

The 'language' and 'feel' of bilingual memory: Mnemonic traces

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Abstract

How are language and emotion integrated in the mnemonic trace underlying reconstructive retrieval? Does remembering in the first *versus* the second language affect the *feel* of memories? In a protocol analysis of the kinds of information activated during memory search, Schrauf (2003) found that, as participants followed a train of associations in response to cue words, they most often evoked visual images (66%) vs. verbal (17%), feeling (13%), or conceptual (29%) associations. Because imagery is known to be a key factor in the mental re-experiencing of past events, this paper examines the interrelation of imagery with emotion and language in bilingual autobiographical memory. Thirty Spanish-English speaking Puerto Rican immigrants to the mainland US rated memories in both languages for visual, emotional, auditory, and linguistic detail. Multidimensional scaling analyses showed that visual detail and emotional intensity clustered together, suggesting that these are linked contributors to the sense of re-experiencing past events. Comparison of bilinguals' recalls in

Spanish vs. English showed more intensity of imagery and emotion in second language (English) than first language (Spanish) memories. We suggest that English memories are more recent, more novel, and require more effort-after-meaning (Bartlett, 1932) than Spanish memories and are therefore recalled with more imagistic detail and emotional intensity than Spanish memories.

Key words: bilingual autobiographical memory, emotion.

Resumo

¿Como se integran lingua e emoción no trazado mnemotécnico cando se leva a cabo a recuperación reconstrutiva? Recordar na primeira lingua *versus* na segunda, ¿afecta ao *sentir* das lembranzas? Nun estudo que analiza os tipos de información activados durante a procura de recordos, Schrauf (2003) atopou que, cando os participantes seguían unha cadea de asociacións en resposta a certas entradas, moi frecuentemente evocaban imaxes visuais (66%) vs. asociacións verbais (17%), sensitivas (13%) ou conceptuais (29%). Dado que se sabe que as imaxes son un factor central no revivir mental de acontecementos pasados, este artigo examina a interrelación das imaxes coa emoción e mais a lingua na memoria autobiográfica bilingüe. Trinta falantes de español e inglés, inmigrantes portorriqueños nos Estados Unidos, clasificaron de maneira detallada recordos nas dúas linguas, visual, emocional, auditiva e lingüisticamente. As análises de proporcións multidimensionais probaron que o detalle visual e mais a intensidade emocional se agrupaban xuntos, e suxeriron que contribúen de maneira conxunta cando se reviven acontecementos pasados. A comparanza das lembranzas dos bilingües en español vs. inglés mostrou unha intensidade de imaxes e emocións meirande nos recordos da segunda lingua (inglés) ca nos da primeira lingua (español). A nosa suxestión é que as lembranzas en inglés son máis recentes, máis novidasas e requiren máis esforzo-despois-do-significado (Bartlett, 1932) cós recordos en español e que, xa que logo, se traen á memoria cun maior detalle nas imaxes e na intensidade emocional cás lembranzas en español.

Palabras clave: memoria autobiográfica bilingüe, emoción.

1. Introduction¹

Current research on autobiographical memories regards them as mental reconstructions of events (Brewer, 1986, 1996) rather than good or bad copies of immutable records. That is, while it is true that remembering is grounded in some mnemonic trace corresponding to a past event, the full retrieval of a memory involves the integration of much other information with that trace (Tulving, 1983). This is certainly true at the level of the brain, where a memory emerges as a pattern of activation drawing information from various centers (Conway, Pleydell-Pearce & Whitecross, 2001; Conway et al., 1999; Greenberg & Rubin, 2003; Schacter, Norman & Koutstaal, 1998) including sensory imagery, language information, emotion, and narrative sequencing along with information in the cue itself (Rubin, 1998). Also important is the powerful influence of the psychological-social context

¹ This research was supported by US National Institute on Aging, grant #R01 AG 16340.

of retrieval. Thus, every memory is produced in a particular situation motivated by personal and/or social circumstances and conditioned by current self-goals and beliefs in the self-system (Conway & Pleydell-Pearce, 2000).

