Crossover Memories and Code-Switching in the Narratives of Arabic-Hebrew and Hebrew-English Bilingual Adults in Israel

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Abstract—This study examines two bilingual phenomena in the narratives of Arabic Hebrew and Hebrew-English bilingual adults in Israel: CO memories and code-switching (CS). The study examined these phenomena in the context of autobiographical memory, using a cue word technique. Student experimenters held two sessions in the homes of the participants. In separate language sessions, the participant was asked to look first at each of 16 cue words and then to state a concrete memory. After stating the memory, participants reported whether their memories were in the same language of the experiment session or different. Memories were classified as 'Crossovers' (CO) or 'Same Language' (SL) according to participants' self-reports. Participants were also required to elaborate about the setting, interlocutors and other languages involved in the specific memory. Beyond replicating the procedure of cuing technique, one memory from a specific lifespan period was chosen per participant, and the participant was required to provide further details about it. For the more detailed memories, CS count was conducted. Both bilingual groups confirmed the Reminiscence Bump phenomenon, retrieving more memories in the 10-30 age period. CO memories prevailed in second language sessions (L2). Same language memories were more abundant in first language sessions (L1). Higher CS frequency was found in L2 sessions. Finally, as predicted, 'individual' CS was prevalent in L2 sessions, but 'community-based' CS was not higher in L1 sessions. The two bilingual measures in this study, crossovers, and CS came from different research traditions, the former from an experimental paradigm in the psychology of autobiographical memory based on self-reported judgments, the latter a behavioral measure from linguistics. This merger of approaches offers new insight into the field of bilingual autobiographical memory. In addition, the study attempted to shed light on the investigation of motivations for CS, beginning with Walters' SPPL Model and concluding with a distinction between 'community-based' and individual motivations.

Keywords—Autobiographical memory, code-switching, crossover memories, reminiscence bump.

I. INTRODUCTION

A. Autobiographical Memory

THIS study investigated autobiographical memory in bilingual adults. Autobiographical memory has been described in different ways: as personal memory, as autobiographical and as generic memory [7]. The present study focuses on personal memory. Reference [50] views memories as layers built upon one another, working dynamically and in turn influencing the retrieval process. "Bilinguals encode and retrieve certain autobiographical memories in one of the other languages according to the context of encoding, and these linguistic characteristics are stable properties of those memories over time" [52].

Reference [54] noted that autobiographical memory consists of the following levels. First, the most general level is that of memories organization according to lifetime periods [11], e.g. high school. Second is a more specific level of memories, such as walking home from school. On the third level are specific events in place and time [12], e.g. walking to school on the first day of school. Last, is "...the level of greatest details, specific memories may be analyzed in terms of their component processes: retrievals of sensory imagery, emotion, and linguistic elements in temporal sequence within the constraints of narrative coherence for instance, remembering visual and emotional aspects of the experience of walking to school on the first day" [1, p. 3]. The research in this paper deals with the third and fourth levels of autobiographical memory.

Reference [53] addressed three concepts of autobiographical memory: The Retention Function (or Recency Effect), childhood amnesia, and the reminiscence bump. The Recency Effect is the tendency to remember more memories from recent life events [47], whereas childhood amnesia refers to the retrieval of memories before the age of 3-4, memories which are not accessible to adults [33].

B. Retrieval of Memories across the Lifespan

The reminiscence bump (RB) is defined as a phenomenon in which the person has a larger portion of memories from the age period of 10-30 than other age periods [1, p. 4]. The RB has been explained by three proposals. First, between the ages of 10-30 years, people have better cognitive capacities and thus remember more events [48]. Second, this is time in which one's personal and social identity is formed [17, p. 261]. The third proposal states,

> "During young adulthood a person goes through a period of rapid change followed by a phase of relative stability. The contrast between change and stability offers optimal conditions for remembering and later recall" [49].

Reference [31] conducted an experiment testing the nature of autobiographical memories produced by Russian-English bicultural bilinguals who immigrated to America as teenagers. Subjects were 21 years old at the time of the study. The experimenters utilized 16 cue words in Russian and English, asking participants to report the first memory to come to mind

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for each specific cue word. Results have revealed that English narration triggered the use of more personal pronouns by the subjects, whereas Russian narration of memories triggered the use of more group pronouns. Marian and Kaushanskaya explain their results by stating that "language functions as a vehicle for culture with cultural differences penetrating into language and potentially influencing cognitive styles and the self".

The principle of encoding specificity [60] indicates that autobiographical memories partly depend on the language used during encoding and the language used during retrieval [32, p. 378]. Matsumoto and Stanny present the following example in their study of Japanese-English bilinguals and American monolinguals. A female subject was cued with the word *baby* in English and its equivalent *akachan* in Japanese. She was asked to report her thoughts of memories associated to each of the words. When presented with the English cue word, the subject retrieved memories of babysitting in America. It was claimed that the Japanese word for 'baby' prompted memories of her friends' babies in Japanese [32, p. 378].

Reference [30] conducted two experiments where they tested Russian-English bilinguals on autobiographical memories where the language was kept consistent in the first experiment but manipulated in the second experiment. Results of the first experiment showed that "Language-dependent access was demonstrated through increased access to memories encoded in the SL as that used during the interview." The second experiment found that when the interview was conducted in Russian, this prompted more memories associated with a Russian setting or language, with the same effect in the English interview session. In other words, language ambience largely affected the retrieval of autobiographical memory. Because of this, "autobiographical memories appear to be encoded in specific languages", and evidence therefore shows that language ambience and the language used for retrieval cues influence the retrieval process [32].

Narrating an autobiographical memory differs culturally. Mothers influence their children in the narrative style they adopt, which in return is reflected in children's narrations of memories [59], [63]. Difference in autobiographical memories' nature, in terms of content and appearance of earliest memory in various cultures, greatly depends on the socialization process and practice of each culture. To demonstrate this phenomenon, [63] examined the autobiographical memory reports of American and Chinese mothers. It was found that American mothers elaborated to a greater extent on their children's response to the mother's prompts. Chinese mothers tended to repeat the same questions directed to the children [32, p. 380]. Similarly, it was found that Korean and Chinese narrative styles had parallel patterns while American narrations were enriched with details and had more references to individuals than their Korean and Chinese counterparts [24], [63].

