

## Language-dependent access to autobiographical memory in Japanese–English bilinguals and US monolinguals

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Japanese bilinguals retrieved autobiographical memories in response to 20 English and 20 Japanese cue words. US monolinguals were cued with 40 English words. All participants reported one *earliest memory*. Japanese bilinguals retrieved more memories and earlier memories when cued with Japanese words. They also retrieved more memories when the cue language matched either the language of memory encoding or the language of first thought. Although English cues elicited equivalent numbers of English and Japanese memories in the more fluent speakers of English, Japanese words elicited significantly larger numbers of Japanese memories in all Japanese–English bilinguals. The average age of cued autobiographical memories was significantly earlier for US than for Japanese students but age of the *earliest memory* did not differ.

When asked to report her thoughts associated with the word *baby* in English and with the equivalent word in Japanese, a Japanese bilingual reported the following (S. Chesney, personal communication, 4 August 2003):

If you give me a word *baby*, I see pictures in my head of the kids that I babysat in America. If you give me a word *akachan*, images of my friends' babies that I have seen in pictures come to my mind—they are Japanese.

Access to autobiographical memories in bilingual individuals may depend in part on the match between the language used during encoding and the language used during retrieval, as suggested by the principle of encoding specificity (Tulving & Thomson, 1973). Language specificity may be

manifested in terms of differences in the number of memories retrieved or differences in the time of life when the remembered events occurred. These effects have been demonstrated by researchers studying several bilingual language groups: Spanish–English (Bugelski, 1977; Schrauf & Rubin, 1998, 2000), Polish–Danish (Larsen, Schrauf, Fromholt, & Rubin, 2002), and Russian–English (Marian & Neisser, 2000).

Bugelski (1977) found that when Spanish–English bilingual immigrants were cued with Spanish words, 45% of their thoughts concerned events from their childhood. On the other hand, when they were cued with English words, 70% of their thoughts were related to events from their lives after immigration. In contrast, Schrauf and Rubin (1998) reported similar levels of access to autobiographical memory based on language of

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This article is based on a master's thesis awarded to the first author. These data were presented at the 2004 meeting of the Southeastern Psychological Association. This research was funded by a Graduate Student Research Award from the University of West Florida. The authors wish to thank Shiho Chesney and Nozomi Matsuzawa for their help with validation of the translation of cue words. Bill Mikulas, Phyllis Lubbers, John Sumlin, and Kay MacKenzie assisted in the recruitment of participants. We wish to thank Sam Mathews and Frank Andrasik for helpful comments and suggestions on an earlier draft of this article. Akiko Matsumoto now resides in Amagasaki, Hyogo, Japan.

the prompt for 12 elderly immigrants. The mean age of events recalled when these respondents were cued with Spanish words (39.8 years) was not significantly different from the mean age of events recalled when cued with English words (40.6 years). However, when memories were grouped on the basis of the language participants reported using when they thought about the memory, the mean age of memories retrieved in response to Spanish cues (29.7 years) was significantly earlier than the mean age of memories retrieved to English cues (46.5 years). Thus, although these participants were able to access their personal memories equally well in their first and second languages, they appeared to have preferential access to earlier (Spanish-only) autobiographical memories when the language of internal thought and the language used to cue the memories were taken into account.

Marian and Neisser (2000) also reported language-specific access to autobiographical memories. In their first experiment, 20 Russian–English bilinguals were asked to retrieve autobiographical memories when the language of the interview and language of the cue words were consistent (both were in English or both were in Russian). Language-dependent access was demonstrated through increased access to memories encoded in the same language as that used during the interview. In their second experiment, the language ambience (language of the interview) and language of the cue words were manipulated factorially. Thus, 24 Russian–English bilingual participants were interviewed once in English and once in Russian. In each session half of the cue words were English prompts and half were Russian. Memories were identified as *Russian* or *English* based on which language participants reported using at the time of the event recalled. *Russian* memories were analysed separately from *English* memories. More *Russian* memories were recalled when interviews were conducted in Russian. *Russian* memories were also more frequently retrieved when the cue words were Russian. Similarly, more *English* memories were recalled when the interview was conducted in English or when the cue words were English. Thus, language ambience and language of the cue word independently produced language-specific access to autobiographical memories, with a larger effect produced by language ambience.

Schrauf and Rubin (2000) examined the autobiographical memories of eight of the participants from their 1998 study. They manipulated language

ambience and assessed the language used when participants first thought about the event. Congruent memories were memories that were retrieved in the language in use on the day of the interview. Crossover memories were memories that were retrieved in the alternate language rather than the language in use on the day of the interview. Language ambience influenced but did not completely determine the language of first thought. Participants tended to retrieve congruent memories (59% of the memories were retrieved in Spanish during Spanish interviews; 36% of the memories were retrieved in English during English interviews) but they also retrieved a large number of crossover memories (21% of the memories were retrieved in English during Spanish interviews; 30% of the memories were retrieved in Spanish during English interviews). When categorised by language of first thought, memories retrieved in Spanish were based on events from an earlier time in life (28.6 years of age for congruent memories; 26.9 years of age for crossover memories) than were memories retrieved in English (48.2 years of age for congruent memories; 52.9 years of age for crossover memories).