These are two coincident dynamics of autobiographical memory: the mental history of mnemonic traces and the current purposes and circumstances of the rememberer. In this paper we focus on recollective experience as a psychological event in itself prior to the narration of the memory. That is, we concentrate on the *mnemonic trace*, an unobservable mental state, as it emerges in the psychological process of recollection in an analytically isolated moment before its transformation in performance. Emphasis is on the “remembering” underlying “telling the story”. This is important because, if we are to know how information from the context-of-remembering (purposes and circumstances) is coordinated and integrated with information in the mnemonic trace, then we need to be clear about what is contributed from either side. The questions we wish to address are the following. For bilinguals, how are language and emotion integrated in the mnemonic trace underlying reconstructive retrieval? Does language information or linguistically mediated memory interact with recall of emotion? Put simply, does remembering in the first *versus* the second language affect the ‘feel’ of memories? Discussion of these issues requires a review of recent research and current thinking on (a) the role of emotion in autobiographical memory, (b) the question of language-specific retrieval for bilinguals, and (c) the mechanics of encoding and retrieval in episodic memory.

Because this paper is devoted to the examination of *remembered emotion* among bilinguals, we treat emotion cognitively —as a mental representation of a past feeling that is now articulated in either of the bilingual’s languages according as it is recalled in either language. This raises the issue of the translatability of emotion labels across languages. In this work we assume that some subset of emotional experience is either biologically universal or psychologically pancultural (probably some mix of both) and we appeal to large-scale cross-linguistic studies in this regard (Frijda et al., 1995; Scherer & Walcott, 1994). These studies suggest that ‘basic emotions’ are lexicalized in most, if not all, cultures, and that all cultures possess many additional emotion labels that provide greater nuance. These latter probably do not have exact translation equivalents in every culture. The characterization of these lexical and semantic networks lies beyond the scope of this paper, but we assume that individual bilinguals are able to either label (or successfully circumlocute) their emotional experience in either language.

2. The role of emotion in autobiographical memory

Considerable research has been devoted to the effects of emotion *on* autobiographical memory (for a review, see Christianson & Safer, 1996). Thus, as

regards emotional effects on encoding and retrieval, for example, the flashbulb memory literature focuses on the durability in memory of highly vivid and significant events (usually of a public nature; Conway, 1995). Memory for traumatic events has been extensively studied, both in the laboratory (Christianson & Loftus, 1987), and in the real world, for example, with victims of the Holocaust (Wagenaar & Groeneweg, 1990) or with immigrants (Schrauf & Rubin, 2001).

Less research has been devoted to memory *for* emotions. In a literature review, Christianson and Safer (1996) noted that, in a tradition starting with William James (1890/1918), psychologists have often dealt with emotion as a cognitive representation in memory (Ross, 1991). Thus, it is not an emotion *per se* that is retrieved, rather details of the memory are retrieved and these serve to activate (or reinstate) the emotion. In experimental work, Strongman and Kemp (1991) found that when subjects were asked to recall the experience of particular emotions, they gave details of past events in which they felt this or that emotion but did not report feeling in itself. Thus, mental search seems to focus on events (but not emotion), and this is wholly in keeping with studies of the structure of autobiographical memory which show that memory is hierarchically organized (and searched) by themes and temporal periods (Conway & Bekerian, 1987; Conway & Rubin, 1993), but probably not by emotional state (Schrauf, 2003). It is also concordant with recent thinking on the ‘emotion system’ as distinct from, but interconnected with, the ‘cognitive system’ (Cacioppo & Gardner, 1999).

In light of the questions that motivate this paper, this research would suggest that emotions are present in the mnemonic trace as cognitive representations and that such representations may be used to reinstate the emotional states associated with the remembered events. This is clear even in cases of memory revision. Beike and Landoll (2000) found that when individuals recalled a memory whose emotional valence was inconsistent with the remembered emotional valence of the life-period from which it came, rememberers initiated various strategies to re-frame the memory. One strategy was to characterize the memory as outweighed by the other memories from the period. Another strategy was to provide justifications that show how such an exceptional memory could occur. While it is true that these cases demonstrate the effects of current mental state on the emotional tenor of retrievals, nevertheless, the cognitive representation of *what was felt* at the time remains to some extent incorrigible, though it may be reframed in the light of subsequent events.

3. The question of language-specific retrieval for bilinguals

Recent experimental research on bilingual autobiographical memory has concentrated on testing whether the language operative during the encoding of an event is predictive of more efficient retrieval in that same language (for a review, see Schrauf, 2000). Thus, the question is: will events that were encoded in the subject’s

first language be more efficiently retrieved (i.e. more numerous retrievals, more detailed retrievals, faster retrievals, etc.) when the subject sets about recalling memories from his or her past in the same language. Experimental work answers this question in the affirmative, and explains the results in terms of Tulving's 'encoding specificity'. Encoding specificity is the theory that successful retrieval is premised on a match between information in the retrieval cue and information stored in the encoded engram (Tulving, 1983). In this case, the language spoken at the time of the event (first language or second language, or both) becomes a feature of the mnemonic trace, and is re-activated at the time of retrieval. Altarriba and Soltano (1996) have referred to this as a "language-tag". Their research on bilingual recall for word lists suggests that, as bilinguals store concepts across languages, they also associate "language-tags" with the concepts that correspond to the language in which the concepts were presented in the lists.

