

Whose Life Is It Anyway? Adoption of Each Other's Autobiographical Memories by Twins

SIMAY IKIER¹, ALI İ. TEKCAN^{1*}, SAMI GÜLGÖZ²
and AYLIN C. KÜNTAY²

¹*Boğaziçi University, İstanbul, Turkey*

²*Koç University, İstanbul, Turkey*

SUMMARY

Anecdotal evidence suggests that twins may dispute ownership of autobiographical experiences. We investigated the frequency and characteristics of such disputed memories in comparison to memories with undisputed ownership. In the present study, monozygotic twins (MZ), dizygotic twins (DZ), and siblings were asked to remember disputed and non-disputed memories. They also dated each memory and provided a rating on the following variables: level of imagery, detail, rehearsal, and importance. Results showed that disputed memories were more common among MZ twins than in DZ twins and siblings. The frequencies of undisputed memories were not different among the three groups. When compared to non-disputed memories, disputed memories were more likely to come from events experienced during preschool years. We consider disputed memories as instances of false memories, at least partly influenced by social interactional processes, and event characteristics. Copyright © 2003 John Wiley & Sons, Ltd.

One of the important issues in autobiographical memory research has been the accuracy of the reported past experiences. The general conclusion from this line of research is that people are quite accurate regarding their autobiographical experiences. For instance, Barclay and Wellman (1986) asked college students to record information (context, description, date) about three autobiographical events every day for four months. Then, after four different time intervals ranging from one month to one year, they gave participants a recognition test in which participants indicated which of the described events they actually experienced. The list of events included real events (taken from participants' own records) as well as distractor descriptions. The foil descriptions included either a revised description of an event that was actually recorded by the participants themselves or an event taken from another student's record who did not participate in the study. Correct recognition of events they have actually experienced was above 90% regardless of the retention interval. This high level of accuracy does not seem to be limited to recollections of the relatively recent past. Studies show that young adults are able to accurately remember certain experiences from their childhood. For instance, Howes *et al.*

*Correspondence to: Dr Ali İ. Tekcan, Department of Psychology, Boğaziçi University, Bebek—80815, İstanbul, Turkey. E-mail: tekcanal@boun.edu.tr

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(1993) showed that 80% of the earliest memories remembered by college-aged participants were fully or partially verified by a parent. Bruce *et al.* (2000) found that parents verified 85% of the memories adults reported from between 0 and 8 years of age (also see Eacott and Crawley, 1998). It should be pointed out that in such studies consistency of the recollections by children and parents are taken only to imply accuracy; it is obviously possible that both children and parents may be wrong about the remembered events. In addition, what children report may not be genuine memories but rather reports based on what parents told them about childhood events.

Partly motivated by real-life cases of false memory such as recovery of the repressed memories, one of the intensely investigated issues has been whether and under what conditions people can have false memories, or whether it would be possible to implant memories into people (e.g. Hyman and Billings, 1998; Hyman *et al.*, 1995; Loftus and Pickrell, 1995). In one of the first empirical demonstrations of this phenomenon, Loftus and Pickrell (1995) asked adult participants in an interview to try to remember as much as possible about four childhood events, one of which was a false event (i.e. an event participants did not experience as a child). These participants were also interviewed about the four events approximately one to two weeks later, during which they again tried to remember details of these events. Their results showed that 25% of the participants (6 out of 24) had full or partial recall of the false event. Using a similar design, Hyman and Billings (1998) were able to implant false childhood memories in 25% of the young adults who participated in their study. Wade *et al.* (in press) showed that exposure to digitally doctored photographs also led to formation of false memories in 35% of the participants for a childhood event that did not occur. In addition to these studies, Roediger and McDermott (1995) showed that people exhibit false memories in a simple word list recall test. In sum, there is considerable evidence showing that people may indeed claim ownership of memories they did not actually experience themselves.