Matsumoto and Stanny's article exemplifies the discrepancy among autobiographical memory reports of Asian cultures versus Western cultures [32]. Researchers highlight the importance of individual personal memories and their influence on the development of earlier memories. For example, Western cultures arguably value the emphasis on the individual and his/her personal memories, which is reflected in supporting a strong personal identity [34]. This in return accounts for the appearance of the earliest memory at the age of three and a half in Western cultures [42], whereas early memories of Asian children appear at later stages [24], [63].

Variance in autobiographical memory reports persist among bilingual immigrant populations as well. Reference [29] examined Polish-Danish bilinguals who immigrated to Denmark 30 years previously. The experiment included 20 subjects who were divided into 'early' and 'late' immigrants. 'Early' immigrants were 10 years younger when immigrating to Denmark than the 'late' immigrants. Both groups were raised for an equal time in Denmark before immigration to Poland. Regardless, early immigrants choose to use Danish for inner speech more often, where late immigrants preferred Polish. Memories from the period prior immigration were often encoded in Polish for both groups, and those associated with events from post immigration were mostly encoded in Danish [32].

Mutsumoto and Stanny conducted a study on Japanese-English bilinguals and US monolinguals aimed at investigating several aspects of the role and interaction between culture and language in accessing autobiographical memories [32]. The study consisted of eighteen Japanese-English bilingual university students. International students outperformed other students in the study in their English competence (i.e. speaking, writing, reading, and listening comprehension). Groups varied in their usage of English, however. The US monolingual group was made up of 15 Caucasian American students with an age range of 17-49 years [32].

Matsumoto and Stanny's methodology and procedure were conducted as follows. First, both groups reported demographic information by filling out a questionnaire. Researchers selected 124 cue words from [46] published cue words. For the Japanese section of the study, these words were translated into Japanese. Subjects were told that they would be cued with 20 English words and 20 Japanese ones. Then they were asked to tell (in the language of their choice) about the first memory retrieved when presented with each cue word. All participants chose to report their memories in Japanese. Monolingual English speakers were presented with the same 40 cue words used for the bilingual group, but words were presented to them solely in English. Reaction time was measured during the experiment. After narrating their personal memory, Japanese participants had to report the language of the first thoughts that came to mind once triggered by a certain cue word. In a later stage, participants were asked to report their earliest memory (this part was carried out in Japanese for Japanese students), their age, date of event, and length of event associated with this early memory. In addition, they had to rate this earliest memory on an emotionality scale from 1 to 7 (1 being unpleasant and 7 being very pleasant). Similar details

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were provided by participants for memories associated with the 40 cue words they encountered. Monolingual participants went through the same process with the exception of having the cue words presented in English, and being asked to report the language of first thoughts or of encoding [32].

Results showed that there was no significant difference between the number of memories retrieved by each of the groups (mean: US monolinguals= 26.9, Japanese bilinguals= 25.7). The age of memories for the US monolinguals was on average 4.7 years earlier than Japanese memories. Japanese participants retrieved 167 memories in English, 284 memories in Japanese, and 14 memories were mixed. The language in which the cue word was given also had a strong effect for the chosen language. English cue words prompted more memories in English, and Japanese cue words prompted more memories in Japanese. Experimenters also found a correlation between the language of the cue word and the language of the first thought. Emotionality rating by both groups did not significantly differ [32].

In sum, [32] study "provides evidence for an encoding specificity effect of language on the retrieval of autobiographical memories", and suggests that accessing autobiographical memories is influenced by the number of languages a person speaks. Matsumoto and Stanny also claim that bilinguals apparently have easier access to autobiographical memories and childhood memories in particular. This is especially true when the language of retrieval and the language of encoding match [32].

C. Crossover Memories

CO memories offer insight into the effect of language on memory retrieval. Studies in the literature on bilingual autobiographical memory make use of cue words in order to elicit such memories [30], [39], [51], [52]. In the study by [39], there were 40 Spanish-English bilingual students, half of which were mono-cultural (born in the US) and half of which were bicultural (immigration between ages 7-18). Participants were required to narrate three of their personal memories before the age of eight years, as well as two memories from the age of 14 years and above. They were then asked to recall personal memories for 10 cue words from each language. Otoya found that mono-cultural students reported earlier memories than bicultural students. These differences, according to Otoya, arise due to the cognitive consequences of immigration.

Another group of researchers have investigated autobiographical memory using the cueing methodology, i.e. [29]. They tested Polish immigrants in Denmark. The study recruited two groups of immigrants over the age of 50 years, one of which consisted of individuals who were 24 years old when they immigrated, the second of which consisted of individuals who were 34 years old at the time of immigration. The study showed that both groups had a tendency to recall more memories in their first language (Polish) for events occurring before their immigration, and more memories in their second language (Danish) for events occurring after immigration [1, p. 8].

Reference [51] examined autobiographical memories of Spanish-English bilinguals who immigrated to the US as adults. Researchers intended to observe the effects of immigration on recall in autobiographical memory. They used the word cueing technique [13], [18] and predicted that cue words in Spanish, the first language (L1), would trigger earlier memories while cue words in English, the second language (L2), would generate memories from post immigration periods. Yet, their results did not show cue word effects with mature adults. Their findings showed that retrieved CO memories amounted to 20% of all memories. Based on Schrauf and Rubin, Altman (2007) claims that: "Memories of bilinguals may be stored in one or the other language in some enduring fashion."

The setting, topic and interlocutors involved in verbal interaction all influence memory retrieval. Speech Accommodation Theory suggests this by stating that "a speaker is said to accommodate his/her choice of code to the code choices of the interlocutor, taking into consideration the interlocutor's identity, social role, and linguistic proficiency…using this model, CS is analyzed in terms of interlocutors' reciprocal adaptation in the course of interaction" [21], [22], In accordance with Speech Accommodation Theory, we predicted that subjects would have a tendency toward more CS in both sessions attempting to show linguistic proficiency in both languages because of familiarity with the examiner's social role, identity, and language capabilities.

D. Bilingualism and CS

Competency in two languages is difficult to obtain by speakers. Consequently, bilinguals often turn to CS. Walters describes lexical access as a very complex process which includes:

...selection and retrieval of words and discourse patterns and matching these structures to the intentions/speech acts generated in the previous stage of processing... When a lexical item from one language is selected from the language choice module and inserted into an utterance in the other language, the lexical item must first be recognized among the pool of available items. The "recognition" process involves searching for a word or expression that matches, or comes close in meaning and form, to the one intended and fits (not necessarily perfectly) the syntactic frame into which it will be inserted [62, p. 188].