To summarise, autobiographical memories appear to be encoded in specific languages. As a result, use of a particular language might provide differential access to an earlier or later time of life. The probability of retrieval of a memory may be influenced by both the language used during an interview (language ambience) and the language used for retrieval cues.

The development of autobiographical memory as a functional system appears to be intertwined with linguistic, social, and cultural development (Leichtman, Wang, & Pillemer, 2003; Nelson, 2003, Nelson & Fivush, 2000, 2004; Wang, 2003, 2004; Wang, Leichtman, & Davis, 2000). The social practice of reminiscing and telling personal stories gives children opportunities to reconstruct memories in a meaningful way and contributes to the emergence of autobiographical memory. The narrative style that characterises interactions between adults and children while engaged in talk about the past can predict the content and quality of children's later memory reports (Nelson & Fivush, 2000, 2004). Mothers and children tend to resemble each other in conversational manners and children appear to use the narrative style modelled by their mother when they relate their memories (Tessler & Nelson, 1994; Wang et al., 2000).

Because socialisation practices may vary among cultures, the nature and development of autobiographical memory may also vary among cultures. Several researchers provide evidence for cultural differences in the age of the earliest autobiographical memory and in the content of autobiographical memory narratives. These differences may reflect cultural differences in narrative style and the emphasis placed on the importance of the individual and of individual personal memories. For example, Wang et al. (2000) found differences in both the content and style of the narratives produced by American and Chinese mother-child dyads. American mothers were more likely to elaborate on their children's responses, whereas Chinese mothers were more likely to ask the same questions repeatedly. Han, Leichtman, and Wang (1998) found that Korean narratives were similar in content to Chinese narratives, but American narratives were more voluminous and included more specific responses than either Asian group. In addition, the memory narratives of American children included more references to the individual and were more detailed than were the narratives of Chinese or Korean children (Han et al., 1998; Wang, 2004; Wang et al., 2000).

Cultural beliefs about the importance of personal memory might also influence the development of early autobiographical memories. Autobiographical memory would be expected to develop at an earlier age in cultures that emphasise the individual and value the sharing of memories that support a strong personal identity (Nelson, 2003). Consistent with this explanation, the earliest reported autobiographical memories frequently vary according to the culture of the respondent. In Western cultures, the earliest autobiographical memory is typically for an event from around the age of 3½ years (Pillemer & White, 1989) whereas the earliest autobiographical memories reported by Asian respondents are from a later period of life (Han et al., 1998; Mullen, 1994; Wang et al., 2000). However, the age of the earliest autobiographical memory can also vary substantially within Asian cultures. The age of the earliest autobiographical memory reported by Korean adults was about 17 months older than the earliest memory reported by Western adults (Mullen, 1994), whereas the age of the earliest memory reported by Chinese adults was about 6 months older (Wang, 2001). In addition, Wang, Leichtman, and White (1998) found that Chinese children reared in a one-child family

recalled earlier autobiographical memories than did Chinese children reared in a family with siblings. In addition, children reared in one-child families included more references to the self in their narratives than did children reared in multiple-child families. Wang et al. attributed this difference to the shift to a more Western-style, child-centred dynamic in Chinese families (the "4-2-1 syndrome", in which children in one-child families become the centre of attention for devoted parents and grandparents). Thus, even differences in child-rearing practices within a culture can alter the content and onset of autobiographical memories.

An examination of autobiographical memory in Japanese bilinguals will necessarily confound the influences of language-dependent access to memory with cultural effects related to child rearing, narrative style, and the importance placed on individuals and individual personal memories within the culture. However, given the variability in autobiographical memory phenomena observed within and between Asian cultural groups, an examination of autobiographical memory in individuals from additional Asian cultures is a valuable addition to our understanding of the relation between language, culture, and autobiographical memory. To date, no studies have been reported on language-dependent access to autobiographical memory in a Japanese sample.

As noted by Schrauf and Rubin (1998, 2000, 2003), skill in the second language may moderate language-dependent access to autobiographical memory. When autobiographical memory is studied in bilingual samples, the participants are frequently immigrants (e.g., Bugelski, 1977; Javier, Barroso, & Munoz, 1993; Larsen et al., 2002; Marian & Neisser, 2000; Schrauf & Rubin, 1998, 2000). The differing findings reported by Marian and Neisser (2000) and Schrauf and Rubin (1998, 2000) might be explained by differences in fluency in English or in the number of years in residence in the US. Schrauf and Rubin's Spanish-English bilingual participants were older (64.6 years old) and had functioned in their second language much longer (approximately 36 years in the US) than Marian and Neisser's participants (20.9 years old, combining the two groups; approximately 7 years in the US). Larsen et al. (2002) examined 20 individuals who immigrated to Denmark from Poland 30 years previously. Early immigrants were approximately 10 years younger at the time of immigration than were late

immigrators. Although both groups had resided in Denmark for the same length of time, early immigrants reported that they preferred to use Danish for inner speech, whereas late immigrants reported a preference for Polish, suggesting that the early immigrants were more comfortable with Danish. Thus, even after long residencies in the new country, differences in use of the second language may be found among bilingual immigrants. Nevertheless, both groups reported that their autobiographical memories for events prior to immigration were typically encoded in Polish, whereas memories for events after immigration were typically encoded in Danish.

