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Culture as automatic processes for making meaning: Spontaneous trait inferences☆

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HIGHLIGHTS

- People make spontaneous trait inferences (STIs) when observing others' behaviors.
- STIs among Americans were more frequent and more automatic than among Japanese.
- No cultural differences were found in estimates of controlled processes in STIs.
- Results support the idea of culture as automatic procedures for making meaning.

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ABSTRACT

Culture shapes how we interpret behavior, symbols, customs, and more. Its operation is largely implicit, unnoticed until we encounter other cultures. Therefore deep cultural differences should be most evident in automatic processes for interpreting events, including behavior. In two studies, we compared American and Japanese undergraduates' spontaneous (unintended and unconscious) trait inferences (STIs) from behavior descriptions. Both groups made STIs but Japanese made fewer. More important, estimates of the controlled (C) and automatic (A) components of their recall performance showed no differences on C, but A was greater for Americans. Thus westerners' greater reliance on traits, in intentional and spontaneous impressions, may reflect cultural differences in automatic processes for making and recalling meaning. The advantages of locating cultural differences in automatic processes are discussed.

1. Introduction

There is no consensual definition of "culture," but our increasingly multi-cultural experience has prompted an explosion of theory and research on culture and psychology (e.g., Gelfand, Chiu, & Hong, 2015; Kitayama & Cohen, 2007; Valsiner, 2012), providing a welter of empirical differences among various "cultural" (usually national) groups. In this article, we describe a national difference that unites two theoretical approaches to culture. One privileges procedural knowledge and the other semiotics.

Many scholars distinguish between knowing *about* a culture (explicit knowledge) and knowing how to enact cultural practices, i.e., knowing *how to do* a culture (procedural knowledge). Procedural knowledge is usually implicit — unnoticed or hard to describe — until you meet someone who does it differently. Chiu and Hong (2007, chap. 34) describe procedural knowledge as "a learned sequence of responses to situational cues. Once the learned response sequence is automated through frequent practices, its performance requires little cognitive deliberation" (p. 789). They cite studies of cultural differences in decoding emotions, visual scanning, language comprehension, deploying attention, categorization, reasoning, and problem solving. Kitayama, Park, Sevincer, Karasawa, and Uskul (2009) posit "cultural mandates" and "cultural tasks" that produce "psychological tendencies" which "become habitual… and automatic… We thus call these tendencies implicit and distinguish them from explicit beliefs…" (p. 239). Chiu, Ng, and Au (2013, chap. 37) note that "Evidence for the automatization of culturally normative cognitive procedures abounds" (p. 775) and cite many examples.

"Semiotics is the study of signification in the most general sense of that term…of meaning-making and the meaning systems and sign systems in which they are embodied and expresses" (Innis, 2012, p. 1,

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chap. 13). The influential cultural anthropologist Clifford Geertz (1973) favored this approach. "The concept of culture I espouse… is essentially a semiotic one. Believing… that man is an animal suspended in webs of significance he himself has spun, I take culture to be those webs…" (1973, p. 5). He also favored attention to concrete behavior. "Behavior must be attended to… because it is through the flow of behavior — or, more precisely, social action — that cultural forms find articulation" (1973, p. 17).

Both of these traditions are illustrated by cultural differences in spontaneous social inferences (Uleman, Saribay, & Gonzalez, 2008). Spontaneous inferences result from unintended and unconscious procedures for giving behaviors meaning. These meanings have included personality traits and goals, situation characteristics, non-social causes, and justice concerns (Uleman et al., 2008). Imagine you observe someone yelling at other people. You are likely to spontaneously infer that this person is *short-tempered*. Spontaneous trait inference (STI) is a relatively effortless implicit process that occurs even when people are not instructed to make such inferences and have no such explicit goal (Uleman et al., 2008). Observed behaviors are encoded in trait terms, and then trait concepts are associated with the actors. And critically for our purpose here, there are cultural differences in STI.

1.1. Cultural differences in STI

Studies of cultural differences in *intentional* impression formation have demonstrated that Westerners emphasize personal causes of social behaviors, such as traits, while Asians emphasize situational causes (e.g., Fiske, Kitayama, Markus, & Nisbett, 1998; Nisbett, Peng, Choi, & Norenzayan, 2001). Differences in attention may play a role. Westerners pay more attention to the central actor while people from East Asian cultures (e.g., Japan, China, and Korea) are more sensitive to contextual information (e.g., Ji, Peng, & Nisbett, 2000; Kitayama, Duffy, Kawamura, & Larsen, 2003; Masuda & Nisbett, 2006). Self-descriptions differ in similar ways, with Euro-Americans describing themselves more in trait terms, Koreans using more social roles and contextual qualifications, and Asian Americans falling in between (Rhee, Uleman, Lee, & Roman, 1995).

