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Neuro-cultural Mechanisms of Choice-Justification:

Culture, Dissonance, and the Brain

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Choice organizes virtually all behavior. Thus, understanding choice is arguably important for understanding of behavior in general. In the current chapter, we will explore mechanisms of choice making with a novel approach that is informed by recent developments in both cultural psychology and cultural neuroscience (e.g., Chiao & Blizinsky, 2010; Kitayama et al., 2011; Han et al., 2013) and neuroscience of decision-making (e.g., Knutson et al., 2009; Plassmann et al., 2010). With a focus on a well-studied phenomenon of choice justification (Brehm, 1957; Steele et al., 1993), we will formulate a new framework called the NeuroCultural Model of Choice Justification.

Three interlocking sets of issues motivate the current effort. Specifically, from social and cultural psychological work we know that choice justification is ubiquitous (Brehm, 1956; Festinger, 1957; Steele, 2008) and, yet, the situations in which it occurs vary systematically across cultures: For example, whereas European Americans (who tend to see themselves as independent from others) justify choices they make for themselves, Asians (who tend to see themselves as interdependent with others) justify choices they make for their friends (Hoshino-Browne et al., 2005; Kitayama & Imada, 2008; Kitayama et al., 2004). From the neuroscience of decision-making, we know that choice justification occurs at the mesocorticolimbic neural pathway of reward processing (Kitayama et al., 2013; Sharot et al., 2009). The goal of the current chapter is to integrate these two hitherto separate lines of work.

Choice Justification and Cognitive Dissonance

When people decide on an important issue by choosing one course of action over its alternatives, they often justify and rationalize the choice by appraising the chosen option as more desirable and likable and the rejected options as less so even when the two options were

appraised equally desirable and likable before the decision. This phenomenon is called **choice justification**. Since first demonstrated by Brehm (Brehm, 1956), numerous experiments have found this basic effect, which provides an empirical cornerstone of cognitive dissonance theory (Festinger, 1957) – one of the most influential theories in social psychology.

In his theory of cognitive dissonance, Festinger (1957) argued that when individuals make an important choice, they feel cognitive conflict since not all attributes of the chosen option might be optimal and, at the same time, some attributes of the rejected option might in fact be quite desirable. This cognitive conflict is thus assumed to entail negative emotional arousal. This negatively arousing cognitive conflict is called **cognitive dissonance**. Because cognitive dissonance is aversive, it motivates the chooser to reduce the dissonance by reinterpreting the choice options. Typically, the chosen option is reappraised as more desirable whereas the rejected option is reappraised as less desirable. This effect is called the spreading of alternatives or **SOA**. SOA is typically understood as an indicator of choice justification.

The choice justification effect has spawned a large number of studies (Harmon-Jones et al., 2009). Much of this work is based on behavioral (i.e., self-report) measures of preferences although some more recent studies have used a neural measure to investigate brain mechanisms underlying this effect (e.g., Kitayama et al., 2013). Further, a recent debate on the validity of the commonly used self-report SOA index (Chen & Risen, 2010) has helped enrich the understanding of the phenomenon in the field at large. Taken in combination, this literature underscores the central significance of the self, culture, and action orientation in the process of choice justification.

Review of Existing Evidence

Self and choice justification. Although the basic premise of dissonance theory is widely accepted, researchers have pointed out that not all cognitive conflicts are equal, arguing that some conflicts are much more self-relevant and thus more important than some others (Steele, Spencer, & Lynch, 1993). In particular, Steele and colleagues (Sherman & Cohen,

2006; Steele, 2008) hypothesized that the dissonance produced by a choice can threaten the image of the self as competent. They argued that it is this self-threat, not the cognitive conflict per se, which motivates the chooser to justify the choice she has made. In support of this analysis, it has been found that choice justification is weaker for individuals with high (vs. low) self-esteem (Steele et al., 1993). Supposedly high self-esteem protects the chooser against the self-threat, thus reducing the need to justify the choice. Compellingly, it has also been found that when individuals are given an opportunity to affirm the self by validating positive personal values they hold, they no longer show a choice justification effect (Heine & Dehman, 1997; Steele et al., 1993).

Recently, Kitayama and colleagues have used functional magnetic resonance imaging (fMRI) to provide converging evidence for the role of the self in choice justification (Kitayama et al., 2012). Participants made a series of choices between two popular music CDs. They were told that they would receive one of the CDs they chose after the experiment. They were scanned while making the choices. Further, the CDs were rated for attractiveness before and after the choices. Behavioral data showed a clear SOA effect, which implies an attitude change that justified the choice. Importantly, the magnitude of the choice–justifying attitude change was predicted by the signal intensity of the activity of two brain regions during choice. As illustrated in Figure 1-A, one of the regions was the **ventral striatum (vSTR)**, which is associated with reward processing (Knutson & Cooper, 2005). Kitayama and colleagues interpreted this finding as indicating that one of the options that is to be chosen has already acquired positive values even before the choice. We will return to this important point later. More relevant to the current discussion, however, is the observation that a region in the **posterior cingulate cortex (PCC)** also reliably predicted the choice-justifying attitude change. A comparable finding is also found in another recent fMRI study on choice justification (Jarcho, Berkman, & Lieberman, 2011) as well as in an fMRI study that tested dissonance effects in an induced compliance paradigm (van Veen, Krug, Schooler, & Carter, 2009). Because PCC is part of the midline default network that

