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Culture and the Cognitive and Neuroendocrine Responses to Speech

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The present research investigated cultural differences in the psychological and biological effects of verbalization of thoughts. Three studies tested how verbalization of thoughts requires a different amount of effort for people from cultures with different assumptions about speech and examined implications for the cognitive performance and stress hormone response to the task. The results showed that verbalization impaired East Asians/East Asian Americans' performance when the task was difficult but not when the task was easy, whereas the effect of verbalization on European Americans' performance was neutral or positive regardless of task difficulty. Moreover, verbalization decreased the level of cortisol response to the task among European Americans but not among East Asian Americans. The results demonstrate how the same act that is intended to create the same psychological experience could inadvertently lead to systematically different psychological experiences for people from different cultures.

Keywords: culture, speech, cognition, stress and cortisol

Thought and word are not connected by a primary bond. A connection originates, changes, and grows in the course of the evolution of thinking and speech.

—L. S. Vygotsky, *Thought and Language*

In the West, speech is often equated with thought. Speech, broadly defined as expression of thoughts in written or spoken form, symbolizes the freedom to be oneself, the strength to stand for one's ideas and beliefs. Thus, the act of speech is associated with an array of positive outcomes, including clarification of thoughts, and many psychological and physical health benefits (e.g., Alexander, 1950; Pennebaker, 1999). Yet, the meaning of speech itself is fundamentally situated within a particular cultural system. For instance, in the East, speech frequently signifies ignorance and disturbance, whereas in the West, speech generally means active thinking and power (Kim & Ko, 2007; Kim & Markus, 2002). When a culture holds a certain set of assumptions about the world, such as a particular meaning of speech, these shared assumptions and meanings influence the psychological tendencies of people who live and participate in the culture (Bruner, 1990; Fiske, Kitayama, Markus, & Nisbett, 1998; Shweder, 1995).

Cultural guidelines govern what, when, where, why, and how one speaks. The question, then, is whether these cultural meanings associated with the act of speech also shape the actual effects of

speech. The psychological impact of speech as a concept and a practice needs to be examined in relation to its cultural context. Studies examining cultural differences in the meanings and practices of talking have shown that there is considerable variation in views on speech and silence (e.g., Kim, 2002; Kim & Markus, 2002; Markus, Kitayama, & Heiman, 1997) as well as in speech practices (e.g., Hall, 1976; Holtgraves, 1997). Yet, with few exceptions, research has not examined how culture influences the actual psychological effects of speech. One such study (Kim, 2002) demonstrated that verbalization tends to impair cognitive performance among East Asian Americans more than among European Americans.

One possible consequence of this cultural difference might be the disparity in the amount of effort that is associated with the verbalization of thoughts. That is, for people from East Asian cultural contexts, the act of speech can be more psychologically burdensome than it is for people from European American cultural contexts. In the present research, this question is examined via the effect of verbalization on cognitive performance and the level of cortisol, a stress hormone, among East Asians/East Asian Americans and European Americans.

The Psychological and Physical Effects of Speech

Speech has been consistently valued and considered important throughout the history of the Western cultural tradition (see Kim & Markus, 2002, for a review). Speech is often considered in relation to thoughts (e.g., Ericsson & Simon, 1984, 1993; Plato as presented in Miller, 1981; Vygotsky, 1934/1986; Watson, 1924; Whorf, 1956). Through speech, individuals in these cultural contexts make their thoughts and feelings known to others, and in so doing, they express core aspects of their selfhood. Along with the freedom to choose one's religion and government, the freedom of speech symbolizes one's ultimate freedom to be oneself. Thus, speech enjoys a special privilege in these cultural contexts, and the freedom of speech is one of the most important rights of individuals in the United States.

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The use of the Socratic method in education assumes the benefit of speech in development and clarification of thoughts (Tweed & Lehman, 2002). Many forms of psychotherapy rely on the assumption of the therapeutic effects of verbal disclosure. Freud believed that only through verbal expression could one truly gain perspective into one's own psyche (Breuer & Freud, 1895/1957). Silence, often synonymous with suppression of self-expression, is viewed as being connected to mental illness and psychopathology (Freud, 1923/1961). Clearly, abundant empirical evidence validated these assumptions by showing the actual psychological and physical benefits of written or spoken disclosure (e.g., Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Petrie, Booth, Pennebaker, & Davison, 1995; Smyth, Stone, Hurewitz, & Kaell, 1999; see also Frattaroli, 2006, for a comprehensive review). Moreover, verbal sharing of thoughts and feelings with close others in social support transactions is also associated with reduced stress responses among European Americans (Taylor, Welch, Kim, & Sherman, 2007). However, in some other cultural contexts, the meaning of speech differs, as well as its beneficial effects.

Cultural Differences in the Meanings of Speech

Contrary to the view of speech prevalent in Western cultural contexts, since the time of ancient Chinese civilization, speech has been viewed as less central and less positive within the East Asian intellectual tradition (Nisbett, Peng, Choi, & Norenzayan, 2001). In the East Asian cultural traditions, silence, rather than speech, is commonly equated with wisdom and maturity (Azuma, 1986; Kim & Markus, 2002; Minami, 1994). Consequently, European Americans, compared with East Asians/East Asian Americans, are more likely to report the belief that speech and thoughts are closely connected (Kim, 2002; Kim & Sherman, 2007) and that speech is beneficial for thoughts (Kim, 2002). Moreover, European Americans value the freedom of speech significantly more and endow greater significance to what is spoken than do East Asian Americans (Kim & Sherman, 2007; Miyamoto & Kitayama, 2002).

These differences in the value of speech are also represented in the actual use of speech among East Asians/East Asian Americans and European Americans. For instance, Japanese middle-class mothers are less verbal with their young children than their American counterparts (Caudhill & Weinstein, 1969). Moreover, Chinese preschool teachers see quietness as an indication of control, rather than passivity, and appreciate silence more than American teachers do (Tobin, Wu, & Davidson, 1989). Consequently, East Asian children tend to be not as verbal as their European American counterparts. Japanese children produce significantly fewer utterances per turn than North American children (Minami, 1994) and use verbal expression to communicate emotions less frequently than do American children (Caudhill & Schooler, 1973). Also, Chinese infants at 7 months of age and older generally vocalize less than European American infants in response to laboratory events (Kagan, Kearsley, & Zelazo, 1977). These tendencies seem to continue among adults, as European Americans score higher than Asian Americans on the Brief Loquaciousness and Interpersonal Responsiveness Test (the BLIRT), a scale to measure the general tendency of being verbally quick, direct, and effusive in social interactions (Swann & Rentfrow, 2001).

Culture and the Effect of Talking on Thinking

These differences in the cultural views on speech and silence are reflected in the actual effects of speech on thoughts and feelings. For example, when European Americans were allowed to express their choice after they had made a choice among objects, their liking for their chosen object increased compared with when they made the same type of choice without expressing their choice (Kim & Sherman, 2007). But the same increase in liking as a result of expression did not occur among Asian Americans (Kim & Sherman, 2007). Similarly, writing down thoughts and feelings in the form of a letter to supportive others in a stressful lab situation—compared with merely thinking about supportive others—lowered stress hormone responses among European Americans, but the same benefit of writing did not occur among Asian Americans (Taylor et al., 2007).

Verbalization of thoughts also affects cognitive performance differently across different cultural groups. Concurrent verbalization while working on a challenging cognitive task has no effect or may even facilitate the performance of European Americans but impairs the performance of East Asian Americans (Kim, 2002). In explaining an underlying mechanism of the observed cultural difference, the research shows that this difference is, at least in part, due to the difference in the common mode of thinking that people from different cultures use. That is, people from a European American cultural context tend to use more analytic thinking (Nisbett et al., 2001) that is more verbalizable (cf. Schooler, Ohlsson, & Brooks, 1993) than holistic thinking, which is more commonly used among people from an East Asian cultural context. One study (Kim, 2002, Study 3) examined this possibility using an articulatory suppression manipulation (i.e., participants repeating the alphabet out loud while working on a cognitive task) that is designed to interfere with verbal mode of thinking more than nonverbal mode of thinking. The results show that the articulatory suppression task interfered with the performance of European American participants more than the performance of Asian American participants, suggesting that European Americans tend to use a more verbal mode of thinking than East Asian Americans (Kim, 2002).

Culture and the Effort Required to Verbalize

One implication from previous findings (Kim, 2002) is that the amount of effort that is required for concurrent verbalization might differ between European Americans and East Asian Americans. If European Americans are more likely to use a more verbalizable mode of thinking (Kim, 2002), verbalization of thoughts probably requires relatively little effort and thus does not distract from problem solving. In contrast, if East Asian Americans are more likely to use a less verbalizable mode of thinking, verbalization of thoughts should require greater effort and thus is more likely to be a distraction from problem solving. Consequently, European Americans might be experiencing the verbalization task as if it is one task of thinking aloud, whereas East Asian Americans might be experiencing the same task as if it is two separate tasks of thinking and talking. In other words, East Asian Americans are more likely to experience a psychological state that is akin to cognitive busyness (Gilbert, 1989; Gilbert, Pelham, & Krull, 1988) while verbalizing their thoughts than European Americans.

Differences in the required effort for verbalization can manifest in different aspects of psychological functioning. First, research on cognitive busyness and cognitive processing (Gilbert, 1989; Gilbert et al., 1988), when applied to the previous findings (e.g., Kim, 2002), leads to a specific prediction for cultural differences in performance outcomes. That is, the cultural difference in the manifested effect of verbalization should depend on how much cognitive effort is required by specific cognitive problems. It is hypothesized that verbalizing their thoughts causes East Asians/East Asian Americans to expend greater effort and therefore verbalizing their thoughts leads them to experience a state akin to cognitive busyness. If so, their performance impairment from verbalization should be found when the cognitive task requires effortful processing (e.g., a difficult task) but not when the task requires relatively effortless processing (e.g., an easy task). In contrast, the effect of verbalization should not differ as a function of the task difficulty among European Americans, for whom verbalization does not require great effort.

Second, if there is a cultural difference in how much effort is required by verbalization, the difference could lead to differences in the degree of stress experienced due to the task. When task demands are large relative to resources, people often experience stress (Blascovich & Tomaka, 1996; S. Cohen, 1978; S. Cohen & Williamson, 1988). If the verbalization requires greater effort among East Asian Americans, the verbalization of thoughts would be more stressful for them than for European Americans. Thus, in this research, I also examined the effect of talking while thinking on the level of a stress hormone, cortisol.