Similar cultural differences in STIs have been reported. Na and Kitayama (2011) found that STIs occurred among European American but not among Asian American students at the University of Michigan. Zárate, Uleman, and Voils (2001) reported a similar cultural difference between European American and Latino American students at the University of Texas—El Paso. Whereas these studies compared ethnic groups within American culture, using materials in English, more recent studies have examined the occurrence of STIs among East Asian people in their own languages (Shimizu, 2012; Zhang & Wang, 2013). For example, Shimizu (2012) investigated STI among Japanese 5th-graders, 7th-graders, and undergraduates, using the savings-in-relearning paradigm (Carlston & Skowronski, 1994). Participants *did* show STIs, indicating that STI is not uniquely western. But comparisons across studies using different methods can be problematic. The present studies compared American and Japanese undergraduates' STI directly, with the false recognition paradigm and the same stimuli but in English and Japanese respectively. They also estimated the contributions of automatic and controlled processes to detecting these STIs through the process dissociation procedure (PDP, Jacoby, 1991).

1.2. Automatic and controlled processes in STIs

Given that STIs are usually unconscious and always unintended, how can we detect them? Studies have employed lexical decisions and memory tasks such as false recognition and savings in relearning to measure STI (Uleman et al., 2008). For example, in Todorov and Uleman's (2004) false recognition paradigm, participants under memory instructions are shown pairs of persons' faces and behavioral sentences that imply (or contain) traits. After a delay, they are presented with face–trait pairs and decide for each pair whether the trait word appeared in the behavioral sentence previously paired with the face. Participants are more likely to falsely recognize implied traits when they are paired with the corresponding actors' faces than when they are paired with other faces that they have seen. This false recognition indicates that participants inferred traits from behaviors spontaneously when they read the behaviors, and that they bound (linked) them to the specific actors.

Early STI studies (e.g., Winter, Uleman, & Cunniff, 1985) explored how automatic STI is by examining criteria for automaticity besides lack of awareness and intention. Unfortunately this approach is limited because various criteria (Bargh, 1994) do not always covary. An alternative approach is to define automatic processes as "not controlled," design tasks to estimate control directly, and use that estimate to calculate the contribution of automatic processes (Jacoby, 1991). This process dissociation procedure (PDP) recognizes that automatic and controlled processes both contribute to performance on most memory and social judgment tasks (Payne & Bishara, 2009). Uleman, Blader, and Todorov (2005) used the PDP to show that STI depends on both automatic and controlled processes (see also McCarthy & Skowronski, 2011). PDP has been applied to other social topics such as decision making (e.g., Ferreira, Garcia-Marques, Sherman, & Sherman, 2006) and stereotyping (e.g., Mazerolle, Régner, Morisset, Rigalleau, & Huguet, 2012; Payne, 2005; Sherman, Groom, Ehrenberg, & Klauer, 2003).

The PDP includes two conditions: "inclusion" in which both automatic and controlled processes contribute to performance, and "exclusion" in which the two processes work in opposition. The difference in participants' performance between these two conditions provides an estimate of controlled processes (C). Automatic processes (A) are then estimated for each participant from that, following a few simple algebraic equations. (C and A do *not* sum to 1.) McCarthy & Skowronski (2011, Experiment 3) showed that participants' reports of unintentionally making trait inferences correlate with estimates of C but not A.

1.3. Culture as automatic procedures for making meaning

All of this suggests identifying "culture" with the automatic procedures for imbuing meaning into our own and others' behavior (and cultural icons, rituals, and customs in particular contexts) in ways that distinguish one culture (or subculture) from another. Particularly revealing are those differences in performance that individuals *cannot control*, even when they wish to. These are most diagnostic of culture-specific procedural knowledge. So in tasks that involve both controlled (C) and automatic (A) processes, as most performances do, and which can be structured so that the contribution of both C and A can be estimated, the differences most diagnostic of deep cultural differences are differences in (A), the automatic processes.

