

## REMEMBERING DATES OF BIRTH: MEMORY AS A DISCURSIVE PROCESS\*

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*In a descriptive study, participants were asked to recall family members' dates of birth and describe their recall experience. The recall protocols were analyzed both in terms of the phenomenological method and performance measures. The phenomenological analysis showed that birth date recall was often mediated by referent objects that bore a logical relationship to the target date unit. Performance measures, for their part, revealed a close relationship between the use of a rule-based referent object and the recall accuracy for date of birth. Furthermore, these findings are discussed in relation to the memory for time of events literature, focusing especially on the equivalence and difference of reference objects and on the presence of scale effects.*

**Keywords:** *memory, veridical memory, autobiographical memory, logical memory, logical inference.*

### Introduction

The purpose of this study was to take a closer look at a common human experience: people's memory for dates of birth. Whether filling out an insurance form for a child or answering a question about the age of a parent, one often faces the task of listing the month, the day, and the year on which someone they know was born. How does memory for dates of birth occur?

In a broader view, the question of how dates are remembered has been explored in the context of autobiographical memory. An extensive literature has emerged that looks at how events a person may have experienced in his or her past are dated—hence, the autobiographical angle (Fradera

& Ward, 2006; Friedman, 1993; Friedman, 2001; Huttenlocher & Prohaska, 1997). For instance, a person may be presented with a past event—these have varied in nature from something personal, for example, a phone call from one's sister about her newborn baby (Larsen & Thompson, 1995) to historical, for example, John Paul II becomes Pope (Brown, Rips, & Shevell, 1985)—and then asked to determine the time of its occurrence, that is, when it took place. Interestingly, the literature indicates that the dates (or times) of past events do not come as ready-made temporal attachments that are inherent in the events themselves. Rather, in order to generate the times of past events, people typically engage in

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a process of construction by resorting to various relational strategies that contextualize the event in terms of their own life experiences. For example, one might think: “My sister’s phone call must have come in January because there was a great deal of snow on the ground.”

Memory for date of birth, of course, may be analogous to memory for time of an event experienced in the past. Like any other event, the birth of a person is something that takes place in the past at a certain point in time that can be dated. Often enough, for example, we have all asked: “When was Uncle Bob born?” In fact, Friedman and Wilkins (1985, p. 169) included a stimulus event: “Prince William is born”—for purposes of dating in their research.

However, the focus of this investigation is different. Instead of focusing on the event in relation to time, the focus in this case is specifically on the date itself as an object of knowledge and of mastery, thus making it available in the present and possibly in the future. When seen or heard for the first time, no doubt, the date of birth may be encoded as an episodic unit of information. But with repeated encounters, it may become part of the semantic memory system (Neath & Suprenant, 2003). Thus the ‘dating of an event’ and ‘memory for a date’ perspectives assume a different stance with respect to the event-date relationship. In the case of dating the time of an event, the event is given priority in relation to the time it took place. In the case of memory for date of birth, the date itself is the main object of focus, placing the birth event aside. Obviously, for some people, especially mothers, both aspects may interact: the date of birth may bring back memory experiences associated with

the birth of a child and the birth event may remind them of the time the child was born.

Given the virtual absence of information about birth date recall, we thought it best first to examine the “actual experience of remembering” as it pertains to date of birth (Watkins, 1990, p. 334). For this purpose the investigation adopted a descriptive approach (Brewer, 1986). Basically, the study followed the common practice of engaging the participants in a memory task and then asking them to describe their recall experience as thoroughly as possible (see Brewer & Pani, 1983). Specifically, members of a family were asked to recall each other’s date of birth: month, day, and year. Once the birth date was recalled, the participants were asked to give a detailed description of their act of recall. The collected protocols were then analyzed with the aid of the phenomenological method (Bullington & Karlsson, 1984; Colaizzi, 1978; Polkinghorne, 1989).

