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SPONTANEOUS INFERENCES FROM CULTURAL CUES
Varying Responses of Cultural Insiders and Outsiders

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Results from two groups of biculturals (Hong Kong undergraduates, Chinese Americans) and a group of European Americans in two studies showed that in the presence of applicable cues of a culture, individuals with expert knowledge in the culture spontaneously make inferences about the culture's moral values, producing a Stroop-like effect. Although both biculturals and European Americans made spontaneous cultural inferences from American cultural cues, only biculturals made spontaneous inferences from Chinese cultural cues. Moreover, American-Chinese bicultural individuals can switch between correspondent cultural inferences from American and Chinese cultural cues numerous times within one experimental session. Implications on cultural adaptation and cultural competence are discussed.

Keywords: cultural processes; spontaneous inferences; moral inferences; bicultural cognition

Cultural psychologists have increasingly studied biculturals—individuals enmeshed in more than one culture (Gardner, Gabriel, & Lee, 1999; Hong, Morris, Chiu, & Benet-Martinez, 2000). All individuals have some understanding of other cultures but biculturals navigate situations in the second culture like an expert; they interpret and express messages in situations in the ways that natives do (Chiu & Hong, 2005). According to this view, learning the contents of a culture and assimilating to its practices and values can be likened to an expertise building process.

A number of studies have investigated individuals who are insiders to both Chinese culture and Anglo-American culture as a result of growing up in the colony of Hong Kong (Hong et al., 2000; Lau-Gesk, 2003), family emigrating from Chinese to Western societies (Hong, Benet-Martinez, Chiu, & Morris, 2003), or studying abroad (Gardner et al., 1999; Ross, Xun, & Wilson, 2002; Trafimow, Triandis, & Goto, 1991). A central question in research on biculturals is determining how they manage to apply their expertise in two cultures discriminatively to guide their interpretations and actions in a particular setting. For example, how do American-Chinese biculturals manage to use their expertise in American culture when navigating an American cultural situation? How do they prevent interference of associations from their Chinese cultural knowledge when processing an American cultural situation?

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In answer to these questions, researchers have proposed a process called *frame switching*. The term originates in qualitative research with biculturals who report the experience of nonvolitional shifts in their mode of interpretation: In one situation, everything is filtered through Chinese lenses; in the next, everything is filtered through American lenses (LaFromboise, Coleman, & Gerton, 1993). Hong et al. (2000) proposed that it occurs through automatic activation of cultural frames, which are interlinked systems of knowledge structures, in response to cues of the cultural requirements of a situation.

In recent years, several studies have produced results consistent with the knowledge activation account of frame switching. Hong et al. (2000) found that the social perceptions of Westernized Hong Kong students were shifted in the direction of Western and Chinese cultural biases, respectively, in conditions where these cultures were primed through a prior unrelated task of commenting on a series of American or Chinese iconic cultural images (see also Verkuyten & Pouliasi, 2002). These results illustrate how the presence of a cultural cue increases a culture insider's reliance on its associated cultural frame or mindset (see Bargh & Chartrand, 2000).

The current studies concern another cognitive characteristic of cultural expertise—the tendency to spontaneously go beyond the information contained in a cultural cue and make inferences from it. If cultural knowledge operates like any other well-developed knowledge structures or expertise, whenever an applicable stimulus comes in range, the powerful, well-oiled cognitive machinery will produce spontaneous inferences. For example, an American-Chinese bicultural watching a baseball game (a cue of American culture) may spontaneously think of freedom and liberty (American cultural values), and the same bicultural seeing a red lantern (a cue of Chinese culture) may spontaneously think of the value of fulfilling interpersonal duties (a Chinese cultural value).

Spontaneous shifts in correspondent cultural inferences and cultural frame switching are different cognitive responses to external cultural cues. Cultural frame switching is a result of mindset priming, and different mindsets seem to reflect different inferential rules. The inferential rule at work when a particular mindset is activated may be more characteristic of Culture A than of Culture B. For example, an inferential rule that links behaviors to the actor's personal dispositions is more widely distributed in American culture than Chinese culture, whereas an inferential rule that links behaviors to the dispositions of the group to which the actor belongs is more popular in Chinese culture (Menon, Morris, Chiu, & Hong, 1999). American-Chinese biculturals primed with American (Chinese) cultural cues may access an American (Chinese) mindset and make more individual (group) dispositional attributions (Hong et al., 2003).

In contrast, a spontaneous shift in correspondent cultural inference does not implicate a switch in cultural frames or mindsets. Individuals with insider knowledge of a culture organize their knowledge of a culture (e.g., the culture's values, customs, history, folklores) in a network of associations. In the presence of an applicable cultural cue, a certain node in this network is excited and spreading activation travels down the connected nodes, producing correspondent cultural inferences. Furthermore, the cultural cues and inferences could be semantically remote from each other because the cues and inferences are connected primarily through their common associations with the corresponding culture and not through their overlap in semantic meanings. For example, for individuals with insider expertise in American culture, the sight of a Thanksgiving turkey may produce inferences of American values such as freedom and uniqueness. Despite their minimal semantic overlap, the turkey affords inferences of these American values because both are part and parcel of American culture.

Individuals with expertise in two cultures have two well-developed networks of associations, one for each culture. They will therefore make spontaneous correspondent cultural

inferences in the presence of applicable cues from either culture. Furthermore, they may make correspondent cultural inferences in response to cues from Culture A at one moment and switch cultural inferences at the next moment when cues from Culture B increase in salience. However, unlike cultural frame switching, which implicates the switching of mind-sets, a spontaneous shift in correspondent cultural inferences only requires accessing the pertinent network of cultural knowledge in response to the situational cue. Once the relevant network is accessed, the same inferential rules will produce the pertinent inferences.

In short, whereas cultural frame switching involves activation of a cultural frame with its attendant inferential rules (e.g., rules for rendering causal attributions), spontaneous correspondent cultural inference involves activation of specific cultural contents associated with the cultural cue. Depending on the kind of cultural expertise they possess, individuals may make different inferences from the same cultural cue but the inferential rules for making these inferences are the same. Despite their apparent differences, the two processes work in concert to produce culturally competent responses. When applicable cues are present, cultural experts will make correspondent cultural inferences spontaneously and retrieve the appropriate cultural frame (or mindset) to process these materials.

In this research, we developed a method to measure spontaneous correspondent inferences from cultural cues. It adapts the false recognition procedure of Uleman, Hon, Roman, and Moskowitz (1996), in which participants are asked to judge whether a given probe word appeared in the preceding sentence. The crux of the method is that spontaneous inferences facilitate processing of related stimuli, and this fluency can impair one's performance in a false recognition task, producing a Stroop-like effect.