A recent study by Lee, Shimizu, and Uleman (2015) illustrates this concept of automatic processes as a signature of deep cultural differences in impression formation. They studied spontaneous trait transference (STT), the unintended transfer of trait inferences to observers who tell about other people's trait-implying behaviors. If Adam says that Bob returned the wallet with all the money in it, and Bob is absent (i.e., no photo of him is present; Goren & Todorov, 2009), then *honest* becomes associated with (the photo of) Adam. Lee et al. (2015) used false recognition with the PDP to study STT among American and Japanese undergraduates in their respective languages. They found that STT occurred among both American and Japanese, but more frequently among Americans. Controlled processes did not differ in both samples, but automatic processes were weaker among Japanese. They noted that, because STT indexes trait activation, an elemental component of impression formation, STT and PDP are useful tools for investigating cultural differences in elemental processes of impression formation.

1.4. The present studies

The present studies used the PDP to investigate cultural variations in automatic and controlled processes underlying detection of STI with the false recognition paradigm. We predicted that STIs among Americans are both more frequent and more automatic than among Japanese. In Study 1, we compared the contributions of automatic and controlled processes to STIs among Japanese and American undergraduates. Study 2 extended the results of Study 1 by comparing three groups of undergraduates — European American, Asian American, and Japanese — using multiple sentences to imply each trait. We report all measures, manipulations, and exclusions in these studies. STIs result from arguably more complex processes than STT (Carlston & Skowronski, 2005; but cf. Orghian, Garcia-Marques, Uleman, & Heinke, 2015) and differ from the cultural differences in intentional impression formation noted above (Nisbett et al., 2001). Would the PDP reveal that cultural differences in STI are at least partly automatic, and thereby support the idea of culture as automatic procedures for making meaning?

2. Study 1

2.1. Method

2.1.1. Participants

Fifty-nine American undergraduates (40 females, $M_{age} = 19.85$, range: 18–23 years old) at New York University and 63 Japanese undergraduates (48 females, $M_{age} = 19.38$, range: 18–24 years old) at Saitama University participated. We excluded five additional participants who described the experiment as relating to the impression formation at the end of the experiment. The number of participants was determined a priori based on a previous study investigating cultural differences in the automaticity of elemental impression formation (Lee et al., 2015). All American participants were native speakers of English and all Japanese participants were native speakers of Japanese. American and Japanese studies were conducted in English and Japanese respectively. American participants received partial course credit and Japanese participants received a small gift for participation.

2.1.2. Material

We pre-tested 100 trait-implying behavioral descriptions in both America and Japan, including descriptions used in a previous study (Uleman, 1988). The sentences written in English were translated into Japanese and checked through back-translations.[1] In an open-ended task, 48 American and 131 Japanese pretest participants were presented with 100 trait-implying behavioral descriptions and asked to write down inferences about each description.[2] We selected the 40 sentences that led to (a) the highest consensus on the same traits (including synonyms), and (b) approximately the same number of similar inferences across cultural groups for all descriptions. The consensus rate for these 40 sentences was 0.85 ($SD = 0.09$) among Americans and 0.80 ($SD = 0.16$) among Japanese, reflecting no difference between the two samples, $t(39) = 1.67$, $p = 0.104$, Cohen's $d = 0.28$.

2.1.3. Procedure

We used a modified version of the false recognition paradigm (Todorov & Uleman, 2004). Participants first viewed a series of 50 photo–behavior pairs in random order, "to memorize for a subsequent memory test," in the exposure task. We selected 50 faces of various races (25 females) for American participants and 50 Asian faces (25 females) for Japanese participants. Twenty pairs composed the inclusion task, explicitly including a trait word (e.g., "He was calm and phoned for help while the others just screamed"), and 20 pairs composed the exclusion task, implying but not including a trait word (e.g., "He told the cashier that she gave him too much change", implying "honest"). The remaining 10 pairs had neutral behaviors adopted from a previous study (Uleman, Hon, Roman, & Moskowitz, 1996) with low consensus on their trait implications. For the recognition task (below), the photos for ten of the trait-explicit behaviors and ten of the trait-implicit behaviors were paired with other (mismatched) explicit and implied traits.