Testing memory for birth date in a family context does offer some distinct advantages. For one, we expected the task to produce successful recall in a significant number of cases; however, we also expected that at times recall failure may also occur, thus allowing for variance in recall performance. Furthermore, assuming that the remembered dates could be verified against some criterion, it would be possible to relate recall performance to various potential variables, such as parents vs. children, male vs. female participants, and others.

Although little is known about how people remember birth dates, existing literature does raise two questions about the kind of results that are possible. First, both Baddeley, Lewis, and Nimmo-Smith (1978) in their study of subjects’ ability to specify the

date of their visit to a psychology laboratory, and Hill, Schwob, and Ottman (1993) in their investigation of subjects' use of spontaneous mnemonic strategies in the recall of number items, reported extensive reliance on relational strategies, as can be seen, for example, in the usage of holiday reference points (e.g., Valentine's Day) or personal information (e.g., "my niece is 22 years old"). Thus, when it comes to remembering dates of birth, one may ask whether recall occurs directly, or whether it, too, needs the support of a mnemonic context. Second, in an online study that investigated birthday recall, Rathbone and Moulin (2010) claim to have found that friends' birthdays tend to be recalled in relation to one's own birthday, thus seemingly demonstrating the dependence of retrieval of dates on the self-reference effect. According to the self-reference effect, memory for information that has been related to one's own person tends to be enhanced (see Searleman & Herrmann, 1994). Here we may ask whether an up-close view of the memory process will support a direct involvement of the self in birth date recall or point to the role of a more basic process, such as mere familiarity with the encoded object.

## **Method**

### ***Participants***

With a view to possible comparative analysis, whole families were invited to participate in this study. The families were expected to meet the following criteria: (1) fathers and mothers must have been present and (2) the family must have had at least three children of whom the youngest was five years or older at the time of the

study. For each family, both parents as well as at least 50% of the children were required to participate. Altogether, 22 families from a large Midwestern United States metropolitan area (Chicago) volunteered for the study. Among them, the families had 86 children of whom 70 (34 sons and 36 daughters) participated in the study. Thus, a total of 114 people were tested: 22 fathers, 22 mothers, and 70 children.

### ***Procedure***

Participants were assessed individually. An instruction sheet first informed them of the main purpose of the study—to see how well they remember birth dates of immediate family members. In addition, they were told that they would be asked to write in the date of birth for each family member separately and then to describe how they went about remembering the date of birth or, in the case of recall failure, to describe why their memory might have failed them. The participants were requested not to share this information with other family members until everyone had been tested. They were also assured that the study was strictly anonymous. At the end of the assessment procedure they would be asked to fill out a short personal information questionnaire.

After reading the instruction sheet, the participants were handed a set of birth date questionnaires corresponding to the number of family members for whom a birth date had to be remembered. Thus, in a family of five the participant had to fill out four questionnaires. Moreover, the participants were also told that they were free to select the order in which the birth dates of family members were to be remembered. For each family member, the participants first

had to identify whether the member was a brother, sister, father or mother. Then they proceeded to recall the person's date of birth by month, day, and year, or indicate that they didn't know it. Finally, if the family member whose date of birth was being remembered happened to be a child, the participants had to indicate the position that a specific child occupied with respect to birth-order in the family. For example, the child of interest might be specified as "second of four children."

The next phase was crucial. The participants were asked to describe in writing their actual experience of remembering the family member's date of birth. This was done in a series of two questions, each one focusing on the recall activity but phrased somewhat differently. The purpose of the second question was to bring out the aspects of the recall experience that the first question might have missed. The participants were first asked to "tell how it is that you were able to recall" the family member's birth date, and then to "describe how you went about recalling the birth date." Each question was also accompanied by a few open-ended pointer words (some event, memory aids, thoughts, and feelings) in order to facilitate the description of the recall experience. These pointer words were presented in writing and identical for all participants.