Uleman et al. (1996) developed their method for studying spontaneous social inferences by adapting a task from McKoon and Ratcliff's (1989, Experiment 1) studies of online inference in text comprehension. Across repeated trials, participants read a sentence followed by a probe word on a computer screen. Their task in each trial was to judge, as quickly and accurately as possible, whether the probe word appeared in the preceding sentence. Probe words implied by the sentence but not literally present are harder to reject than are probe words not implied. Hence, the evidence for spontaneous inference is delay in rejecting related probe words, measured by increased reaction time (RT) in responding "no."

In this research, we adapted this procedure by using sentences that referred to characteristic customs or traditions of Chinese culture (e.g., "Tai-chi is good for one's health") or American culture ("A summer game involves a ball, glove, and a diamond"). The references were things a cultural insider would recognize and associate with core cultural values (Hirsch, Kett, & Trefil, 1988). Our probe words were core values of Chinese culture (e.g., loyalty) and American culture (e.g., uniqueness). The key idea is that for cultural insiders these values are implied by the corresponding culture-reference sentences. Hence, the delay in judging that these probe words were not included in the sentence should be greater than for the same probe words following sentences that do not imply the value.

This method has several advantages. First, the procedure enables a test of the difference between cultural insiders and outsiders. Because the sentences and cultural values used are not strongly and directly semantically related, spreading activation from a cultural cue to a culture's core values requires cultural expertise. The sentences are descriptions of landmarks, folktales, or artifacts in a culture that are not directly associated to the cultural values serving as test probes in our task. Outsiders to a culture would not respond to the sentences in the same way that insiders do; outsiders may fail to recognize the cultural references in the sentences, or even if they do, their associations may not travel from the references to the values as efficiently as in insiders. For instance, many European Americans know what kung-fu is and they

may make semantically related inferences like fighting and physical sports from a sentence that references kung-fu. However, unless they possess insider expertise in Chinese culture, the sentence would unlikely activate Chinese cultural values such as modesty and self-restraint.

Second, past studies manipulated cultural cues between groups to measure a one-time shift in cultural frames. The multiple-trial, within-subject design in our method tests whether the same biculturals shift their inferences when moving across successive trials. Finally, the task, disguised as a decision-making task, would unlikely be seen as one for studying culture and cognition. Thus, demand characteristics are completely eliminated. In short, this method allows us to test the predictions that spontaneous correspondent inferences made from cultural cues (a) are specific to people who have internalized the given culture, (b) are reversible when cues from another culture are present, and (c) have only remote semantic connections with the cues.

In our first study, we used this method to study spontaneous correspondent cultural inferences in Westernized students in Hong Kong. In our second study, we probed more deeply by comparing the responses of two groups of participants at an American university: Chinese Americans who are insiders to both American and Chinese cultures and European Americans who are insiders to American culture only.

STUDY 1

The bicultural population we investigated in our first study is Hong Kong Chinese undergraduates. More than 95% of the residents in Hong Kong are ethnic Chinese. Most Hong Kong Chinese speak Cantonese, a Chinese dialect, as their native language; grew up in a Chinese cultural milieu; and are familiar with the Chinese cultural traditions. At the same time, younger people are also familiar with the dominant values in the West. Hong Kong had also been a British-administered territory since 1842. Before Hong Kong was returned to China in 1997, about 80% of the high schools in Hong Kong had English, not Chinese, officially as the main medium of instruction (Young, Giles, & Pierson, 1986). Additionally, Hong Kong Chinese have been exposed to European American culture through their education and the media. For example, a total of 27 U.S. television channels are available in Hong Kong. From 1997 to 2003, 7 to 13 of the 20 most popular movies in Hong Kong each year (in terms of box office records) were U.S. movies. During this period, half of the 100 most popular movies were U.S. movies (Chiu & Hong, 2006). Schoolchildren in Hong Kong also learn Western cultural values through reading stories of famous Americans like Thomas Edison and Abraham Lincoln (Fu & Chiu, 2006). In short, Hong Kong Chinese university students are experienced in processing the American and Chinese cultural content in their environment.

METHOD

Participants

Forty Hong Kong Chinese undergraduates (11 men, 29 women; mean age = 19.88, SD = 1.04) participated in this study in exchange for course requirement credit.

Spontaneous Inference Task

In the spontaneous inference task (McKoon & Ratcliff, 1989; see also Uleman et al., 1996), the participant read a sentence on a computer screen on each trial. After reading the

sentence, the participant indicated whether the sentence included a probe word. Consider the following two sentences:

Sentence 1: He carried the heavy luggage for the old lady.
Sentence 2: He bought some apples from the food market.

If the probe word is *helpful*, the correct response to both Sentences 1 and 2 is "no" (*helpful* was not in the sentence). However, because *helpful* is a cognitively accessible concept after the participant has read Sentence 1, a competing "yes" response will interfere with the correct "no" response, hence retarding response time. Thus, response time to the probe word should be slower when its preceding sentence is Sentence 1 than when its preceding sentence is Sentence 2.

We used a similar inference task in which 180 experimental trials were formed by pairing 15 sentences with each of 12 probe words. The participant read three kinds of sentences: (a) 5 Chinese culture–reference sentences (e.g., "Tai-chi is good for one's health"), (b) 5 American culture–reference sentences (e.g., "Turkey is a festive food for Thanksgiving"), and (c) 5 culture-neutral sentences that did not refer to either culture (e.g., "Eating fruits and vegetables helps digestion").

There were three categories of probe words: words denoting Chinese moral values, words denoting American moral values, and words unrelated to either culture. Previous studies have revealed marked differences in the conceptions of morality between Chinese and American cultures. The core values in Chinese culture emphasize interpersonal duties and relationships, and those in American culture emphasize personal independence and human rights (Chiu, Dweck, Tong & Fu, 1997; Hong, Ip, Chiu, Morris, & Menon, 2001). Thus, we used the following as Chinese probe words: *obedience*, *loyalty*, *yi-qi* (obligations and affective bonds to family members and friends), and *shame*. We used the following as American probe words: *freedom*, *democracy*, *individuality*, and *uniqueness*. The neutral probe words were *weather*, *language*, *time*, and *symbol*.

In all experimental trials, the correct response was "no." In addition to the experimental trials, we created 38 filler trials that would yield "yes" responses by using words in the stimulus sentences as probe words (e.g., *babies* as a probe for "Clothes for babies are best made of cotton").

All research materials were written in Chinese and presented on a cathode ray tube monitor connected to a computer with a Pentium II central processing unit. A "yes" sticker was placed on the "/" key and a "no" sticker on the "Z" key. The computer recorded participants' responses and response times automatically.