In sum, building on the previous research (Kim, 2002), in the present research, I examined whether the seemingly identical task of verbalizing thoughts requires a different amount of effort and, therefore, leads to systematically different psychological experiences between East Asians/East Asian Americans and European Americans. In so doing, I sought to provide further evidence as to whether verbalization is less compatible with the cultural mode of thinking among East Asians/East Asian Americans than among European Americans. Additional aims were to identify a boundary condition (i.e., task difficulty) of the demonstrated cultural effect and to examine the potential health implications of the cultural difference in the effect of speech.

Overview

The present research examined the cultural difference in the amount of effort required by verbalizing thoughts during problem solving. In Studies 1 and 2, the level of task difficulty was manipulated to examine its moderating role on the effect of verbalization. Participants in these studies worked on two different tasks—a difficult task, which required more effortful processing, and an easy task, which required less effortful processing—either while verbalizing thoughts or working silently. The studies examined the interactions of culture, task difficulty, and talking. Study 3 was designed to examine cultural difference in the neuroendocrine implication of talking while thinking among East Asian Americans and European Americans. That is, are people from a culture in which talking is less encouraged more distressed by verbalization compared with people from a culture in which talking is more encouraged? In order to test this question, Study 3

included a measure of the level of the stress hormone, cortisol, released in response to the task of verbalizing thoughts.

Study 1

Participants in Study 1 worked on two different tasks varying in difficulty while either verbalizing their thoughts or being silent. It was hypothesized that verbalization of thoughts would impair the performance of East Asians significantly more for a difficult task (i.e., when the problem solving required effortful processing), because the verbalization leads to a cognitive busyness-like state. However, verbalization of thoughts would not impair their performance for an easy task (i.e., when the problem solving required effortless processing). In contrast, it was hypothesized that the verbalization would not impair the performance of people from European American cultural context as a function of the task difficulty, because for them, the verbalization does not lead to the same psychological state as for East Asians.

Method

Participants. Eighteen European American college students (7 men and 11 women) and 18 East Asian college students (9 men and 9 women) who were visiting the United States from Taiwan and Japan as a part of an international summer exchange program were recruited to participate in the study. All the participants received \$8 for their participation.

Materials. The task was modeled after a visual pattern discrimination game called the “Set” (Set Enterprises, 2000). The object of the game is to identify a “set” of 3 symbols from 12 symbols laid out (see Appendix for a black-and-white example). Each symbol has four features, which can vary in shapes, colors, number of shapes, and shading. A set consists of 3 symbols in which each of the symbol’s features is the same or different across the 3 symbols. All of the features must separately satisfy this rule. Players have to find a set among the 12 symbols that satisfies the rule. This standard rule was used in the difficult task condition. In the easy task condition, the same layout of the 12 symbols was used, but the object was to simply find any 3 symbols that had the same color.

Procedure. When a participant arrived at the lab, the experimenter¹ explained that the purpose of the study was to examine patterns of speech intonation related to cognitive processes. Participants were asked to solve the game as presented on the computer screen according to specific instructions. The experimenter informed them that in one part of the experiment, they would be asked to verbalize their thought process as it occurred while working on the task and explained that a microphone attached to the computer would automatically digitize their voice and code their speech intonation. Also, the experimenter told participants to talk in their native language since only the intonation, not the content, of the speech was the focus of the study. Then, the experimenter left the room where a participant worked on the problem solving alone. Presentation of test items and recording of

¹ The experimenter was either East Asian American or European American, and in all studies, the ethnicity of experimenter was counterbalanced across participants in order to control for the potential effect of the experimenter ethnicity.

the response were done on the computer using PsyScope (J. D. Cohen, MacWhinney, Flatt, & Provost, 1993).

The study had a mixed model design in which task difficulty and talking were within-subject variables and culture was a between-subjects variable. Thus, every participant had to complete four parts of the experiment, and in each part, participants were asked to solve five problems. The order was: (a) a difficult task performed in silence, (b) an easy task performed in silence, (c) a difficult task performed while verbalizing, and (d) an easy task performed while verbalizing. The computer assessed the participants' performance, both in accuracy (number of items answered correctly) and speed (length of time taken to complete the task).

Results

First, the number of items answered correctly was subjected to a repeated measures analysis of variance (ANOVA) with culture (European American vs. East Asian) as a between-subjects variable and task difficulty (difficult vs. easy) and talking (silence vs. verbalization) as within-subject variables. There was a significant main effect of task difficulty on how many items were answered correctly, $F(1, 34) = 135.86, p < .001, \eta^2_p = .80$, confirming that the difficult task ($M = 2.17, SD = 1.57$) was indeed more difficult than the easy task ($M = 4.85, SD = .37$). There were no other significant main effects or two-way interactions. However, there was the predicted three-way interaction among culture, task difficulty, and talking, $F(1, 34) = 8.48, p < .01, \eta^2_p = .20$ (see Figure 1). The gender of participants did not have any effect on the results, so it will not be mentioned further.

The interaction between culture and talking was examined separately for easy and difficult tasks, using separate repeated measures ANOVAs. With the difficult task, there was the predicted interaction, $F(1, 34) = 5.83, p = .02, \eta^2_p = .15$. With the easy task, there was a marginal interaction, $F(1, 34) = 3.76, p = .06, \eta^2_p = .10$.

Simple effect tests with the least significant difference (LSD) test showed that the results in the difficult task condition replicated the findings from previous research (Kim, 2002). Among European Americans, the performance on the difficult task was not affected by talking ($M = 1.94, SD = 1.63$ in the silence condition, and $M = 2.56, SD = 1.89$ in the verbalization condition), $F(1, 17) = 2.37, p = .14, \eta^2_p = .12$. In contrast, among East Asians, talking impaired performance significantly in the difficult task condition ($M = 2.33, SD = 1.19$ in the silence condition, and $M = 1.83, SD = 1.51$ in the verbalization condition), $F(1, 17) = 4.64, p = .046, \eta^2_p = .21$. On the easy task, European American participants' performance was again not affected by talking ($M = 4.89, SD = 0.32$ in the silence condition, and $M = 4.78, SD = 0.43$ in the verbalization condition), $F(1, 17) = 2.13, p = .16, \eta^2_p = .11$. Unlike their performance on the difficult task, East Asian participants' performance on the easy task was not significantly affected by talking ($M = 4.78, SD = 0.43$ in the silence condition, and $M = 4.94, SD = 0.24$ in the verbalization condition), $F(1, 17) = 1.89, p = .19, \eta^2_p = .10$. In fact, the marginal interaction between culture and talking on the easy task was driven by slightly better performance in the verbalization condition among East Asians and slightly worse performance in the verbalization condition among European Americans, although neither contrast was significant.

Then, the speed (in minutes) was also examined. There was no significant effect involving culture on the length of time, $F(1, 34) = 1.97, p = .17, \eta^2_p = .06$, for the three way interaction. These results show that the interaction effect found on the number correct was not driven by the different length of time participants spent on the task.²

Discussion

The results support the hypothesis that verbalization impairs the performance of East Asians on a difficult task but not on an easy task. This pattern is consistent with the notion that verbalizing thoughts is more likely to produce a cognitive-busyness state among East Asians than among European Americans. Thus, it appears that, for East Asians, verbalization was a considerably more demanding extra task. In contrast, verbalization did not negatively affect the performance of European Americans whether the task was easy or difficult. It appears that the verbalization for European Americans was not a demanding distractor. These results support the hypothesis that the task of talking while thinking would require greater effort among East Asians than among European Americans.

However, there are several methodological issues that may prevent a clear interpretation of the results. First, a ceiling effect might conceal the effect of talking on the easy task, as most participants' performance was nearly perfect because the task was so easy. Given the marginal interaction pattern with the easy task, it seems unlikely that the lack of significant effects with the easy task was entirely due to a ceiling effect, but still the restricted range of performance is a concern. Second, the variables other than culture (i.e., task difficulty and talking) were within-subject variables, and the ordering of condition was not counterbalanced. Although this is not a concern for the interpretation of the interaction involving culture as both cultural groups followed identical procedures, the structure of this study does not allow a clear understanding of the exact nature of the effect of talking within each cultural group. Also, the study was conducted in multiple languages, and participants were people with different native languages. This aspect opens an alternative explanation that the effect is primarily due to the effect of language (e.g., Boroditsky, 2001; Markman & Hutchinson, 1984; Slobin, 1996; Waxman & Kowowski, 1990). Study 2 was designed to clarify these issues.

Study 2

Study 2 examined the same question as Study 1—the interaction between culture and task difficulty on the effect of talking on cognitive performance. Study 2 clarified the methodological ambiguities of Study 1. First, unlike Study 1, in which accuracy in problem solving was the main dependent measure, Study 2 was designed so that participants could not advance to the next problem until the earlier problem was answered correctly. Thus, Study 2 used the *speed* of the performance in correctly completing a task as the dependent measure to eliminate the possibility of a ceiling effect. Second, Study 2 featured a between-subjects design and

² Controlling for the length of time did not change the pattern of main effects or interaction with the measure of the number of correct answers.