is recruited when self-relevant cognitions are retrieved and elaborated on (Addis, Wong, & Schacter, 2007; Kelley et al., 2002; Northoff et al., 2006), the finding is consistent with the notion that choice justification occurs only to the extent that self-relevant cognitions are retrieved during choice (supposedly because the self is threatened).

Culture and choice justification. The last two decades of research in cultural psychology has shown that different cultures endorse quite divergent views of the self (Kitayama, Duffy, & Uchida, 2007; Markus & Kitayama, 1991). If the forms of the self vary, conditions in which the self is threatened should also vary. We may therefore expect that the conditions in which choice justification occurs will vary across cultures.

Kitayama, Markus, and colleagues (Kitayama et al., 2007; Kitayama & Uskul, 2011a; Markus & Kitayama, 1991; 2010) have argued that in North American cultures of European descent (i.e., European Americans and European Canadians), a view of the self as independent from others is strongly endorsed. As illustrated in Figure 2-A, the self is defined primarily by its internal attributes such as attitudes, preferences, personality traits, and motives. The person uses these internal attributes to guide his or her own actions. In contrast, in East Asian and Asian American cultures, a view of the self as interdependent is much more common and strongly valued. As illustrated in Figure 2-B, the self is defined primarily by social attributes such as social roles, duties, and obligations. Internal attributes such as attitudes and preferences are less important.

Over the last two decades, numerous cross-cultural behavioral experiments have provided support for the cultural difference in the self. For example, whereas North Americans of European descent are cognitively more attuned and focused on a goal-relevant object in lieu of its context, Asians are more holistic, attentive to the surrounding context and relations between the object and the context (Kitayama, Duffy, Kawamura, & Larsen, 2003; Masuda & Nisbett, 2001). Furthermore, the basis of happiness differs across cultures such that North Americans of European descent associate happiness primarily with personal achievement

whereas Asians and Asian Americans tend to associate happiness with social harmony (Kitayama et al., 2007; Uchida & Kitayama, 2009). Correspondingly, European Americans are motivated to influence their surroundings including other people, while Asians tend to be motivated more to adjust to their surroundings, including expectations held by others (Morling, Kitayama, & Miyamoto, 2002). Likewise, as compared to Asians, North Americans of European descent are motivated to achieve uniqueness of the self (Kim & Markus, 1999) and affirm the positive view of their personal self (Heine, Lehman, Markus, & Kitayama, 1999). Recent neuroscience evidence corroborates these general conclusions with respect to cognition (Goh et al., 2007; Hedden, Ketay, Aron, Markus, & Gabrieli, 2008; Kitayama & Murata, n.d.), emotion (Murata, Moser, & Kitayama, 2012), and motivation (Park & Kitayama, 2012). This evidence is reviewed elsewhere (Han et al., 2011; Kitayama & Park, 2010; Kitayama & Uskul, 2011a).

Regarding cultural variation in choice justification, we may expect that North Americans of European descent will be strongly motivated to justify a choice they make if the choice is expressive of their personal self and, thus, posing a potential threat to the self (e.g., “Am I stupid that I have made this choice?) (Kitayama & Imada, 2008). A choice will be expressive of the personal self if it is made in private, without any social constraints; but this threat will be diminished if the choice is made in public in the presence of “social eyes” because the social eyes are perceived as constraining the choice (Imada & Kitayama, 2010). In support of this analysis, when asked to make a choice between two equally attractive items and subsequently evaluate the items again, European Americans show a SOA effect (with the preference increased for the chosen item and decreased for the rejected item). But this effect occurs only when the choice is made without cues indicating any presence of social eyes. Importantly, this effect becomes much weaker in the presence of a subtle cue indicative of such eyes (e.g., a poster of schematic faces that is hung inconspicuously in front of the chooser, see Figure 3-A) (Imada & Kitayama, 2010; Kitayama, Snibbe, Markus, & Suzuki, 2004). It may also be expected that Asians and Asian Americans would be most motivated to justify a choice they make if the

choice poses a potential threat to the social, public self. A choice is threatening to the social self if it is made in public in the presence of social eyes. In support of this analysis, Asians rarely show a choice justification effect when they make a choice in completely private conditions, but they show this effect when they are surreptitiously exposed to a cue indicating social eyes (e.g., schematic faces as in Figure 3-A) during choice (Imada & Kitayama, 2010; Kitayama et al., 2004).

