Among those with

the AA genotype, this cultural pattern did not show. These results provide initial support for the idea that individuals who are genetically prone to susceptibility to socio-emotional cues are indeed the ones who seem to direct their emotional attention to culturally normative aspects of communication.

The Interplay of Genes and Culture on Emotion Regulation and Beyond

While the present review focused on the case of emotion regulation, the same approach may be applied in other areas of psychology. For instance, we also have found that the same pattern of gene-culture interaction occurs with a serotonin receptor polymorphism (5-HTT1A) on a more cognitive process, namely locus of attention (Kim et al., 2010b). As a rapidly growing body of literature identifies an increasing number of genes reliably associated with behavioral and psychological outcomes, the ways in which one may formulate predictions regarding how these genetic influences exert themselves within smaller and larger social contexts from interpersonal dynamics to cultures will expand.

Moreover, at the moment, very little is known regarding the exact neural and psychological mechanisms underlying the interaction. Fully understanding any link between genes and behaviors requires analysis at numerous levels. We propose socio-emotional sensitivity as one contender for a psychological mechanism and found some empirical support for the idea. However, we do not know if the cultural moderation occurs at molecular and neural levels as well as behavioral levels. Epigenetic research finds the influence of environment even at the molecular level of gene expression. These findings, combined with the mounting evidence from cultural neuroscience showing that many behavioral differences across cultures have their neural correlates (e.g., Han & Northoff, 2008; Ishii, Kobayashi, & Kitayama, 2010; Chiao et al., 2008), suggest that cultural input may assert its influence even at the most basic biological level.

The idea that genetic influences are moderated by environmental inputs is not new. However, the evidence presented in this review underscores the necessity to broaden the notion of environment from personal experiential environment to larger cultural contexts. Emotion regulation, just like any other psychological process, is constrained by both genetic and cultural factors, and the interplay of the two factors may at times lead to unexpected outcomes. In this paper, we reviewed research findings on biological and socio-cultural factors that influence emotion regulation. More generally, we aimed to present an integrative model that allows empirical examination of the interplay between genetic and cultural influences. Much of the previous research on biological and cultural antecedents and consequences has by and large focused on one of these factors or another, but the present model illustrates the promise of considering these factors together to understand how biology and culture can jointly influence emotion regulation.

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Short Biographies

Heejung S. Kim is an Associate Professor in the Department of Psychological and Brain Sciences at University of California Santa Barbara. She received her Ph.D. from Stanford University. Her research interests are in cultural psychology. Her research has been funded by multiple grants from the National Science Foundation. More recently,

Dr. Kim has been examining cultural and genetic influences on the use and effect of self-expression.

Joni Y. Sasaki is currently a doctoral student at the University of California, Santa Barbara. In July 2012, she will be an Assistant Professor in the Department of Psychology at York University. Her research interests include: the cultural shaping of religion, emotion, and social attention, moderators of the effects of religion, and gene-culture interactions.

Endnote

* Correspondence address: Department of Psychological and Brain Sciences, University of California, Santa Barbara, CA 93106-9660, USA. Email: kim@psych.ucsb.edu

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