After an anagram filler task lasting 5 min, to eliminate participants' short-term memory, they saw a series of 40 photo–trait word pairs in the recognition task. In half of them traits and photos were mismatched. Participants indicated whether the trait word actually appeared in the behavior shown with that photo in the exposure task. "Yes" responses on trials in which the trait word had been presented in the exposure inclusion task yielded the *hit rate*. "Yes" responses on trials in which the trait was not presented but was implied (the exclusion task) yielded the *false recognition rate*. Guessing was assessed by examining "yes" responses on the other twenty trials in which trait and photo had each been presented but were mismatched. These yielded the *mismatch rate* and controlled for familiarity of pairs' components. After completing these 40 trials in random order, participants filled out a short questionnaire about the procedure and were thanked and debriefed.

2.2. Results and discussion

2.2.1. Recognition task performance

A 2 (Culture; American, Japanese) × 3 (Trial Type: hit, false recognition, mismatch) mixed ANOVA was performed on "yes" response rates (Table 1). The main effects for culture, $F(1,120) = 20.56$, $p < 0.001$, $\eta_p^2 = 0.15$, and for trial type, $F(2,240) = 362.84$, $p < 0.001$, $\eta_p^2 = 0.75$, were significant. The "yes" response rate among Americans ($M = 0.494$, $SE = 0.015$) was higher than that among Japanese ($M = 0.399$, $SE = 0.014$) ($t(120) = 4.53$, $p < 0.001$, Cohen's $d = 0.82$). The post-hoc tests on trial type means revealed that all three trial types differed significantly from each other: the hit rate was higher than the false recognition rate ($t(121) = 14.84$, $p < 0.001$, Cohen's $d = 1.36$) and the mismatch rate ($t(121) = 27.53$, $p < 0.001$, Cohen's $d = 2.52$), and the false recognition rate was higher than the mismatch rate ($t(121) = 11.35$, $p < 0.001$, Cohen's $d = 1.09$). It is especially important to note that the *difference* between the false recognition and the mismatch rates was significant among both American and Japanese participants (American $t(58) = 8.63$, $p < 0.001$, Cohen's $d = 1.18$, Japanese $t(62) = 7.57$, $p < 0.001$, Cohen's $d = 1.01$), because this difference indicates that STIs did occur within both cultural groups. Although the Culture × Trial Type interaction was not significant, $F(2,240) = 1.77$, $p = 0.172$, $\eta_p^2 = 0.02$, the difference between the false recognition and mismatch rates was marginally larger among Americans than Japanese ($t(120) = 1.88$, $p = 0.062$, Cohen's $d = 0.34$), suggesting that the STIs were somewhat more frequent among Americans.

2.2.2. PDP analysis

We calculated the parameter estimates of automatic (A) and controlled (C) processes for each participant, using a PDP analysis (Jacoby, 1991; Payne, 2005). In the inclusion task, controlled processes (C) and automatic processes (A) work in concert; in the exclusion task, the two processes work in opposition. Therefore in the inclusion task, the hit rate represents participants' recall of the behavior through controlled processes (C) and, when controlled processing fails (1 − C), their responses based on automatic processes (A). This can be described as hit rate = C + A (1 − C). The false recognition rate, in the exclusion task, depends on automatic

[1] Japanese translation of the sentences can be considered as equivalent to English, as conjugated verbs have a special form in both English and Japanese languages amenable to direct translation.

[2] The Japanese version of the pretest material was divided into three blocks and Japanese pretest participants were randomly assigned to each block.

Table 1
Percentage of "yes" responses for the recognition task in Study 1 and 2.

	Study 1		Study 2		
	American	Japanese	European American	Asian American	Japanese
Hit rate	0.790 (0.021)	0.708 (0.023)	0.831 (0.024)	0.813 (0.025)	0.780 (0.023)
False recognition rate	0.483 (0.031)	0.343 (0.026)	0.564 (0.034)	0.563 (0.039)	0.420 (0.029)
Mismatch rate	0.212 (0.018)	0.146 (0.015)	0.140 (0.018)	0.148 (0.020)	0.110 (0.015)

Note. Standard error in parentheses.

processing when the controlled processing fails. Of course it must fail because the trait was only implied, not presented. This can also be expressed as the false recognition rate = A (1 − C). Based on these equations, we can obtain the parameter estimates of controlled and automatic processes (see McCarthy & Skowronski, 2011, for more details).[3]

Fig. 1 shows the controlled processing estimates (C) and the automatic processing estimates (A) corrected for guessing.[4] The differences between cultures on A and C were examined in separate *t*-tests because these are on different scales and not directly comparable. The A parameter estimate was higher among American participants than among Japanese participants, $t(120) = 2.39$, $p = 0.018$, Cohen's $d = 0.43$, but the C parameter estimate did not differ between cultures, $t(120) = 1.11$, $p = 0.271$, Cohen's $d = 0.20$.