After completing the birth date questionnaires for all the family members, the participants filled out a short personal information sheet that requested information about their role within the family (e.g., mother), date of birth, age, number of children in the family, and, if they were a child, which number child they were out of the total number of children in the family (e.g., second of four children).

Throughout the assessment procedure, the researchers maintained a professional relationship with the participants. They avoided being intrusive and simply answered questions the participants might have had, reminding them to focus only on what they were actually experiencing as they recalled a family member's date of birth.

### *Phenomenological analysis*

The participants' written descriptions of their recall experience were analyzed according to the phenomenological method (see Colaizzi, 1978; Giorgi, 1985). The method used here consisted of four steps. First, researchers' expectations about possible findings were set aside; second, the descriptions were parsed into sense units (significant statements); third, the sense units were evaluated for their psychological meaning; and fourth, an overall description of the structure of the various meanings that emerged during analysis was offered.

The first requirement of the phenomenological analysis is straightforward: the data must be looked at without any preconditions. With this in mind, the protocols were evaluated in an open-ended fashion, placing all assumptions regarding memory phenomena aside. The purpose was to let the data speak for itself in an attempt to discern the meanings that it harbored and any potential interrelationships that might exist.

In the first phase of analysis, the protocols were read carefully with the goal of identifying sense units—sequences of text that expressed a coherent meaningful description of the recall process. Often the sense unit coincided with either the whole

or part of a sentence: “It’s Valentine’s Day, and the year is the year after her brother.” In this example the first part specified how the month and day were remembered, and the second how the year was remembered. Here are some other examples: “She was born on the Feast of the Immaculate Conception.” “It is easy to remember because it is the day before Halloween.” “He is a bicentennial (1976) baby.” Sometimes a sense unit was embedded in a richer text, possibly spanning several sentences or even crossing other sentences. In these cases, the basic sense unit was articulated in relation to a significant context carried by the associated text with a procedure akin to Kuiken and Wild’s (1988) phenomenological technique of relational analysis of discourse. Specifically, the procedure sought to express the meaning relationship that existed between the basic sense unit and its respective significant context. One such example is the relation of elaborative paraphrase: “I recall the birth date because she was born on George Washington’s Birthday. I can remember the nurses in the hospital suggested the name of Georgina, which I rejected.” “It was the bicentennial of the U.S.—1976. I remember watching events on T.V. and an Independence Day Parade.” In both cases, date of birth is remembered as related to a landmark event that is further supported by an associated episodic experience. Another is the relation of implication: “Two years after first born.  $1980 + 2 = 1982$ .” “Well, since her birthday is only three days after my birthday, I just add three to my birthday.” Here the additional text explicitly implements a rule that is apparent in the basic sense unit: the grasp of a certain relative connection between the dates of birth of two

family members. Obviously, by bringing the context into play, it was possible to express the basic sense unit with greater specificity and precision.

In the next phase, the meaning units were critically interpreted for the purpose of transforming them into aspects of *psychological meaning*. Thus, the process of analysis moved from the surface protocol language to the intended meaning. This analysis was carried out for each subject and family separately. Here are some examples of transformations that occurred: “Same year we bought our 1974 Charger.” In this example the subject recalled the year of birth with reference to a significant event. “It is one month before mine.” There the subject recalled the month of birth with reference to himself. “It just popped into my head.” The subject recalled the birth date *directly*. In the case of a more extended text, the psychological meaning may become more complex: “I just remember that he is second to the last in that month. I am almost the same that way. I thought about how many days were in the month of January and knew it.” In addition to relying on the position effect, the subject in that extended example also noticed similarities to herself as she recollected her brother’s day of birth. “My date of birth is the 9th day of my birth month. I am the oldest child. My younger sister, who is child 2 of 3, her birth date is the 19th of her birth month. Thus,  $9 + 10 = 19$ th.” There the subject recalled her sister’s day of birth in reference to herself with the *exact day* determined by applying the rule of addition.