Procedures

Participants were recruited to a study of decision making. Upon arrival, they signed consent forms, the task was explained, and 16 practice trials were given. On each trial, participants first set their gaze at a "+" sign at the center of the computer screen. Two seconds later, the first word of the sentence appeared. By pressing the space bar, participants proceeded through the words of the sentence. The last word was followed by an alert sound, a 250 ms interstimulus interval, and then the presentation of the probe word. At this point, the participants made a judgment of whether the previous stimulus sentence included the probe word as quickly and accurately as possible. The participants indicated their response by pressing the "yes" key with the index finger of their right hand or the "no" key with that of their left

hand. After the response, a blank screen appeared for 1 s before the next trial began. The 218 trials were randomly divided into 3 blocks, with a short break before each new block started. The trials were presented in a different randomized order for each participant.

In this paradigm, correspondent inferences from culture sentences would show up as delayed response times to the culturally corresponding probe words. That is, response times for Chinese probe words would be slower when they are preceded by Chinese culture–reference sentences than culture-neutral or American culture–reference sentences. Likewise, response times for American probe words would be slower when they are preceded by American culture–reference sentences than culture-neutral or Chinese culture–reference sentences.

RESULTS

The percentage of correctly made "no" responses in the experimental trials was high (98.4%), and the percentage of correctly made "yes" responses in the filler trials was lower (84.1%). This difference was probably because there were many more experimental trials that demanded a "no" response than filler trials that demanded a "yes" response; some participants might have developed a bias toward giving "no" responses. The mean RTs was 530.95 ms (SD = 311.13 ms) for all trials, 512.25 ms (SD = 279.71 ms) for the experimental trials, and 649.19 ms (SD = 373.93 ms) for the filler trials. To prepare for data analysis, we first eliminated those RTs that were from wrong answers. Mean latency became 543.65 ms (SD = 331.63 ms) for all trials, 511.15 ms (SD = 275.85 ms) for the experimental trials, and 678.90 ms (SD = 366.38 ms) for the filler trials. Next we log transformed the RTs in the experimental trials and created the necessary summary variables for subsequent inferential statistical analysis. For ease of interpretation, means and standard deviations were calculated based on nontransformed latencies.

Predictions were tested with summary variables representing the mean log-transformed RT in each of the Sentence × Probe conditions. A repeated-measure analysis of variance (ANOVA) performed on the mean RTs revealed a significant main effect of probe: $F(2, 78)$ = 13.98, p < .001, η_p^2 = .26. This main effect was interpreted in the context of the significant Sentence × Probe interaction, $F(4, 156)$ = 3.95, p < .005, η_p^2 = .09.

Recall the two hypotheses in this study: First, response times for Chinese probe words would be slower when they are preceded by Chinese culture–reference sentences than culture-neutral or American culture–reference sentences. To test this hypothesis, we created a set of Helmert contrasts for Sentence (see Table 1), which consists of two contrasts, one pitting Chinese culture–reference sentences against American culture–reference and culture-neutral sentences (Sentence$_{Chinese}$ vs. Sentence$_{Other}$) and one pitting American culture–reference sentences against culture-neutral ones (Sentence$_{American}$ vs. Sentence$_{Neutral}$). A similar set of contrasts was created for Probe, which consists of one contrasting Chinese probe words against American and culture-neutral probe words (Probe$_{Chinese}$ vs. Probe$_{Other}$) and one contrasting American probe words against culture-neutral probe words (Probe$_{American}$ vs. Probe$_{Neutral}$). These two sets of contrasts allowed us to decompose the 4-df omnibus Sentence × Probe interaction into four planned comparisons when we crossed the two sentence contrasts with the two probe contrasts. Our first hypothesis predicted a significant interaction between the Sentence$_{Chinese}$ versus Sentence$_{Other}$ contrast and the Probe$_{Chinese}$ versus Probe$_{Other}$ contrast; the RTs to the Chinese (vs. Other) probe words would be higher only when they were preceded by Chinese culture–reference (vs. Other) sentences.

In our second hypothesis, response times for American probe words were predicted to be slower when they were preceded by American culture–reference sentences than culture-neutral

TABLE 1
Planned Contrasts for Identifying Correspondent
Inferences From Cultural Sentences

	Helmert Contrasts for Sentence (Set 1)		*Helmert Contrasts for Sentence (Set 2)*	
	Chinese culture-reference sentences vs. American culture-reference or culture-neutral sentences	*American culture-reference sentences vs. culture-neutral sentences*	*American culture-reference sentences vs. Chinese culture-reference or culture-neutral sentences*	*Chinese culture-reference sentences vs. culture-neutral sentences*
Chinese culture–reference sentence	1.00	0	–0.50	1
American culture–reference sentence	–0.50	1	1.00	0
Culture-neutral sentence	–0.50	–1	–0.50	–1

	Helmert Contrasts for Probe (Set 1)		*Helmert Contrasts for Probe (Set 2)*	
	Chinese probe words vs. American or culture-neutral probe words	*American probe words vs. culture-neutral probe words*	*American probe words vs. Chinese or culture-neutral probe words*	*Chinese probe words vs. culture-neutral probe words*
Chinese probe words	1.00	0	–0.50	1
American probe words	–0.50	1	1.00	0
Culture-neutral probe words	–0.50	–1	–0.50	–1

or Chinese culture–reference sentences. To test this hypothesis, we constructed another set of Helmert contrasts (see Table 1). The contrasts for Sentence consist of one pitting American culture–reference sentences against Chinese culture–reference and culture-neutral ones ($Sentence_{American}$ vs. $Sentence_{Other}$) and one pitting Chinese culture–reference sentences against culture-neutral ones ($Sentence_{Chinese}$ vs. $Sentence_{Neutral}$). The Helmert contrasts for Probe consist of one pitting American probe words against Chinese and culture-neutral ones ($Probe_{American}$ vs. $Probe_{Other}$) and one pitting Chinese probe words against culture-neutral ones ($Probe_{Chinese}$ vs. $Probe_{Neutral}$). Using these two sets of contrasts, we decomposed the 4-df omnibus Sentence × Probe interaction into four focused contrasts. Our second hypothesis predicted a significant interaction between the $Sentence_{American}$ versus $Sentence_{Other}$ contrast and the $Probe_{American}$ versus $Probe_{Other}$ contrast; the RTs to the American (vs. Other) probe words would be higher only when they were preceded by American culture–reference (vs. Other) sentences.