This description of the process lying behind accessing lexical items may involve difficulties of different measures which may result in CS on the part of the speaker.

Bilingual CS is approached from different perspectives within the literature, since bilinguals acquire their languages in a variety of contexts and attain a highly variable range of proficiencies. References [9] and [10] presented the notion of "triggering" saying that the speaker chooses to continue a certain utterance in a different language because of "triggering" words that come in many forms such as homophones. On the other hand, [45] suggests that the choice

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of code in a given context or situation is influenced by factors such as identity, topic, relationship, and others.

Investigating bilingual CS has led to the categorization of two frameworks of formal CS grammars: (1) The two grammatical systems remain separate while a switching mechanism is developed to switch between them; (2) there is a combination of the two grammatical systems into a third grammar which is modified syntactically [43]. Yet, researchers like [27] criticize the second framework by stating that in order for this framework to exist there has to be a constituent which contains a lexical item from both languages and that none of the monolingual grammatical systems is able to generate the structure of this constituent. Since this condition fails to be fulfilled, there is skepticism about the second framework. There have been numerous attempts to characterize CS in the speech of bilinguals. Reference [43] mentions five different theories which describe constraints on CS behaviour. These constraints are "surface word order, lexical, morphological categories, grammatical categories, and symmetry" [43].

A study of intrasentential CS investigated the speech of Yiddish-English adult bilinguals. In this study, [43] distinguished among CS, borrowing and interference. Most importantly for the present study, CS was coded by determining the matrix language for each mixed sentence, the switched constituent, and whether the switched item belonged to an open or closed class item.

Reference [6] suggested that open and closed class items are stored and accessed differently. Furthermore, [20] proposed that these lexical items cross two levels of sentence planning in which closed items are planned and selected syntactically in the first level, and open class items are selected in the second level. The Translation Model, as proposed by [27] assumes that CS is not permitted in the first level, but rather in the second level. The Translation Model claims that the metatheses of L1 and L2 closed class items do not exist, due to their early first level selection in sentence planning. Conversely, the 'Only Open Model' suggests that L2 closed class items are similar to open class items in their selection at the second level of sentence planning; thus this model recommends that they undergo metathesis. Prince and Pintzuk found that closed class switching occurred mainly from L2 to L1, a fact which supports the "Translation Model of Acquisition and Production", which in turn suggest that closed class items are not actually switched but rather undergo "a sort of performance error of the type that has generally gone under the rubric of 'interference'" [43].

The perspective of [14] regarding CS highlights the role of emotion as a cause of CS. These authors also mention that CS functions to distance the speaker from the conversation topic. They claim that emotional words cause more pauses, hesitations and other paralinguistic phenomena in one's speech, thus leading to CS. References [15] and [16] relate hesitation and pauses to fluency. CS, then, may be used to control fluency.

Pauses, hesitations, and dysfluencies are addressed by [62] as follows: Walters claims that "L2 to L1 CS should lead to more evidence of dysfluency, in the form of hesitation phenomena, than L1 to L2 switching, which may be marked by other pragmatic phenomena" [62, p. 203].

1. Walters' Sociopragmatic-Psycholinguistic Model of Bilingualism

CS occurs as a result of linguistic and social factors. In [62], the SPPL Model classifies CS functions as follows:

TABLE I
FUNCTIONS OF CS ACCORDING TO SPPL MODEL

Psycholinguistic functions (PL):	Socio-Pragmatic functions (SP):
1. Easing word retrieval	1. Indicating a change in setting, or topic
2. Higher frequency words	2. Emphasis
3. Lexicalization differences	3. Quotation
	4. Translation

2. Community Based vs. Individual CS

The SPPL model's classification system leads to some ambiguity, whereby some instances of CS could be included in both the Sociopragmatic and Psycholinguistic categories. In order to better account for these ambiguities in judgments, [2] proposed a new classification system which outlines two kinds of CS: Community-based CS and Individual CS. The former category includes words from the L2 which are widely used in the L1 community. For example, Arabic-Hebrew bilinguals often use: *monit* 'taxi,' *ambulance* 'ambulance,' etc. Individual CS, on the other hand, is bilingual switching due to difficulties in retrieval or other reasons in an individual's speech. The latter are often found to co-occur with hesitations, pauses, or uncertainty in the speaker's utterance (i.e. searching for the word). Instances of Individual CS occurred in this study as well. For example, one of our participants said the following: "how would they say *migzira* ('massacre') in Hebrew?"

3. Other Approaches to Bilingualism and CS

Reference [66] notes that the variations of the CS patterns extend to additional dimensions. For instance, she mentions that we may find a difference in the CS classifications of a small group of girls, similar in class, ethnicity, and place of living. Reference [66] relates this CS variation to age, individual's personalities, and other aspects of social identity.

Spanglish is a language variety spoken by Hispanics in the US. Reference [38, p. 85] rejects the term 'Spanglish,' and claims that

"it expresses an ideology of exceptionalism and scorn that actually deprives the North American Latino community of a major resource in this globalized world: mastery of a world language".

According to these researchers, Spanglish is an unfortunate term for a number of reasons: 1) it contains similar features to those characterizing Spanish in Latin America and Spain; 2) it suggests that Spanish in the US is unique; 3) it erroneously claims that Spanish in the US structurally mixes with English; 4) it creates a separation between Spanish speakers within the US and those outside. Otheguy and Stern refuse to refer to Spanglish as a new language and justify their judgment by

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providing counter examples. For instance, some words in Spanish in the US have morphological endings which do not exist in Spanish outside of the US. Otheguy and Stern justify this phenomenon by pointing out that morphological geographic variation is common among languages in the world and it in fact makes a distinction among local forms. They conclude their investigation of Spanglish by rejecting the usage of the term and stating that there is no justification for its use "on the basis of observation and analysis of actual linguistic usage" [38, p. 85].