Finally, by integrating the various categories of psychological meaning, a structural description of the memory-for-date-of

birth experience could be offered that would point to some of the essential aspects of the birth date memory phenomenon.

### ***Performance analysis***

In addition to the qualitative analysis, objective memory performance data were also taken into account. Specifically, these data included pertinent variables such as family status, gender, and order of birth that were related to various date of birth recall performance measures. Furthermore, the question of whether some of the qualitatively derived findings might be in some way related to the objective performance measures was left open as a possibility.

## **Results**

The results are presented in terms of two kinds of analyses: phenomenological analysis of collected protocols and performance analysis of birth date recall, along with a *post hoc* attempt to interrelate the two.

### ***Protocol analysis***

Table 1 shows a summary of the categories of psychological meaning based on phenomenological analysis. Altogether, 1141 units of psychological meaning were identified and placed in ten thematic categories.

The bottom four categories describe statements that do not involve memory processes as such or, in some cases, are simply too ambiguous for interpretation. The first external memory aids category refers to those few cases whereby date of birth information is obtained through the use of some outward device. The construction category encompasses cases in which

participants were able to determine family members' year of birth by taking notice of their present age in relation to the current calendar year. Note that construction always targeted the year but not the month or the day. The recall failure category comprises statements that pertain to the participant's inability to recall the birth date of family members. Three themes emerged in these various accounts of failure: information deemed unimportant, lack of interest and motivation, and insufficient focus of attention. In some cases, also, a sense of self-doubt appeared regarding one's memory ability. The fourth nonspecific category consists of statements that do not lend themselves to clear interpretation as to memory activity. Some of these statements may be lengthier in form, such as "He was born just after midnight, and I can remember the ride to the hospital." But most consist of one or two words, such as "past experience," "thoughts," "memory," and others. Quite possibly, a more interactive method might show that many of these nonspecific statements actually engage the memory process that we looked at next.

The six top categories bear a relationship to memory performance. In a few cases, as we see in the recency effect category, participants were able to recall birth date information because they had just recently experienced it. Two categories are used to express the claim of immediate recall. In the direct recall category, birth date recall is said to occur instantaneously: "It comes so naturally and quickly (like my own birthday) that I'm not sure what triggers it." As for the memorization category, immediate recall is made possible by effortful memorization or sheer amount of exposure:

“After many years of filling out school and medical forms, it’s pretty much embedded in one’s mind.”

But most of the statements pertaining to birth date recall belong to the attitude, indefinite referent, and referent-rule categories. In contrast to the others, these three categories offer a more immediate description of thoughts and feelings that accompany the memory for date of birth experience. The sizable attitude: importance-feelings category ( $n = 101$ ) brings out various emotional and evaluative aspects associated with birth date memory experience. What this category implies is that emotions may be an important component of the memory-for-date-of-birth process. The indefinite referent category is also large ( $n = 117$ ). It includes statements that identify some person, event

or relation by means of which birth date memory may be accessed. What it fails to specify—thus the term indefinite—is how exactly did the access take place. Thus, to be told that someone was born in the spring does not tell us whether it is April or May.

By far the largest number of statements was found in the referent-rule category—all told 567 or 61% (Table 1). In addition to identifying an object that makes recall possible, these statements also point to or imply a rule by which the person is able to access a specific birth date or one of its units: “I remember my daughter’s birth year because it was two years after my son’s year.” “I remember it is in August because her birthday always falls when we are on vacation.” “We celebrate her birthday three days before 4th of July.”