It is also possible to find instances of such 'false memories' in regular autobiographical memory studies where there is no implantation of false memories. For instance, Howes *et al.* (1993) asked university students to remember their earliest three memories. One of their findings was that in approximately 5% of the protocols, participants remembered an emotion experienced by another individual as their own emotional reaction. A more direct evidence of claiming ownership of autobiographical memories comes from the Barclay and Wellman (1986) study. Although, as mentioned previously, subjects correctly recognized their own experiences with more than 90% accuracy, they were less successful in rejecting the foil events, events experienced by other individuals who were not part of the study but were students at the same university as the participants. After 1–3 months, participants' error rate of claiming that the described experience was their own was 16% , increasing to 41% after an interval of 10–12 months. In a similar vein, Burt *et al.* (1995) showed that when people are asked to identify photographs involving their autobiographical experiences, they made, albeit infrequently (1%), commission errors selecting other people's photographs as their own. Moreover, they claimed to have remembered the circumstances under which the photograph was taken. These findings imply that people have a tendency to own up to events as their own, especially if the to-be-remembered event is also known to them through an external source. Thus it may also be plausible that people with similar experiences are more likely to have memory problems of the sort mentioned here.

Anecdotal evidence suggests that siblings and especially twins are especially prone to these types of memory confusions. Although there is a plethora of studies on twin

performance on a variety of cognitive measures including memory (e.g. Finkel *et al.*, 1998; Johansson and Whitfield, 1999), almost all of these studies address the issue of relative contributions of genetic versus environmental factors. An exception is a recent study by Sheen *et al.* (2001) who investigated disputed memories in which twins agree that an event occurred but disagree about who experienced the event.

In three experiments using different methods (cue word or direct elicitation), Sheen *et al.* (2001) found that 65–70% of the twin pairs produced at least one disputed memory. Sheen *et al.* did not find any effect of zygosity on the number of disputed memories. However, twins were more likely than siblings to have such memories; only 8% of the students who had siblings reported disputed memories. In terms of temporal distribution of disputed memories, the median age of the participants at the time of the event was 10, indicating that these events tended to come from late childhood or early adolescence. Regarding phenomenological characteristics, disputed memories interestingly received higher ratings of imagery and reliving than non-disputed memories, but there was no difference in terms of importance and rehearsal.

The main purpose of the present study was to provide further data on disputed memories among twins and siblings. We were also interested in potential differences between monozygotic (MZ) and dizygotic (DZ) twins, because there is evidence that MZ twins may actually be more alike in a number of social and psychological variables and have closer relationships with their twins compared to DZ twins (LaBuda *et al.*, 1997; Segal, 2000). More specifically, as different from Sheen *et al.* we compared the frequency and characteristics of disputed memories in twins and siblings by using the same method of memory elicitation in order to provide a more direct comparison. We also provided comparative data on disputed versus non-disputed memories on temporal distribution and other variables in addition to phenomenological characteristics. Moreover, we compared disputed memories with the types of non-disputed memories.

METHOD

Participants

Fifteen pairs of monozygotic twins (7 female, 8 male), fifteen pairs of same-sex dizygotic twins, and fifteen pairs of same-sex siblings participated in the study. The age range for the participants was between 17 and 43 years ($M = 24.8$, $SD = 6.8$). The participants were recruited by means of convenience sampling, mostly through advertisements posted through bulk electronic mail addressed to students at two universities in Istanbul, Turkey.

Procedure

The participants were asked to appear together with their twins or siblings to meet the experimenter in a lab at the university or at the participants' house. When the participants arrived, they were first told that they were participating in a memory study. They would be asked to briefly describe some of the events they experienced in the past and to answer some questions about these events. Each individual in a twin or sibling pair was tested separately within the same session.