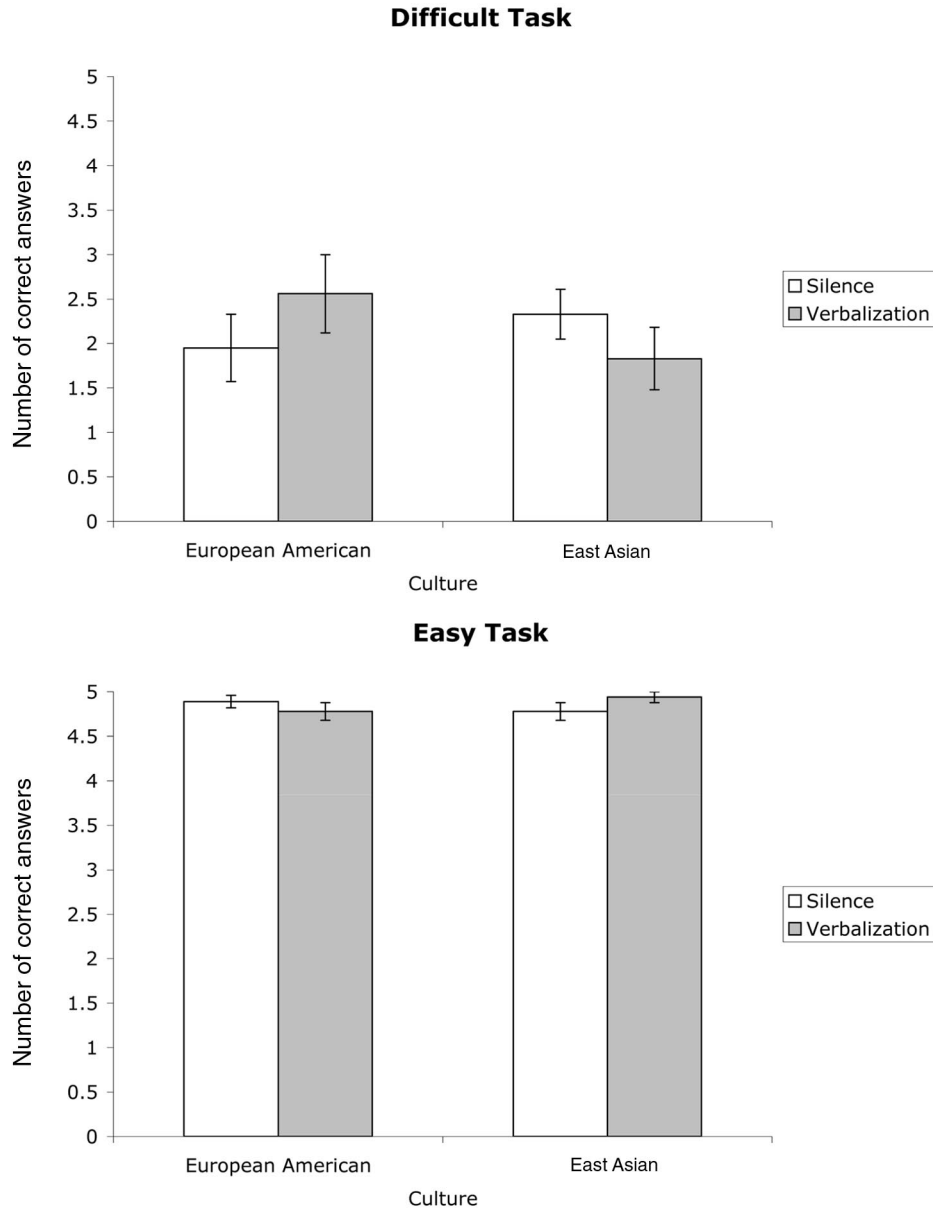


Figure 1. Number of correct answers as a function of culture and verbalization with difficult and easy tasks in Study 1. Error bars = standard errors of the means.

proper counterbalancing so that the exact effects of the independent variables could be observed. Third, participants in Study 2 were U.S.-born European Americans and East Asian Americans who differed in terms of cultural background but are both native English speakers, eliminating the confound of language.

Method

Participants. Thirty-two European American (12 men and 20 women) and 35 East Asian American (12 men and 23 women) college students participated in the study. They were all native English speakers. All European American participants were third-generation or older Americans (i.e., both of their parents were also

born and raised in the United States), whereas all East Asian Americans were second-generation Chinese, Japanese, or Korean Americans (i.e., both of their parents were immigrants from these East Asian countries). Previous research (Kim, 2002) has shown that the second-generation East Asian Americans' reported parental upbringing significantly differs from that of European Americans. East Asian Americans report that their parents engaged in significantly less verbal interaction with them than do European Americans. Thus, the second-generation East Asian American participants were preselected in this study because their parental upbringing would be more likely to reflect East Asian parenting styles, yet their English proficiency would be as good as their

European American counterparts. The categorization of culture was based on self-reported ethnicity information. All the participants received course credit for their participation.

Materials. The difficult items were from Raven's Advanced Progressive Matrices Set II (J. C. Raven, 1941) and the easy items were from Raven's Colored Progressive Matrices (J. Raven, Raven, & Court, 1998). Both sets of matrices are nonverbal tests for reasoning ability. Raven's Advanced Progressive Matrices are designed for adolescents and adults of above-average cognitive capacity and is the task used in the study by Kim (2002). The Raven's Colored Progressive Matrices are designed for younger children and mentally disabled groups.

Procedure. When a participant arrived at the lab, an experimenter who was unaware of both the hypothesis and condition assignment explained that the purpose of the study was to examine the cognitive processes of problem solving. Then, the participant was instructed to solve a set of problems selected from Raven's Progressive Matrices according to specific instructions presented on the computer screen. The experimenter informed the participant that in one part of the experiment, the participant would be asked to talk aloud. The experimenter set up a tape recorder for the participant and left the room where the participant worked on the problem solving alone, and subsequent instructions were presented on the computer screen.

Participants were randomly assigned to one of two conditions: the difficult task condition or the easy task condition. In the difficult task condition, participants had to correctly solve 5 items (from the Advanced Progressive Matrices) in silence and another 5 items while thinking aloud. In the easy task condition, participants had to correctly solve 10 items³ (from the Colored Matrices) in silence and another 10 items while thinking aloud. In both conditions, participants first received practice items before the real test. In the test, participants had to enter the correct answer, and unless they gave the correct answer, they were not allowed to move on to the next item. The computer measured both the speed of completing the task as well as the responses in each condition. The responses were recorded in order to detect any participant who simply hit all the number keys to advance to the next problem without actually solving the problem. Thus, the only dependent variable of the study was speed. The order of the within-subject variable—verbalization and silence—was counterbalanced.

Results

First, the speed of problem solving (in minutes) was subjected to a 2 (culture: European American vs. East Asian American) \times 2 (task difficulty: difficult vs. easy) \times 2 (talking: silence vs. verbalization) repeated measures ANOVA with talking as the within-subject variable. There was a significant main effect of task difficulty ($M = 4.48$, $SD = 1.13$ for the difficult task, and $M = 1.09$, $SD = 0.54$ for the easy task), $F(1, 63) = 242.81$, $p < .001$, confirming that, overall, participants were indeed slower to solve the task in the difficult task condition than in the easy task condition (despite the fact that there were only 5 items compared with 10 items in the easy task condition). There was also a significant main effect of talking, $F(1, 63) = 52.73$, $p < .001$, $\eta^2_p = .46$. The general tendency that verbalization would slow down the problem solving was expected because of previous findings on the effect of verbal protocols (see Ericsson & Simon,

1984, 1993, for review). However, the degree to which the verbalization reduced the speed of problem solving differed as a function of culture and experimental conditions and their interactions. There was no significant main effect of culture, $F(1, 63) = 0.57$, $p = .45$, $\eta^2_p = .01$. There were two-way interactions between task difficulty and talking, $F(1, 63) = 17.07$, $p < .001$, $\eta^2_p = .21$, and between culture and task difficulty, $F(1, 63) = 8.25$, $p < .01$, $\eta^2_p = .12$. However, these interactions were qualified by the predicted three-way interaction among culture, task difficulty, and talking, $F(1, 63) = 7.08$, $p = .01$, $\eta^2_p = .10$ (see Figure 2).

The interaction between culture and talking was examined separately with repeated measures ANOVAs for the easy and the difficult task. With the difficult task, there was the predicted significant interaction, $F(1, 31) = 8.04$, $p < .01$, $\eta^2_p = .21$. With the easy task, there was no significant interaction, $F(1, 32) = 0.14$, $p = .71$, $\eta^2_p = .004$.

It is also important to examine whether the two cultural groups differ in the pattern of interaction between task difficulty and talking. Thus, the interaction between task difficulty and talking was also examined using separate repeated measures ANOVAs with European Americans and East Asian Americans. With European Americans, as predicted, there was no significant Task Difficulty \times Talking interaction, $F(1, 30) = 1.49$, $p = .23$, $\eta^2_p = .05$. With East Asian Americans, there was a significant Task Difficulty \times Talking interaction, $F(1, 33) = 18.92$, $p < .001$, $\eta^2_p = .36$. Thus, East Asian Americans' performance was slowed down by verbalization only when the task was difficult but not when the task was easy, whereas the effect of verbalization on European Americans' performance was not moderated by task difficulty.

The speed in the silence condition was subtracted from the speed in the verbalization condition to calculate the talking effect score (in minutes). Because the speed was slowed down by verbalization in all conditions, I examined the effect of culture and task difficulty on the relative degree of speed reduction due to verbalization. Thus, higher numbers indicate that the performance was worse (i.e., the participants were slower) when the participants were talking than when they were silent, and lower numbers indicate that the performance was better (i.e., the participants were faster) when the participants were talking than when they were silent.

Then, planned comparisons with the LSD were used in further analyses to examine the effect of task difficulty on the talking effect score between the cultural groups. The effect of verbalization did not differ between European Americans ($M = 0.40$, $SD = 0.46$) and East Asian Americans ($M = 0.45$, $SD = 0.42$) for the easy task, $F(1, 63) = .02$, $p = .88$, $\eta^2_p < .001$. In contrast, the effect of verbalization was much more debilitating for the East Asian Americans ($M = 2.30$, $SD = 1.70$) than it was for European Americans ($M = 0.80$, $SD = 1.26$) for the difficult task, $F(1, 63) = 15.02$, $p < .001$, $\eta^2_p = .19$.

Discussion

Verbalization once again impaired the performance of East Asian Americans significantly more when the task was difficult

³ Different numbers of test items were given in order to make the overall length of each condition reasonably comparable.