**Table 1. Categories of Psychological Meaning in Relation to the Date of Birth Recall Experience: (1) Memory Process Present, and (2) Memory Process Absent or Ambiguous**

Categories of Psychological Meaning		Frequency	Percentage
(1) Memory process present:			
Referent-Rule	Identification of a specific referent in connection with a rule. “I remembered it because it is on St. Patrick’s Day. I remember it because my mom is all Irish and it’s a fun time at home.” “I remember that this birthday is near Christmas. Therefore, I remember the birth month is December.” “His birthday is in June which is the 6th month and he was born on the 6th day.” “The year was ’47 and that’s switched from mine ’74.”	527	61
Indefinite Referent	Identification of an open-ended referent. “There’s a summer and there’s carnival.” “We always celebrate my father’s birthday together with a religious holiday.” “I always knew it was around Spring break.”	117	14
Attitude: Importance-Feelings	Presence of an attitudinal stance. “I only expected to have a son and was overwhelmed when I also had a daughter. I could never forget the birth of my twins.” “He was my only son so it was an important date to me.” “My wife threatens my life if I don’t remember.”	101	12

Categories of Psychological Meaning		Frequency	Percentage
(1) Memory process present:			
Direct Recall	Experience of automatic recall. “It just popped into my head.” “I just know it.” “These are things you just automatically remember.”	76	9
Memorization	Deliberate commitment to memory. “I just made myself memorize it.” “I know the year from filling out forms.” “Brain washed myself.”	27	3
Recency Effect	Occurrence of a recent reminder. “It just past.” “Heard it recently.” “We are planning a surprise party for his 60th birthday coming up.”	8	1
(2) Memory process absent or ambiguous:			
External Memory Aids	Use of object or person as an instrument of recall. “I carry a copy of her green card.” “My license plate.” “She always reminds me.”	10	
Construction	Use of person’s age to construct his or her year of birth. “Subtracted her age from this year.” “I figure out the year by subtracting his age from the current year.”	31	
Recall Failure	Reasons for inability to recall. “I don’t memorize dates very well.” “She doesn’t have a party or celebration.” “I never bothered to remember.”	63	
Nonspecific	Statements not specific enough for interpretation. “My mother celebrates by buying something new to wear.” “Thoughts and past birthday parties.” “I remember it with the use of memory aids.”	181	

Seeing that referents played a crucial role in enabling birth date memory access, we decided to take a closer look at the kinds of referents participants bring to bear on the process of birth date recall. Table 2 presents a list of 11 referent objects carried in the statements of the two referent categories. The frequency with which these referent objects occurred is shown for both the referent-rule and indefinite referent (found in parentheses) categories. However, all the examples of the different kinds of referent objects belong to the referent-rule category.

Interestingly, the referent objects fall into four groups. The first group, consisting of four referent objects, revolves around persons starting with one’s own self and ending with non-family members. In every case one’s knowledge of another’s birth date serves as a reference point for accessing the birth date of a family member. Note that one’s own self appears as the most frequently used object. Next in order are members of one’s immediate family, and then come the more distant relatives. Least frequently used are one’s acquaintances, those outside the circle of relatives.

**Table 2. List of Referent Objects and Frequencies for the Referent–Rule (Open Numbers) and Indefinite Referent (Numbers in Parentheses) Categories**

Referent Objects		Frequencies	
Myself	Subject himself or herself. “My age minus 21 years.” “Born same month as myself.” “Her birthday is one day after mine.”	108	(6)
Family Member	An immediate family member. “I recall because my first son was born in the same month.” “Three days after oldest daughter.” “She’s four years younger than her sister T.”	87	(18)
Extended Family Member	A relative outside the immediate family. “My mom’s birthday is four days before my grandmother’s.” “The year he was born is the same as my husband’s.” “It is the same day as my favorite cousin’s birthday.”	23	(1)
Significant Other	An important person. “My best friend G’s birthday is June 26th and he was born the 27th.” “It happens to by my boyfriend’s birthday.” “My friend’s birthday is one month before hers.”	12	(1)
Season	Season of the year. “The morning she was born there was a terrific snow storm and it looked so much like Christmas–December.” “I can remember the month of April because it was the most beautiful spring that I can ever remember.” “Season reminds me–best fall weekend of year–last time to see colorful leaves before they are blown off.”	16	(33)
Calendar	A calendar cycle. “September always comes to mind because my oldest child started kindergarten (school month) while I was still in the hospital with R.” “She is the last day under the Libra sign.”	9	(7)
Holiday	A day of celebration. “She was born on George Washington’s birthday.” “Twenty days after the New Year.” “My brother was born on Mother’s Day and he will never let us forget that.”	103	(12)
Significant Event	An important personal event or experience. “I was wondering if she would be born on my anniversary the 28th. I remember her date, being born five days before my anniversary.” “I always remember that my daughter died November, 1985; and, since I was pregnant with this child at the time, I know he was born the following March in 1986.”	45	(19)
Meaningful Fact	An important fact or occurrence. “As for the year 55, five is my lucky number.” “She was born the year of America’s bicentennial celebration – 1976.” “When she was born our twins were 10 years old.”	78	(14)