In each session, the first twin/sibling was given the definition of disputed memories in which two individuals in a (sibling or a twin) pair disagree on which of the two

experienced an autobiographical experience. Each participant was then given five minutes to think about whether (s)he experienced such memories and was provided with pencil and paper to take notes if needed. At the end of five minutes, the participant was asked for a brief descriptive statement about each of the events that led to disputed memories. Most subjects provided narratives, which were more informative and elaborated than 'brief descriptive statements'. These narratives were recorded for further reference and analysis. The interviewer made a brief descriptive note of the reported memories, making sure to include enough information for the subject to be able to identify the reported memory when the researcher brings it up again. This was followed by asking the participant to provide information for each of the events on the basis of the following features:

- *Date of the event.* The participant was asked to provide the day, month, and the year of the event.
- *Importance rating.* The participant was asked to rate the perceived importance of the event on a 5-point Likert-type scale ranging from 1, 'it was not an important event at all', to 5, 'it was a very important event'.
- *Imagery ratings.* The participant was asked to rate in how much detail (s)he was able to form a mental image of the event on a 5-point Likert-type scale ranging from 1, 'I cannot imagine it at all', to 5, 'I can imagine it with all its details as if I am experiencing it right now'.
- *Communication ratings.* The participant was asked to rate (a) how frequently they have talked about the event with the other twin/sibling on a 5-point Likert scale ranging from 1, 'we have not talked about it at all', to 5, 'we have talked about it very frequently and we still talk about it sometimes', and (b) in how much detail they have talked about the event with the other twin on a 5-point Likert-type scale ranging from 1, 'we have not talked about it at all', to 5, 'we have talked about it with all its details'.

Once the part of the session about disputed memories was completed, the participant was also asked to provide descriptive statements of events that are clearly personal memories experienced by him/herself and of events that are clearly experienced by the other twin/sibling in 5 minutes each. All the above ratings were also collected for each of the memories except for communication ratings in case of other's memories, because such information would not be available to the participants.

RESULTS

We performed two sets of analyses. In the first set of analyses, the frequencies of different types of memories for the three participant groups were investigated. In the second set of analyses, each memory was treated as a separate observation and was assumed to be independent of other memories even if the same person reported them.

When we look at the descriptive statistics for each type of memory produced by the participants, it is seen that overall participants produced an average of 0.74 disputed memories ($SD = 1.20$) as opposed to 3.22 personal memories ($SD = 1.26$) and 2.97 other memories ($SD = 1.22$). The range of the number of memories produced was between zero and six for disputed and other memories and between one and seven for personal memories. However, the values for disputed memories can be misleading in that 56 of the participants (62.2%) produced no such memories and only four participants produced more than three.

Table 1. Means and standard deviations of each memory type produced by three participant groups

Memory type	Participant group					
	Monozygotic twin		Dizygotic twin		Sibling	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Disputed	1.40	1.50	0.57	1.10	0.27	0.52
Personal	3.57	1.30	3.07	1.26	3.03	1.19
Other	3.10	1.09	2.83	1.37	2.97	1.22

Table 1 shows the mean number of each type of memory produced by the three different groups of participants. The participant groups varied on the frequency of producing disputed memories such that 23% of non-twin siblings, 30% of DZ twins, and 60% of MZ twins produced at least one disputed memory.

The data presented in Table 1 were also analysed by a 3×3 (memory type \times participant group) mixed ANOVA. This analysis revealed a main effect of memory type ($F(2, 174) = 142.05, p < 0.001, MSE = 1.18$); the number of disputed memories was lower than other memories which was lower than personal memories, all significantly different from each other according to Tukey's HSD test ($p < 0.05$). The main effect of participant group was also significant ($F(1, 87) = 4.93, p = 0.01, MSE = 1.97$) with identical twins producing more memories overall than the other two groups who were not different from one another. There was no interaction of memory type by participant group. Univariate analyses on each type of memory showed that the effect of participant group was mostly due to the differences between the groups in the number of disputed memories. The analysis on disputed memories revealed a main effect of participant group ($F(2, 87) = 8.30, p < 0.005, MSE = 1.25$). Similar analyses did not show any effect of participant group on personal memories ($F(2, 87) = 1.71, p > 0.05, MSE = 1.57$) or others' memories ($F(2, 87) = 0.35, p > 0.05, MSE = 1.52$). *Post-hoc* analyses using Tukey's HSD test on disputed memories showed significant differences only between MZ twins ($p < 0.05$) and the other two groups of participants, which were not different from each other.