Clearly, not all bilinguals have the same level of fluency in their second language. In addition, bilingual students who are temporary residents of a host country might not have the same degree of commitment to assimilation to a new culture that may characterise a sample of immigrants. For example, international students usually earn degrees from a university in the United States and plan a lengthy stay in the United States to complete their studies. In contrast, exchange students come for one or two terms and plan to receive degrees from their home university. Similarly, language study students simply take courses in English as a Second Language (ESL) or enrol in an Intensive English Programme (IEP). The length of stay for exchange students and ESL or IEP students may be as short as a few weeks but is seldom longer than an academic year. The level of proficiency in English varies widely among these students, which in turn might influence their ease of access to autobiographical memories in English. With the exception of Schrauf and Rubin (1998), who described the second language skill of their participants in detail, reports of autobiographical memory in bilinguals provide little information about the proficiency of participants in their second language.

Finally, bilinguals have been reported to experience different levels of emotionality when talking about personal experiences in their first and second language (e.g., Aragno & Schlachet, 1996; Javier et al., 1993). Marcos (1976) argues that bilingual patients are more emotionally withdrawn in therapeutic settings when they use their second language than when they use their native language. Thus, the language used during therapy might impair access to autobiographical memory. Schrauf (2000) and Schrauf and Rubin (2003) describe clinical cases in which choice of language was related to clients' access to

emotions, access to early personal memories relevant to the therapeutic process, or use of strategies for coping with the experience of emotion during therapy.

The purpose of this study was to investigate several questions regarding the role of culture and language in accessing autobiographical memories. First, the effect of language on retrieval of autobiographical memory was examined. Japanese bilinguals were expected to retrieve earlier memories when they were cued with Japanese words than when cued with English words. Further, to examine the encoding specificity of language for the retrieval of autobiographical memories, the match between the language of encoding and language of retrieval was examined. Bilingual participants were asked to report the language of first thoughts to each cue word to evaluate hypotheses concerning the encoding specificity of language. Retrieval of autobiographical memories by Japanese–English bilinguals may depend in part on their proficiency in English. Students who were more proficient in English were expected to retrieve more memories when cued with English words than students who were less skilled in English. The *earliest memory* reported by US monolinguals was expected to be concerned with an event that occurred at an earlier age than the *earliest memory* reported by Japanese bilinguals. Finally, the relation between language and the emotional content of autobiographical memories was explored. Specifically, memories retrieved with Japanese cue words might differ in their emotional quality compared to memories retrieved with English cue words.

## METHOD

### Participants

Two groups of students at the University of West Florida were recruited as volunteers for this study. One group consisted of Japanese-born bilingual students who were proficient in Japanese and English. The second group consisted of US monolingual students who were not proficient in a second language.

*Japanese bilingual participants.* The Japanese sample consisted of 18 students (4 men and 14 women) who ranged in age from 20 years to 28 years ( $M = 22.7$ ,  $SD = 2.65$ ). There were eight international students, three exchange students

enrolled in degree credited courses, and seven students enrolled in an Intensive English Programme (IEP). To evaluate proficiency in English, Japanese participants were asked to report their age when they began to study English, the number of years spent studying English, their score on the Test of English as a Foreign Language (TOEFL), their current use of English, and the nationality of their current friends. Most students started learning English around the same age (10–12 years). Of 18 students, 13 reported that their first contact with English was during junior high school. Four students reported that their study of English began around age 8—three during cram school (a supplementary school) and one during elementary school. One reported beginning to learn English from a family member at the age of 2½ years.

Japanese students were also asked to report their perceived competence in English by rating their ability to speak, write, read, and understand English. Ratings were reported as a percentage relative to their ability in Japanese. For example, competence in English that was equal to competence in Japanese was reported as 100%. These data are presented in Table 1. Japanese students were also asked which language they usually used when they dreamt, thought, expressed themselves, and took a note to themselves. Table 2 presents these data.

*US monolingual participants.* US monolingual students had studied a second language but identified themselves as English monolinguals.

TABLE 1

Self-reported competence in English reported as a percentage by Japanese International, exchange, and IEP students

	<i>Status of students</i>		
	<i>International</i> <i>n = 8</i>	<i>Exchange</i> <i>n = 3</i>	<i>IEP</i> <i>n = 7</i>
Speaking			
Mean	52.5%	46.7%	45.7%
SD	14.14	5.77	7.32
Writing			
Mean	65.0%	60.0%	55.7%
SD	11.65	0.00	7.87
Reading			
Mean	66.3%	63.3%	55.0%
SD	13.03	15.28	10.41
Understanding			
Mean	62.5%	60.0%	57.1%
SD	12.82	0.00	11.13

TABLE 2

Frequencies of use of language reported by Japanese International, exchange, and IEP students

	<i>Status of students</i>			
	<i>International</i> <i>n = 8</i>	<i>Exchange</i> <i>n = 3</i>	<i>IEP</i> <i>n = 7</i>	<i>Total</i> <i>n = 18</i>
Express				
Japanese	5	1	6	12
English	0	0	0	0
Both	3	2	1	6
Dream				
Japanese	0	1	5	6
English	0	0	0	0
Both	8	2	2	12
Think				
Japanese	0	1	6	7
English	0	0	0	0
Both	8	2	1	11
Note				
Japanese	0	0	3	3
English	3	0	1	4
Both	5	3	3	11