As predicted, the interaction between the $Sentence_{Chinese}$ versus $Sentence_{Other}$ contrast and the $Probe_{Chinese}$ versus $Probe_{Other}$ contrast was significant, $F(1, 39) = 6.82$, $p < .05$, $\eta_p^2 = .15$. The predicted interaction between the $Sentence_{American}$ versus $Sentence_{Other}$ contrast and the

TABLE 2
Nature of the Significant Interaction Contrasts (Study 1)

$Sentence_{Chinese}$ vs. $Sentence_{Other} \times Probe_{Chinese}$ vs. $Probe_{Other}$

	Sentence	
Probe Word	Chinese Culture Reference	Other Reference
Chinese		
M	501.34	478.26
SD	133.35	111.41
Other		
M	505.78	526.36
SD	117.94	134.01

$Sentence_{American}$ vs. $Sentence_{Other} \times Probe_{American}$ vs. $Probe_{Other}$

Probe Word	American Culture Reference	Other Reference
American		
M	545.60	507.59
SD	143.50	120.04
Other		
M	506.89	500.08
SD	137.20	115.77

$Probe_{American}$ versus $Probe_{Other}$ contrast was also significant, $F(1, 39) = 7.58, p < .01, \eta_p^2 = .16$. Table 2 illustrates the nature of these two interactions. Consistent with our predictions, RTs to the Chinese probe words were higher when they followed Chinese culture–reference sentences than American culture–reference sentences and culture-neutral sentences. Likewise, RTs to the American probe words were higher when they followed American culture–reference sentences than Chinese culture–reference sentences and culture-neutral sentences.

Figure 1 shows the mean RT in each Sentence × Probe condition. We tested the simple main effect of sentence for each type of probe words using a set of Helmert contrasts. For RTs to American probe words, the contrasts used to test our specific prediction consisted of one pitting American culture–reference sentences against other sentences and one pitting Chinese culture–reference sentences against culture-neutral sentences. The omnibus simple main effect of sentence was significant, $F(2, 78) = 6.69, p < .005, \eta_p^2 = .15$. More important, the predicted $Sentence_{American}$ versus $Sentence_{Other}$ contrast was significant, $F(1, 39) = 10.13, p < .005, \eta_p^2 = .21$, and the $Sentence_{Chinese}$ versus $Sentence_{Neutral}$ contrast was not, $F(1, 39) = 3.68$, *ns*. Figure 1 shows that the RTs to the American probe words were higher when they followed American culture–reference sentences ($M = 545.60$ ms) than Chinese culture–reference sentences ($M = 502.07$ ms) and culture-neutral sentences ($M = 513.12$ ms).

For Chinese probe words, the Helmert contrasts consisted of one that pitted Chinese culture–reference sentences against other sentences and one that pitted American culture–reference sentences against culture-neutral sentences. As predicted, the omnibus simple main effect was significant, $F(2, 78) = 5.07, p < .01, \eta_p^2 = .12$. The predicted $Sentence_{Chinese}$ versus $Sentence_{Other}$ contrast was also significant, $F(1, 39) = 7.56, p < .01, \eta_p^2 = .16$ whereas the $Sentence_{American}$ versus $Sentence_{Neutral}$ contrast was not, $F(1, 39) = 1.47$, *ns*. Figure 1 shows that the RTs to the Chinese probe words were higher when they followed Chinese
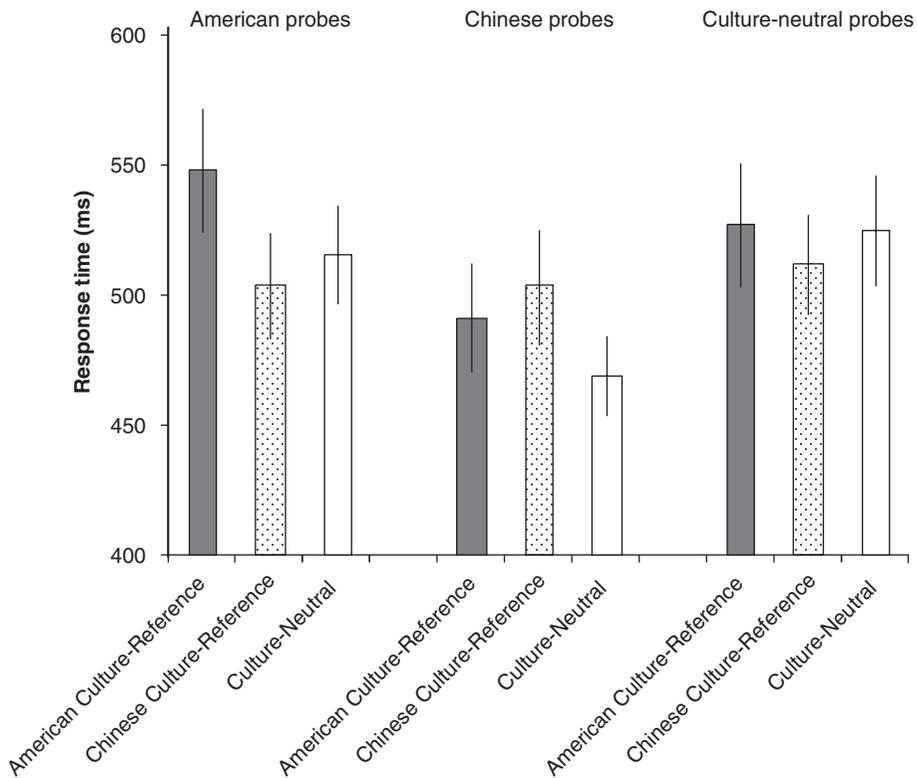
Figure 1:   Response Times to Chinese, American, and Culture-Neutral Probe Words as a Function of Types of Sentences Among Hong Kong Chinese (Study 1)

culture–reference sentences ($M = 501.34$ ms) than American culture–reference sentences ($M = 489.28$ ms) and culture-neutral sentences ($M = 467.24$ ms).

As the nonsignificant simple main effect of sentence indicated, RTs to the culture-neutral probes were not affected by the sentence manipulation ($M = 509.50$ ms for Chinese culture–reference sentences, $M = 524.50$ ms for American culture–reference sentences, and $M = 522.22$ ms for culture-neutral sentences), $F(2, 78) = 0.25$, *ns*.

To provide further evidence for correspondent cultural inferences, we used trials as the unit of analysis. The trials of interest here are those with Chinese or American probe words. In 65% of these trials, the RTs were consistent with our hypotheses: The RT to a Chinese (American) probe word was higher when the preceding sentence was a Chinese (American) culture–reference versus other sentence. This percentage was significantly higher than chance, $z = 1.99$, $p < .05$. In short, the results from the current study provided some evidence for spontaneous correspondent cultural inferences among Hong Kong Chinese.