There is a controversy over the different approaches for analyzing Jewish-American English. Reference [4, p. 143] addressed core aspects of different approaches to this language variation. Benor argues that the speech of Jews in America should not be considered as a distinct ethnolect or language variety, but rather as "English with a repertoire of distinctive linguistic features stemming from Yiddish, Hebrew, Aramaic, and other sources." Benor conducted an online survey examining the knowledge and usage of linguistic features as well as other background and demographic information about participants. She selected a non-random sample of respondents to the survey and tested them on a large sample of linguistic features. These linguistic features included: "loanwords from Hebrew, Yiddish, and Aramaic, several Yiddish-influenced grammatical constructions and phrases, lexical options..., and regional pronunciations". The study revealed that American Jews seem to use certain words in order to acknowledge their Jewish identities. Age was found to have a prominent effect on many of the linguistic features tested. For example, older Jews tended to use Yiddish words more often than younger Jews to indicate their Jewishness [4, p. 145]. Another example is evident in Israeli Hebrew, which is significantly affected by age, time spent in Israel, religious factors, and Jewish friends. Words like *yofi* 'beautiful' and *yallah* 'let's go' are used more by those who feel emotionally attached or closer to Israel [4, p. 145]. These examples, among others, are used by Benor to support the idea that American Jews use their language selectively to serve their social goals [4].

4. Frequency of CS

This section surveys how different approaches lead to different rates of CS. Studies on natural speech have reported CS frequencies ranging from 5-25%. Reference [40] focused on the differentiation between lexical CS and CS of large speech segments, and found that the percentage of lexical CS usage (nouns and noun phrases) ranged from 14-70%. Reference [66] reported that 14% of children's and adults' CS was lexical. Reference [25] found that 70% of the CS instances of English-Hebrew pre-school children were lexical.

Beyond frequency of CS, researchers have also examined motivations for CS, including: social motivations based on setting, participants, and topic. Pragmatically, focus, emphasis, clarification and contrast express CS behaviour [19], [66]. There has been research on the CS of children from infancy [28], [26] until later stages of childhood, which distinguished between "borrowed" lexical items and other uses of CS based on social and pragmatic [66]. Thus, frequency

and motivation for CS go hand-in-hand.

Reference [40, p. 294] investigated language choice, language dominance and sensitivity to sociolinguistic context in French-English bilingual preschool children. Their study revealed that preschool bilingual children can achieve discourse separation in language choice, but whether they do so depends on an interaction of their language dominance and sensitivity to the bilingual speech patterns of the larger community. Similarly, it was found in the study by [58] that "4-year-old French-English and Nepali-English bilingual children's experiences with bi- and monolingualism in adults appeared to affect their language choices in different discourse situations" [58, p. 279]. In a study of Spanish-English bilingual children, three and six years old, it was found that the children would code-switch less during an interview with an adult and would switch more when playing with other children [57].

Reference [36] explained in their study on Portuguese-English bilingual children that 90% of the switches children made were due to gaps in their lexicon. Similarly, code-mixing instances in other studies were explained as a grammatical gap-filling strategy [5], [41]. Reference [35] state that both of these gap filling strategies can account for the lack of discourse separation in children's languages.

The frequency and directionality of CS was also examined by [23]. These researchers collected narratives and speech samples from 40 typically developing and 18 language impaired Spanish-English bilingual children. Results showed that 6.5% of CS occurrences involved CS, a relatively small rate due to the exclusion of borrowings involving phonological, morphological and syntactic elements as well as proper names and place names. It should be noted also that the directionality and amount of CS differed among Spanish-dominant and English-dominant children. Yet, no discrepancy was seen in the CS frequency from the more dominant language to the less dominant language nor in the CS frequency of impaired children [25].

Reference [25] also studied CS in narrative production of bilingual preschool children who were typically developing and another group of language impaired children. The authors found more CS from L1 to L2, and most CS involved switching of nouns and noun phrases (87% vs. 13% of verb CS). Impaired children produced more CS than typically developing children, especially with verb CS. In addition, more CS emerged in L1/English than in L2/Hebrew narratives. The second of two studies that [25, p. 66] conducted attempted to address both sociolinguistic (e.g. setting, topic, and interlocutor's language background) and psycholinguistic motivations (e.g. language preferences) for CS, as well as structural elements such as the locus of CS. Three stories were presented for retelling, each one in a different sociolinguistic setting: home (English), preschool (Hebrew), and doctor's office (bilingual setting). Overall results showed a rate of 25% of utterances involved CS, with impaired children generally CS more than typically developing ones. An interaction of social setting and directionality of CS was also found. The high percentage of utterances containing one or more

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instances of CS contrasts with studies such as [23], where Spanish-English bilinguals produced less than 12% CS in their utterances; it is noteworthy that this contrast may have appeared because [23] excluded single noun CS.

II. METHOD

The present study examined bilingualism in the context of autobiographical memory, focusing on retrieval of memories across the lifespan, 'SL' and CO memories, and frequency and motivations for CS. Reference [51] used cue word technique with additional stimulus words from [46]. Two groups of bilinguals were recruited for the purpose of the study: Arabic-Hebrew and Hebrew-English bilinguals. Below is an elaboration of the predictions, participants, research settings, materials and procedures.

A. Predictions

(1) Retrieval of memory across the lifespan: More memories are predicted to be retrieved for the age period 10-30 years in both L1 and L2 sessions, based on the literature supporting this phenomenon [48].

(2) Same Language and Crossover Memories: More SL memories are expected in the participants' narratives for L1 sessions, as seen in previous research [51], [52]. For the present study, this prediction is based on speakers' dominance in their L1. In addition, more CO memories are predicted for L2 sessions, also due to L1 dominance.

(3) CS in L1 and L2 sessions and for Crossover and Same Language memories: It was hypothesized that CS would be more frequent in L2 than L1 sessions due to L1 language dominance and more frequent for CO memories than for SL memories.

(4) Individual vs. Community-based CS: More Individual CS was predicted for L2 sessions due to retrieval difficulties, while more Community-based CS was predicted for L1 sessions due to identity factors.

B. Participants

The study included two groups: an Arabic-Hebrew bilingual group and a Hebrew-English bilingual group, with a total of 22 participants, 15 Arabic-Hebrew (AH) bilinguals and seven Hebrew-English (HE) bilinguals. Arabic-Hebrew participants' ages ranged from 54 to 72 years and Hebrew-English participants' from 61 to 82 years old. All of the participants took part voluntarily. Arabic-Hebrew participants' first language was Arabic and their second language was Hebrew. Participants varied in level of education. Seven had an academic degree; two had completed schooling through high school. The others dropped out of school at different stages. The Hebrew-English group's native language was Hebrew while English was acquired at later stages. Hebrew-English bilinguals acquired their second language via extended visits abroad or via study abroad. All Hebrew-English participants completed higher education degrees and all except one (a housewife) had been employed in professional careers.