The second set of analyses was based on separate memories assuming that each memory is an independent event. This assumption may be debated because memories produced in studies such as this one are nested within participants. Wright has recently suggested a multilevel approach that may be useful in the analysis of such data (Wright, 1998; Wright and Nunn, 2000). Given that our main purpose in this paper was to delineate the descriptive and boundary conditions of a relatively new phenomenon, we opted for the type of analyses that has traditionally been used in the literature. The first analysis was cross-tabulation of memory type and participant group, presented in Table 2. The

Table 2. Percentage of each type of memory for each participant group

Memory type	Participant group		
	Monozygotic twin	Dizygotic twin	Sibling
Disputed	62%	25%	12%
Personal	37%	32%	31%
Other	35%	32%	33%

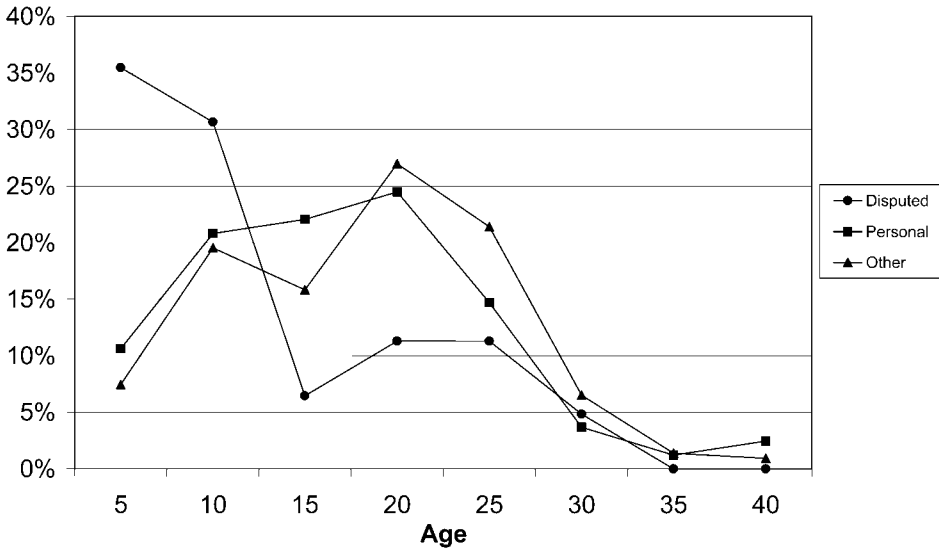


Figure 1. Distribution of memories according to age of participants at event time

chi-square analysis for independence revealed that the type of memory was not distributed the same way for all participant groups ($\chi^2(4, N = 624) = 20.42, p < 0.001$). The proportion of disputed memories was much lower in siblings and DZ twins than in MZ twins. On the other hand, the distribution of personal and other memories showed the same pattern for all three types of participants.

Another purpose in the analyses was to compare various characteristics of different types of memories. First, we focused on the age of the participants at the time of experiencing the events. Figure 1 shows the distribution of three types of memories according to the ages that they were experienced. A sizeable proportion of disputed memories (35.5%) belonged to events reported to be experienced before the age of five. Slightly more personal memories were reported for the same period but these represented a much smaller proportion of all personal memories (10.6%). The modal age group for personal memories as well as other memories was between 16 and 20.

A 3×3 (memory type \times participant group) ANOVA on the age of experiencing the event revealed only a main effect of memory type ($F(2, 515) = 9.25, p < 0.001, MSE = 56.08$). There was not an effect of participant group ($F(2, 515) = 1.88, p > 0.05, MSE = 56.08$) or an interaction ($F(4, 515) = 1.38, p > 0.05, MSE = 56.08$). Tukey's HSD test ($p < 0.05$) showed that the mean age for disputed memories (10.0, $SD = 7.88$) was significantly lower than those for personal (14.36, $SD = 7.70$) and other memories (16.35, $SD = 7.29$), which were not different from each other. The median age of the participants at the time of the event was 6.56 for the disputed memories, 14.36 for personal memories and 16.35 for other memories, indicating that, on average, disputed events tended to come from preschool periods.