DISCUSSION

In previous studies of Hong Kong Chinese bicultural individuals (Hong et al., 2000), cultural cues called out culture-characteristic inferential rules; in the presence of Chinese

(American) cultural references, more (fewer) external causal attributions are produced. The results of this study extend this finding by identifying another aspect of biculturals' cognitive flexibility. We have shown that among Hong Kong Chinese undergraduates who have grown up in an environment saturated with both Chinese and American cultures, the presence of Chinese and American cultural cues could call out correspondent cultural inferences—exposure to Chinese cultural references evoked inferences of Chinese cultural values and, likewise, exposure to American cultural references evoked inferences of American cultural values. This suggests that cultural materials in an environment can act as reminders of core cultural values and that these bicultural individuals went beyond the information given and made inferences from the cultural cues that are not semantically related to the probe words. Finally, correspondent cultural inferences were made spontaneously: Within the same experimental session, the biculturals made correspondent inferences to cues from American culture at one moment and correspondent inferences to cues from Chinese culture at the next moment. This phenomenon, together with that of cultural frame switching, illuminates how biculturals are able to navigate a culturally mixed social environment such as Hong Kong.

STUDY 2

Study 1 demonstrated spontaneous inferences from cultural cues among American-Chinese biculturals in Hong Kong. This study sought to replicate this finding with Chinese Americans who grew up in the United States, an American-Chinese bicultural group in the United States. As these individuals have grown up in a culturally mixed environment, moving frequently between interactions involving family (Chinese) and school (American), we expected them to make spontaneous correspondent inferences from both American and Chinese cultural cues as the Hong Kong biculturals did.

Additionally, we ran another group through the procedure to test our assumptions about the preconditions for spontaneous correspondent cultural inferences. We recruited a group of European Americans to test whether being a cultural insider is a necessary condition for making correspondent inferences from cultural references. These participants were not insiders to Chinese culture; because they do not possess a rich cognitive network linking Chinese history and customs to core values, they should not make spontaneous inferences from Chinese culture–reference sentences. That is, exposure to Chinese cultural references should not affect their RTs to Chinese cultural values. In sum, our account predicts that European Americans would make spontaneous inferences from American cultural references but not from Chinese cultural references.

METHOD

Participants

We recruited 26 participants on the campus of a California university. To qualify for the study, they had to first fill out a screening questionnaire asking their ethnicity, primary and secondary identity, and nationality. They were paid US$10 for their participation.

Chinese Americans. We recruited 10 Chinese Americans (4 men, 6 women; mean age = 19.45, *SD* = 1.13). They were all ethnic Chinese and self-identified as either Chinese

American or Asian American in the screening test. All were fluent in English, and all except 1 also spoke Chinese (Mandarin or Cantonese). Six were born in the United States and the remaining 4 had lived in the United States for at least 9 years ($M = 17.18$, $SD = 3.19$).

European Americans. Sixteen European American students (7 men, 9 women, mean age = 20.56, $SD = 2.00$) who had lived in the United States throughout their lives participated in this study. They were participants who identified themselves as American in the screening test. They were all ethnic European. For their secondary identity, they either listed Jewish, Texan, Individual, or left the item blank. None of them spoke an Asian language as their primary language and only 1 participant spoke an Asian language as her secondary language.

Procedure

The procedure was adjusted and fine-tuned in several ways. First, the test materials were written in English. Second, we reduced the number of stimulus sentences (four per condition) and probe words (three per condition) so we could include more filler trials in the session. This helped disguise the study's focus on references to American and Chinese culture. Third, the stimulus sentences were edited to eliminate Romanized Chinese characters (e.g., "Emperor Qin") in the stimulus sentences. We wanted sentences that only produced associations to Chinese culture for cultural insiders who could understand the cultural references. The example stimulus sentence became "A great emperor once produced an underground army of clay warriors." Fourth, the lengths of the sentences across conditions were matched as much as possible.

A set of probe words was chosen with similar goals in mind. The Chinese values were ones that can be clearly expressed in English. The American, Chinese, and neutral probe words were selected to be similar in length, frequency, and desirability. The probe words were *obedience*, *modesty*, *conformity* (Chinese probe words), *freedom*, *diversity*, *independent* (American probe words), *exercise*, *prosperity*, and *elegant* (culture-neutral probe words). These nine probe words were paired with the 12 stimulus sentences to form 108 experimental trials.

We included more filler trials in this experiment. The proportion of filler to experimental trials was 1:1.57 compared to 1:4.74 in Study 1. We constructed 36 filler trials using the same procedure as in Study 1. Also we created 24 filler trials by pairing a stimulus sentence with a probe word that was included in another sentence. In addition, we created 9 filler trials by constructing stimulus sentences ("Dance can be an elegant art or merely an independent form of exercise") with two or three experimental probe words (e.g., *independent*, *elegant*, and *exercise*) and used one of these words as the accompanying probe word in the trial.

Participants performed the task on 10 practice trials before they proceeded to the 177 experimental trials. These were randomly divided into three blocks of trials with a short break before each new block began. The participants were then debriefed.

RESULTS AND DISCUSSION

The percentage of correct responses was 99.5% in the experimental trials and 95.5% in the filler trials. The mean RTs were 635.42 ms ($SD = 250.51$ ms) for the experimental trials and 735.10 ms (SD = 383.01 ms) for the filler trials (including both "yes" and "no" responses.) To prepare for data analysis, we first eliminated those RTs that were from

wrong answers. Mean latency became 633.62 ms (SD = 239.97 ms) for the experimental trials and 722.61 ms (SD = 330.88 ms) for the filler trials. Like Study 1, we log transformed the latencies of the experimental trials for inferential statistical analysis and reported mean latencies calculated from the raw scores.

We performed a 3 (sentence: Chinese culture-reference, American culture-reference, or culture-neutral) × 3 (probe: Chinese, American, or culture neutral) × 2 (group: Chinese American or European American) ANOVA on the summary variables. Results showed a significant main effect of probe, $F(2, 48) = 12.82$, $p < .001$, $\eta_p^2 = .35$ and a significant Sentence × Probe interaction effect, $F(4, 96) = 4.18$, $p < .005$, $\eta_p^2 = .15$.

Although the Sentence × Probe × Group interaction was not significant, $F(4, 96) = 1.54$, ns, we performed planned contrast analysis to test our hypotheses. As in Study 1, we constructed two sets of Helmert contrasts (see Table 1). We hypothesized that both Chinese and European Americans would make spontaneous correspondent inferences from American cultural cues. Thus, we expected a significant interaction between the $Sentence_{American}$ versus $Sentence_{Other}$ contrast and the $Probe_{American}$ versus $Probe_{Other}$ contrast. As expected, this interaction was significant, $F(1, 24) = 10.03$, $p < .005$, $\eta_p^2 = .30$, and the three-way interaction involving group and these two contrasts was not, $F(1, 24) = 0.10$, ns. As shown in Table 3, RTs to American probe words with American culture–reference sentences were higher than those with other sentences for both European Americans ($M_{American} = 685.95$ ms and $M_{Other} = 626.97$ ms) and Chinese Americans ($M_{American} = 735.04$ ms and $M_{Other} = 668.07$ ms).