C. Research Setting

Arabic is a minority language in Israel, and Hebrew is the dominant language [65]. Legally, Arabic is an official language used and recognized by government authorities in Israel according to Article 82 of the Palestine Order in Council of 1922 [65, p. 6]. Arabs in Israel study Hebrew formally in schools and acquire it informally at work [56].

Kfar Kassem is a village located in central Israel. The people from Kfar Kassem were fellahin (i.e. farmers) who worked their family's land as a source of living. This village went through a devastating massacre in 1956 which left a strong emotional wound in Arab citizens living in Israel. Some of the participants in our study lived through the trauma of the massacre, and others had a relative who lived through it. Some of the memories relate to the massacre; thus it would be edifying to see the influence of such an emotional event on the linguistic performance of our participants, especially since our participants are considered bilinguals.

Hebrew-English participants came from the central region of Israel. Their primary language was Hebrew. English, their second language, was instrumental in their work environment and "life-enriching" involving travel abroad.

1. Design, Materials and Procedure

In order to ensure participants' mastery of L2, the first session was conducted in L2, and after a period of a week or two, the second session was held in L1. Participants were also asked to complete a language background questionnaire at the end of the second session. Each session lasted for approximately 90 minutes. Sessions were recorded and transcribed. Data were collected by students as part of a seminar requirement. Each student experimenter held two sessions in the homes of the participants. Reference [51] used cue word technique along with stimulus words from [46]. In each language a participant was asked to look first at one of the 16 cue words and then to state a specific/concrete memory. The following instructions from [47] served as a model:

This study is concerned with bilingualism. In a minute you will be asked to look at a series of words and think of a specific and concrete memory associated with the word. We are looking for a memory in your life that you can say occurred at one particular place and time. As soon as you think of such a memory, you should write it down or tell me. A few words are enough, since it is meant for you to refer to later when talking about the events.

The experimenters illustrated the notion of a specific and non-specific memory with an example of the word "bicycle". For example, a memory telling about when one's father was holding a bike and teaching his child to ride it for the first time is considered a specific memory. A memory of the participant riding home from school would not be considered specific enough in details such as time, place, and more. After stating the memory, the participant was asked to report the language of the memory (no language, L1, L2, or both L1 and L2). This procedure allowed classification of the memories as 'Crossovers' (CO) or 'Same Language' (SL). If the memory

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was reported in a language other than the language of the experimental session or as both L1 and L2, then it was categorized as CO. If the memory came to mind in the SL as the language of the session, the memory was categorized as SL. In addition, participants were asked to provide details about the setting, people and other languages involved in the specific memory.

In addition to replicating the Schrauf and Rubin procedure, an additional, narrative task was conducted following the cue word procedure. For each time period across a participant's lifespan, one memory was chosen, and the participant was asked to provide further details about the memory. For these longer memories, instances of CS were counted each time a switch to L2 occurred in an L1 session and each time a switch occurred to L1 in an L2 session.

D. Data Analyses

The retrieval data and classification of 'SL' and 'CO' memory data were analysed in accord with autobiographical memory procedures [51], [52]. The CS functions reviewed above and outlined in [2] were coded based on the context of the memory, the cue word, and the speaker's background. Based on the categorization of CS functions, the frequencies of each function prior to, during, and after the Reminiscence Bump period (ages 10-30 years) were examined.

For the Arabic-Hebrew bilingual group, individual profiles were conducted for each participant in terms of relative abilities in Arabic and Hebrew. Linguistic ability was self-assessed by means of a 10-point rating scale as well by a fluent Arabic-Hebrew bilingual who made ratings on the basis of the transcribed data. In addition, two raters evaluated the linguistic abilities of both bilingual groups in terms of vocabulary, grammar, and fluency.

III. RESULTS AND DISCUSSION

Initially, frequencies of memories and words per memory will be reported for each of the retrieved memories. Next, results for lifespan periods will be presented for each of the bilingual groups. Then CO and SL memories will be reported for both L1 and L2 sessions. Finally, CS results will be presented, first for L1 and L2 sessions and CO and SL memories and then for Community based and Individualistic CS.

A. Frequencies

1. Frequency of Memories

The total number of memories retrieved was as follows: For the Arabic-Hebrew group there were 288 memories in L1 sessions and 284 memories in L2 sessions, whereas Hebrew-English participants retrieved 85 memories in L1 sessions and 67 memories in L2 sessions. This yielded overall totals of 373 and 351 memories in L1 and L2 sessions, respectively.

2. Frequency of Words in Retrieved Memories

The length of narratives was calculated for each group of participants for CO and SL memories as well as for L1 and L2 sessions. Table II shows that the same pattern emerged for both groups, viz. SL memories were longer than CO memories. Regarding L1 and L2 sessions, however, Arabic-Hebrew participants produced longer narratives in L2 than L1, while HE participants produced longer narratives in L1 than L2.

TABLE II
MEAN LENGTH OF NARRATIVES (IN WORDS) FOR BOTH GROUPS FOR CO AND SL MEMORIES IN L1 AND L2 SESSIONS

Mean	CO	SL	L1	L2
AH	3439	5770	4230	4979
HE	4018	4668	4580	4105

B. Retrieval of Memory across the Lifespan

The data are presented separately for CO and SL Memories, first for L1 sessions and then for L2 sessions.

1. Frequency of CO and SL Memories in L1 Sessions

Figs. 1 and 2 display the distributions of memories across the seven decades for L1/Arabic and L1/Hebrew, respectively. Comparing Figs. 1 and 2, it can be seen that different patterns of retrieval were reported for the two groups of participants. Arabic-Hebrew participants showed the largest percentage age of memories in the 10-20 age period (0.25) and 40-50 age period (0.22), while HE participants show the largest number memories in the 0-10 years and 10-20 years age groups (0.20 for each decade). Following [48], the total number of memories for the Reminiscence Bump period (ages 10-30) was compared to the total number of memories for the surrounding two decades. For the Arabic-Hebrew participants, the Reminiscence Bump period yielded a total of 41.3% of the memories in these two decades and only 35.8% in the decades surrounding this period (0-10 years and 30-40 years). Thus, the first prediction was confirmed for the Arabic-Hebrew participants. A similar calculation for the Hebrew-English participants showed a trend in the same direction: the 10-30 age period yielded 28.5% of the memories, while the surrounding decades (0-10 years and 30-40 years) yielded 24.9%. Neither of these trends was as strong as the robust Reminiscence Bump effects reported in the literature. Two notable features in these graphs are the high peak of memories in the 40-50 age period for the Arabic-Hebrew participants and in the 0-10 age period for the Hebrew-English participants.
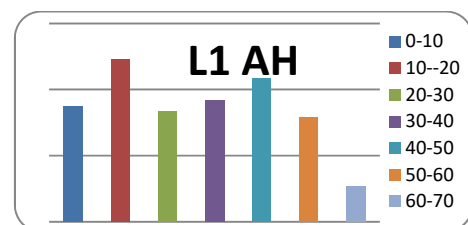