The cross-culturally divergent effect of social eyes has been conceptually replicated with a performance measure of motivation (Na & Kitayama, 2012). Na and Kitayama asked both European Americans and Asians (Koreans in Korea) to choose among three different facets of their IQ (i.e., fluid IQ, creativity, and verbal IQ) to be tested. The choice was made either in the absence of any cues indicating watching others (called “no priming choice”) or in the presence of such a cue (shown in Figure 3-A, called “social eyes priming choice”). A control condition includes assignment of one of the three IQ tests by the experimenter. After this choice/assignment manipulation, all participants were taken to an individual cubicle and worked on the same set of cognitive problems under the disguise of the chosen/assigned IQ test. As predicted, European Americans performed better (in terms of the number of questions completed) in the no priming choice condition than in the no choice control condition. Importantly, as compared to the no-choice control, performance was no better in the social eyes priming choice condition (see Figure 3-B). Moreover, the improved performance in the no priming choice condition was mediated by independent self-construal (as assessed by a paper and pencil measure). Korean participants showed a contrastingly different pattern. As predicted, performance was significantly better in the social eyes priming choice condition than in either the no priming choice condition or the no-choice control condition, with the latter two conditions not differing with one another. Moreover, the improved performance in the social eyes priming choice condition was mediated by interdependent self-construal.

The reasoning behind the studies examining effects of social eyes priming may be applicable to other situations, particularly situations involving gift giving. In the literature on choice justification, researchers have mostly tested choices a person makes for him or herself (called self-choice). However, people do often make choices for others, particularly others they care about such as friends and spouses. Such choices are public in the sense that the chooser is aware that the pertinent other will come to know the choice she makes. We may therefore expect that that in the self-choice condition North Americans of European descent will show a strong SOA effect, but this effect will be much attenuated in the friend-choice condition (wherein participants chose a gift for their friends). As illustrated in Figure 4, this pattern has been observed (Hoshino-Browne et al., 2005). In contrast, Asian Canadians showed a strikingly strong SOA effect in the friend-choice condition, but not in the self-choice condition. A subsequent study has found that North Americans of European descent do show a reliable justification effect even in the friend-choice condition when interdependent orientations are subtly primed (Kimel, Grossmann, & Kitayama, 2012). This is consistent with the supposition that the cultural difference in the friend-choice condition is mediated by interdependent self-construal. As shall be seen, the current proposal will extend this choice type (self vs. friend) x culture (European vs. Asian) interaction in a cross-cultural imaging genetics study.

Action orientation increases choice justification. Yet another important backbone for the study proposed here comes from an important series of work showing that action orientation moderates the SOA effect (E. Harmon Jones & Harmon Jones, 2008; E. Harmon Jones, Amodio, & Harmon Jones, 2009). Harmon-Jones and colleagues have argued that one important function of choice justification is to facilitate subsequent actions vis-à-vis the option that has been chosen. Several studies measured the personality trait of action vs. state orientation and found that choice justification is more pronounced for those high in action (vs. state) orientation (E. Harmon Jones & Harmon Jones, 2002). A similar pattern has been observed when action orientation is assessed with electroencephalogram (EEG). It has been

shown that the left-dominant frontal EEG asymmetry is associated with approach tendencies. As may be predicted, choice justification is greater for those who show stronger left (vs. right) frontal EEG activity. More intriguing is the finding that when biofeedback was used to reduce (or increase) the left frontal EEG dominance, the choice justification effect was also reduced (or increased), thus demonstrating the causal role of the left EEG asymmetry and, thus, that of action orientation (E. Harmon Jones, Harmon Jones, Fearn, Sigelman, & Johnson, 2008).

Action orientation is related to the left frontal cortical activation because the left dorsolateral prefrontal cortex is involved in translating the appetitive behavioral tendency of approach into concrete actions (E. Harmon Jones & Harmon Jones, 2008). Yet, the appetitive behavioral tendency itself is likely to be produced at mesocorticolimbic regions of the brain including the ventral striatal areas such as nucleus accumbens (NAcc) and the caudate head (Berridge, 2012; Knutson & Delgado, 2009) as well as orbitofrontal cortical areas (Pizzagalli, Sherwood, Henriques, & Davidson, 2005). These areas are linked closely to reward processing and innervated by dopamine neurons. It is noteworthy that in the aforementioned study Kitayama and colleagues observed that the SOA effect was predicted by the vSTR activity during choice (Kitayama et al., 2012). Hence, what Harmon-Jones conceptualized as action orientation might have an important root in the subcortical dopaminergic systems of reward processing.