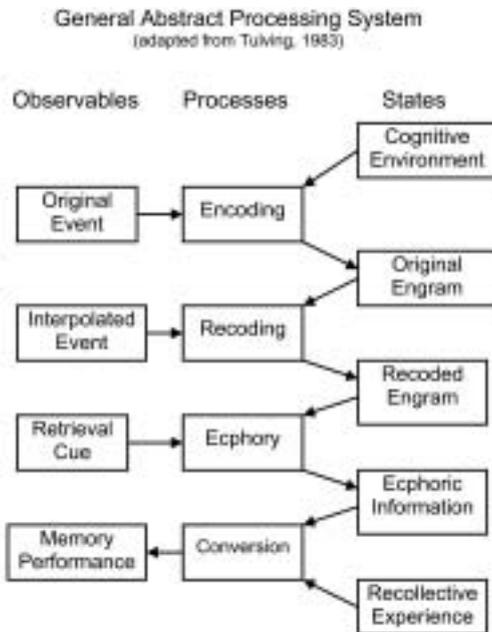
In a study of autobiographical memory with younger Russian-English bilingual immigrants to the US (mean age = 20.2), Marian and Neisser (2000) found that both the language of the cue-words used to stimulate memories and the language of the experimental session were effective predictors of events in which individuals used that language. With older (over age 60) Spanish-English bilingual immigrants to the US, Schrauf and Rubin (1998, 2000) did not find an effect of language of cue or language of session, perhaps because of the fluency and second language experience of the participants and covert translation, but they did find robust effects for "internal language of retrieval". That is, when participants were asked in what language the memory came to them, their first language memories corresponded to events in the Spanish-speaking homeland while second language (and mixed language) memories corresponded to events after immigration to the English-speaking US. This study was replicated with Polish-Danish speaking immigrants to Denmark (Larsen et al., 2002).

In light of the questions that motivate this paper, this research would suggest that the specific language associated with an event at encoding is indeed present in the mnemonic trace. Of course, contextual factors at retrieval may well play a role in such remembering. Gulgoz, Schrauf and Rubin (2001) conducted an experiment in which Turkish-Ladino speakers were cued in both languages to generate autobiographical recalls. For each memory they were asked, not only in what language the memory came to them, but also about the context of the memory, including: the language usually spoken with others in the memory, the setting of the event and language associated with that setting, and frequency of rehearsal of the event. Each of these factors was seen to play a role in individuals' judgments about "what language the memory came in". This suggests that inferential processes and contextual factors at the time of retrieval may affect the memory for the language of the event. The question is: can the participant get close enough to the actual recollective experience to make the judgment —prior to the influence of other factors?

4. The mechanics of encoding and retrieval in episodic memory

The process of experiencing an event, encoding it into memory, and retrieving it later as a “memory” has been captured by Tulving (1983) in a model of memory that he called the General Abstract Processing System (Figure 1). The model distinguishes observable events, the underlying mental processes and associated mental states. It is important to note that in research we are usually limited to the moment of memory retrieval. Though in theory observable, the original events from across the lifespan (childhood, youth, adulthood, even those of last month) are generally no longer available for inspection. They exist only as mental traces: the *engram*. Additionally, this original engram may be affected by subsequent experiences and be recoded. The work of Loftus and colleagues on the influence of post-event information on memory is a dramatic instance of this process (Loftus, 1979; Wright & Loftus, 1998). Engrams are mental states and as such are unobservable. In experimental situations, we stimulate retrieval by presenting the participant with a *retrieval cue* —generally a word, possibly a picture, or we ask for a story (sometimes the “life-story”). Retrieval is a complex process in which selected information in the recoded engram is accessed by and integrated with information in the retrieval cue: a process Tulving called *ecphory*. The observable result is a *memory performance* which is the report of the unobservable mental states that Tulving calls *ecphoric information* and *recollective experience*.