Fig. 1 AH participants' distribution of memories across seven decades in L1/Arabic

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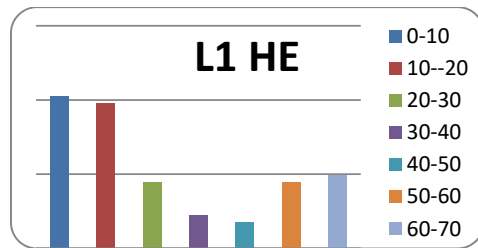International Journal of Cognitive and Language Sciences
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Fig. 2 EH participants' distribution of memories across seven decades in L1/Hebrew

2. Frequency of CO and SL Memories in L2 Sessions

In L2 sessions there were also an augmented number of memories between from ages 10-30 for both bilingual groups. Arabic-Hebrew bilinguals showed a total of 43.7% of their memories in this 20 year period and only 33.8% in the two surrounding decades, while Hebrew-English bilinguals recalled 25.9% of their memories from age 10-30 and approximately half as many in the surrounding decades (14.3%). This falls in line with the first prediction and the trend found in other research [48]. These results are presented graphically in Figs. 3 and 4.
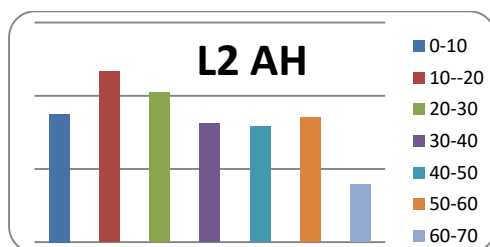

Fig. 3 AH participants' distribution of memories across seven decades in L2/Hebrew

Fig. 3 shows a classical Reminiscence Bump graphic pattern for Arabic-Hebrew bilinguals, with a rise in the percentage of memories in the 10-20 and 20-30 age decades. There was also a modest rise in the percentage of memories in the age 50-60 decade.
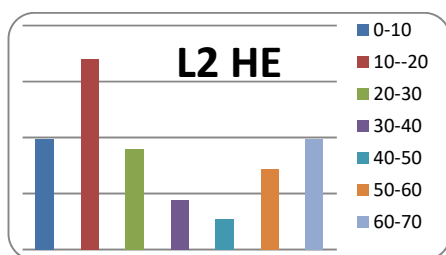

Fig. 4 HE participants' distribution of memories across seven decades in L2/English

Fig. 4 shows a classical Reminiscence Bump graphic pattern for Hebrew-English bilinguals, in this case the in the percentage of memories falling in the 10-20 age period. Fig. 4 also shows a typical recency effect with a rise in the percentage of memories in the final decades (ages 50-60 and 60-70).

C. Overall Frequency of Crossover and Same Language Memories in L1 and L2

Table III summarizes the frequency of CO and SL memories during L1 and L2 sessions, showing overall a larger percentage of SL memories than CO. Moreover, in line with the second prediction, a higher frequency of SL memories occurred during L1 sessions and a higher frequency of CO memories were found in L2 sessions for both groups of bilinguals.

TABLE III
MEAN FREQUENCY OF CO AND SL MEMORIES IN L1 AND L2 SESSIONS FOR AH AND HE PARTICIPANTS

	Memory Type	L1	L2
AH bilinguals	CO	1.20	9.06
	SL	13.26	5.33
HE bilinguals	CO	1.71	8.57
	SL	11.85	3.71

This finding supports [51], [52]. The high frequency of Same SL memories during L1 sessions can be attributed to the speakers' dominance in L1. The higher frequency of CO memories in L2 sessions can also be attributed to L1 dominance, since despite activation of L2 by the instructions and interaction with the experimenter, more memories were retrieved in L1 by both groups of bilinguals.

D. CS

Bilingual CS results from many motivations, which can be classified most generally into social and/or linguistic factors. In order to examine CS in this study, the total frequency of CS for each participant's memories was divided by the frequency of words for that specific memory. This calculation was based on [40] and [25]. In addition, mean instances of CS were calculated for each memory type (CO and SL) and for L1 and L2 sessions, separately.

Table IV presents the frequencies for both groups of bilinguals broken down for L1 and L2 sessions as well as for SL and CO memories. Overall, it can be seen that for both groups, there were more instances of CS in L2 sessions (0.0110 and 0.0111) than in L1 sessions (0.0085 and 0.0067) for both Arabic-Hebrew bilinguals and Hebrew-English bilinguals, respectively. For SL and CO memory types, however, group differences emerged. Hebrew-English bilinguals showed the predicted pattern of more frequent CS in CO memories (0.0098) than SL memories (0.0050), but Arabic-Hebrew bilinguals showed a reverse trend, with more CS in SL memories (0.0110) than in CO memories (0.0086). This latter finding for Arabic-Hebrew bilinguals can be attributed to the high frequency of CS for SL memories in L1 sessions (0.0124), almost as high as the frequency of CS for CO memories in L2 sessions (0.0126).

Pairwise T-tests comparing the cells in Table V showed that the difference in CS frequency for L1 and L2 sessions was significant for the Hebrew-English group (p=0.04), but not significant for the Arabic-Hebrew bilinguals (p=0.18). The difference in frequency of CS between CO and SL memories was also significant for Hebrew-English bilinguals (p=0.04)

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but not for Arabic-Hebrew bilinguals (p=0.21).

TABLE IV
FREQUENCY OF CS FOR ARABIC-HEBREW AND ENGLISH-HEBREW
BILINGUALS DURING L1 AND L2 SESSIONS FOR SL AND CO MEMORIES

		L1	L2	Totals
AH Bilinguals	SL	0.0124	0.0095	0.0110
	CO	0.0045	0.0126	0.0086
	Subtotal	0.0085	0.0111	
EH Bilinguals	SL	0.0018	0.0083	0.0050
	CO	0.0062	0.0134	0.0098
	Subtotal	0.0067	0.0110	

The higher number of CS instances in L2 sessions than in L1 sessions is consistent with the findings of [31], where participants used more CS in L2. It can be further explained that it is related to retrieval difficulties or lexicon gaps in [36]. Since most memories which help form personal and social identity occur during youth and early adulthood and since this age period is typically associated with one's mother tongue, CS to L1 occurs while retrieving personal memories.