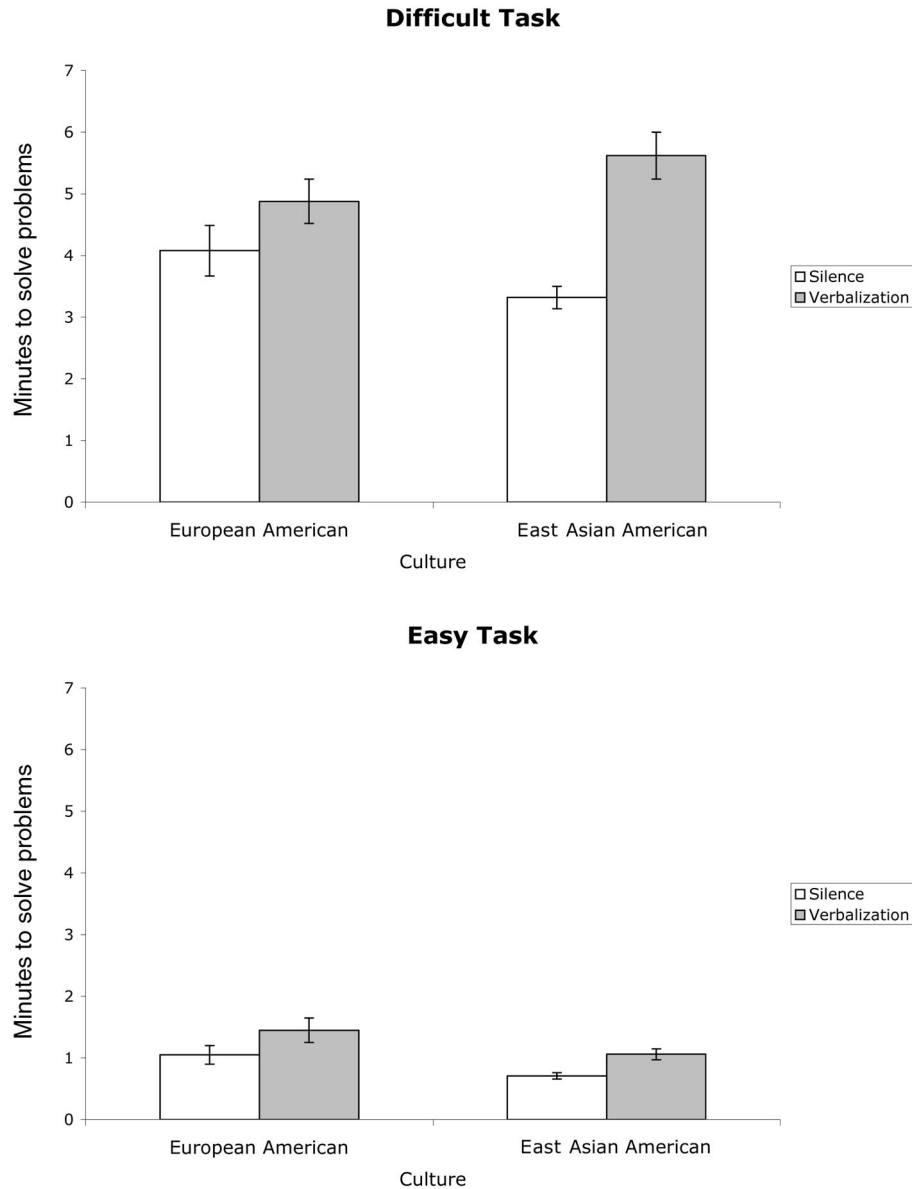


Figure 2. Length of time to complete the task as a function of culture and verbalization with difficult and easy tasks in Study 2. Error bars = standard errors of the means.

than when the task was easy. By contrast, verbalization affected the performance of European Americans in the same way whether the task was easy or difficult. Study 2 clarifies that the lack of the effect of talking with the easy task among East Asians in Study 1 was not due to a ceiling effect. Rather, the results from both studies support the notion that verbalization is more likely to lead to the state of cognitive busyness among East Asian Americans than among European Americans.

The present research also provides some evidence that the difference in the effect of talking cannot be explained by differences in language structure. Language has powerful influences on human thoughts (e.g., Boroditsky, 2001; Markman & Hutchinson, 1984; Slobin, 1996; Waxman & Kosowski, 1990) and plays an important role in the development of culturally divergent cognitive

processes. However, the group difference in the effect of talking demonstrated in the present research cannot be explained by the cross-linguistic difference alone, as the cultural difference was found whether East Asian/East Asian American participants spoke in one of the East Asian languages (Study 1) or English (Study 2).

These two studies, in which the pattern of cognitive performance outcomes was examined, support the idea that there is a cultural difference in the amount of effort required by verbalization while thinking. Next, I addressed the biological consequences of this cultural difference. Beyond performance outcomes, another consequence of experiencing high task demand could be the experience of stress (Blascovich & Tomaka, 1996; S. Cohen, 1978; S. Cohen & Williamson, 1988). Those people for whom verbalization of thoughts during problem solving requires more effort

may find the task of verbalization to be a greater stressor than those for whom verbalization requires less effort. Study 3 was conducted to examine this idea.

Study 3

Study 3 was designed to assess the effect of speech during a cognitive task on the level of individuals' stress as a function of cultural background. The hypothalamic–pituitary–adrenal (HPA) axis system is typically activated in response to threatening situations that are uncontrollable, unexpected, socially evaluative, and potentially important (see Dickerson & Kemeny, 2004 for review). In response to these situations, the HPA axis coordinates the release of glucocorticoids, including cortisol. Although activation of this stress system facilitates release of glucose to increase energy to deal with short-term threats, prolonged or recurrent activation can compromise the resilience of these systems, laying the groundwork for chronic mental and physical health disorders (McEwen, 1998). In fact, stress is often associated with the development and progression of a broad array of illness, including psychological disorders, such as depression and anxiety (Alonso et al., 2004), as well as physical illness, such as coronary heart disease, hypertension, and diabetes (McEwen & Seeman, 1999).

In this study, the procedure was similar to the first two studies. Participants solved the Raven's Advanced Progressive Matrices (J. C. Raven, 1941) either while verbalizing their thoughts or working in silence. In addition to the standard procedure, saliva samples were collected at predetermined time intervals in order to measure salivary cortisol responses to the experimental tasks. An additional benefit of the examination of the cortisol levels in relation to the speech during problem solving is that because of the known health implications of stress, cortisol levels can be informative as to how verbalization of thoughts might potentially affect the health of people from different cultural contexts.

It was hypothesized that East Asian Americans would show higher cortisol levels in the talking condition in which the task would be more taxing and burdensome, compared with cortisol levels in the silence condition. In contrast, it was hypothesized that European Americans would show either comparable or lower cortisol levels in the talking condition compared with the levels in the silence condition.

Method

Participants. Initially, 60 participants (35 European Americans and 25 East Asian Americans) were included in the study. Among those, 7 participants were excluded from the analyses because they engaged in activities that affect basal cortisol level (e.g., waking up less than 1 hr prior to the experimental session, drinking more than five cups of coffee, or smoking more than one pack of cigarettes). In addition, 3 participants (2 European Americans, and 1 East Asian American) were excluded because they finished the task very rapidly without solving any cognitive problems correctly, and thus it appeared that they did not actually work on the task as instructed. The final sample included 30 European American (6 men and 24 women) and 21 East Asian American (4 men and 17 women) college students who participated in the study. All of the European Americans were born in the United States (ranging from third- to sixth-generation Americans). All of the

East Asian Americans were also born in the United States (ranging from second- to fifth-generation Americans), and the sample included Chinese, Japanese, and Korean Americans, according to their self-reported ethnicity information. They were all native English speakers. All the participants received course credit for their participation.

Procedure. Experimental sessions were scheduled between 2:30 and 6:30 p.m. to control for the circadian rhythm of cortisol. Every participant received an e-mail with guidelines to follow 1 day prior to the day of his or her participation. These guidelines included not engaging in daily activities that could influence the basal cortisol level. Upon arrival at the laboratory, the participants were told that the study concerned cognitive problem solving and cortisol. Participants were first told to relax for 20 min in a room in which various magazines were present. At the end of the relaxation period, participants filled out a questionnaire to measure their daily activities that might have affected the basal level of cortisol such as the time that they woke up; whether they had taken any medications, including birth control pills; and how much coffee and how many cigarettes they had consumed. Right after completion of the questionnaire (approximately 30 min after the participants' arrival), the first saliva sample (Sample 1) was collected to measure the baseline cortisol level prior to the stressor task. Participants gave saliva samples by placing a small roll of cotton in their mouth for 3 min and saturating it with saliva before depositing the cotton into a sterile collection tube (Salivette, Sarstedt, Newton, NC).

Then, all participants proceeded to the problem-solving task. The task (Raven's Advanced Progressive Matrices Set II [J. C. Raven, 1941]) and the manipulation of talking were the same as the ones in Study 2 except that instead of the within-subject manipulation of verbalization, a between-subjects design was used. That is, participants were randomly assigned to work on a set of 10 Raven's Advanced Progressive Matrices either in silence or while thinking aloud. This study did not include the easy task condition. The task lasted approximately 10 min. Unaware of the experimental condition, a second experimenter handled the condition assignment, the set-up of a tape recorder, and the introduction to the task. The computer presented specific instructions as in previous studies. Neither experimenter was aware of the hypothesis of the study. The computer recorded both the accuracy (the number correct) and speed (the length of time to complete the task). At the end of the computer problem-solving task, participants filled out a questionnaire that was designed to measure their subjective experience of stress, which included five items: (a) "How difficult was the task?" (b) "How stressful was the task?" (c) "How able were you to cope with the task?" (d) "How overloaded did you feel when you were working on the task?" and (e) "How in control did you feel when you were working on the task?" Then, participants provided the second saliva sample (Sample 2; approximately 10 min after the onset of the task).