We also hypothesized that only Chinese Americans would make spontaneous correspondent inferences from Chinese culture–reference sentences. As expected, the three-way interaction involving Group, the contrast between $Sentence_{Chinese}$ versus $Sentence_{Other,}$ and the contrast between $Probe_{Chinese}$ versus $Probe_{Other}$ was significant, $F(1, 24) = 7.37$, $p < .05$, $\eta_p^2 = .24$. The interaction between the two contrasts was significant among Chinese Americans, $F(1, 9) = 6.89$, $p < .05$, $\eta_p^2 = .43$, but not among European Americans, $F(1, 15) = 1.29$, ns. As shown in Table 3, for Chinese Americans, RTs to Chinese probe words with Chinese culture–reference sentences were higher ($M = 644.54$ ms) than those with other sentences ($M = 614.96$ ms). For European Americans, RTs to Chinese probe words with Chinese sentences ($M = 584.05$ ms) were similar to those with other sentences ($M = 601.63$ ms).

Again using trials as the unit of analysis, we found that the percentage of trials supporting our hypotheses (correspondent inferences from both Chinese and American cultural references among Chinese Americans and correspondent inferences from American cultural references only among European Americans) was 66.7%, which was significantly higher than chance (50%), $z = 2.45$, $p < .05$.

Next, we analyzed the data from the Chinese and European American groups separately, using the same analytic strategies as in Study 1. For Chinese Americans, the predicted Sentence × Probe interaction was significant, $F(4, 36) = 3.77$, $p < .05$, $\eta_p^2 = .30$. For Chinese probe words, the contrast between Chinese culture–reference sentences and other sentences was significant, $F(1, 9) = 5.66$, $p < .05$, $\eta_p^2 = .39$. As shown in Figure 2, RTs to Chinese probe words with Chinese culture–reference sentences ($M = 644.54$ ms) were higher than those with American culture–reference sentences ($M = 605.69$ ms) and culture-neutral sentences ($M = 624.23$ ms). For American probe words, the contrast between American culture–reference sentences and other sentences was significant, $F(1, 9) = 6.31$, $p < .05$, $\eta_p^2 = .41$. RTs to American probe words with American culture–reference sentences ($M = 735.04$ ms) were higher than those with Chinese culture–reference sentences ($M = 648.77$ ms) and culture-neutral sentences ($M = 687.36$ ms). Finally, for RTs to culture-neutral probe words, sentence type had no effect,

TABLE 3
Nature of the Interaction Contrasts (Study 2)

Group × Sentence$_{Chinese}$ vs. Sentence$_{Other}$ × Probe$_{Chinese}$ vs. Probe$_{Other}$

		Sentence	
	Probe Word	*Chinese Culture-Reference*	*Other Reference*
Chinese American	Chinese		
	M	644.54	614.96
	SD	159.35	144.42
	Other		
	M	652.99	689.57
	SD	167.29	171.77
European American	Chinese		
	M	584.05	601.63
	SD	97.53	95.41
	Other		
	M	629.45	624.62
	SD	113.51	102.65

Sentence$_{American}$ vs. Sentence$_{Other}$ × Probe$_{American}$ vs. Probe$_{Other}$

	Probe Word	*American Culture-Reference*	*Other Reference*
Chinese American	American		
	M	735.04	668.06
	SD	171.81	150.86
	Other		
	M	630.91	651.43
	SD	160.21	168.52
European American	American		
	M	685.95	626.97
	SD	169.96	110.45
	Other		
	M	592.88	604.77
	SD	92.52	94.49

NOTE: The entries are mean response times.

$F(2, 18) = 0.53$, *ns*. These results show that Chinese probe words were more associated with Chinese culture–reference sentences than with American culture–reference and culture-neutral sentences whereas American probe words were more associated with American culture–reference sentences than with Chinese culture–reference and culture-neutral sentences.

Among European Americans, the Sentence × Probe interaction was significant, $F(4, 60) = 2.84$, *p < .05,* $\eta_p^2 = .16$. Figure 3 shows that for American probe words the contrast between American culture–reference sentences and other sentences was marginally significant, $F(1, 15) = 3.46$, $p = .08$, $\eta_p^2 = .19$. RTs to the probe words were higher with American culture–reference sentences ($M = 685.95$ ms) than with culture-neutral sentences ($M = 627.22$ ms) and Chinese culture–reference sentences ($M = 626.72$ ms). As expected, for Chinese probe words the contrast between Chinese culture–reference sentences and other sentences was not significant, $F(1, 15) = 2.12$, *ns*. If anything, the RTs to Chinese probe words following Chinese culture–reference sentences were faster than those
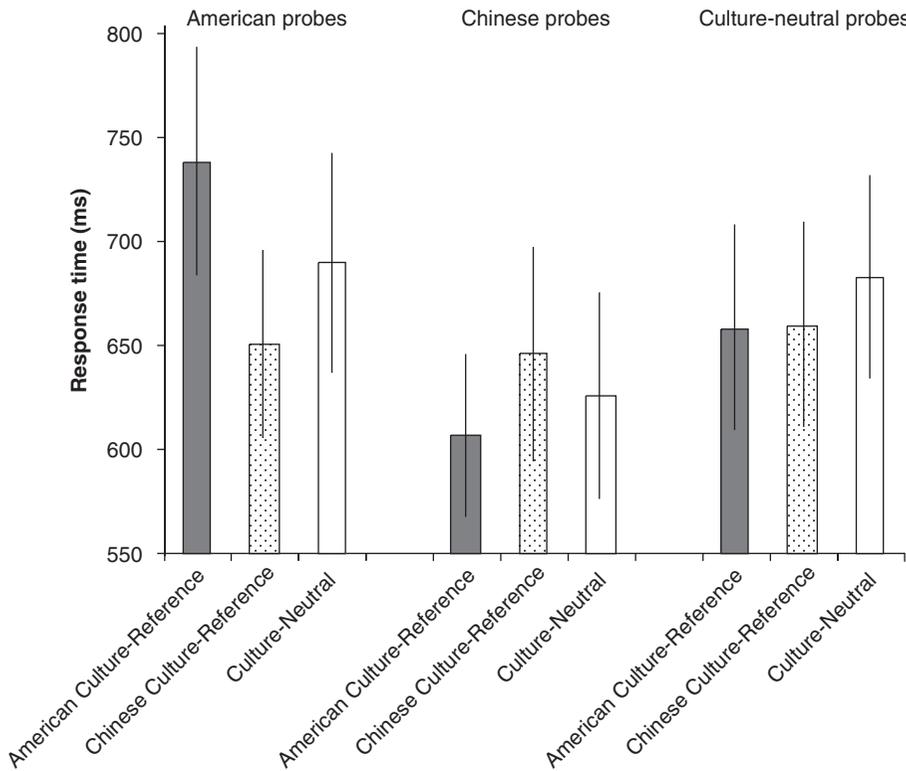
Figure 2:   Response Times to Chinese, American, and Culture-Neutral Probe Words as a Function of Types of Sentences Among Chinese Americans in the United States (Study 2)

following other sentences. Unexpectedly, the simple main effect of sentence on RTs to neutral probe words was significant, $F(2, 30) = 3.42$, $p < .05$, $\eta_p^2 = .19$. RTs to neutral probes with Chinese culture–reference sentences ($M = 632.20$ ms) were higher than those with American culture–reference sentences ($M = 594.72$ ms) and culture-neutral sentences ($M = 590.60$ ms), $F(1, 15) = 5.62$, $p < .05$, $\eta_p^2 = .27$.