Referent Objects		Frequencies	
Relation	Grasp of a connection between two or more events. "Two kids birth date the same month and hers is last." "First I remember the month (8) and then the day is the same (8)." "My husband's birthday is 8/2 and mine is 2/8; this is how I always remember it... I simply reverse my birthday."	68	(9)
Position Effect	Awareness of a salient point. "I just remember that he is second to the last day in that month." "I always remember the year because the decade changed. It was 1960." "First day of December—it's easy."	44	(3)

*Note.* All referent object examples pertain to the referent–rule category.

The next referent group comprises temporal type events: experiences related to season, calendar timelines, and holiday periods. For the indefinite referent category, season is the only referent object that occurs with greater frequency ( $n = 33$ ), even to the point of exceeding the referent-rule category. As one can see, the holiday group for the referent-rule category was quite large ( $n = 103$ ). Only the days that are socially recognized as celebratory were included in this group. Thus, if someone referred to Mozart's birthday, that reference was simply considered a meaningful fact type object.

This brings us to the next two referent objects—significant events and meaningful facts. Although these two objects are closely related, since they both refer to a certain mental experience, they differ in terms of their memorial basis. Significant events refer to episodic memorial experiences that are singular and unique and are not part of some context, such as the season cycle. A typical example would be the following: "The doctor told us he would be born on September 20th, and my husband said: 'the doctor is wrong—he'll be born on the 21st,' and he was, and that helps me remember the day." Meaningful facts, on the other

hand, express a factual piece of knowledge. Although the objects of knowledge can be quite varied, ranging from historical events to one's lucky number, they all represent a certain cognitive grasp that comes to serve as a reference point. Even a certain intonation may become cognitively meaningful and serve as a basis for birth date recall: "6-2-82 has a certain rhyme to it, and I have always remembered it that way."

The last two groups of referent objects, relation and position effect, depend on relational mental activity. What participants come to grasp in this case is some kind of interrelatedness inherent in the object of knowledge itself. In the case of relation referents, they might apprehend a certain type of connectedness among the aspects of the known object. This often takes on the form of analogy: "M was my second child born on the second day of the month," but it may also express other forms of relationship: reversal, presence of pattern, etc. For instance, "Our children's ages are 27, 25, 17, and 15. It's like having two separate families." As for the position effect referent, it points to the recognition of contextual contrast in which a certain time unit might stand out more distinctly, as, for instance, coming first

in a sequential order relative to others. Thus, “It is the first day of the month.”

The referent-rule category, in addition to specifying a referent object, also identified a rule process by means of which date memory access took place. Table 3 lists five types of rules associated with the various referent objects. As to the origin of these rules, they obviously bear the markings of an inference that the participant must have formed as they

interacted with date of birth information. For this reason, the rules appear to possess a logical character: one simply has to work out the implications, and the birth date information becomes available. Sometimes the rule encompasses all three units of date of birth; more often it is limited to one of the units: month, day or year.