After the task, participants remained in the lab relaxing and provided three more saliva samples 30, 50, and 70 min after the onset of the task. Among these collections, Sample 3 (30 min after the onset of the task) was expected to capture the level of cortisol released in response to the experimental task because it takes 20–40 min for cortisol responses to the stress manipulation to be most detectable in the saliva after the onset of a stressful event (Dickerson & Kemeny, 2004). Samples 4 and 5 were collected to

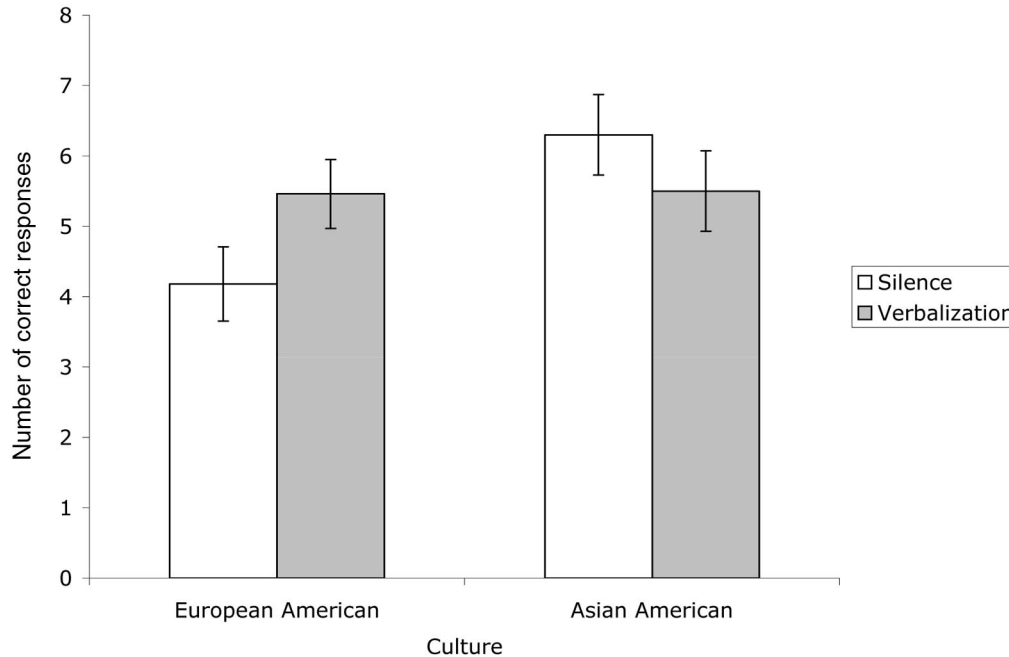


Figure 3. Number of correct answers as a function of culture and verbalization in Study 3. Error bars = standard errors of the means.

observe the rate of recovery to the baseline. At the end of the collection of Sample 5, participants completed a demographic questionnaire and were debriefed.

Immediately following each participant's session, the samples were stored in a freezer at approximately -80°C . The samples were shipped to the California National Primate Research Center at the University of California, Davis, for analysis. Prior to assay, samples were centrifuged at 3,000 rpm for 10 min to separate the aqueous component from mucins and other suspended particles. Salivary concentrations of cortisol were estimated in duplicate with commercial radioimmunoassay kits (Diagnostics Products, Los Angeles, CA). Assay procedures were modified to accommodate overall lower levels of cortisol in human saliva relative to plasma as follows: (a) Standards were diluted to concentrations ranging from 2.76 to 345 nmol/L, (b) sample volume was increased to 200 μl , and (c) incubation times were extended to 3 hr. Serial dilution of samples indicated that the modified assay displayed a linearity of .98 and a least detectable dose of 0.548 nmol/L. Intra- and interassay coefficients of variation were 3.06 and 6.29, respectively.

Results

Cognitive performance. The results generally replicated the previous findings with the difficult task in Studies 1 and 2 (see also Kim, 2002) that the effect of verbalization would be more positive for European Americans' performance than East Asian Americans' performance. Participants' gender did not have any effect and thus will not be mentioned further. The primary dependent variable was accuracy (number of items answered correctly). The accuracy was subjected to a 2 (culture: European American vs. East Asian American) \times 2 (condition: silence vs. verbalization)

ANOVA. The test revealed that there was no main effect of condition, $F(1, 40)^4 = .20, p = .66, \eta_p^2 < .01$, but a main effect of culture, $F(1, 40) = 3.97, p = .05, \eta_p^2 = .09$. However, this effect was qualified by the marginal interaction between condition and culture, $F(1, 40) = 3.69, p = .06, \eta_p^2 = .08$ (Figure 3). A simple effects test with the LSD test revealed that European American participants' performance was marginally better when they verbalized their thoughts ($M = 5.46, SD = 1.90, n = 13$) than when they were silent ($M = 4.18, SD = 1.60, n = 11$), $F(1, 40) = 3.06, p = .09, \eta_p^2 = .07$. In contrast, East Asian American participants' performance was somewhat worse when they verbalized their thoughts ($M = 5.50, SD = 1.65, n = 10$) than when they did not ($M = 6.30, SD = 1.95, n = 10$), although the difference was not significant, $F(1, 40) = 1.00, p = .32, \eta_p^2 = .02$.

The speed (in minutes) was also examined. There was no significant interaction effect involving culture on the length of time, $F(1, 40) = 2.80, p = .19$. These results show that the interaction effect on accuracy was not due to the different lengths of time that participants spent on the task.⁵

Psychological stress. Five items from the psychological stress questionnaire yielded one combined measure of psychological stress experience ($\alpha = .81$). There was no significant main effect of culture, $F(1, 47) = 2.08, p = .17, \eta_p^2 = .04$, or condition, $F(1, 47) = .22, p = .64, \eta_p^2 = .01$, and there was no interaction

⁴ Due to computer failure in recording the performance data, the cognitive performance analysis only included 41 participants.

⁵ Controlling for the length of time did not change the pattern of main effects or interaction with the measure of the number of correct answers. If anything, the interaction became slightly stronger, $F(1, 39) = 4.49, p = .04$.

between condition and culture, $F(1, 47) = .63, p = .43, \eta^2_p < .016$.⁶

Neuroendocrine stress response. First, I examined the baseline cortisol level (Sample 1) as a function of culture and condition, using ANCOVA with the use of birth control pills entered as a covariate. There were no main effects for culture, $F(1, 46) = .07, p = .93, \eta^2_p < .001$, or for condition, $F(1, 46) = 2.24, p = .14, \eta^2_p = .05$, and no interaction in the baseline cortisol level, $F(1, 46) = .10, p = .75, \eta^2_p = .002$.

Then, I conducted a repeated measures ANCOVA to test for the effects of condition and culture on cortisol levels linked to the task, with the baseline cortisol (Sample 1) and the use of birth control pills⁷ entered as covariates. As predicted, there was a significant three-way interaction, $F(3, 42)$ ⁸ = 2.90, $p = .04, \eta^2_p = .07$ (see Figure 4). There was no gender difference or any interactions involving gender on the cortisol results, and it will not be mentioned further.

In order to examine the effects of culture and condition on the level of cortisol at each time period, I calculated change scores by subtracting the Sample 1 cortisol level from the cortisol levels of subsequent samples (Samples 2–5). Using ANCOVA, I examined the effect of culture and condition on the cortisol level change from the baseline at each time period. The only significant interaction was found with the change score between Sample 1 (the baseline) and Sample 3 (30 min after stress onset), which is the key change as Sample 3 was when the cortisol released as a response to the experimental task could be best detected (Dickerson & Kemeny, 2004). After the baseline cortisol level and the use of birth control pills were controlled, there were no main effects but a significant interaction between culture and condition, $F(1, 45) = 4.72, p = .04, \eta^2_p = .10$ (Figure 5). Simple effect tests conducted with the least significant pairwise comparisons test with the same covariates showed that European American participants' cortisol levels significantly differed across conditions (adjusted $M = -1.53, SD = 2.03$ in the verbalization condition, and adjusted $M = 0.38, SD = 2.34$ in the silence condition), $F(1, 45) = 6.84, p = .01, \eta^2_p = .13$. In contrast, East Asian American participants' cortisol levels did not significantly differ, $F(1, 45) = .36, p = .55, \eta^2_p < .01$, although the cortisol level decreased somewhat more in the silence condition (adjusted $M = -1.04, SD = 2.60$) than in the verbalization condition (adjusted $M = -0.70, SD = 1.69$). It should be noted that, in this present study, cortisol levels did not increase from the baseline in response to the experimental tasks, except among European Americans in the silence condition. This is not surprising given that the task was not a strong stressor compared with typical lab stressors that involve more intense tasks such as public speech (see Dickerson & Kemeny, 2004, for a review). Moreover, cortisol is expected to naturally decline over time in the late afternoon. Thus, it is more appropriate to interpret the data in terms of the extent to which the task counteracted this normal decline in different cells (Nes, Segerstrom, & Sephton, 2005).

Discussion

The results in Study 3 show that the effect of verbalization was more positive for European Americans than for East Asian Americans in terms of both performance and cortisol response. Compared with the silence condition, European American participants answered more items correctly and had lower cortisol levels in

response to the task when they were in the verbalization condition. However, East Asian American participants did not differ in the two conditions in relation to either performance or cortisol levels. Although this pattern is consistent with the general hypothesis that the effect of verbalization would be more positive among European Americans than among East Asian Americans, the results are somewhat inconsistent with the prediction and the previous findings (Studies 1 & 2 in this article as well as studies in Kim, 2002) showing that East Asian Americans' cognitive performance was significantly impaired by verbalization. In the case of European Americans, the effect of verbalization has been neutral (e.g., Studies 1 & 2 in this article or Study 1 in Kim, 2002) or positive (e.g., Studies 2 & 3 in Kim, 2002), and even when it is neutral, the effect of verbalization tends to be more positive than silence.

While no previous study has shown the effect among East Asian Americans that resembles the present findings, it is important to note that even in the present study, the effect of verbalization was numerically negative, albeit statistically nonsignificant. There is a fair amount of individual difference within each cultural group, including the difference in the degree of acculturation, and it is possible that the present results were obtained because the particular sample of East Asian American participants in this study were more "Americanized" than other samples in previous studies. In all previous studies using East Asian Americans (studies in Kim, 2002 and Study 2 of this article), participants were second-generation Americans (i.e., those who were born in the United States but whose parents were immigrants), whereas Study 3 included later generations of East Asian Americans. Thus, it is not surprising that the negative effect of verbalization in the present study was weaker.

The current sample size was too small to allow a reliable analysis of the effect of generation. However, an analysis separating the second-generation East Asian Americans from later generation East Asian Americans showed that second-generation participants' performance in the verbalization condition ($M = 4.75, SD = 0.50$) was significantly worse than in the silence condition ($M = 6.50, SD = 1.34$), $t(7) = 2.59, p = .03$. In contrast, there was no condition difference among later generation East Asian Americans ($M = 6.00, SD = 2.00$ in the verbalization condition, and $M = 6.00, SD = 2.55$ in the silence condition), $t(9) = .00, p =$

⁶ The lack of effects on the psychological stress might be due to the fact that it was measured retrospectively (after the stressor), unlike the performance measures and cortisol measures. Moreover, self-report of stress experiences are influenced by many factors, such as self-presentational concerns and response bias. Thus, it has been suggested that much more room for error exists with the self-report than physiological measures, though self-report can provide important information (Blascovich & Mendes, 2000). In fact, studies using physiological measures often find different patterns of results with self-report and physiological measures (e.g., Creswell et al., 2005) and only moderate relationships between them (Feldman et al., 1999).