All but one of these students were recruited from an introductory psychology course and received extra credit for their participation. The one student who was not recruited from introductory psychology was an acquaintance of the first author who was interested in the study. A total of 15 US students (2 men and 13 women) volunteered. Age of US participants ranged from 17 years to 49 years ( $M = 20.9$ ,  $SD = 7.84$ ). (However, only one US participant was older than 21.) All US participants identified themselves as Caucasian. Self-report data showed that 13 of the students had studied a second language in high school—seven studied Spanish, three studied Spanish and a third language (German or Hebrew), three studied French—one had studied American Sign Language and a second language (Spanish) in college, and one had never studied another language. The mean number of years of study was 2.2 years and ranged from 1 year to 4 years. None of the students reported that they considered themselves fluent in the language they had studied.

## Materials and procedure

Monolingual participants described their experience with a second language and reported demographic information (age, date of birth, and gender) on a questionnaire. Japanese bilinguals completed a different questionnaire in which they

described their knowledge of English as a second language, reported demographic information (age, date of birth, and gender), provided their score on the Test of English as a Foreign Language (TOEFL), described the extent of their study of English and any other languages, and described their use of English in daily life.

Cue words were randomly selected from 124 words published by Rubin (1980). Equivalent Japanese translations were used for Japanese cue words. Two independent Japanese bilinguals checked the translation of each cue word for its equivalency in Japanese. Several words were deleted from the list either because they were considered overly abstract or because they were judged to be culturally inappropriate for the Japanese sample. These words included *agility*, *army*, *capacity*, *contents*, *context*, *priest*, *truth*, and *virtue*. The cue words and their Japanese translations are presented in the Appendix.

Participants were interviewed individually. Each session lasted for 1–2 hours. The interviewer told the participants that the study concerned the recall of personal memory and explained the difference between personal memory and generic memory. Bilingual participants were told that they would be given 20 words in Japanese and 20 words in English and would be asked to report the first personal memory that was associated with each word. Japanese participants were interviewed in Japanese and were told that they could report their memories in either English or Japanese. However, all Japanese participants chose to report their memories in Japanese. Cue words were presented both verbally and visually (printed on a 3" × 5" index card) to prevent confusion associated with words that have the same sound but are either spelled differently in English or written differently in Kanji. For example, the English words *tail* and *tale* sound alike but have different meanings and the Japanese word pronounced as *shi* can mean either *poetry* or *death* depending on the Kanji used. The order of language used for the cue words was counterbalanced among the bilingual participants. Monolingual participants were presented with the same 40 words used as cues for the Japanese participants but all cue words were presented in English.

Participants were asked to report their memories as soon as they came to mind. If a word did not retrieve a personal memory, the participants were told to say *no memory*. Eleven bilingual participants requested Japanese translations for some English cue words (for example, the mean-

ing of *hatred* and *salute*). The interviewer provided these participants with translations when requested. Memories retrieved in response to these translated cue words were excluded from data analysis (64% of the students who requested Japanese translations of English cue words were exchange or IEP students). Reaction time to retrieve each memory was timed using a stopwatch. Japanese participants were asked to report the language of their first thoughts triggered by the cue word immediately following retrieval of each memory.

Participants were next asked to report their *earliest memory*—the earliest event from their life that they could recall as a personal autobiographical memory. This part of the interview was also conducted in Japanese for the Japanese students. Participants were asked to report either their age at the time of this *earliest memory*, the exact date of the event, or how long ago the event occurred. They were also asked to rate their *earliest memory* for its emotionality on a 7-point scale ranging from 7 (very pleasant) to 1 (very unpleasant). After completing the *earliest memory* retrieval and rating, participants were asked to provide information about the memories they retrieved in response to the 40 cue words. Participants were asked to report the language of encoding; the date of event, their age at the time of the event, or how long ago each remembered event occurred; and to rate each memory for its emotionality. Procedures for monolingual participants were similar to those for bilingual participants, except that the 40 cue words were all presented in English and US participants were not asked to report the language of first thoughts or the language of encoding. All interviews were recorded with a Sony microcassette tape recorder.

## RESULTS

Memories were identified as autobiographical memories if the event took place only once, was a personal memory about a specific episode, and the participant could date the time of the event. A total of 866 autobiographical memories were collected using the cue word procedure (401 memories by US students and 465 memories by Japanese students). US students retrieved a mean of 26.9 ( $SD = 7.17$ ) autobiographical memories in response to the 40 cue words, with a range of 11–38 memories. Japanese students retrieved a mean of 25.7 ( $SD = 6.01$ ) autobiographical memories in

response to the 40 cue words, with a range of 15–35 memories. There was no significant difference between the number of memories retrieved by US and Japanese students,  $t(31) = 0.50, p = .62$ . Japanese students retrieved their memories more slowly ( $M = 11$  s,  $SD = 5.91$ ) than did US students ( $M = 6.3$  s,  $SD = 2.44$ ),  $t(31) = 2.84, p < .01$ . However, they required no more time to retrieve memories when they were cued with Japanese words ( $M = 11.65$  s,  $SD = 6.07$ ) than when they were cued with English words ( $M = 10.32$  s,  $SD = 6.61$ ),  $t(17) = 1.23, p = .24$ .