The direct identity rule simply makes a straight connection between a known refer-

*Table 3. List of Rules Used in the Inference Process*

	Rule	Frequency
Direct identity	Presence of straight identity between referent and subject’s date of birth. “Seven is my lucky number (for day 7).” “Same month as my father.” “It’s the same day as my own.”	137
Mediated identity	Presence of an intermediary connection between referent and subject’s date of birth. “Her birthday lands on Valentine’s Day.” “I remember that this birthday is near Christmas. Therefore, I remember the birth month is December.” “It falls on St. Patrick’s Day.”	111
Functional relation	Presence of an intervening function, which relates a referent object to the subject’s date of birth. “Two years after first born. $1980 + 2 = 1982$ .” “Well, since her birthday is only three days after my birthday, I just added three to my birthday.” “My Dad’s birthday is always remembered because it comes 5 days before Christmas.” “My daughter’s birthday is 6 days before our anniversary.”	225
Analogy	Presence of analogy among referent objects in relation to subject’s date of birth. “First I remember the month (8) and then the day is the same (8).” “My son is also my first child and he was born on the first. As soon as I think of my first son, I recall his birthday to be the first.” “And who could forget that your child was born on <u>Labor Day</u> of that particular year.” “I first think of Jamie (her name) which begins with ‘J’ and so does June.”	42
Disjunction	Presence of disjunction between referent objects in relation to subject’s date of birth. “I remember August and know the numbers aren’t the same (month and day), so then I know it’s 9 instead of 8. The reason I do this is the next child (and last) is on the 8 <sup>th</sup> day and sometimes I get mixed up with 8 and 9.” “I keep getting 22 vs. 23 mixed up with my sister. Amy’s (sister) the 23.” “I’m able to remember it because of the numbers 4-8-46. My mom used to trick us by saying it was 4-6-48 – that would make her 2 years younger. I remember by saying April eighth: they both begin with the “a” sound. April sixth doesn’t have that.” “I know that her birthday is the last one of the year in our family. I usually just think of her birthday being last. I know there are no family birthdays in December, and November is the next logical choice.”	16

ent and the date of birth. For example, “She was born the same month as myself.” may be regarded as: The month she (*s*) was born = the month I (*i*) was born, or symbolically:

$$s = i.$$

The mediated identity rule appears to operate as a categorical syllogism. Take, for instance, the statement: “Her birthday lands on Valentine’s Day.” This may be viewed as a syllogistic argument in which the first term is understood:

The date of Valentine’s Day =  
February 14th.

The date of her birthday =  
the date of Valentine’s Day.

Therefore, the date of her birthday =  
February 14th.

The functional relation rule introduces a function to bridge the gap between the referent and some birth date element. This rule occurred most frequently ( $n = 225$ ). Thus, the statement: “Two years after first born.  $1980 + 2 = 1982$ .” implies the following logical argument:

The year first born was born = 1980.

The year he (target) was born =  
two years after first born.

But  $1980 + 2 = 1982$ .

Therefore, the year he was born = 1982.

The analogy rule, too, though not as prevalent as the first three rules ( $n = 42$ ), played an important role in helping participants access birth date information. By drawing a relationship with something known, analogies, in a sense, tell us how to look for the appropriate birth date unit. Some of the statements carried the standard analogy format, as in the expression: “And who could forget that your child was born on Labor Day of the particular year.” Thus,

Birth is to labor as September  
is to Labor Day.

Symbolically,  $A : B :: C : D$ .

However, most often the analogies assumed a semidegenerate form (Sternberg, 1977), as can be seen in the following statement: “I first think of Jamie (her name) which begins with a ‘J’ and so does June.” Thus,

Jamie is to J as June is to J.

Or,  $A : B :: C : B$ .

The least common rule takes on the form of a disjunctive syllogism ( $n = 16$ ). Consider the following example: “I usually just think of her birthday being last. I know there are no family birthdays in December, and November is the next logical choice.” We can formulate this argument as follows:

Her birthday is either in December  
or November.