In summary, as expected, Chinese American participants who were insiders to both American and Chinese cultures made spontaneous correspondent cultural inferences from both American and Chinese cultural references. For the European Americans, there was a trend toward making cultural inferences from American cultural references only. American probe words associated with American culture–reference sentences more than with Chinese culture–reference and culture-neutral sentences. No significant sentence effect was observed for Chinese probe words. This establishes cultural experience as a necessary condition for making spontaneous inferences about the culture's values from cultural references.

GENERAL DISCUSSION

How biculturals manage to apply their expertise in two cultures discriminatively to guide their interpretations and actions in a particular setting is an important research question in
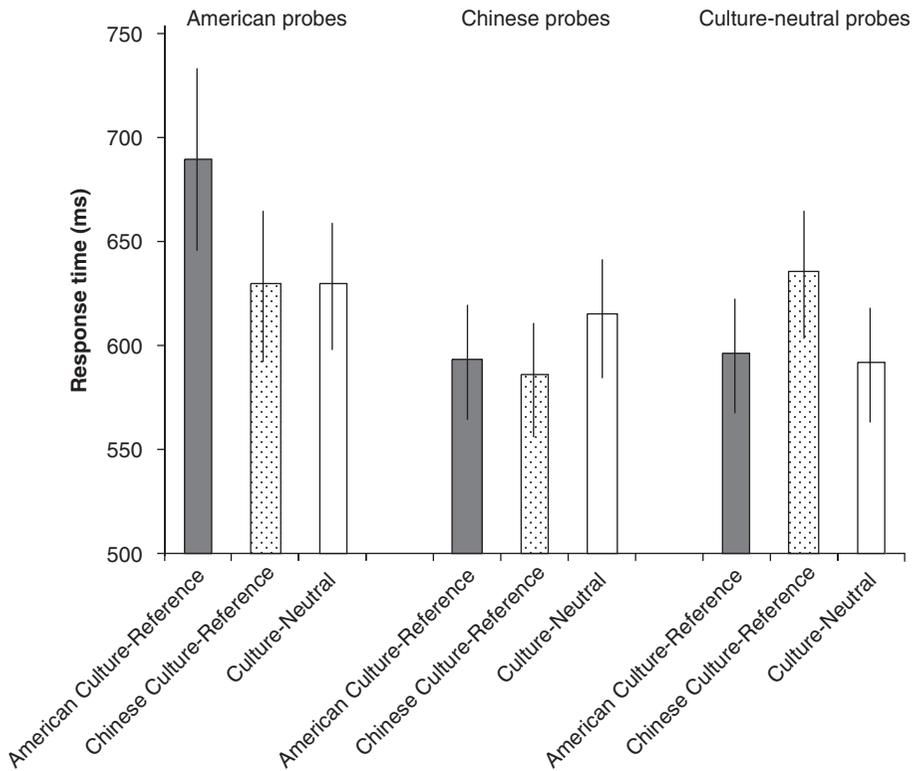
Figure 3:   **Response Times to Chinese, American, and Culture-Neutral Probe Words as a Function of Types of Sentences Among European Americans in the United States (Study 2)**

bicultural psychology. Previous experimental studies have offered initial evidence for the phenomenon of cultural frame switching as a response to this question. In the experimental demonstrations of this phenomenon, biculturals displayed differential deliberative responses (e.g., attributions) to certain linguistic or symbolic materials from either internalized culture. This finding is consistent with the mindset priming account of the bicultural mind—biculturals selectively access the characteristic inferential rules in the cued culture and use them to form an interpretive frame.

These studies demonstrated another aspect of biculturals' cognitive flexibility that may also be implicated in bicultural expertise—a spontaneous shift in correspondent cultural inference. Using a modified spontaneous inference task, we recorded in the current experiments a reliable tendency to make spontaneous correspondent inferences from both American and Chinese cultural materials among the Hong Kong biculturals (Study 1) and Chinese Americans (Study 2). For these participants, a reference to American or Chinese culture spontaneously called out its attendant core values.

Moreover, the findings comparing American-Chinese biculturals and European Americans illustrate the critical importance of having insider cultural knowledge for the occurrence of a spontaneous shift in correspondent cultural inferences. Like Hong Kong Chinese and Chinese American participants, European American participants, possessing

insider cultural knowledge of American culture, spontaneously inferred American values upon registering an American cultural reference. However, although European Americans might have superficial knowledge about differences in American and Chinese value systems, they were outsiders to Chinese culture. The finding that European American participants did not make spontaneous correspondent inferences in responses to Chinese cultural references as American-Chinese biculturals did indicates that superficial knowledge is not sufficient for the occurrence of this phenomenon. However, it should be emphasized that this finding does not imply that European Americans are not capable of shifting back and forth between cultural inferences. This sample of European Americans did not have insider knowledge of Chinese culture but they might have insider expertise in other cultures to make them capable of making spontaneous correspondent cultural inferences to these cultures.

The current experiments tested both American-Chinese biculturals and European Americans with a new within-subject task that required inhibition of a spontaneous correspondent cultural inference. This task has several methodological advantages. First, both the inference evocation procedure and the dependent measure are embedded in a single-sentence comprehension task, hence obscuring the task's true purpose. Second, participants motivated to give the correct response in an experimental trial would need to suppress a momentarily accessible inference. The strength of the spontaneous correspondent cultural inference is reflected in the amount of cognitive effort expended on inhibiting the evoked inference, measured in terms of delayed response time, which is relatively not amenable to conscious control. Accordingly, a reliably recorded effect of the cultural materials on spontaneous correspondent cultural inference in the current experiments would unlikely result from demand characteristics. Furthermore, to obtain a reliable spontaneous shift in correspondent cultural inferences, the bicultural participants would have to switch back and forth between American and Chinese cultural inferences repeatedly in a single experimental session. In short, our newly developed spontaneous inference task confers some distinctive advantages in assessing the robustness and reversibility of the shift in spontaneous correspondent cultural inference.