Regression toward true attitudes (RTTA). Recently, a question has been raised on the validity of SOA as a measure of choice justification. Chen and Risen (2010) pointed out that in the free choice procedure, choice pairs are formed on the basis of pre-choice preference ratings such that the two items are (nearly) equal in preference. However, any ratings are prone to noise. As a consequence, even though the two items are rated very similarly, one of the items may well be more likable than the other at the level of true attitudes. The item that is truly more likable should be more likely to be **both** chosen when a choice is requested **and** rated more favorably when liking ratings are requested again. That is, both subsequent choice and ratings

will show what may be called the **regression toward true attitudes (RTTA)**. Because of this stochastic process, the SOA can happen even in the absence of a true attitude change. Parenthetically, Chen and Risen also note that approximately 20% of subjects who change post-choice ratings in the direction opposite to the prediction are typically discarded. This assertion, however, does not apply at least to the studies that are reviewed above.

While the RTTA artifact presents a potential threat to the validity of the behavioral SOA measure it might not be always sizable. Specifically, if the RTTA artifact is the main driving force, then the preference change as reflected in SOA should occur **even when the second rating precedes the choice**. The fact that SOA can be observed even under such a condition (Chen & Risen, 2010) suggests that RTTA does occur sometimes. However, evidence shows that SOA is often substantially greater when choice precedes the second rating, as compared to when it follows the latter (Chen & Risen, 2010; Izuma et al., 2010; Sharot et al., 2012). In fact, one study found no preference change when the choice followed (rather than preceded) the second rating (Sharot et al., 2012). Furthermore, the RTTA artifact is expected to produce a non-zero SOA score even in conditions in which choice justification is expected to be minimal. Hence, if the SOA score were in fact no different from zero under such conditions, this would suggest that the RTTA artifact was negligible. In several behavioral experiments, such findings have been obtained. For example, the SOA scores were practically zero in several studies in which European Canadians (or Asians) made a choice for their friends (or for themselves) (Hoshino-Browne et al., 2005). Similar null SOA effects have also been obtained when the dissonance is “washed away” by a symbolic act of “washing hands” (Lee & Schwarz, 2010) or when the self has been affirmed to reduce the need to defray the sense of threat to the self (Steele et al., 1993). The “washing-hand” manipulation is especially compelling because it occurs **after** the first rating task. Regardless, all these null SOA effects are hard to reconcile with the RTTA artifact. Finally, the findings obtained with the self-report SOA measure have been replicated with a performance measure of motivation (Na & Kitayama, 2012, Figure 3-B). Taken together,

it is reasonable to assume that the evidence from behavioral free choice studies is valid even though, on an *a priori* basis alone, it is difficult to preclude RTTA in these studies.

It bears an emphasis that a neural measure of SOA is instrumental in addressing the RTTA artifact. As noted above, recent fMRI studies have shown choice justification with a neural indicator of reward processing (activity in the ventral striatum [vSTR]) (Izuma et al., 2010; Jarcho et al., 2011; Sharot, De Martino, & Dolan, 2009). Chen and Risen (2010) argue that because brain activity and self-report ratings are correlated (Sharot et al., 2009; Qin et al., 2011), these neural findings could also be caused by RTTA. However, this correlation occurs because both rating and brain activity reflect **true attitude**. In all likelihood, the sources of errors associated with the measurement of the true attitude are distinct for self-report versus brain activity. For example, errors in self-report can arise from inadequate cognitive calibration of the true attitude in terms of a rating scale that is used, but a cognitive process like this will be irrelevant in the measurement of the attitude with brain activity. Likewise, errors in brain activity can result from numerous random firings of neurons involved, but neural processes like these will unlikely be relevant in self-report. Thus, a brain region (e.g., vSTR) will unlikely show any greater (or lesser) activity **by error** simply because the self-report measure over- (or under-) estimates the true attitude **by error**. While these two types of errors always exist, they are likely unrelated statistically.

Aside from the theoretical consideration above, we should be mindful that the plausibility of the assertion that SOA reflects substantive psychological/neural mechanisms and processes will increase if theoretically expected empirical patterns can be verified across different measures including self-report (e.g., Hoshino-Browne et al., 2005), performance (Na & Kitayama, 2012), and neural measures (Kitayama et al., 2013).

Unresolved Questions

To make further progress in this area of research, several outstanding issues must be addressed. In this section, four such challenges are identified.

Cultural variation in choice justification as indicated by ventral striatum (vSTR) activity. On the basis of a premise that dissonance is a fundamental building block of human decision making, many scholars have assumed that this process must be pancultural and universal. Yet, it is increasingly problematic to equate the significance of psychological mechanisms with their pan-cultural nature. During the past decade, numerous studies have documented plastic change of brain connectivity that occurs as a function of diverse experiences including socio-cultural experiences (Kitayama & Uskul, 2011). Moreover, analogous effects of experience can extend to gene expression (Cole, 2009) and, more intriguingly, even to the frequency of genetic polymorphisms across populations (Chen et al., 2009; Chiao & Blizinsky, 2010).