### Culture and age of memory

Every participant reported one *earliest memory*. Although US students were expected to report memories for events that occurred at an earlier age than those reported by Japanese students, there was no reliable difference in the age of events reported for the *earliest memory* by US students ( $M = 4$  years,  $SD = 1.36$ ) and Japanese students ( $M = 3.2$  years,  $SD = 1.09$ ),  $t(31) = 1.88, p = .07$ . In fact, Japanese participants tended to report slightly earlier memories (on average, 9.6 months earlier) than US students, although this difference was not statistically significant. The analysis of the age of events reported for memories retrieved with the cue word procedure produced a different pattern of results. US students retrieved memories from a significantly earlier time of life when the cue word procedure was used ( $M = 12.75$  years,  $SD = 2.96$ ) than did Japanese students ( $M = 17.42$  years,  $SD = 3.02$ ),  $t(31) = 4.47, p < .01$ . In this case, the average age of memories was 4.7 years earlier for US students than for Japanese students.

### Language proficiency and language-dependent recall of autobiographical memory

Based on TOEFL scores and the number of months in residence in the United States, international students appeared to be more proficient in English than were exchange or IEP students. International students had significantly higher scores on the TOEFL ( $M = 551.6, SD = 38.77$ ) than did exchange and IEP students ( $M = 499.6, SD = 30.98$ ),  $t(16) = 3.08, p < .01$ . (One student did not report a TOEFL score.) Not surprisingly, international students reported significantly longer residence in the US ( $M = 32.3$  months,  $SD$

$= 16.49$ ) than did exchange and IEP students ( $M = 4.4$  months,  $SD = 2.91$ ),  $t(17) = 5.28, p < .01$ .

A  $2 \times 2$  ANOVA in which student status (international, exchange/IEP) was a between-subjects factor and language of the cue word was a repeated measure was computed on the number of memories retrieved. A significantly larger number of memories were retrieved in response to Japanese cue words ( $M = 13.8, SD = 3.88$ ) than to English cue words ( $M = 12.0, SD = 2.81$ ),  $F(1, 16) = 5.41, MSE = 5.10$ , partial omega squared = .11,  $p < .05$ . However, the number of memories retrieved was unaffected by student status, which reflects both fluency in English and length of time residing in the US. Neither the main effect of student status nor the interaction between student status and language of the cue was significant,  $F(1, 16) < 1$  for both tests. A parallel analysis on the age of the memories retrieved indicated that international students retrieved memories from a significantly later time in life ( $M = 19.7$  years,  $SD = 2.54$ ) than did exchange and IEP students ( $M = 15.6$  years,  $SD = 2.42$ ),  $F(1, 16) = 15.33, MSE = 9.88$ , partial omega squared = .28,  $p < .01$ . In addition, Japanese cues triggered the retrieval of memories from a significantly earlier time in life ( $M = 16.8$  years,  $SD = 3.15$ ) than did English cues ( $M = 18.1$  years,  $SD = 3.29$ ),  $F(1, 16) = 6.87, MSE = 2.57$ , partial omega squared = .14,  $p < .05$ . The interaction of student status and language of the cue was not significant,  $F(1, 16) = 1.09$ .

### Analysis of the number of autobiographical memories retrieved

One approach to evaluating language-dependent access to autobiographical memories is based on the relation between language of encoding and language of the cue word used to access autobiographical memory. Japanese participants retrieved 167 memories that they said had been encoded in English at the time of the event (*English memories*), 284 memories that had been encoded in Japanese (*Japanese memories*), and 14 memories for which Japanese and English or some other language were used concurrently at the time of the event (*mixed memories*). Because few memories were *mixed memories*, these memories were not included in the analysis. The number of autobiographical memories retrieved was analysed with a  $2 \times 2$  ANOVA in which language of cue (English, Japanese) and language of encoding (English, Japanese) were repeated measures.

English cue words triggered the retrieval of more *English memories* ( $M = 5.8$ ,  $SD = 3.75$ ) than did Japanese cue words ( $M = 3.4$ ,  $SD = 2.68$ ). Similarly, Japanese cue words triggered the retrieval of more *Japanese memories* ( $M = 10.1$ ,  $SD = 4.36$ ) than did English cue words ( $M = 5.8$ ,  $SD = 3.70$ ). These findings produced significant main effects for language of cue  $F(1,17) = 6.19$ ,  $MSE = 2.75$ , partial omega squared = .07,  $p < .05$ , language of encoding  $F(1,17) = 5.16$ ,  $MSE = 38.12$ , partial omega squared = .05,  $p < .05$ , and a significant interaction between the language of cue and language of encoding  $F(1,17) = 38.40$ ,  $MSE = 5.12$ , partial omega squared = .34,  $p < .01$ . Post hoc analysis using Tukey's HSD showed that Japanese bilinguals retrieved significantly more *Japanese memories* when cued with Japanese words than any other memories, and significantly more *English memories* when cued with English words than when cued with Japanese words.