Figure 1



Given the questions that motivate this paper, the model has important caveats. We want to know if the language of an event or the emotion experienced at the time of the event belong in some incorrigible way to the mnemonic trace, but of course there is absolutely no access to the original trace. What we do have access to is either the memory performance (the publicly observable narration of the memory) or the subjective experience of retrieval that produces it (accessible only by self-report). Both are problematic. While the memory performance —“telling the story”— has the virtue of being directly observable, it is subject to whatever editing the participant chooses to engage in (consciously or unconsciously) as well as to the constraints imposed by his or her verbal abilities. The difficulties of disentangling the performance from the memory, the “telling” from the “remembering”, makes narrative evidence rather suspect. On the other hand, the participant’s mental states —the ecphoric information and recollective experience— have the disadvantage of not being directly observable except by self-report. More precisely, they are observable to whatever extent the subject is aware of them and can report them. If autobiographical memories are reconstructions, we may attempt to get as close to the real-time, on-line experience of retrieval and query the experience itself. At least, we may assume that the participant can judge the consciously available phenomenological properties of the remembering-experience.

5. Experiment one: Emotion and language during mental search

How might we approximate information in the memory trace? In light of these considerations, we have employed two methods. The first is protocol analysis; the second is a self-rating task. The protocol analysis experiment discussed here focuses not so much on the mnemonic trace itself but rather on the process of mental search for a mnemonic trace matching the criteria of the search cue. Thus, the emphasis is on how different kinds of information in memory (imagistic, emotional, linguistic, conceptual) are sampled during search.

In a study focusing on the kinds of information activated during the retrieval process, Schrauf (2003) employed protocol analysis to detect what kinds of sensory and linguistic information predominated during retrieval. Protocol analysis treats memory retrieval as a kind of step-wise, problem-solving activity in which a chain of associations (imagery, language, feelings, concepts) is activated and progressively matched to search requirements until a target memory is triggered. In the experiment, 10 Spanish-English speaking, simultaneous bilinguals (mean age = 19.10, SD = 1.37) were cued with words in blocked language conditions on separate days (in which all instruction, cues, and conversations were in Spanish on Spanish days and in English on English days). Participants were asked to say everything that they were thinking as they used the cue-word to search for a memory. The protocols were then transcribed and coded for kinds of informational states intervening

Table 1. Frequency distribution of types of mental states across all retrieval sequences.

Mental state	Number of occurrences across all sequences	Relative frequency in multi-step memories*
Image	47	.66
Idea	21	.29
Verbal	12	.17
Feeling	9	.13
Totals	89	1.00

* Note: Total number of multi-step memories = 71.

between the cue and the final memory. These informational states were *visual imagery*, *emotion*, *concepts*, and *linguistic elements*. Inspection of the sequences, following from cue word to full retrieval of an autobiographical memory, suggested that visual imagery was the most frequent state accessed. Fully 66% of the total mental states traversed concerned visual information (see Table 1).

This is not surprising in that visual information is a critical feature of autobiographical memory (Brewer, 1996). (In a neuropsychological study of patients with visual deficit amnesia, Rubin and Greenberg [1998] found that patients were typically unable to access autobiographical memories from before the onset of the amnesia). Activation of specifically linguistic information occurred in 17% and activation of emotional information occurred in 13% of the mental states traversed in retrieval. Where language was implicated, bilinguals were seen to consciously translate cues and make automatic associations within- and across-languages at morphological, lexical, and semantic levels to trigger memories. This experiment suggests that linguistic and emotional information play secondary roles to visual information in memory search.

6. Experiment two: Emotion and language in the recollective experience

A second approximation to information in the mnemonic trace (reported here) emphasizes self-ratings of the phenomenological properties of information activated during retrieval. In this paradigm, an individual retrieves a memory to a cue and then makes a series of judgments about the experience of remembering. Emphasis is on the immediate experience of recollecting an event. These metamemory judgments might seem odd but, in fact, they are a very common kind of reflection on memory. People readily say during everyday recall, for example, “I can see it as if it were right before my eyes”, “I can hear her voice as if she were alive and standing there”, “It’s not clear anymore and I don’t remember the details”. (Indeed, metamemory judgments ground the entire practice of relying on eyewitness testimony).

6.1. Sample

A group of 30 older Puerto Ricans (over 60 years of age) were recruited for the study. These were Spanish-English speakers living in a large midwestern city who had emigrated from the island to the mainland in early adulthood. Acquisition of English as a second language took place after their arrival on the mainland, and the majority reported feeling competent in English approximately 4 years after their arrival. Demographic data are found in Table 2. All participants gave informed consent and were recruited in accordance with the policies for the protection of Human Subjects of Northwestern University.