Study 1 indicates that STIs occurred among both American and Japanese participants, but the incidence of STIs among Americans was a little higher than among Japanese. In addition, the contribution of automatic but not controlled processes to STI false recognition varied between cultures. As expected, STIs among Americans were more automatic than among Japanese. This is consistent with identifying deep cultural differences as differences in automatic procedural knowledge.

3. Study 2

In Study 1, American participants consisted of people from various ethnic groups. Given that previous studies have found differences in STI among ethnic subgroups within the United States (Na & Kitayama, 2011; Zárate et al., 2001), exploring cultural influences on STIs between American subgroups and Japanese participants is of interest. Therefore, we included three groups of participants in Study 2: European Americans, Asian Americans, and Japanese.

In addition, we decided to use multiple sentences in the exposure task in Study 2. Zárate et al. (2001) found cultural differences only when they showed participants several behaviors that implied each trait. Multiple sentence stimuli may be more sensitive for detecting cultural differences in STI than single sentences.

3.1. Method

3.1.1. Participants

Participants were 60 European American (40 females, $M_{age} = 19.68$, range: 18–26 years old) and 58 Asian American (42 females, $M_{age} = 19.47$, range: 18–23 years old) undergraduates at New York University, and 50 Japanese (36 females, $M_{age} = 19.86$, range: 18–23 years old) undergraduates at Saitama University. Seven additional participants who related the experiment to impression formation were excluded. The sample size was determined a priori and was based on a previous study (Lee et al., 2015). All American participants were native speakers of English and all Japanese participants were native speakers of Japanese. Studies were conducted in the language of instruction. Participants from two American groups received partial course credit and Japanese participants received a small gift for participation.

3.1.2. Material

For each stimulus, we combined two behavioral sentences that had a high consensus implication rate in the pretest for Study 1 and implied the same trait. For example, two sentences that imply "honest" were combined into "He told the cashier that she gave him too much change. He even returned a lost wallet with all the money still in it." Twenty four multiple sentences were used in the exposure task. We also constructed multiple neutral sentences in the same way.

3.1.3. Procedure

The procedure was the same as Study 1, except that we randomly showed 34 photograph–behavior pairs in the exposure task and 24 photograph–trait word pairs in the recognition task. In the exposure task, photographs were paired with 34 multiple sentences: 12 explicit, 12 implicit, and 10 neutral. We used 34 faces of various races (17 females) for the two American groups and 34 Asian faces (17 females) for the Japanese group.

3.2. Results and discussion

3.2.1. Recognition task performance

A 3 (Culture; European American, Asian American, Japanese) × 3 (Trial Type: hit, false recognition, mismatch) mixed ANOVA was performed using "yes" response rates as the dependent variables (Table 1). The main effects for culture, $F(2,165) = 5.31$, $p = 0.006$,

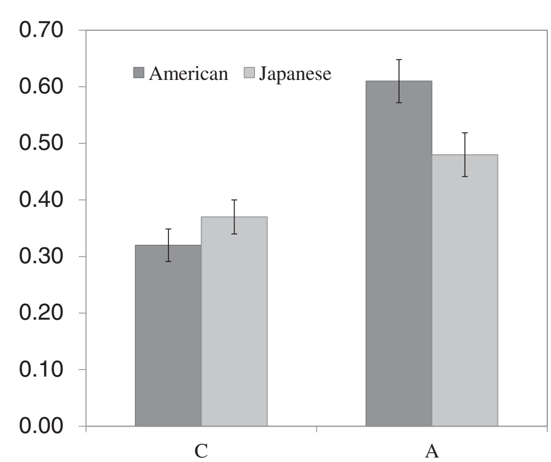

Fig. 1. Estimates of controlled and automatic processing in Study 1. Error bars represent standard errors.

[3] The A and C parameters can occasionally have negative values. It is theoretically impossible for either automatic or controlled processing to have less-than-zero influence on subsequent tasks. Therefore, following McCarthy and Skowronski (2011), negative estimates of automatic processing or controlled processing were replaced by zero. These cases were rare, 6.1% in Study 1 and 7.3% in Study 2.