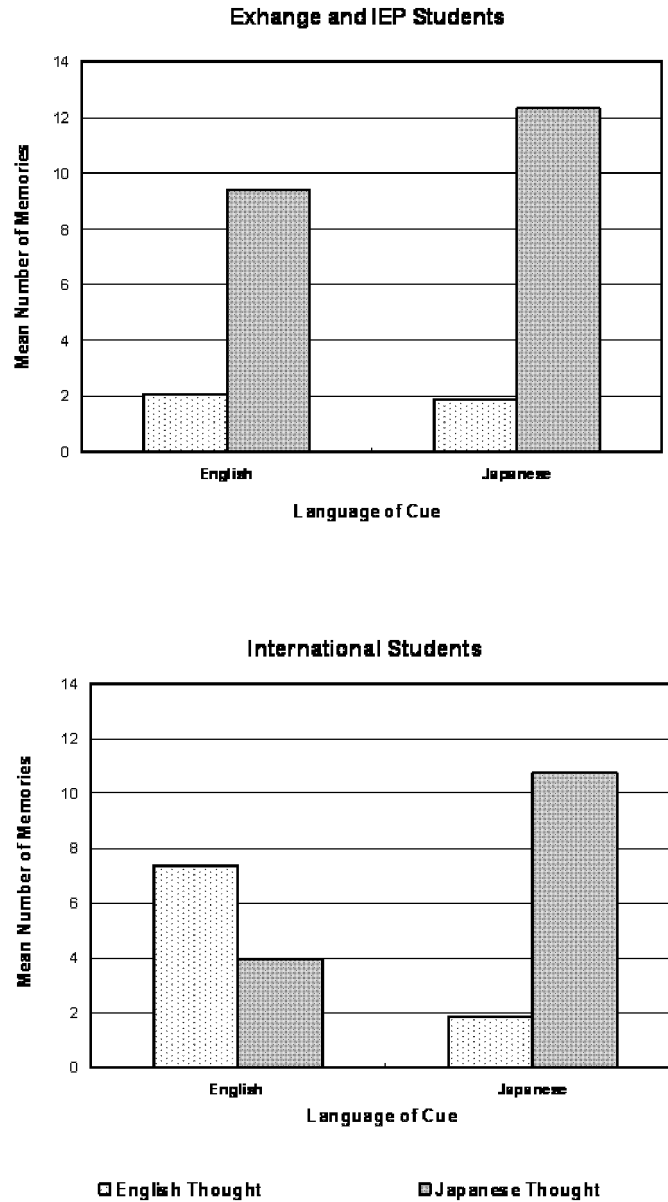
Language-dependent access to memories was also evaluated by examining the relationship between the language of cue and language of first thought. A  $2 \times 2$  repeated measures ANOVA was computed on the number of memories retrieved. When presented with a Japanese cue word, a larger number of memories were first thought about in Japanese ( $M = 11.6$ ,  $SD = 3.99$ ) than in English ( $M = 1.9$ ,  $SD = 2.52$ ). When presented with an English cue word, the mean number of memories that were first thought about in English was 4.4 ( $SD = 4.59$ ) and the mean number of memories that were thought about in Japanese was 7 ( $SD = 4.68$ ). These findings produced significant main effects for language of cue  $F(1,17) = 5.80$ ,  $MSE = 3.28$ , partial omega squared = .06,  $p < .05$ , language of first thought  $F(1,17) = 19.80$ ,  $MSE = 34.26$ , partial omega squared = .21,  $p < .01$ , and a significant interaction between the language of cue and language of first thought  $F(1,17) = 12.98$ ,  $MSE = 17.81$ , partial omega squared = .14,  $p < .01$ . A Tukey HSD analysis of the interaction indicated that Japanese bilinguals reported significantly more memories when both the language of the cue and the language of first thought were Japanese. This condition produced significantly more memories than any other. English cue words triggered equivalent numbers of memories that were first thought about in English and in Japanese.

Because international students appeared to be more proficient in English than were exchange or IEP students, a series of three-way ANOVAs

were computed on the number of memories retrieved by Japanese participants. These analyses added level of skill in English as a third factor to the analyses just discussed. Because part of these analyses duplicates findings reported earlier, only those findings relevant to skill in English are reported here. Although none of the analyses produced significant main effects of skill in English, each analysis produced one or more significant interactions between skill in English and other variables in the analysis. The interaction of skill in English and language of encoding was significant,  $F(1,16) = 12.32$ ,  $MSE = 21.45$ , partial omega squared = .14,  $p < .01$ . The interaction of language of first thought and skill in English was also significant,  $F(1,16) = 7.13$ ,  $MSE = 21.42$ , partial omega squared = .07,  $p < .05$ . Finally, a three-way interaction between skill in English, language of first thought, and language of the cue word was statistically reliable,  $F(1,16) = 7.10$ ,  $MSE = 13.1$ , partial omega squared = .08,  $p < .05$ . This interaction is presented in Figure 1.