Table 2. Sample characteristics (N = 30).

Variable	M	SD
Age	69.35	(6.90)
Age at immigration	22.13	(7.09)
Age at competence in English*	26.04	(10.04)
Education	7.12	(3.95)

* Note: How old were you when you felt that you were capable and comfortable of saying anything that you wanted to say or expressing any idea that you had in English?

6.2. Methods

Participants engaged in seven sessions across a period of six months: 1 screening session, 4 cuing sessions, 2 narrative sessions. A Spanish-English bilingual whose first language was Spanish conducted all sessions. An initial *screening session* was devoted to gathering demographic information, language history, acculturation information, and health status, and to testing for English proficiency using the Adult Language Assessment Scales (De Avila & Duncan, 1981). Four *cuing sessions* were then devoted to a memory-cuing paradigm (counterbalanced: two in Spanish, two in English). Again, these were blocked language conditions in which all instructions, cues, and conversation took place in Spanish on Spanish days and in English on English days. In each session, limited to two hours, participants received between 12 and 20 word cues alternating with pictures from the Snodgrass set (Snodgrass & Vanderwaart, 1980) and were asked to think of a personal memory, something that happened to them or something they did, from anytime of life (from remote past to very recent), of any importance (from trivial to highly significant). Memories were verbally reported and audiotaped. Immediately after each memory, individuals were asked if the memory came to them in no language, Spanish, English, or both. After retrieving the entire set of memories

for a particular session, participants provided the following ratings on seven-point Likert scales. “I can feel now what I felt then...” (FEEL). “I can see it in my mind...” (SEE). “I can hear myself or other people speaking...” (HEAR). For FEEL, SEE, and HEAR: 1 = nothing, 3 = vaguely, 5 = distinctly, 7 = as clearly as if it were happening right now. “There were words in the memory...” (WORDS) on the following scale: 1 = no language element whatsoever, 4 = vague words, phrases or fragments, 7 = very clearly in words. “I have talked about this event...” (TALK) on the following scale: 1 = not at all, 3 = sometimes, 5 = many times, 7 = as often as any event in my life. “This experience changed my life...” (SIGNIFICANCE) on the following scale: 1 = not at all, 4 = some, 7 = completely. For each memory, individuals were also asked: Where did the event take place? What did you feel at the time of the event? To assist in responding to this latter question, participants were given the following list (in Spanish in Spanish sessions and English in English sessions) and could select as many items as they wished: none, anger, disgust, envy, humiliation, pride, safety, fear, surprise, guilt, grief, love, happiness, sadness, anxiety, humor, anticipation, suspicion, tiredness. Participants were also encouraged to name emotions not found on the list. Finally, participants were asked to assign a date to the event.

6.3. Results

The following strategy describes analysis of the data. First, descriptive statistics are provided for the phenomenological ratings. Second, to address the issue of the linguistic and emotional content of the memory trace, correlations are computed for the six Likert-scaled judgments of phenomenological features of memory, and then subjected to multivariate data reduction. The goal is to detect in the data how the different kinds of information integrated in the experience are grouped. Third, to address the interaction between language and emotion in bilingual recollective experience, the memories are grouped according to language of retrieval (Spanish and English) and repeated measures analysis of variance is conducted on means for ratings of each of the variables (visual detail, emotional intensity, auditory detail, linguistic information, frequency of rehearsal, and significance of the memory).

6.3.1. Descriptive statistics

Across four cuing sessions (2 in Spanish, 2 in English), participants provided an average of 59.23 memories ($SD = 8.76$). Means and standard deviations and intercorrelations of the phenomenological features are presented in Table 3. Relatively high correlations are seen between most of the ratings of phenomenological features (not surprising since subjects were encouraged to think of personal events), but particularly high correlations are found between ratings of emotional activation and visual imagery, and between ratings on hearing voices and the presence of words in the memories.