[4] We used the probability correction procedure that is the most conservative approach to correction for guessing (G) (see McCarthy & Skowronski, 2011). In this approach, guessing was considered to reflect the probability of a yes response in the absence of both controlled and automatic processing. This is expressed as Guessing (the mismatch rate) = G(1 − C)(1 − A). Following McCarthy and Skowronski (2011), we adjusted inclusion and exclusion task performance for guessing; the hit rate = C + A(1 − C) + G(1 − C)(1 − A) and the false recognition rate = A(1 − C) + G(1 − C)(1 − A). Therefore, A estimates can be expressed as A = (the false recognition rate − G + GC) / [(1 − C)(1 − G)].

$\eta_p^2 = 0.06$, and for trial type, $F(2,330) = 571.91$, $p < 0.001$, $\eta_p^2 = 0.78$, were significant. The "yes" response rates among European American ($M = 0.512$, $SE = 0.018$) and Asian American participants ($M = 0.508$, $SE = 0.020$) were higher than that among Japanese participants ($M = 0.437$, $SE = 0.013$) ($t(108) = 3.25$, $p = 0.002$, Cohen's $d = 0.62$; $t(106) = 2.84$, $p = 0.005$, Cohen's $d = 0.55$, respectively). The post-hoc tests on trial type means revealed that all three trial types differed significantly from each other: the hit rate was higher than the false recognition rate ($t(167) = 12.86$, $p < 0.001$, Cohen's $d = 1.02$) and the mismatch rate ($t(167) = 38.66$, $p < 0.001$, Cohen's $d = 3.01$), and the false recognition rate was higher than the mismatch rate ($t(167) = 19.33$, $p < 0.001$, Cohen's $d = 1.64$). The interaction for Culture × Trial Type was marginally significant, $F(4,330) = 2.03$, $p = 0.090$, $\eta_p^2 = 0.02$. The post-hoc analyses revealed that simple effects for trial type were significant among all culture groups (European American $F(2,118) = 218.48$, $p < 0.001$, $\eta_p^2 = 0.79$, Asian American $F(2,114) = 168.38$, $p < 0.001$, $\eta_p^2 = 0.75$, Japanese $F(2,98) = 205.37$, $p < 0.001$, $\eta_p^2 = 0.81$). The differences between false recognition and mismatch rates differed among cultures, $F(2,167) = 3.23$, $p = 0.042$, $\eta_p^2 = 0.04$. The difference was larger among European Americans and Asian Americans than among Japanese ($t(108) = 2.43$, $p = 0.017$, Cohen's $d = 0.47$; $t(106) = 2.18$, $p = 0.031$, Cohen's $d = 0.42$, respectively). There was no difference between American subgroups ($t(116) = 0.17$, $p = 0.867$, Cohen's $d = 0.03$). Thus STIs occurred among all groups, and were more frequently among European and Asian Americans than among Japanese.

3.2.2. PDP analysis

The C and A parameter estimates were calculated in the same way as in Study 1 (Fig. 2). One-way ANOVAs were conducted for A and C parameters separately to examine the differences among culture groups. Results replicated the results of Study 1: the A parameter differed among culture groups, $F(2, 165) = 4.41$, $p = 0.014$, $\eta_p^2 = 0.05$, and the C parameter did not differ among culture groups, $F(2, 165) = 2.19$, $p = 0.116$, $\eta_p^2 = 0.03$. The A parameter for the European American and Asian American group was higher than for the Japanese group ($t(108) = 2.90$, $p = 0.005$, Cohen's $d = 0.56$; $t(106) = 2.23$, $p = 0.028$, Cohen's $d = 0.43$, respectively).

4. General discussion

The present studies were designed to explore the extent to which cultural variations in STI are the result of automatic procedures for inferring and recalling meaning. We used a modified version of the false recognition paradigm (Todorov & Uleman, 2004) and PDP (Jacoby, 1991; Payne, 2005) to determine whether contributions of automatic and controlled processes to STIs differ across cultures. Two studies compared American and Japanese participants on STI. The results of Study 1 indicate that STIs occurred among both American and Japanese participants, and STIs were more frequent and more automatic among American than among Japanese participants. In Study 2, we used multiple sentences in the exposure task and compared European American, Asian American, and Japanese participants. Study 2 replicated the results of Study 1 in that STIs occurred among all groups, and STIs among European and Asian American groups were more frequent and more automatic than that among the Japanese group.