These results did not fully support the third prediction that retrieving memories in another language (CO memories) would activate the second language and lead to CS [2]. Hebrew-English bilinguals' CS data did support this prediction, but Arabic-Hebrew bilinguals' data did not. With regard to the findings in the CS data of both groups in general and Arabic-Hebrew bilinguals in particular, [32] state that "...language-dependent access to autobiographical memory may change as a person becomes fluent in the second language." Arabic-Hebrew participants grew up and learned in Israeli schools and worked in neighboring Hebrew-speaking cities. This exposure in Hebrew-speaking environments afforded a degree of fluency in Hebrew, which led to CS and activation of Hebrew memories.

E. Community-Based vs. Individual CS

In an effort to further clarify the group differences reported above, CS instances were categorized as Individual and Community based CS. Table V presents the mean number of instances of these two CS categories for SL and CO memories during L1 and L2 sessions for the two bilingual groups.

TABLE V
MEAN INSTANCES OF CS FOR SL AND CO MEMORIES IN L1 AND L2 SESSIONS

	Individual				Community			
	L1-SL	L2-SL	L1-CO	L2-CO	L1-SL	L2-SL	L1-CO	L2-CO
AH	5.36	7.67	1.60	4.64	6.11	6.75	1.00	2.78
HE	2.50	6.50	4.00	15.33	--	1.00	--	1.75

Overall, both bilingual groups produced a mean of 3.44 instances of Community-based CS in SL memories during L1 sessions and a mean of 5.60 instances during L2 sessions. More Individual-based CS was expected in L2 sessions than Community based CS due to retrieval difficulties. This prediction was supported, each group showing more Individualistic than Community based CS in L2 sessions.

These results fall in line with previous literature which states that CS is often a result of lexical gaps in speaker's lexicon. In the study of [36] on Portuguese-English bilinguals, for instance, it was found that 90% of the CS was due to gaps in the participants' lexicon. Others explained this kind of CS as a grammatical filling strategy [5], [41].

The lack of many instances of Community based CS during L1 in the memories of Arabic-Hebrew bilinguals may be a result of the fact that they spoke mainly Arabic to show their strong connection to their social, religious, linguistic, or national identity. This is perhaps related to their background as fallahin (villagers) in origin. Furthermore, most of the Arabic-Hebrew participants related to the massacre which occurred in the village in 1956. They spoke more about their feelings in L1, since it was the language which best expressed emotion. This interpretation contrasts [14], who indicate that CS can serve as a means to distance oneself from an emotional topic. The Hebrew-English bilinguals' infrequent Community CS was most likely a result of the lack of emotional involvement with their bilingualism; thus, they expressed themselves with no perceivable need to stress or emphasize something linguistically as a sign of identity. Nevertheless, they did show a large portion of Individualistic CS during L2 sessions.

IV. GENERAL DISCUSSION

A. Summary and Discussion of Findings

The present study examined self-reported memory retrieval and CS behavior of bilingual adults in the context of autobiographical memory. Two different bilingual groups participated: Arabic-Hebrew adults (n=15) and Hebrew-English adults (n=7). Four hypotheses were investigated and the major findings can be summarized as follows: Both bilingual groups showed evidence for a Reminiscence Bump during the 10-30 age period [48]. In addition, SL memories prevailed in L1 sessions for both groups, supporting [51], [52], while there was a higher frequency of CO memories in L2 sessions. CS in L2 sessions exceeded CS in L1 sessions for both groups as well. CS categorization revealed that both groups had more Individual based CS in L2 sessions due to lexical gaps, yet, Community based CS was not abundant during L1 sessions.

The first prediction hypothesized that there would be more memories retrieved from the 10-30 age period in both L1 and L2 sessions, based on the rich literature supporting this phenomenon [48]. The data in this study from both bilingual groups confirm this prediction, owing to an augmented number of memories between the age periods of 10-30 years in both L1 and L2 sessions. This prediction replicates the findings of [48] as well as Altman (2007).

As reviewed above, the increased number of memories retrieved in the Reminiscence Bump period (ages 10-30) has been explained by various proposals. The cognitive capacity explanation maintains that events are remembered better in this period and thus facilitate better recall [8]. This approach is somewhat related to an explanation based on the fact that this age period involves a great deal of change and is followed by greater stability, the contrast leading to improved memory

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abilities [49]. Finally, a more social approach claims that personal and social identity formation is involved in memory retrieval during this period [17, p. 261]. The first approach mentioned here, the period of change followed by relative stability, applies to Arabic-Hebrew bilinguals. These participants had various life experiences during their youth. Some of them finished school studies and completed higher education; others dropped out of school and began to work, while others stayed home. In all cases we saw evidence of change followed by stability. In contrast, the second approach mentioned above applies more to the Hebrew-English bilinguals. In their youth, these bilinguals were involved in studies or travelling abroad for study purposes, a stage in which they were forming their personal and social identity in the Israeli society.

Reference [52] investigated autobiographical memory in immigrant bilinguals, in particular the language of encoding. They found a correlation between a person's memory and the language in which it was encoded. In a further study, [54] characterized four aspects of autobiographical memory: 1) general properties of memory, organized according to lifetime periods [11], 2) specific properties of memory retrieval [3], 3) place and time of specific events [12], and 4) sensory and emotional details of memories [49], [54]. The present research examined autobiographical memory in terms of the setting and time of specific events.

The second prediction of the study was related to Same Language (SL) and Crossover (CO) memories. More SL memories were predicted for L1 sessions and more CO memories for L2 sessions. The results here confirmed this hypothesis for both Arabic-Hebrew and Hebrew-English bilinguals. These results replicated what Schrauf and Rubin found in their studies [51], [52]. The large number of SL memories during L1 sessions and CO memories during L2 sessions can be attributed to speakers' language dominance, which was L1 for both groups.

The third prediction focused on CS in L1 and L2 sessions and for CO and 'SL' memories, hypothesizing more CS in L2 sessions than in L1 sessions and more CS for CO memories than for SL memories. Results fully supported this hypothesis for Hebrew-English bilinguals but not for AH bilinguals. More specifically, Hebrew-English bilinguals had more CS in L2 sessions and for CO memories than they had for L1 sessions and SL memories. For Arabic-Hebrew bilinguals the pattern was somewhat more complex. This group did have more CS for L2 than L1 sessions, but they also had more CS for SL memories than for CO memories.