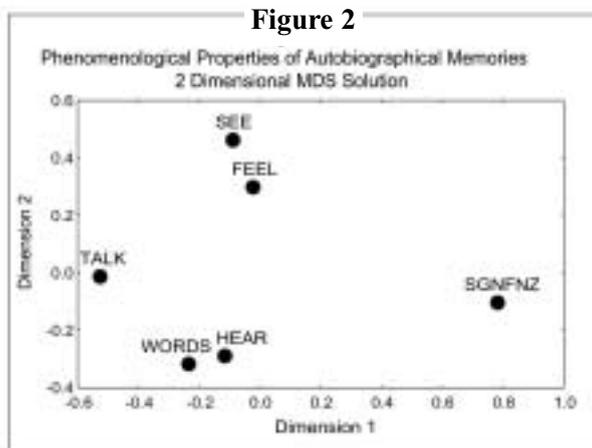
Table 3. Intercorrelations, means, and standard deviations for ratings of phenomenological characteristics of autobiographical retrievals.

	HEAR	SEE	SIGNFCZ	TALK	WORDS	M	SD
FEEL	0.62	0.93	0.32	0.55	0.59	5.56	1.07
HEAR		0.48	0.29	0.65	0.95	5.31	0.95
SEE			0.23	0.53	0.48	6.08	0.80
SIGNFCZ				0.24	0.21	2.58	0.56
TALK					0.67	4.31	0.96
WORDS						4.96	0.98

Note: all correlations in bold are significant at the $p < .05$ level.

6.3.2. Multivariate data reduction

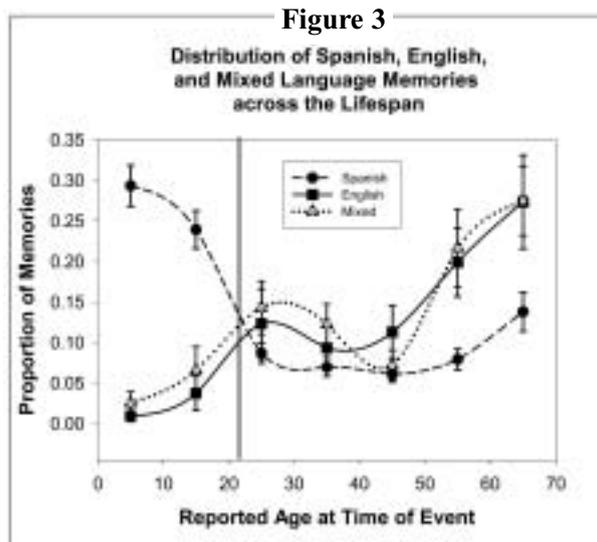
The underlying structure of the phenomenological ratings data may be probed via singular value decomposition in any of three forms of metric scaling (principal components, multidimensional scaling, and correspondence analysis; Weller & Romney, 1999). These data reduction techniques provide visual displays of how variables group together. With these data, all three methods yield similar results. In this case, on the supposition that highly correlated variables are more 'similar' to one another, we chose multidimensional scaling as a way of visualizing the data in the correlation table. (Strictly speaking, what we see is how similar the response patterns are between self-ratings on the variables). The stress value for the two dimensional solution is 0.106 (Figure 2).



Interpreting the results of multidimensional scaling may be done either by labeling the dimensions of contrast (the meaning of the X and Y axis) or by noting clusters (“neighborhoods”) and verifying these by cluster analysis (Kruskal & Wish, 1978). The latter strategy is employed here. Neighborhood effects are apparent as follows. Ratings on the emotional intensity of the remembering experience (FEEL) and the vividness of visual imagery (SEE) cluster together. Ratings on clarity of voices heard in remembering (HEAR) and on the presence of words (heard, said, or read: WORDS) also cluster together. Standing independent of these, and from each other, are ratings on how often memories have been rehearsed (TALK) and on the importance or significance of the memory in the context of the person’s life (SIGNFCZ).

6.3.3. Analysis of variance

After each autobiographical retrieval, in response to both English and Spanish cues, participants judged whether they thought the memory came to them in no language, Spanish, English, or mixed-languages (for previous applications of this method, see Schrauf & Rubin, 1998, 2000). Because we are interested in specifically linguistic retrievals, memories judged to be ‘non-linguistic’ are not considered here. These ratings produce results consistent with the experience of immigration (and language learning) in that retrievals that came in Spanish (the first language) generally commemorate events before immigration and retrievals that came in English or in mixed (English and Spanish) language generally commemorate events after immigration. Of course, some events after immigration are also retrieved in Spanish (only) since experiences after immigration could be marked by any of the three combinations. The histogram in Figure 3 shows the patterns of retrieval for



each language across the lifespan. The vertical line in the figure represents the mean age-at-immigration ($M = 22.13$, $SD = 7.09$) for the whole sample and nicely illustrates how retrievals in either language cluster on either side. There was no significant difference in reaction times for Spanish ($M = 13.70$, $SD = 4.37$) versus English ($M = 16.70$, $SD = 8.82$) versus mixed-language ($M = 14.79$, $SD = 5.99$) retrievals ($F(2,50) = 2.56$, n.s.).