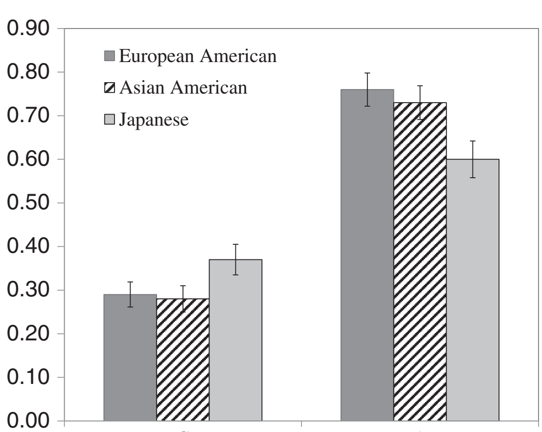

Fig. 2. Estimates of controlled and automatic processing in Study 2. Error bars represent standard errors.

We found cultural differences in STI between American and Japanese participants but no differences between European American and Asian American participants (Study 2). This seems inconsistent with previous findings that STIs do not occur among Asian Americans (Na & Kitayama, 2011) or Latino Americans (Zárate et al., 2001). However, there are several important differences among these studies. First, the tasks differed. Na and Kitayama (2011) used novel measures of STI, a face-primed lexical decision task and an N400 ERP measure. Zárate et al. (2001) used a lexical decision and an adapted savings-in-relearning (Carlston & Skowronski, 1994) task. These may differ in their sensitivity from our more common false recognition procedure.

Second, instructions and materials were in English for both the Euro- and Asian-American samples in Na and Kitayama (2011) and the Anglo and Latino samples in Zárate et al. (2001). This may have compromised the tasks' sensitivity.

Third, there were likely bilingual participants in the Asian- and Latino-American groups in these studies. Bilingualism confers cognitive benefits on adults (Kroll & Bialystok, 2013) and children (Adesope, Lavin, Thompson, & Ungerleider, 2010). In particular, recent studies of executive functions found advantages for bilinguals (Barac & Bialystok, 2012). Such enhanced executive function may have affected sensitivity in previous studies, especially on tasks that require fast, accurate responses. For example, in Na and Kitayama's (2011) study 1, STIs were detected with a lexical decision task with face primes. Results showed differences in accuracy and RT between implied traits and unrelated traits among Europeans but not Asian Americans. But Asian Americans showed a ceiling effect on accuracy (99% for real words) and uniformly rapid RTs (p. 1027). Bilingualism and degrees of acculturation should be controlled for in future studies.

4.1. Culture, automaticity, and STIs

Are STIs universal or culture specific? Our results suggest that STIs are universal *and* culture specific. Even 6–11-month-old infants evaluate others based on their helpful and unhelpful behaviors (Hamlin, 2014), and 12-month olds make trait inferences of some kind (Kuhlmeier, Wynn, & Bloom, 2003). Given the likelihood that infants' social perceptions are spontaneous (Baillargeon, Scott, & Bian, 2016), STI may be fundamental and universal for humans. The ability to mentalize and infer others' traits immediately is one of the important survival skills in a complex social world. So people may universally infer others' traits from their behaviors, spontaneously and automatically, from very early in ontogeny. However, STI processes should also be gradually attuned to culture-specific patterns with age. For example, Miller (1984) investigated cultural differences in the development of causal attributions. Hindu and American adults and children aged 8, 11, and 15 described others' behaviors and the reasons for them. Young children did not differ. But Americans showed increasing rates of dispositional attributions with age, while Hindu participants maintained high rates of situational attributions.

The two studies reported here show that STIs occur in both American and Japanese samples, but they differ in the extent to which automatic processes are involved. False recognition in both samples depended on controlled and automatic processes, but automatic processes were more prominent for Americans. Cultural difference in automatic processes are particularly important because automatic processes are "deep" — difficult to change, and hence relatively enduring and more diagnostic of membership and participation in the culture. They represent knowledge acquired slowly through socialization and/or acculturation. They are a kind of expertise, conferred by specific national, ethnic, socio-economic or occupational subcultures.

Automatic processes and procedural knowledge differ from the declarative knowledge of explicit beliefs. Explicit beliefs and values are measured through self-report and are relatively easy to change. Many cross-cultural research programs rely on self-reports. For example, Spencer-Rodgers, Williams, and Peng (2010) describe "three main traditions in cultural psychology" that focus on 1) norms and values (e.g., collectivism/individualism), (2) self-construals (e.g., interdependence/independence), and (3) culture and cognition (e.g., holistic/analytic thinking) which has focused largely on exploring East–West differences in basic cognition. All three traditions rely largely (but not exclusively) on self-reports and explicit judgments.