Post hoc analyses of the three-way interaction indicated that students who were less skilled in English (exchange and IEP students) reported memories that had been encoded in Japanese significantly more often than did the more fluent international students, who reported memories that had been encoded in English as often as they reported memories that had been encoded in Japanese. Both groups tended to report that their first thoughts of memories occurred in Japanese rather than in English. However, this difference was significantly larger for the students who were less skilled in English. Finally, the less fluent students retrieved few memories that were first thought of in English regardless of the language of the cue word. In addition, they retrieved more memories that they first thought of in Japanese when they were cued with a Japanese word than with an English word. In contrast, when the more fluent International students were cued with English words, they retrieved more memories that they reported thinking about in English than memories that they reported thinking about in Japanese. However, when cued with Japanese words, even the more fluent speakers of English reported few memories that first came to them in English and a large number of memories that first came to them in Japanese. Thus, the pattern of retrieval of auto-





**Figure 1.** Mean number of autobiographical memories retrieved as a function of language of cue, language of first thought, and fluency in English (International students were more fluent in English than were exchange and IEP students).

biographical memories in the more fluent students was consistent with language-dependent access. Deviation from this pattern observed in data from less fluent students probably represents a basement effect for access to memories in English. These students retrieved very few memories that they first thought of in English ( $M = 2$  memories thought in English for both English and Japanese retrieval cues).

### Language, culture, and emotion of memories reported

The emotionality rating of memories retrieved when Japanese participants were cued with Japanese words ( $M = 4.2$ ,  $SD = 0.53$ ) was not significantly different from that of memories retrieved when cued with English words ( $M = 4$ ,  $SD = 0.43$ ),  $t(17) = 1.08$ ,  $p = .30$ . Similarly, the mean emotionality rating of the *earliest memories*

reported by Japanese students ( $M = 4.2$ ,  $SD = 1.89$ ) was not significantly different from the mean emotionality reported by US students ( $M = 3.9$ ,  $SD = 2.26$ ),  $t(31) = 0.42$ ,  $p = .68$ .

## DISCUSSION

These results provide evidence for an encoding specificity effect of language on the retrieval of autobiographical memories. Japanese bilinguals retrieved a larger number of memories and they retrieved memories from an earlier time in their life when they were cued with Japanese words than when cued with English words. Although the number of memories retrieved was unrelated to student status (which reflects both fluency in English and length of time residing in the US), both groups of students retrieved more memories in response to Japanese prompts than to English prompts. In particular, Japanese participants reported more memories when cued with Japanese words than when cued with English words. In addition, Japanese cue words were more likely to elicit memories for events for which the language used at the time of the event was Japanese rather than English. Thus, access to autobiographical memory by Japanese bilinguals was optimal when there was a match between the language of the cue word and the reported language of memory encoding.

These findings are consistent with the language-dependent effects reported by Marian and Neisser (2000) with Russian-English bilinguals, in which the match between the language used for the interview and the language of the cue word was effective in facilitating the retrieval of autobiographical memories. Because all interviews with Japanese participants were carried out in Japanese, one might argue that the interview procedures maximised the effect of language ambience and might have reduced the ability of English cue words to retrieve English-specific memories. However, even in the context of an interview conducted in Japanese, Japanese bilinguals accessed *English memories* significantly more often with English prompts than with Japanese prompts, supporting the language specificity of cue words for the retrieval of autobiographical memories. Japanese participants also tended to report that they first thought about their memories in the same language as the language of the cue words, even in the context of a Japanese language ambience. These results provide further

evidence for the role of encoding specificity of language on the retrieval of autobiographical memory in bilinguals.

Marian and Neisser (2000) questioned the validity of using mean age of memories to evaluate language specificity in the retrieval of autobiographical memories because the age of a remembered event does not necessarily reflect the language that was used when the event was encoded. This criticism may be valid for fluent bilinguals who might use both languages frequently during a large part of their lives. Marian and Neisser propose that failures to find significant differences in the ages of memories retrieved by participants when cued with Spanish and when cued with English may be accounted for by this explanation.

Schrauf and Rubin (1998, 2000) also found that the average age of memories can depend on whether comparisons are based on the language of the cue word, the language of encoding, or the language of first thought. The Japanese students in this study were unlikely to have been as skilled in English as were the participants in the Schrauf and Rubin (1998, 2000) studies of Spanish bilinguals. Their participants were older immigrants who had lived in the US for decades, whereas the Japanese students in the current study had been in the US for less than 5 years. Schrauf and Rubin found differential access when the language of first thought for the memories was taken into account, but did not report differential access to memories with English versus Spanish cue words. In addition, they did not find an interaction between cue word and language of encoding. It is possible that language-specific access to autobiographical memories might dissipate with high levels of skill in the second language. In contrast, we identified significant differences in the age of memories retrieved based on the language of the cue, language of encoding, and language of first thought. Moreover, the students who were more skilled in English (international students) retrieved more memories when cued with English than did the students who were less skilled in English (exchange and IEP students). International students retrieved more memories that were encoded in English and reported that they thought about their memories in English more often than did exchange and IEP students. Thus, these results suggest that language-dependent access to autobiographical memory may change as a person becomes more fluent in the second language.