In order to start investigating the socio-cultural regulation of the brain, then, it is crucial to examine population-level variation with respect to specific neuropsychological mechanisms. Our approach is a way to address this general intellectual agenda, with an expectation that the precise conditions in which choice justification as revealed in vSTR activity occurs will depend, among various situational factors, on cultural backgrounds of subjects. In conjunction with the earlier behavioral data by Hoshino-Browne and colleagues (2005, Figure 3), the vSTR choice justification effect should be observed when European Americans make self-choices (but not friend choices) and when Asians make friend-choices (but not self-choices).

Preliminary evidence is encouraging. Thus, for example, Sharot et al. (2009) tested British subjects and observed that the vSTR area extending vertically to the caudate nucleus tracked choice justification. Thus, this activation was greater for chosen options than for rejected options especially after (vs. before) the choices. Interestingly, we followed the procedure of the Sharot et al. study and failed to obtain this particular effect (Qin et al., 2011). More recently, we did observe the vSTR choice justification among North Americans, as predicted. Intriguingly, the vSTR choice justification effect was significantly more pronounced for those with independent construals of the self (Tompson et al., 2013). In combination, the available evidence is

consistent with the supposition that under the typical condition used in these experiments (which use what we call **self-choices**), the vSTR choice justification effect is stronger for more independent individuals, namely, for Americans relative to Asians. On the basis of the Hoshino-Browne et al. (2005) study (Figure 3), we may also expect that the vSTR choice justification effect will be more pronounced for Asians (vs. European Americans) once **friend-choices** are tested. Future work should test this expectation.

Demonstrating the involvement of dissonance in choice justification. All the studies reviewed so far are premised on the assumption, central to dissonance theory, that difficult choices produce dissonance and, moreover, this dissonance motivates the chooser to justify the choice she makes because it is supposedly self-threatening. There is some evidence for this possibility. For example, it has been observed that the choice justification (i.e., SOA) effect disappears once the chooser is allowed to engage in a symbolic act of cleansing, thus indicating that the effect is mediated by something "dirty" (Lee & Schwarz, 2010). More direct evidence of dissonance comes from our imaging study mentioned above (Kitayama et al., 2013). In this study participants made a series of choices, which varied in difficulty, with some choices more difficult (because the options are equally attractive) than some others (because one option is more attractive than the other). The difficult vs. easy contrast during choice showed a reliable activation of both the **dorsal anterior cingulate cortex (dACC)** and the **anterior insula (aINS)** (see Figure 1-B). Because dACC and aINS are linked to cognitive conflict (Bush, Luu, & Posner, 2000) and negative arousal such as disappointment and regret (Chua, Gonzalez, Taylor, Welsh, & Liberzon, 2009), respectively, the evidence suggests that difficult choices did in fact produce negatively arousing cognitive conflict.

Will the dissonance as revealed in the activities of both dACC and aINS (Figure 1-B) lead to choice justification? Such evidence was obtained in an induced compliance paradigm (van Veen et al., 2009). In the Kitayama et al. study discussed above, the activity in dACC and aINS during choice was correlated with the activity in vSTR during choice (within subjects

across the choice trials), which in turn predicted the choice-justifying attitude change (see Figure 1-A). However, this experiment did not have an adequate no-choice control condition, which would be required to establish the functional connectivity that is implied between dissonance (dACC and aINS) and preference change (vSTR) both during choice and afterward. Future work should improve on the Ktiayama et al. (2013) to test the functional connectivity between dACC/aINS and vSTR.

Visual search as a key mediating mechanism of choice justification. For a long time, choice justification was tested with a behavioral measure (SOA) as the key dependent variable. Typically, participants were asked to make only one choice and then preferences for two relevant choice options were assessed both before and after the choice to yield a SOA index. In these studies, researchers assumed that the choice justification effect (SOA) occurs post-choice, during a period between the time choice is made and the time the second attitude assessment is made, typically 5-10 minutes after the choice (Steele et al., 1993). Recent imaging studies including the ones reviewed above (Jarcho et al., 2011; Kitayama et al., 2013; Sharot et al., 2009), however, have participants make dozens of choices and preferences for all choice options are assessed both before and after the choices. Because it is impossible for the participants to keep track of all the choices they make, the fact that a reliable SOA effect has been observed even under these conditions raises a significant question on the prevailing assumption that choice justification occurs post-choice. It may in fact occur during choice.

To address this puzzle, Kitayama and colleagues (2013) have hypothesized that when confronted with a choice between two attractive options and experiencing dissonance, the chooser is likely to look for positive attributes in one of the options during choice. Once they have identified positive distinctive features in one of the choice options, they will choose that option. Consistent with this reformulation of dissonance theory, when asked to choose the more likable of two faces, participants are known to look at the face to be chosen right before the choice itself (S. Shimojo, Simion, Shimojo, & Scheier, 2003; Simion & Shimojo, 2006).

Furthermore, if this visual search process is responsible for the making of a choice that is justifiable, then the choice justification should be predicted by the identification of positive features during the choice. The finding that choice-justifying attitude change is predicted by vSTR activity is supportive of this supposition – for this activity is likely induced by the positive features that have been identified (Figure 1-A). At present, however, evidence is missing about the visual search process that supposedly causes this brain signal. Nor do we know whether this visual search is motivated by dissonance as revealed in the activity in dACC and aINS (Figure 1-B). Addressing these issues in future work will be crucial to understanding the mechanism underlying choice justification.