⁷ Use of birth control pills has been shown to affect HPA responsiveness to a psychosocial stressor (Kirschbaum, Kudielka, Gaab, Schommer, and Hellhammer, 1999).

⁸ The degrees of freedom in various tests are slightly different because some participants did not provide sufficient amounts of saliva sample at all five collection times. But participants were included in the analyses so long as they yielded usable samples for the critical timing (i.e., Sample 1 and Sample 3).

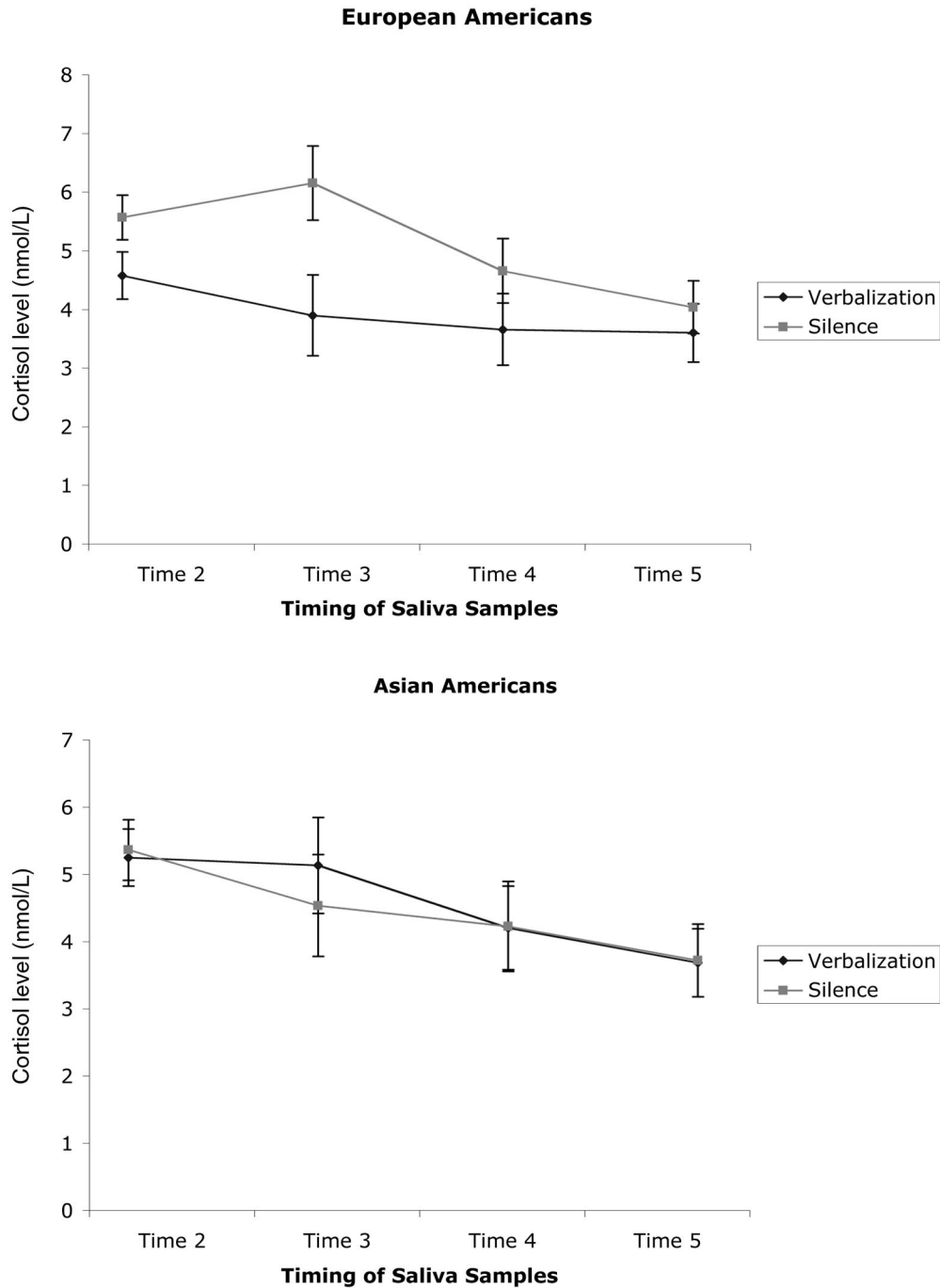


Figure 4. Salivary cortisol response to stress controlling for the baseline cortisol level and the use of birth control pills in Study 3. Error bars = standard errors of the means.

1.00. Perhaps, the fact that inclusion of later generation East Asian Americans weakened the cultural tendency repeatedly found suggests that the group difference in the effect of verbalization is influenced by acculturation. Nevertheless, it is important to note that there was a clear cultural difference in how positive the effect of talking was and that European Americans were psychologically benefited by verbalization, whereas there East Asian Americans showed no such benefit from verbalization.

General Discussion

Summary

The present research examined the cultural difference in the effort associated with verbalization of thoughts. Studies 1 and 2 showed that East Asian and East Asian American participants' performance was impaired by verbalization when the problem-solving task required more effortful processing but was unaffected

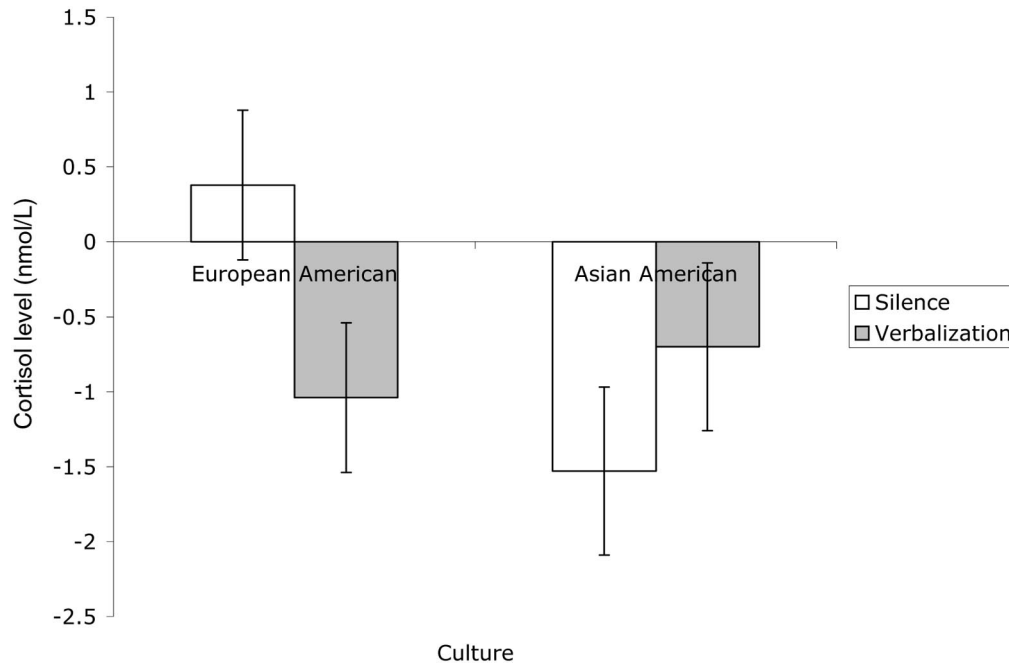


Figure 5. Changes in cortisol level (Sample 3 – Sample 1) as a function of culture and verbalization controlling for the baseline cortisol level and the use of birth control in Study 3. Error bars = standard errors of the means.

by verbalization when the task required considerably less effortful processing. In contrast, the effect of verbalization on performance did not differ for European American participants whether the task was difficult or easy. These findings support the idea that verbalization of thoughts in problem solving might require greater effort among East Asian Americans than among European Americans. Study 3 showed that verbalization reduced stress hormone response among European American participants, whereas it did not show the same stress-reducing effect among East Asian American participants. Taken together, the results of the present research demonstrate that speaking is more effortful for East Asian and East Asian American participants. Hence, East Asian Americans are more likely to experience verbalization as a greater distraction to thinking and a greater stressor than European Americans.

These results show how the same act that is intended to create the same psychological experience could inadvertently place a systematically different “burden” on people from different cultural contexts. People from the European American cultural context, in which the shared assumption is that talking is closely connected to thinking, may experience simultaneous talking and thinking as one natural task and, therefore, do not find verbalization to be an additional burden. People from the East Asian cultural context, in which the shared belief is that talking and thinking are unrelated, however, may experience talking while thinking as two tasks that are mutually distracting and therefore may find verbalization to be an additional burden and a stressor.

Cultural Influence on the Psychological Effects of Speech

What are the roles of culture and cultural beliefs in shaping these differences? There are many ways in which this question can

be narrowed and answered. Research findings have provided answers to two specific questions concerning the process of cultural influence. One way in which research can investigate cultural influence is by examining the mediating role of culturally shared beliefs. My contention is that the different meanings of speech in East Asian and European American cultures lead to the differential effect of verbalization on cognitive performance. Although the present studies did not directly examine the relationship between culturally shared beliefs about speech and the psychological effect of speech, previous studies (Kim, 2002; Kim & Sherman, 2007) demonstrated that the beliefs held by individuals mediate the cultural effects. One study (Kim, 2002, Study 2) tested whether individuals’ beliefs in the close relationship between speech and thoughts were linked to the actual effect of verbalization on cognitive performance on Ravens’ Advanced Progressive Matrices. The results showed that East Asian American participants and European American participants indeed differ in their beliefs about speech in that European American participants believed speech to be more closely linked to thoughts than did East Asian Americans. Moreover, individuals’ beliefs were significantly correlated with the way in which they were actually affected by verbalization. That is, those who believed that speech is closely related to thoughts tended to indeed be more positively impacted by verbalizing than those who did not.

Another study (Kim & Sherman, 2007) examined the mediating role of cultural beliefs in the cultural difference in the effect of speech on preference judgment. Similar to the study described above, this study examined the cultural difference in the value as well as the relationship between the value and the actual effect of speech. The results showed that European Americans value ex-

pression more than East Asian Americans. Moreover, this cultural difference in how much people value the expression of thoughts explained the difference in how expression of choice affected people from East Asian American and European American cultural contexts. For European Americans who place greater value on expressing their thoughts and feelings, expression mattered more, whereas for East Asian Americans who do not place as much value on expressing their thoughts and feelings, expression did not matter as much.