By applying separate one-way ANOVAs, the differences between types of memories in three different measures were tested. Table 3 shows the means and standard deviations for importance ratings, frequency of talking about the memories, for the level of detail included when talking about the memories and for the level of imagery during recollection according to three types of memories.

Table 3. Means and standard deviations of different types of memories in importance, frequency of talking, level of detail and imagery

	Memory type					
	Disputed		Personal		Other	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Importance	3.07	1.27	3.75	1.20	3.46	1.18
Frequency	2.60	1.09	3.00	1.22	3.24	1.01
Detail	2.90	1.43	3.36	1.36	3.58	1.17
Imagery	3.37	1.24	3.82	0.96	3.46	1.07

An ANOVA on the importance ratings showed significant effect of memory type ($F(2, 624) = 10.17$, $p < 0.001$, $MSE = 1.44$). *Post-hoc* comparisons using Tukey's test revealed that personal memories were rated as more important events than both disputed and other's memories ($p < 0.01$). Comparison of the distribution of ratings showed that 39% of disputed memories and 51% of other's memories were rated as important or very important whereas for personal memories, this ratio was 65%.

The difference between memories in the frequency of talking about them was significant ($F(2, 624) = 9.56$, $p < 0.001$, $MSE = 1.26$). Tukey's HSD test ($p < 0.05$) showed that disputed memories were not talked about as frequently as personal memories, which in turn, were rehearsed less frequently than other's memories. A similar pattern emerged in the detail of memory during rehearsal. The difference between memories on the level of detail was significant ($F(2, 624) = 7.80$, $p < 0.001$, $MSE = 1.67$). Tukey's HSD test ($p < 0.05$) showed that the conversations on disputed memories did not include as much detail as personal or other's memories, which were equally detailed. Finally, the level of imagery during the study differed according to the memory type ($F(2, 624) = 10.37$, $p < 0.001$, $MSE = 1.09$). In this case, Tukey's HSD test ($p < 0.05$) results showed that the recollection of personal memories contained the highest level of imagery with other's memories and disputed memories being significantly lower than personal memories.

DISCUSSION

Recent research on false memory informs us that in certain situations particular types of individuals will formulate inaccurate memories. Recent research has started to investigate which specific types of individuals, and under what conditions, will improvise on memories (Hyman and Billings, 1998; Platt *et al.*, 1998; Winograd *et al.*, 1998). The aim of the present work is to contribute to the ongoing effort of determining the types of individuals and conditions that give rise to inaccurate memories. We propose that disputed memories that are adopted by one member of the twins/siblings from the other member of the pair constitute a special kind of confabulation, where the rememberer reports an event in which there is uncertainty regarding who the actual participant (i.e. the protagonist) was. Our results show that this kind of disputed memories is present in all sibling types but likely to be experienced most frequently by MZ twins, followed by DZ twins, and least frequently by non-twin siblings. This pattern of results is similar to that of Sheen *et al.*

(2001) and indicates that this is a robust phenomenon that appears under different methods of elicitation. There were two main differences between findings of these two studies: first, different from Sheen *et al.* we found that zygosity in twins did affect the reported number of disputed memories, and second, we found, in line with much of previous research on false memories (e.g. Loftus and Pickrell, 1995), that disputed memories were associated with lower level of detail and imagery than non-disputed memories.

Disputed memories of the kind observed in this study appear to be special in several respects: When compared to personal and other's personal memories, (1) they tend to be experienced at younger ages, and originate from more remote events, (2) they tend to have the lowest reported frequency of being talked about, (3) they tend to contain the lowest reported level of detail when talked about, and (4) they tend to involve much lower level of imagery.

These properties of disputed memories seem to be consistent with one another. Remote memories naturally involve some difficulty of recollection compared with relatively recent memories (e.g. Barclay and Wellman, 1986), which might bear some uncertainties with regard to the identity of the protagonist. Temporal remoteness, coupled with scarcity of rehearsal, might be leading to a loss of granularity of event details in the rare occasions of conversational reference to the event and to a decline of visual imagery associated with the event.