A Conceptual Framework: NeuroCultural Model of Dissonance

Although the four future directions identified above are crucial in identifying precise mechanisms of choice justification, this discussion also highlights that the field has produced an empirical base that is sufficient to tentatively propose a model of choice justification that take into account both cultural and neural processes. One such a model, called the neurocultural model (Kitayama et al., 2013) is illustrated in Figure 5. The model holds that, when faced with equally attractive choice options, individuals experience dissonance (i.e., negatively arousing cognitive conflict as revealed in activity in dACC and aINS). Because the dissonance is aversive, individuals are motivated to look for positive distinctive features in one of the options. Once positive features are identified and judged as self-relevant, relevant preferences (as revealed in vSTR activity) will be updated, which provides the informational basis for the choice to be made. Importantly, we hypothesize that the preference updating is more efficient with high (vs. low) dopamine signaling capacity in the corticolimbic reward processing pathways (as determined in part by dopamine-related genetic polymorphisms).

Within this scheme, self-processing (as revealed in midline default network including PCC) is brought to bear on the judgment of self-relevance. This accounts for the cultural differences in the conditions in which choice justification is observed. Features identified during

personal (vs. public) choices will be more personal (vs. social), which will be more relevant to Americans (vs. Asians) because they are likely to have independent (vs. interdependent) self construals.

Conclusion

The present chapter brings together two previously separate bodies of knowledge to further illuminate the nature of choice processes, with a particular emphasis on choice justification (a phenomenon involving increased preference for a chosen option and decreased preference for a rejected option). Specifically, from cultural psychological work we know that choice justification is ubiquitous and, yet, the situations in which it occurs vary systematically across cultures: Whereas European Americans (who tend to see themselves as independent from others) justify choices they make for themselves, Asians (who tend to see themselves as interdependent with others) justify choices they make for their friends. From the neuroscience of decision-making, we know that choice justification occurs at the mesocorticolimbic neural pathway of reward processing. In combination, these three bodies of literature add importantly to the view, common in the current judgment and decision making literature, that choice making is neither static nor merely cognitive. Instead, choice making is best conceptualized as an open, dynamic process that receives constant input from both immediate situations and broader cultural contexts.

As noted in the section of unresolved questions, the proposed model of choice justification raised as many new questions as it solved some old ones. These new questions must be addressed future work. But more generally, the current effort illustrates how collaborative effort among social and cultural psychologists and neuroscientists can be fruitful and can generate new insights. From this vantage point, the most important contribution of the current effort is to point to the promise of an integrative approach that combines insights from both behavioral and neuroscience methods and concepts – the approach called cultural neuroscience. This approach has begun to emerge at the cross-section of social and cultural

psychology and neuroscience and has been applied to a variety of phenomena (Han et al., 2011; Kitayama & Uskul, 2011b).

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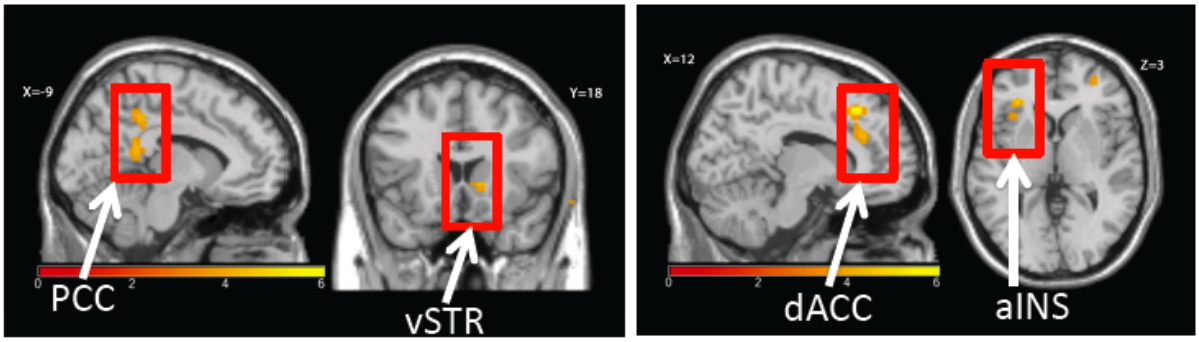
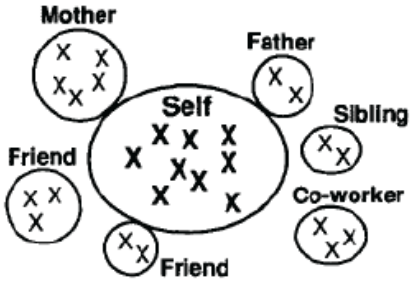


A. Activity in two areas during choice between two attractive options predicted choice-justifying attitude change: Posterior cingulate cortex (PCC) and ventral striatum (vSTR), which are linked to self-processing and reward processing, respectively.