This latter finding requires explanation. It should first be pointed out that for the Arabic-Hebrew participants it was in the L1 sessions that the large amount CS occurred (M= 0.0124), almost an equivalent amount to the CS for CO memories (M=0.0126). So, we need to ask why there was so much CS from Arabic to Hebrew for memories retrieved in Arabic. One possible explanation is that many of the Hebrew words and phrases which were code-switched are more frequently used in the Arabic-speaking community than the equivalent expressions in Arabic. Another explanation is

based on what [36] call lexical gaps and what [62] calls "fluency maintenance."

Returning to the overall consistent finding for both Hebrew-English and Arabic-Hebrew bilinguals, i.e. the prevalence of CS in L2 sessions (i.e. CS into L1), this finding is consistent with [31]. It is also consistent with the notion that many of the memories reported involved personal and social identity issues [17], where L1 is preferred. Finally, these switches from L2 to L1 may also be a signal of membership of the speaker within a bilingual community, as claimed by [61].

In part, due to the mixed findings for the previous prediction and in since the motivations for CS specified in the SPPL Model [62] allows for some ambiguity, a different classification system was proposed, based on a distinction between community-based and individual CS [2]. It was stated previously that bilinguals in general have unique capacities of language usage and they can mix their spoken languages to create new lexical items matching their realities [55]. These unique capacities would also provide an explanation for the rationale behind the CS divergence observed. Based on this rationale, our fourth prediction stated that there would be more Community based CS during L1 sessions and more Individual CS during L2 sessions.

Due to the fact that very few instances of 'community-based' CS emerged for the Hebrew-English bilinguals, only the data for Arabic-Hebrew bilinguals were relevant for this prediction. Overall there was more individual CS for L2 sessions than for L1 sessions and slightly more 'community-based' CS for L1 sessions.

The prevalence of individual CS in L2 sessions is most likely due to imperfect L2 fluency of the participants. One example of Individual participant ASA11, an Arabic-Hebrew bilingual, came from a memory in response to the cue word 'tree' in an L2/Hebrew session: ***shu bekolo fe mawsem*- *ex omrim be'onat. Ken, be'onat ha'zejtim be'shana she- avra halaxnu lasade shelanu kedej liktof zejtem im hayeladem sheli*** "how do they say in the season of- how do they say in the season of olives in the past year I went to our field to collect olives with my children." This instance of CS signaled a retrieval difficulty the speaker faced on the individual level, leading to a return to L1, his/her mother tongue. Another example of an Individual came from Hebrew-English participant RA07, who experienced a retrieval difficulty while narrating a memory related to the cue word *money* (in an L2 session). The participant used the following sentence: "*we were like **baldarim**. I don't know how to say it in English.*"

These results fall in line with the literature which claims that CS is often a result of lexical gaps in a speaker's lexicon. In a study of Portuguese-English bilinguals, for instance, it was found that 90% of the CS resulted because of gaps in the participants' lexicon [36]. Others labeled this kind of CS a grammatical filling strategy [5], [41].

Turning now to the small amount of "community-based CS" in the Hebrew-English bilinguals' corpus in comparison to the Arabic-Hebrew bilinguals, the best explanation for this is that the two groups did not come from similar or even parallel communities. For the Arabic-Hebrew bilinguals

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Arabic is the language of social, religious, linguistic, and national identity. It was acquired by all participants in similar circumstances. And just about all Arabic-Hebrew participants mentioned the 1956 massacre in one or more of their memories. The Hebrew-English bilinguals learned their L2/English in different contexts and cannot even be said to form a community. Thus, the little 'community-based' belongs to an international, academic community. Hebrew-English bilinguals' infrequent Community CS, and thus may be related to their lack of need to stress or emphasize their linguistic or social identity. Reference [66], commenting on [64]'s definition of bilingualism, states that the multiplicity of a bilingual's identities (which do not necessarily occur simultaneously) indicate that an ideal bilingual is expected to master the ability to shift roles as a function of different settings and interlocutors on the one hand and linguistic form on the other [37]. In this sense, Hebrew-English bilinguals have multiple identities and are expected to master role shifts, thus avoiding "community-based CS" and sticking to a single linguistic identity in each of the experiment sessions.

References [14] and [44] point out that CS can serve as a distancing tool from an emotional topic. To illustrate, the following is an example of "community-based CS" during the L2 (Hebrew) session in response to the cue word *maxbo* "hide." Participant ASA06 produced the following Hebrew sentence: *hayiti smexa meod...***mabsuta** *ve reguaa* "I was very happy, *mabsuta* and calm." CS on the word *mabsuta*, is considered "community based" due to its high frequency of use in Israeli discourse; thus, it cannot be said to be a gap in the individual speaker's lexicon.

B. Contributions, limitations and Future Research

Contributions. The study combined two bilingual measures, CO and CS, the former from an experimental paradigm in the psychology of autobiographical memory based on self-reported judgments and the latter a behavioral measure from linguistics. This combination offered a behavioral basis to the field of bilingual autobiographical memory, which has been based largely on self-report measures. Moreover, it attempted to shed light on the investigation of motivations for CS, beginning with Walters' detailed classification of psycholinguistic and socio-pragmatic functions and concluding with a distinction between 'community-based' and individual motivations. In the context of CS, the study also touched on emotional aspects of the CS phenomenon.

Limitations. The presented study attempted to expand the study of bilingual autobiographical memory to different populations (Arabic-Hebrew and Hebrew-English bilinguals), engaging 22 participants from two native language groups. Several modifications would provide more informative results. For example, similarity of cue words utilized in L1 and L2 sessions raises questions of transfer effects. A unique list of cue words for the two sessions would correct this problem. Finally, the interviewers for Arabic-Hebrew and Hebrew-English groups were bilingual people in both cases, allowing the participants a certain degree of familiarity in the second L2

session. This familiarity as well as the confounding of experimenter and language may have influenced retrieval processed. A different interviewer for each session, especially a native speaker for each language session, would alleviate this problem. Despite these methodological limitations, the study has highlighted fundamental phenomena in the field of bilingualism, autobiographical memory and CS.

Future research. Investigations which could emerge from this study should involve methodological variations outlined in the previous section, investigation of immigrant and non-immigrant bilinguals with various degrees of bilingualism and periods of residence abroad.

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