Of interest here is whether there are any differences in the ratings of phenomenal properties and recollective experience in first language (L1) (Spanish) versus the second language (L2) (English) versus mixed language retrievals. The results of single factor analysis of variance for each variable are listed in Table 4, and show significant differences between language means for each variable. Planned comparisons of languages show that for every variable the pattern of results is the same. Spanish ratings are significantly lower than English or Mixed ratings, while English and Mixed ratings are not significantly different. In sum, L1 Spanish retrievals are rated as less phenomenally vivid than L2 English memories.

Table 4. Analysis of variance:
Differences on ratings of memory properties by language.

Memory property	Spanish memories		English memories		Mixed memories		F	p<
	M	SD	M	SD	M	SD		
Visual detail (SEE)	5.98	(.89)	6.44	(.79)	6.45	(.78)	7.14	.01
Emotional intensity (FEEL)	5.38	(1.22)	5.99	(1.49)	5.88	(1.26)	4.01	.05
Auditory detail (HEAR)	5.21	(.99)	6.07	(.21)	6.24	(.97)	15.01	.001
Linguistic detail (WORDS)	4.89	(1.00)	5.59	(.26)	5.57	(1.22)	4.97	.01

Note: degrees of freedom = 1,29

7. Discussion

The results of the multivariate data reduction suggest that (1) ratings on visual imagery of memories and emotional intensity at recall have similar response patterns, and (2) that ratings on hearing voices in the memories and the presence or absence of words (read, heard, or spoken) also have similar response patterns.

The close association between visual imagery and emotion may be explained in terms of auto-noetic consciousness: a defining property of episodic memory. According to Wheeler, Stuss and Tulving (1997) episodic remembering is uniquely marked by “a type of awareness experienced when one thinks back to a specific moment in one’s personal past and consciously recollects some prior episode or state as it was previously experienced” (p. 333). This awareness contrasts with our memory for facts about the world (or even ourselves) in which something is known “but does not possess any personal veridicality or pastness and represents retrieval from semantic memory” (p. 333). Wheeler, Stuss and Tulving suggest the metaphor of “traveling back in time” to capture the phenomenal feeling accompanying autobiographical retrieval. Although auto-noetic consciousness is traced to the frontal lobes, the spreading activation of an autobiographical retrieval through areas of the midbrain and the activation of information from the sensory cortices are integral in the temporal formation of a ‘remembered event’ (Greenberg & Rubin, 2003). As noted above, primary among these is information from visual cortex that imparts to individuals their strongest sense of the reality (and veridicality) of their memories. Asked if they “can feel now what [they] felt then”, participants give evidence of response patterns similar to their judgments of visual vividness. This may be explained by the same sense of reliving. That is, for these participants, the greater the sense of reliving, the higher the likelihood that they will report “feeling now what I felt then”.

The association between ratings on hearing voices and memory for words is not surprising since for the greater part the ratings overlap. Participants were instructed, however, that any presence of words in a memory would count in the latter rating. This was meant to include the perception of words on signs, in notes, in newspapers, etc., as well as words that the individual might think to him or herself, but not speak out loud, in memories. Thus, remembering may involve non-auditory ‘inner speech’ (Larsen et al., 2002). The association of the two (hearing voices, the presence of words) and its clustering independent of the SEE-FEEL ratings suggest an independent role in autobiographical retrieval, and this is important for explicitly bilingual retrieval. That is, for a bilingual, there is a fundamental kind of variation (first language/second language) possible within this cluster that is not present for a monolingual and which may (or may not) affect or be affected by the information in the other cluster: visual/emotional information. This allows us to focus the question of the interaction of language and emotion in bilingual autobiographical retrieval.

Will the tenor of emotional retrieval differ from first- to second-language retrievals? In fact, results showed that on *all* variables, including emotion, first language memories were rated as less intense than second language memories. This is a surprising result. In research on emotion words in first and second languages, Altarriba and her colleagues (Altarriba, 2003; Altarriba, Bauer & Benvenuto, 1999) have found that emotion words in the first language are mentally represented differently (more easily tied to contexts) than emotion words in the second language.