But there is growing interest in the ways that automatic processes distinguish among cultures. Mason and Morris (2010) reviewed attribution and neuroscience evidence, finding that cultural psychology has demonstrated that East–West differences emerge with tasks that tap automatic processing. They noted that "this view that culture permeates into automatic, unconscious processing of attributions…has the potential to provide a more complete account of the mechanisms underlying cultural differences" (p. 300). Mauss, Bunge, and Gross (2008, chap. 2) also reviewed automatic emotion regulation. They note that cultural norms and practices become habitual, and have a powerful automatic component.

The criteria for automaticity differ among the studies cited, and usually depend on identifying particular tasks as automatic (e.g., priming, and/or tasks that are unconscious, or uncontrolled, or unaffected by cognitive load, etc.). However, these tasks require both automatic and controlled processes. The various properties of "automaticity" cited in past literature do not always covary. Our preference for the PDP conception of "automatic" and "controlled" is based on (1) recognizing that both automatic and controlled processes usually contribute to task performance; (2) preferring the theoretical clarity of defining "automatic" processes as those that cannot be controlled, in tasks that actually require control (i.e., avoiding false recognition in the studies above); and (3) valuing the quantitative estimates it provides of the contribution of automatic (A) and controlled (C) processes to task performance, which facilitate comparisons across studies.

Controlled processes are central to following instructions, focusing attention, and monitoring performance. So as noted, "tasks are almost never process pure" (Jacoby, 1991, p. 534). PDP addresses this issue. In addition, relying on single indicators of automaticity such as null results with cognitive load or a lack of awareness does not ensure that other indicators of automaticity will yield the same results. For example, initial research on STIs (Winter & Uleman, 1984) suggested that they are automatic because they are unintended and unconscious. However, subsequent work showed that concurrent cognitive load can interfere with STI (Uleman, Newman, & Winter, 1992) and that it depends on working memory capacity (Wells, Skowronski, Crawford, Scherer, & Carlston, 2011). Defining an automatic process as one which cannot be controlled when control is a task requirement is more straightforward and closer to the usual meaning of "control" than is defining automaticity with a list of requirements that do not always covary. The PDP does this. Finally, the quantitative estimates of controlled and automatic processes' contributions to task performance allow comparisons across studies and samples, as illustrated in this paper. These estimates will vary with task, context, and sample, but such variation is informative.

The PDP model is based on controlled (C) and automatic (A) processes being independent. Although empirical independence does not guarantee theoretical independence (Jacoby & Shrout, 1997), it may support this assumption. The correlations between C and A (corrected for guessing) in Study 1 were 0.20 in the Japanese sample and 0.15 in the American sample. In Study 2, they were −0.24 in the Japanese sample, −0.03 in the Asian-American sample, and −0.01 in the American sample. Using the r to z transformation, these average 0.01, and none reach conventional levels of significance. Furthermore, research on STIs by McCarthy and Skowronski (2011) and Ferreira et al. (2012) has shown the dissociation of C and A by manipulating each independent of the other.

4.2. Future directions

Future studies are needed to explore cultural variations in the co-occurrences of spontaneous trait and spontaneous situation inferences (SSIs). Ham and Vonk (2003) reported that STIs and SSIs can occur simultaneously. Given that Asian people are more sensitive to contextual information than Westerners, they may make more SSIs and do so more automatically than Western people. We expect that the same would be true of spontaneous trait inferences about groups (STIGs; Hamilton et al., 2015) and spontaneous role inferences (Chen, Banerji, Moons, & Sherman, 2014) because these are both more contextual than STIs. It would also be interesting to explore how chronic cultural differences in inference goals and cognitive load interact on stimuli that equally afford trait and situational inferences, as in Todd, Molden, Ham, and Vonk (2011, Experiment 4).

Beyond this lies the larger project of expanding the list of tasks (inferences, actions, judgments, stereotyping, etc.) in which cultural differences result from automatic rather than controlled processes. A comprehensive literature review is beyond the scope of this paper, and most of the research remains to be done. But such a project could put our understanding of deep cultural differences on a firmer empirical basis, and advance a more tractable conception of "culture."

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