Although US students were expected to retrieve an earlier event than would Japanese students as their *earliest memory*, this hypothesis was not confirmed. In fact, the age of the *earliest memory* reported by US students did not differ statistically from the age reported by Japanese students. Other researchers (e.g., Mullen, 1994; Wang, 2001) reported that the age of earliest memories reported by Asian individuals is 6 months to 17 months later than that of US individuals. This discrepancy might be due to the different methods used to ask participants to estimate the age of their *earliest memory*. For example, Wang (2001) and Mullen (1994) asked their participants to report their *earliest memory* by writing down their age at the time of the event in years and months. In the present study, participants reported their age for their *earliest memory* in years, although several participants reported their age in terms of half-years (e.g., "between 3 and 4 years old" or "3½ years old"). Thus, estimating the *earliest memory* in years and months, instead of years only, might have influenced the different findings. It is important to estimate the age of the *earliest memory* precisely. However, it might be difficult for people to give accurate reports of the date of their *earliest memory* in years and months. Mullen (1994), for example, observed that Korean students were less likely to include months in their reports of the age of their earliest memory than were US students, although they were explicitly asked to do so. She noted that this finding is consistent with cultural differences in the significance and elaboration of autobiographical memories in US and Korean cultures. In addition, Mullen argued that Asian individuals might be more cautious about estimating an age when they are not certain.

In contrast to the findings concerning the age of the *earliest memory*, US students retrieved significantly earlier autobiographical memories compared to Japanese participants when the cue word procedure was used to retrieve autobiographical memories. This finding is consistent with other findings on the age of the *earliest memory*, in that US participants retrieved earlier memories than did Japanese participants. Moreover, the average difference in age (4.7 years) is too large to account for in terms of the methods used for estimating these ages.

The surprising findings regarding the age of the *earliest memory* reported by Japanese participants might be explained by cultural differences among Asian groups. This study is the first to examine the

*earliest memory* reported by Japanese individuals. Just as differences have been reported in the age of *earliest memories* reported by Chinese and Korean individuals (Mullen, 1994; Wang, 2001), there may be cultural differences in the reported age of the *earliest memory* of members of other Asian cultures. Another explanation may be based on within-culture variability in autobiographical memory. Wang et al. (1998) found within-culture changes in earliest memories related to child-rearing practices in China. Similarly, Japanese students who seek out international study experiences might represent a group of highly Westernised individuals who have been socialised somewhat differently and recall their memories differently from individuals who choose to remain in Japan. It would be interesting to conduct a study on the *earliest memory* with Japanese individuals in Japan, who may differ in a variety of ways from individuals who choose an adventure of study in a different country. However, access to bilingual populations is necessarily limited by constraints of geography and resources.

Japanese bilinguals were expected to rate the emotionality of their memories differently depending on the language of the cue word. However, there was no reliable difference in the emotionality rating of memories retrieved by English cue words and Japanese cue words. However, because Japanese participants retrieved more *Japanese memories* when they were cued with Japanese words and more *English memories* when cued with English words, we might conclude that bilinguals have easier access to their memories when the language of encoding matches the language of retrieval (Marian & Neisser, 2000). A practical implication of this finding is that bilingual clients who seek therapy may find it easier to talk about their memories when using the same language they used at the time of the original events.

The present study is the first examination of autobiographical memory in a sample of Japanese bilinguals. Consistent with previous research, these results provide evidence for language-dependent recall of autobiographical memories. In addition, proficiency in the second language was found to moderate the retrieval of autobiographical memories. English cue words became increasingly effective as retrieval cues for both English and Japanese memories as language proficiency increased. However, Japanese cue words continued to retrieve primarily Japanese memories even in the most fluent speakers of

English. Although the ages of the *earliest memory* did not differ for US and Japanese students, the average age of cued memories reported by US students was significantly earlier than that reported by Japanese students. Together, these results support the notion that bilinguals have easier access to their memories, especially memories from childhood, when there is a match between language of encoding and language of retrieval. This finding might have significant consequences when the retrieval of these memories is important for resolution of psychological conflicts during therapy.

The present study was unique in that the interview for Japanese bilinguals was conducted throughout in Japanese. Japanese bilinguals could choose either English or Japanese to report their memories, although all Japanese bilinguals chose to report their memories in Japanese. This might have occurred because the interviewer was Japanese and the participants were more comfortable speaking in Japanese rather than in English. However, as discussed earlier, a significant language effect was found when comparing the number and ages of *English memories* and *Japanese memories* retrieved by English cue words and Japanese cue words. These results support the effects of language on the retrieval of autobiographical memories.

Manuscript received 22 November 2004

Manuscript accepted 20 September 2005

PrEview proof published online 21 December 2005

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## APPENDIX

### Cue words and their Japanese translations

<i>English</i>	<i>Japanese</i>	<i>English</i>	<i>Japanese</i>
Salad	サラダ	Salute	敬礼
Window	窓	Money	お金
Violation	違反	Mountain	山
Kiss	キス	Wine	ワイン
Anxiety	不安	Dress	ドレス
Tobacco	タバコ	Person	人
Hatred	憎しみ	Fire	火
Time	時間	Bowl	わん
Theory	学説	Poetry	詩
Church	教会	Hostage	人質
Doctor	医者	Engine	エンジン
Hide	隠れ家	Thief	泥棒
Fur	毛皮	Candy	飴
Bird	鳥	Kindness	親切心
Flower	花	Pride	誇り
Hospital	病院	Earth	地球
Comedy	コメディ	Custom	習慣
Tree	木	Joy	喜び
Village	村	Girl	女の子
Table	テーブル	Green	緑