An alternative way to examine whether the demonstrated phenomenon was culturally shaped is to examine how the degree of acculturation among East Asian Americans moderated the results. The cursory analysis with the immigration status suggests that the observed cultural difference might disappear among third- or later generation East Asian Americans (i.e., East Asian Americans who had nonimmigrant parents). This finding raises important questions regarding how culturally shaped behavioral patterns and psychological tendencies are maintained and transformed. In particular, it will be important to examine the role of parenting and the process of early socialization in development of different modes of thinking as well as the proneness to verbalization.

Limitations, Implications, and Future Questions

The present research demonstrated that there are cultural differences in how psychologically demanding speech is. Given the previous findings on cultural differences in the compatibility between the mode of thinking and verbalization, the predictions made in the studies relied mostly on the cognitive explanation (i.e., required cognitive effort) for the cultural difference. However, psychological demand can be shaped by many factors, such as an individual's affective state (Blascovich & Mendes, 2000), and thus, other factors could have contributed to the demonstrated outcomes in the present research. For instance, East Asians/East Asian Americans tend to care more about potentially negative social implications of expressing thoughts than European Americans (Gudykunst, Gao, & Franklyn-Stokes, 1996; Kim & Ko, 2007; Taylor et al., in press). Thus, East Asian Americans could have experienced higher levels of negative affect while verbalizing than European Americans because of social concerns that are habitually associated with speech in their cultures. In contrast, previous research shows that European Americans tend to feel better about themselves after expressing their thoughts but worse about themselves after being denied a chance to self-express (Kim & Ko, 2007). This finding is consistent with the present finding (Study 3) that European American participants fared better when they were verbalizing than when they were silent. Future research shall directly examine the effect of affective state on psychological demand of speech as a function of culture.

Further, it should be noted that the pattern of cultural difference largely depends on the nature of cognitive task. For example, Raven's Progressive Matrices can be solved via both verbal and nonverbal processes (Ericsson & Simon, 1993; Sokolov, 1972). This flexibility makes the task a good test with which to detect cultural differences in the mode of thinking because a problem solver has the freedom to adopt a process that is most culturally familiar. However, some other cognitive tasks do not allow such flexibility because they can be solved only by verbal processing or only by nonverbal processing. For instance, some tasks, such as

those involving insight, predominantly require thought processes that are unreportable and distinct from language process (Bruner, 1966; James, 1890; Schooler et al., 1993). With these tasks, the cultural difference in the effect of verbalization would be eliminated or markedly reduced, and the effect would be negative regardless of cultural background. In contrast, other tasks, such as mental arithmetic, are predominantly processed through internal or external articulation (Fryer, 1941). With these tasks, the cultural difference in the effect of verbalization would also be eliminated or markedly reduced, and the effect would be neutral or positive regardless of culture. In other words, if the cultural difference in the effect of talking is due to the difference in modes of thinking, there should be smaller cultural differences in how a person is affected by talking compared with how that person performs the tasks that afford greater cognitive flexibility.

Finally, working on a computerized reasoning test in a private cubicle is very different from being in a college seminar, and the generalization of present findings can only be very speculative at this point. However, the present findings at least suggest the possibility that talking or the expectation of talking in classrooms can have a different psychological impact on people from different cultural contexts, and this is a question that is worthy of future empirical investigation.

Culture, Speech, and Health

The current findings raise questions about cultural differences in the health consequences of talking. European American participants were significantly less stressed by the task when they were instructed to speak aloud their thought processes. This finding is consistent with the prevailing American notion that speech is beneficial but that silence, often a synonym for suppression, is harmful for psychological and even physical health (e.g., Pennebaker & Beall, 1986; Pennebaker et al., 1988; Petrie et al., 1995; Smyth et al., 1999). In the United States, where the value of self-expression is strongly shared (Inglehart & Baker, 2000), speech is viewed as the most common and effective way to express one's thoughts and feelings. In many places in this cultural context, the act of talking itself becomes a way to reify those expressed thoughts and feelings (Kim & Sherman, 2007). Thus, it seems that written or spoken verbal expression might buffer individuals from potentially threatening experiences by affirming a valued self-image (Sherman & Cohen, 2006; Steele, 1988).

Yet, the present findings suggest that such health benefits (or harm from silence) may not be universally true. Verbalization did not reduce the cortisol response among East Asian Americans. This pattern of cultural difference in the effect of talking was also shown in a study that examined the effect of using explicit social support among European Americans and East Asian Americans (Taylor et al., 2007). Explicit verbal sharing of personal concerns with close friends or family reduces psychological and biological stress responses to a lab stressor among European Americans but not among East Asian Americans. Instead, East Asian Americans benefit more from using implicit social support, that is, being with or thinking about close friends and family without explicitly talking about their problems.

Of course, the type of speech used in the present studies is quite different from more common types of expressive writing used in disclosure research, as the typical type of disclosure involves either

writing or talking about stressful or traumatic experiences (Frataroli, 2006). Thus, findings from the present research do not directly test cross-cultural applicability of these disclosure findings. However, they clearly raise the question as to whether the typical psychological and health benefits of disclosure hold true among East Asians/ East Asian Americans.

The present findings also demonstrate that the manifestation of psychological effects of talking (i.e., interfering with cognitive performance or not) is situation dependent. The cultural difference in the interference effect of talking on East Asian students was observed only with a task that required more effortful cognitive processing. This finding has implications for how to understand the talking behavior of people from these different cultures in more mundane settings. For instance, the common perception is that East Asian and East Asian American students are relatively quiet in classroom settings but that the same people may be as chatty as European American students in conversations with their friends and family. While this cross-situational variability of talking behaviors is most often explained by social factors, such as concern for disrupting harmony or sensitivity to social hierarchy (Gao, Ting-Toomey, & Gudykunst, 1996; Kim & Markus, 2002; Markus et al., 1997), it is also consistent with the cognitive explanation that mundane conversations require less cognitive effort than more academic discussions.

Conclusion

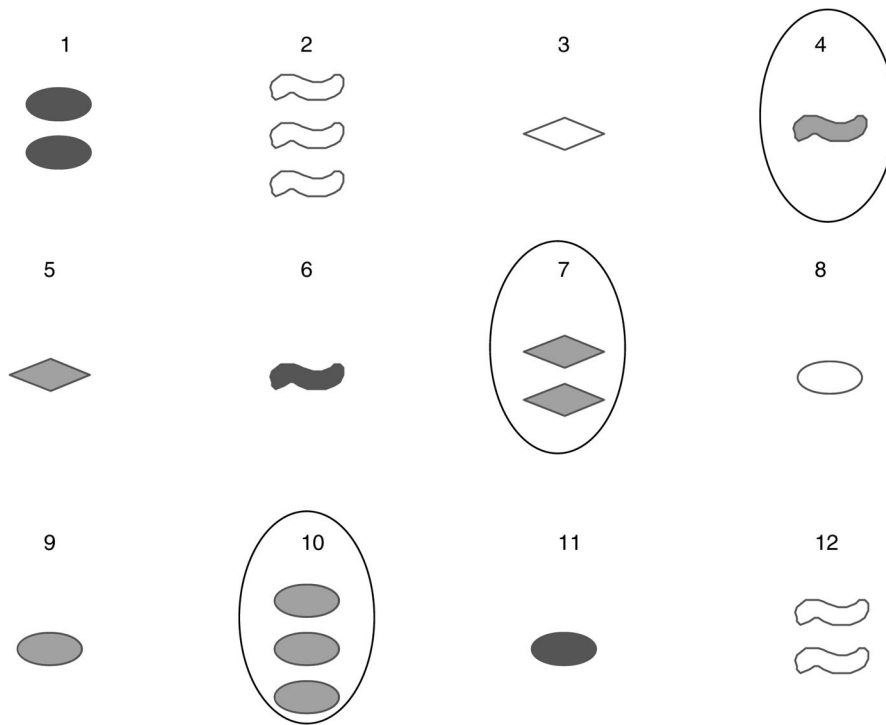
Even the identical act can lead to quite divergent psychological experiences when the act involves the mind of individuals who are from different cultural contexts that hold different cultural assumptions. The present research shows that the seemingly identical act of verbalizing thoughts led to very different cognitive and biological consequences for people from East Asian and European American cultural contexts. As Vygotsky (1986) stated, thought and word are not connected by a primary bond. Perhaps, the strength of the connection between thought and word depends on the cultural context in which the connection originates, and the connection may not be a mere bond between thought and word but a bond that governs body and soul.