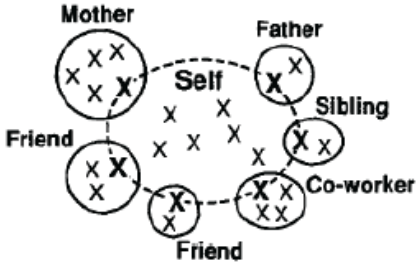
B. The difficult vs. easy choice contrast during choice revealed two areas: dorsal anterior cingulate cortex (dACC) and anterior insula (aINS), which are linked to cognitive conflict and negative arousal, respectively.

Adapted from Kitayama et al., 2013, *NeuroImage*, *13*, 206-212.

Figure 1. Key findings from a recent fMRI study on choice justification: Choice justifying attitude change is predicted by in-choice activity in two regions (A). Further, difficult (vs. easy) choices activate two brain areas that are predicted by dissonance theory (B).



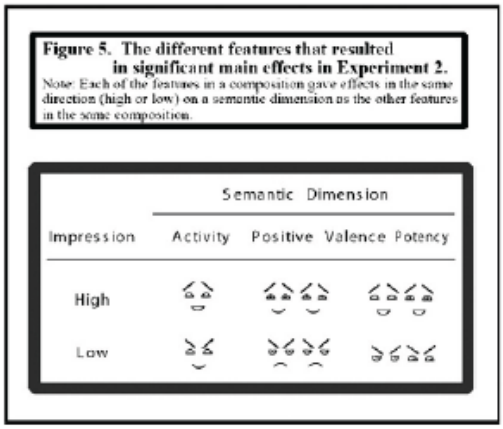
A. Independent view of the self that is dominant among North Americans of European descent.



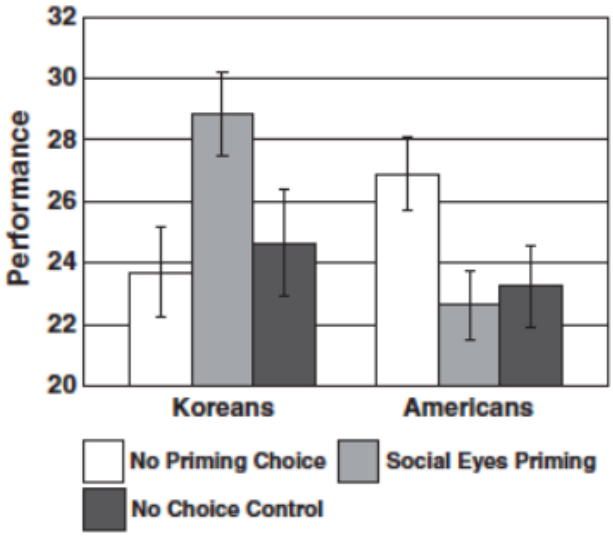
B. Interdependent view of the self that is dominant among Asians and Asian Americans.

Figure 2. Culturally dominant views of the self as independent and interdependent.

Adapted from Markus & Kitayama, 1991, *Psychological Review, 98*, 224-253.



A. Social eyes priming: A poster of schematic faces



B. Effects of social eyes priming during choice on subsequent performance

Figure 3. Effect of choice on task performance: The effect is moderated by social eyes priming during choice by means of a schematic faces poster (A). Whereas Koreans performed best when social eyes were primed during choice, European Americans performed best when social eyes were *not* primed during choice (B).

Adapted from Na & Kitayama, 2012, *J of Exp & Soc Psychology, 48*, 284-290.