One of the plausible explanations of these special types of disputed memories might come from the fact that a good percentage of them (35%) are reported to have been experienced by the participants when they were between the ages of 0 and 5, a very early age period indeed. Fivush *et al.* (1997) point out that children, as novice rememberers of past experiences, rely on externally presented cues such as parental elicitations, to organize their autobiographical memories. In the process, these externally generated cues might be incorporated to children's own accounts of personal events, occasionally constituting false memories. Especially when twins are involved, it is likely that parents are, at times, uncertain about which of the two was a participant in a particular event. Such uncertainties and confusions might then be reflected in parent-child conversations regarding the event. There is no doubt that other people including grandparents would be even more vulnerable to these types of confusions and may be instrumental in instilling false memories.

Prior to the age of 5, the period where a sizeable proportion of the disputed memories are placed in by the participants, is of particular relevance to memory research given that it covers the period of childhood amnesia, wherein very few adults can locate more than a handful memories (e.g. Bruce *et al.*, 2000; Fivush, 1994; Fivush *et al.*, 1997; Pillemer and White, 1989). Some researchers (Fivush, 1993, 1994; Nelson, 1993; Pillemer and White, 1989) have argued that the onset of autobiographical memory and the offset of childhood amnesia is marked by the beginning of children sharing their experiences with others linguistically. In other words, as children learn to include references to the past in their conversations with adults, they organize these events autobiographically in memory. Nelson (1993) points out that the development of autobiographical memory does not start before the language-based representational capacity emerges, reaching a completion late in the preschool years. As a result of the parallel development of representational language skills and autobiographical memory, memories about events start to constitute a life history that is temporally extended. As suggested by Howe (2000), verbal rehearsal during conversations about the past does not only result in event reinstatement, but also can lead to the introductions of errors into the original account. That is, distortions of fact could

occur as a result of conversational (and collaborative, in the case of child–adult reminiscences) reconstructions of events (Wagenaar, 1988). Regarding the present study, this raises the point that even the apparent protagonist's recollections of the real event may come from an external source (e.g. parents' retellings of the experience).

Howe and Courage (1993) explain the offset of childhood amnesia through the emergence of knowledge of the self. According to Howe (2000), what seems to change in the late preschool years has to do with the personalization of events. Prior to the emergence and articulation of a cognitive self, experiences will not be organized as specific events that happened to a 'me'. This hypothesis is also relevant to our findings: memories that are disputed with respect to the identity of the protagonist come from preschool years, a developmental period where event memories 'may exist in a non-personalized form before the advent of autobiographical memory' (Howe, 2000, p. 89).

The reason why disputed memories occur most frequently in identical twins, and more frequently in fraternal twins than in same-sex siblings, should be partially sought for among the characteristics of the rememberers. MZ twins are very similar in appearance and behaviour. This similarity contributes to the possibility that parents, grandparents and other people will confuse the precise protagonist as they retell a past event. Events comprising the narratives of family history may be repeated with each of the twins separately identified as the main actor. The possibility of confusion in the family may be compounded by the fact that they spend a lot of time together, they react to events similarly, and they get similar reactions from their environment. In general, MZ twin pairs report significantly closer relationships than DZ twin pairs (LaBuda *et al.*, 1997). Also, there is some evidence suggesting that mothers of monozygotic twins have more difficulty in treating their children as individuals than mothers of dizygotic twins (Robin *et al.*, 1992).

Barclay and Wellman (1986) had shown that university students could claim 41% of fellow university students' experiences as events experienced by themselves. In twins, the similarity of context, and similarity of behaviours are factors that give rise to the probability that they would adopt each others' memories. This is particularly true of the events that are not significant events. Our data indicated that most of the disputed memories were rated as of average or less than average importance (61%). Personal memories, however, contained few (35%) memories with average or low ratings of importance. Thus, we observe that the similarity of experiences, the confusion of the twins by parents and others, the relative insignificance of the events contribute to the process of adopting others' memories.

This was a mainly descriptive study focusing on false autobiographical memories in a different context, from a different perspective with a particular set of participants. Further research will need to address the types of events that give rise to such phenomenon and types of people (e.g., best friends, couples) who experience such events in order to test possible theoretical accounts of this phenomenon.

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