References

- Alexander, F. (1950). *Psychosomatic medicine*. New York: Norton.
- Alonso, R., Griebel, G., Pavone, G., Stemmelin, J., Le Fur, G., & Soubrie, P. (2004). Blockade of CRF(1) or V(1b) receptors reverses stress-induced suppression of neurogenesis in a mouse model of depression. *Molecular Psychiatry*, 9, 278–286.
- Azuma, H. (1986). Why study child development in Japan? In H. Stevenson, H. Azuma, & K. Hakuta (Eds.), *Child development and education in Japan* (pp. 3–12). New York: Freeman.
- Blascovich, J., & Mendes, W. B. (2000). Challenge and threat appraisals: The role of affective cues. In J. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition* (pp. 59–82). Paris: Cambridge University Press.
- Blascovich, J., & Tomaka, J. (1996). The biopsychosocial model of arousal regulation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 28, pp. 1–51). San Diego, CA: Academic Press.
- Boroditsky, L. (2001). Does language shape thought? English and Mandarin speakers' conceptions of time. *Cognitive Psychology*, 43, 1–22.
- Breuer, J., & Freud, S. (1957). *Studies on hysteria* (J. Strachey, Trans.). New York: Basic Books. (Original work published 1895)
- Bruner, J. (1966). *On knowing: Essays for the left hand*. Cambridge, MA: Harvard University Press.
- Bruner, J. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press.
- Caudhill, W., & Schooler, C. (1973). Child behavior and child rearing in Japan and the United States: An interim report. *Journal of Nervous and Mental Disease*, 157, 323–338.
- Caudhill, W., & Weinstein, H. (1969). Maternal care and infant behavior in Japan and America. *Psychiatry*, 32, 12–43.
- Cohen, J. D., MacWhinney, B., Flatt, M., & Provost, J. (1993). PsyScope: A new graphic interactive environment for designing psychology experiments. *Behavioral Research Methods, Instruments, and Computers*, 25, 257–271.
- Cohen, S. (1978). Environmental load and allocation of attention. In A. Baum, J. E. Singer, & S. Valins (Eds.), *Advances in environmental psychology: Vol. 1. The urban environment* (pp. 1–29). Hillsdale, NJ: Erlbaum.
- Cohen, S., & Williamson, G., M. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), *The social psychology of health* (pp. 31–67). Newbury Park, CA: Sage.
- Creswell, J. D., Welch, W., Taylor, S. E., Sherman, D. K., Gruenewald, T., & Mann, T. (2005). Affirmation of personal values buffers neuroendocrine and psychological stress responses. *Psychological Science*, 16, 846–851.
- Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, 130, 355–391.
- Ericsson, K. A., & Simon, H. A. (1984). Verbal reports as data. *Psychological Review*, 87, 215–251.
- Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data*. Cambridge, MA: MIT Press.
- Feldman, P., Cohen, S., Lepore, S., Matthews, K. A., Kamarck, T. W., & Marsland, A. L. (1999). Negative emotions and acute psychological response to stress. *Annals of Behavioral Medicine*, 21, 216–222.
- Fiske, A. P., Kitayama, S., Markus, H. R., & Nisbett, R. E. (1998). The cultural matrix of social psychology. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (Vol. 2, 4th ed., pp. 915–981). New York: McGraw-Hill.
- Frataroli, J. (2006). Experimental disclosure and its moderators: A meta-analysis. *Psychological Bulletin*, 132, 823–865.
- Freud, S. (1961). The ego and the id. In J. Strachey (Ed. and Trans.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 19, pp. 3–66). London: Hogarth Press. (Original work published 1923)
- Fryer, D. H. (1941). Articulation in automatic mental work. *American Journal of Psychology*, 54, 504–517.
- Gao, G., Ting-Toomey, S., & Gudykunst, W. B. (1996). Chinese communication processes. In M. H. Bond (Ed.), *The handbook of Chinese psychology* (pp. 280–293). Hong Kong: Oxford University Press.
- Gilbert, D. (1989). Thinking lightly about others. In J. Uleman & J. Bargh (Eds.), *Unintended thought* (pp. 189–211). New York: Guilford Press.
- Gilbert, D. T., Pelham, B. W., & Krull, D. S. (1988). On cognitive busyness: When person perceivers meet persons perceived. *Journal of Personality and Social Psychology*, 54, 733–740.
- Gudykunst, W. B., Gao, G., & Franklyn-Stokes, A. (1996). Self-monitoring and concern for social appropriateness in China and England. In J. Pandey, D. Sinha, & D. P. S. Bhawuk (Eds.), *Asian contributions to cross-cultural psychology* (pp. 255–267). New Delhi, India: Sage.
- Hall, E. T. (1976). *Beyond culture*. New York: Doubleday.
- Holtgraves, T. (1997). Styles of language use: Individual and cultural variability in conversational indirectness. *Journal of Personality and Social Psychology*, 73, 624–637.
- Inglehart, R., & Baker, W. E. (2000). Modernization, cultural change, and

- the persistence of traditional values. *American Sociological Review*, 65, 19–51.
- James, W. (1890). *The principles of psychology*. New York: Holt.
- Kagan, J., Kearsley, R. B., & Zelazo, P. R. (1977, February 1). The effects of infant day care on psychological development. *Evaluation Quarterly*, 1, 109–142.
- Kim, H. S. (2002). We talk, therefore we think? A cultural analysis of the effect of talking on thinking. *Journal of Personality and Social Psychology*, 83, 828–842.
- Kim, H. S., & Ko, D. (2007). Culture and self-expression. In C. Sedikides & S. Spencer (Eds.), *Frontiers of social psychology: The self* (pp. 325–342). New York: Psychology Press.
- Kim, H. S., & Markus, H. R. (2002). Freedom of speech and freedom of silence: An analysis of talking as a cultural practice. In R. Shweder, M. Minow, & H. R. Markus (Eds.), *Engaging cultural differences: The multicultural challenge in liberal democracies* (pp. 432–452). New York: Russell Sage Foundation.
- Kim, H. S., & Sherman, D. K. (2007). “Express yourself”: Culture and the effect of self-expression on choice. *Journal of Personality and Social Psychology*, 92, 1–11.
- Kirschbaum, C., Kudielka, B. M., Gaab, J., Schommer, N. C., & Hellhammer, D. H. (1999). Impact of gender, menstrual cycle phase, and oral contraceptives on the activity of the hypothalamus-pituitary-adrenal axis. *Psychosomatic Medicine*, 61, 154–162.
- Markman, E., & Hutchinson, J. (1984). Children’s sensitivity to constraints on word meaning: Taxonomic versus thematic relations. *Cognitive Psychology*, 16, 1–27.
- Markus, H. R., Kitayama, S., & Heiman, R. J. (1997). Culture and “basic” psychological principles. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 857–913). New York: Guilford.
- McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine*, 338, 171–179.
- McEwen, B. S., & Seeman, T. (1999). Protective and damaging effects of mediators of stress: Elaborating and testing the concepts of allostasis and allostatic load. In N. E. Adler, M. Marmot, B. S. McEwen, & J. Stewart (Eds.), *Annals of the New York Academy of Sciences*, Vol. 896. *Socio-economic status and health in industrial nations* (pp. 30–47). New York: New York Academy of Sciences.
- Miller, G. A. (1981). *Language and speech*. San Francisco: Freeman.
- Minami, M. (1994). English and Japanese: A cross-cultural comparison of parental styles of narrative elicitation. *Issues in Applied Linguistics*, 5, 383–407.
- Miyamoto, Y., & Kitayama, S. (2002). Cultural variation in correspondence bias: The critical role of attitude diagnosticity of socially constrained behavior. *Journal of Personality and Social Psychology*, 83, 1239–1248.
- Nes, L. S., Segerstrom, S. C., & Sephton, S. E. (2005). Engagement and arousal: Optimism’s effects during a brief stressor. *Personality and Social Psychology Bulletin*, 31, 111–120.
- Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review*, 108, 291–310.
- Pennebaker, J. W. (1999). The effects of traumatic disclosure on physical and mental health: The values of writing and talking about upsetting events. *International Journal of Emergency Mental Health*, 1, 9–18.
- Pennebaker, J. W., & Beall, S. K. (1986). Confronting a traumatic event: Toward an understanding of inhibition and disease. *Journal of Abnormal Psychology*, 95, 274–281.
- Pennebaker, J. W., Kiecolt-Glaser, J. K., & Glaser, R. (1988). Disclosure of traumas and immune function: Health implications for psychotherapy. *Journal of Consulting and Clinical Psychology*, 56, 239–245.
- Petrie, K. J., Booth, R. J., Pennebaker, J. W., & Davison, K. P. (1995). Disclosure of trauma and immune response to a hepatitis B vaccination program. *Journal of Consulting and Clinical Psychology*, 63, 787–792.
- Raven, J., Raven, J. C., & Court, J. H. (1998). *Manual for Raven’s Progressive Matrices and Vocabulary Scales*. Oxford, England: Oxford Psychologists Press.
- Raven, J. C. (1941). Standardization of progressive matrices. *British Journal of Medical Psychology*, 19, 137–150.
- Schooler, J. W., Ohlsson, S., & Brooks, K. (1993). Thoughts beyond words: When language overshadows insight. *Journal of Experimental Psychology: General*, 122, 166–183.
- Sherman, D. K., & Cohen, G. L. (2006). The psychology of self-defense: Self-affirmation theory. In M. P. Zanna (Ed.) *Advances in experimental social psychology* (Vol. 38, pp. 183–242). San Diego: Academic Press.
- Shweder, R. (1995). Cultural psychology: What is it? In N. R. Goldberger & J. B. Veroff (Eds.), *The culture and psychology reader* (pp. 41–86). New York: New York University Press.
- Slobin, D. (1996). From “thought and language” to “thinking for speaking.” In J. Gumperz & S. Levinson (Eds.), *Rethinking linguistic relativity* (pp. 70–96). Cambridge, MA: Cambridge University Press.
- Smyth, J. M., Stone, A. A., Hurewitz, A., & Kaell, A. (1999). Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis: A randomized trial. *Journal of American Medical Association*, 281, 1304–1309.
- Sokolov, A. N. (1972). *Inner speech and thought*. New York: Plenum Press.
- Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 21, pp. 261–302). New York: Academic Press.
- Swann, W. B. Jr., & Rentfrow, P. J. (2001). Blurtatiousness: Cognitive, behavioral, and physiological consequences of rapid responding. *Journal of Personality and Social Psychology*, 81, 1160–1175.
- Taylor, S. E., Welch, W., Kim, H. S., & Sherman, D. K. (2007). Cultural differences in the impact of social support on psychological and biological stress responses. *Psychological Science*, 18, 831–837.
- Tobin, J. J., Wu, D. Y. H., & Davidson, D. H. (1989). *Preschool in three cultures: Japan, China, and the United States*. New Haven, CT: Yale University Press.
- Tweed, R. G., & Lehman, D. R. (2002). Learning considered within a cultural context. *American Psychologist*, 52, 89–99.
- Vygotsky, L. S. (1986). *Thought and language*. Cambridge, MA: MIT Press (Original work published 1934)
- Watson, J. B. (1924). The place of kinesthetic, visceral, and laryngeal organization in thinking. *Psychological Review*, 31, 339–347.
- Waxman, S. R., & Kosowski, T. D. (1990). Nouns mark category relations: Toddlers’ and preschoolers’ word-learning biases. *Child Development*, 61, 1461–1473.
- Whorf, B. L. (1956). *Language, thought, and reality: Selected writings*. Cambridge, MA: Technology Press of Massachusetts Institute of Technology.

Appendix: Example of Symbols in Visual Pattern Discrimination Game, Study 1



Note. Each symbol has features that can vary (e.g., shape, number of objects, shading). From the 12 symbols displayed, players are asked to identify a “set,” which is 3 symbols with features that are all the same or are all different across all 3 symbols. The three symbols circled represent an example of a set.

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