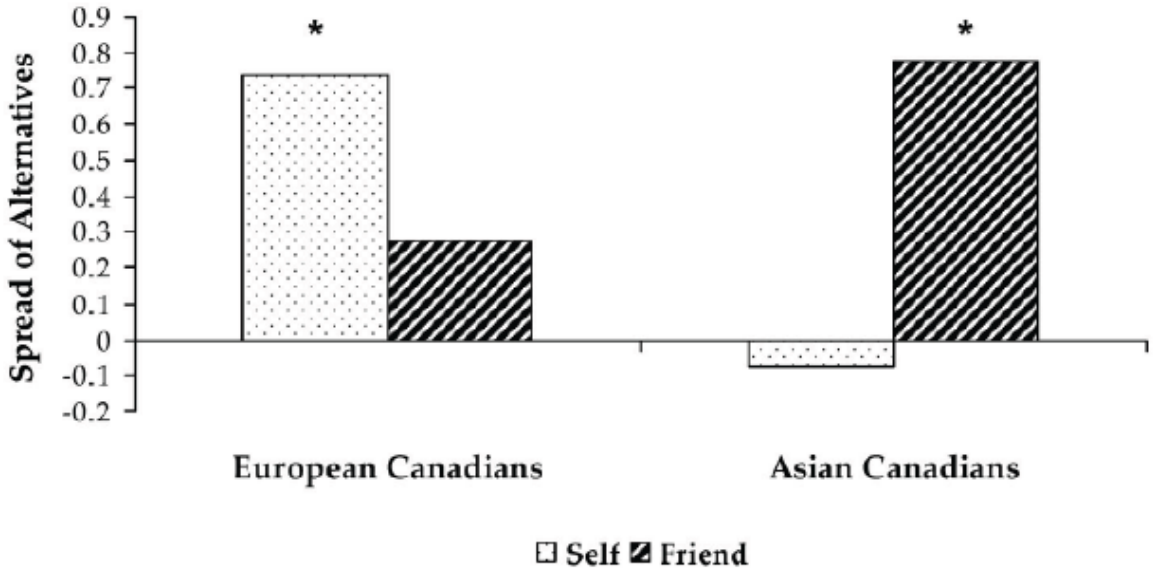


Figure 4. The SOA effect is observed when European Canadians have made a choice for themselves and Asian Canadians have made a choice for their close friend. Note that there is no SOA effect in the friend-choice condition for European Canadians and in the self-choice condition for Asian Canadians.

Adapted from Hoshino-Browne et al., 2005, *J of Per & Soc Psych, 89*, 294-310.

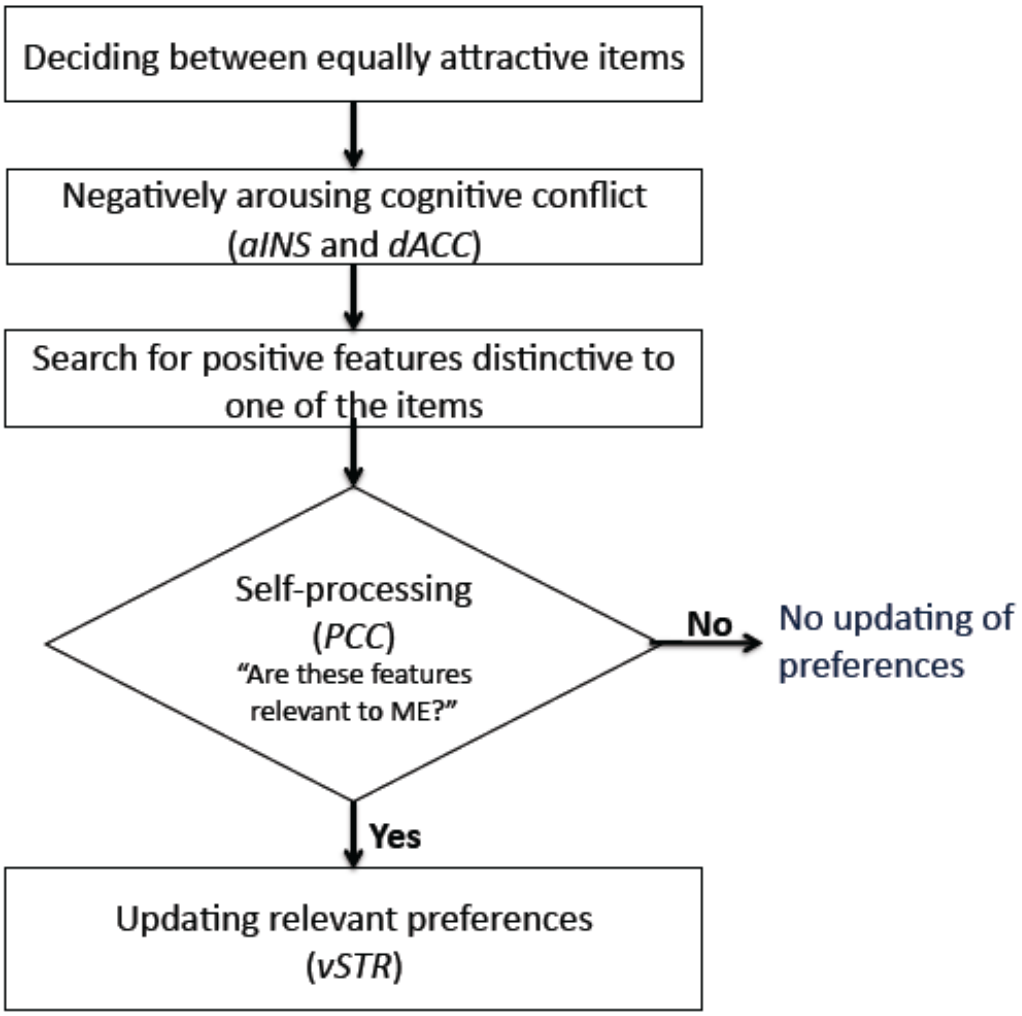


Figure 5. Neurocultural model of choice justification. Adapted, with modification, from Kitayama et al., 2013, *NeuroImage, 13,* 206-212*.*