IMPLICATIONS FOR FUTURE RESEARCH

Ethnographic studies often depict the cognitive flexibility as an adaptive and strategic response style biculturals have developed to acculturate into a new culture. The adaptive aspect of bicultural cognitive flexibility is illustrated in the conscious reflections of some immigrants, like the following one from a Vietnamese immigrant in the United States:

> As a result of all these [cultural] differences and having been forced to adapt to this new culture, I have developed another cultural identity which is capable of surviving in this new environment. . . . This identity functions like a second personality that appears when it is necessary to adopt a culturally appropriate behavior in the new culture. (Sparrow, 2000, p. 192)

Our findings concur with the adaptation aspect of this characterization of bicultural flexibility. As shown in the current studies, the Hong Kong Chinese and Chinese American biculturals have the advantage of making different cognitive responses to references of two cultures. This ability affords flexible and efficient response to the changing demands in bicultural environments (Chiu & Hong, 2005). However, our findings also showed that biculturals not only possess declarative knowledge of more than one culture but they also make correspondent responses to cultural cues spontaneously. Together, our findings raise

a number of interesting future research questions: How can biculturals make use of this cognitive advantage? Are there constraints or payoffs in doing so? One area that is worth future study is the automaticity of the culture activation effects (including cultural frame switching and shift in spontaneous cultural inferences) on both cognition and behaviors (Bargh, Chen, & Burrows, 1996). If the cognitive activation and the subsequent behavioral responding are automatic when biculturals are exposed to certain cultural cues, it is crucial to find out when such automatic responses would bring interactional advantages and when they would not—hence, what cognitive and motivational mechanisms and constructs could further help differentiate these situations. This is because sometimes people are lured by the available cultural cues in a situation and hence overlook the individuality of the target person. For instance, when meeting a new business client named Fan Zhang, a Chinese American bicultural might be too ready to use the client's surname as the basis of interaction (e.g., greeting her in Mandarin), only to find out later that the client was indeed born in the United States and may not speak Mandarin very well. Future research is needed to uncover the individual differences and contextual factors that would distinctively bring about adaptive responses required in multicultural environments.

In summary, these studies extend previous research on cultural frame switching in three important ways—first by establishing a new cognitive response implicated in cultural expertise and then by eliminating the theoretically less interesting demanding characteristic account of the previous findings. Additionally, the spontaneous inference task used in these studies enables researchers to examine the spontaneous shift in correspondent cultural inferences by a bicultural. Using this task with two American-Chinese bicultural groups and a European American comparison group, we showed that a spontaneous shift in correspondent cultural inferences is robust, reversible, and specific to biculturals. We hope that researchers probing the dynamic nature of the bicultural mind will find the spontaneous inference task a useful research tool.

REFERENCES

Bargh, J. A., & Chartrand, T. L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 253-285). New York: Cambridge University Press.

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, *71*, 230-244.

Chiu, C-y., Dweck, C. S., Tong, J. Y-y., & Fu, J. H-y. (1997). Implicit theories and conceptions of morality. *Journal of Personality and Social Psychology*, *73*, 923-940.

Chiu, C-y., & Hong, Y-y. (2005). Cultural competence: Dynamic processes. In A. Elliot & C. S. Dweck (Eds.), *Handbook of motivation and competence* (pp. 489-505). New York: Guilford.

Chiu, C-y., & Hong, Y-y. (2006). *Social psychology of culture*. New York: Psychology Press.

Fu, H-y., & Chiu, C-y. (2006). *Local culture's responses to globalization: Exemplary persons and their attendant values.* Unpublished manuscript.

Gardner, W. L., Gabriel, S., & Lee, A. (1999). "I" value freedom, but "we" value relationships: Self-construal priming mirrors cultural differences in judgment. *Psychological Science*, *10*, 321-326.

Hirsch, E. D., Kett, J. F., & Trefil, J. S. (1988). *Cultural literacy: What every American needs to know*. New York: Vintage Books.

Hong, Y-y., Benet-Martinez, V., Chiu, C-y., & Morris, M. W. (2003). Boundaries of cultural influence: Construct activation as a mechanism for cultural differences in social perception. *Journal of Cross-Cultural Psychology*, *34*, 453-464.

Hong, Y-y., Ip, G., Chiu, C-y., Morris, M. W., & Menon, T. (2001). Cultural identity and dynamic construction of the self: Collective duties and individual rights in Chinese and American cultures. *Social Cognition*, *19*, 251-268.

Hong, Y-y., Morris, M. W., Chiu, C-y., & Benet-Martinez, V. (2000). Multicultural minds: A dynamic construc-
tivist approach to culture and cognition. *American Psychologist*, *55*, 709-720.

LaFromboise, T., Coleman, H., & Gerton, J. (1993). Psychological impact of biculturalism: Evidence and theory.
Psychological Bulletin, *114*, 395-412.

Lau-Gesk, L. G. (2003). Activating culture through persuasion appeals: An examination of the bicultural con-
sumer. *Journal of Consumer Psychology*, *13*, 301-315.

McKoon, G., & Ratcliff, R. (1989). Semantic associations and elaborative inference. *Journal of Experimental
Psychology: Learning, Memory and Cognition*, *15*, 326-338.

Menon, T., Morris, M. W., Chiu, C-y., & Hong, Y-y. (1999). Culture and the construal of agency: Attribution to
individual versus group dispositions. *Journal of Personality and Social Psychology*, *76*, 701-717.

Ross, M., Xun, W. Q. E., & Wilson, A. E. (2002). Language and the bicultural self. *Personality and Social
Psychology Bulletin*, *28*, 1040-1050.

Sparrow, L. M. (2000). Beyond multicultural man: Complexities of identity. *International Journal of Intercultural
Relations*, *24*, 173-201.

Trafimow, D., Triandis, H. C., & Goto, S. G. (1991). Some tests of the distinction between the private self and
the collective self. *Journal of Personality and Social Psychology*, *60*, 649-655.

Uleman, J. S., Hon, A., Roman, R. J., & Moskowitz, G. B. (1996). On-line evidence for spontaneous trait infer-
ences at encoding. *Personality and Social Psychology Bulletin*, *22*, 377-394.

Verkuyten, M., & Pouliasi, K. (2002). Biculturalism among older children: Cultural frame switching, attributions,
self-identification, and attitudes. *Journal of Cross-Cultural Psychology*, *33*, 596-609.

Young, L., Giles, H., & Pierson, H. (1986). Sociopolitical change and perceived vitality. *International Journal of
Intercultural Relations*, *10*, 459-469.

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