If emotion words enjoy some deeper level of representation, this might predict that memory retrievals in the first language would be rated as more emotionally intense than memories in the second language. Further, in a review of psychotherapeutic cases with bilinguals, Schrauf (2000) found that bilinguals in therapy recalled more emotional events in more detail when working in the first as opposed to the second language. What would explain the finding here that emotional activation at retrieval was lower for first- *versus* second- and mixed-language retrievals?

Several explanations suggest themselves. On the one hand it is possible that, for this group of immigrants who learned English in their early 20's, retrieval in a second language remains more effortful and therefore marked in some way. However, the equivalence of reaction times across the three language classes of retrieval indicates little difference in processing time. Another explanation is that English- and mixed-language retrievals generally commemorate events that are more recent in participants' lives. Thus, a recency effect might account for more salient retrievals. Recency effects in studies of autobiographical memory show up as an increase in retrievals for the last 10-15 years of life, which is true of this sample. However, given that these individuals, now aged 60+, immigrated at a mean age of 22, their post-immigration memories would span a period of up to 40 years, well beyond the 10-15 years for which recency might have some effect.

A third explanation is the following. The multidimensional scaling and cluster analysis of this data have emphasized the grouping together of ratings of emotional intensity and visual vividness and offered the explanation that, taken together, these variables amount to a rating of the degree of auto-noetic consciousness associated with memory. Higher ratings on emotional experience and visual vividness suggest a more fulsome re-experiencing of the event in the recollective experience. Thus, emotional ratings are in fact indicative of the general degree of reactivation of remembered experience. For the immigrant, English and mixed-language retrievals correspond to events marked by a different cultural framing (and 'feel'), and taken as a class, these experiences may possess more salience than experiences marked by the more familiar associations (and language) of the culture-of-origin. Because of the psychological primacy of enculturation in the home culture (childhood development and coming to adulthood), the home-culture possesses a pervasive power across the lifespan. In this regard, emotional experience itself, mediated by ethnopsychological acculturation to the emotional register of the culture-of-adoption, may also be more cognitively salient than experiences in the first culture.

In cognitive terms, this explanation would suggest that novelty and effort-after-meaning (the need to integrate a new experience; Bartlett, 1932) accrue to second-language/culture-of-adoption experiences and make them more available at retrieval. In psycholinguistic terms, this explanation suggests that the underlying representations of emotion terms (semantic representations) are different for each of the bilingual's

languages (Altarriba, 2003; Altarriba, Bauer & Benvenuto, 1999; Pavlenko, 1999, 2002) and that this difference is operative even prior to the narrative performance of memories. That is, differing patterns of the semantic representation of emotion affect the experience of emotion —whether such experience is rendered verbal or not. Elsewhere, we have employed the term ‘linguaculture’ to explain the embedding of cultural experience in language (Schrauf & Rubin, 2003).

8. Conclusion

Autobiographical memories emerge from a recollective experience that integrates information encoded into memory (the mnemonic trace) with other information, including the motivations and circumstances of the rememberer. Adopting the perspective of reconstructive retrieval, this paper has concentrated on how linguistic and emotional information are represented in the recollective experience and grounded in the mnemonic trace. We considered two questions in particular.

For bilinguals, how are language and emotion integrated in the mnemonic trace underlying reconstructive retrieval? Protocol analysis of memory search and self-ratings of the phenomenological properties of memories confirm a large role for visual information in the formation of autobiographical memories. To this experience of vivid visual information, this research also links the re-activation of emotional information and suggests that together these account for what Wheeler, Stuss and Tulving (1997) call *autonoetic consciousness*: the experience of reliving an event in memory. A separate channel of information is linguistic-auditory and comprises the experience of hearing voices or perceiving words (including one’s own inner speech) during reconstructive retrieval.

Does language information or linguistically mediated memory interact with recall of emotion? Bilingual participants also indicated with each retrieval, ‘on-line’ as it were, whether their memories came to them in their first language, their second language, or a mix of the two. The analysis of ratings of emotional intensity of memories at recall suggested the rather surprising result that retrievals in the second-language and mixed-language retrievals were marked by more intense emotional accompaniment than those in the first language. One possible explanation for this phenomenon is that ethnopsychological acculturation to the emotional register of the second language and culture-of-adoption renders second-language memories more salient at retrieval. Research targeting this ethnopsychological acculturation and the cultural semantics of biculturals’ emotion lexicons would shed some light on this issue (Schrauf, 2002).

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