But it cannot be in December.

Therefore, her birthday must be  
in November.

Taking a cue from Kuiken, Schopflocher, and Wild (1989), who make a case for combining the phenomenological method with numerical analysis, we next took a closer look at the nature of transition implicit in the rule process as it enables contact with a date unit. For identity, analogy, and disjunction rules, the transition from the referent to the date unit is immediate. Thus, to connect the lucky number 7 with day 7 is to access the day element directly, with no mediation. Quantitatively immediate transitions may be represented as zero. However, in the case of the functional relation rule, the transition from the referent to one of the birth date units (day, month or year) is mediated by some numerical difference value, such as

one day before Christmas or three years after dad's date of birth, representing difference values of  $-1$  and  $+3$ , respectively. In the final phase of analysis, all the zero and difference values were brought together and looked at separately in relation to the three birth date time units: day, month, and year.

The results of this analysis are presented in Figures 1, 2, and 3. A glance at these figures shows that they all have two common features. First, the most frequently occurring score by far is zero. These would be cases where recall is assumed to be immediate. This is especially true in the case of the day and month units. Second, the distributions of difference values, with a few exceptions, fall well within the range of immediate memory span. Those values that do exceed the range, such as 10 or 20, probably do so by assuming some special meaning. Beyond these commonalities, the three figures for day, month, and year value distributions are marked by signifi-

cant differences. Looking first at Figure 1, the day difference values approximate a normal distribution, and one that is surprisingly symmetrical—the positive and negative scores are nearly equal. As for Figure 2, what stands out is the predominance of zero values. Apparently, birth months for the most part are accessed immediately. The few difference values that do occur tend to cluster around the zero score. This implies, of course, that the month temporal scale lacks a natural quantitative continuum. The relations among the months, rather, seem to exhibit a qualitative character: essentially, the month stands as a location point with a before and after. Finally, as we can see in Figure 3, the year difference values do show a significant spread, not unlike the day difference values. However, what distinguishes the year difference value distribution is the presence of a strong negative skewness. Over twice as many scores are positive as negative. Note also that the

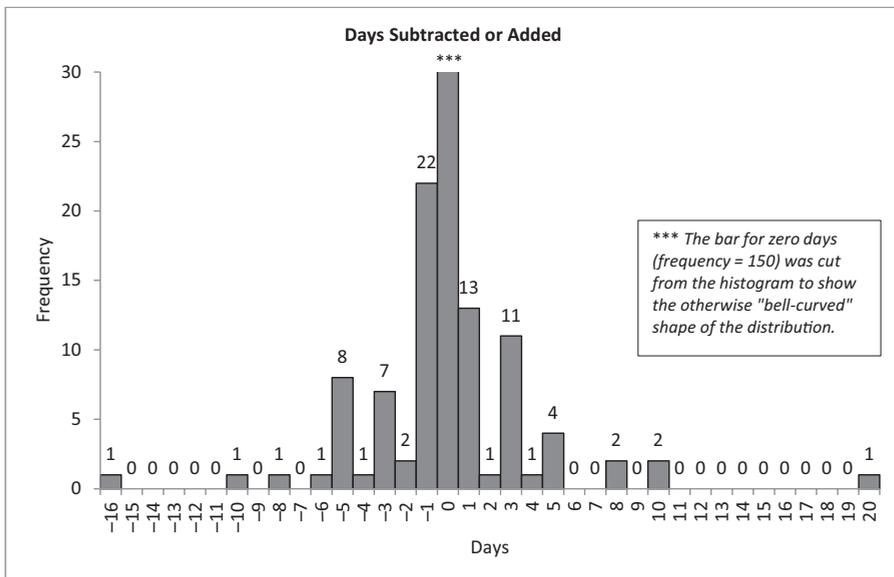


Figure 1. Days considered as identical (0), added or subtracted in transition from the referent point to the day unit.

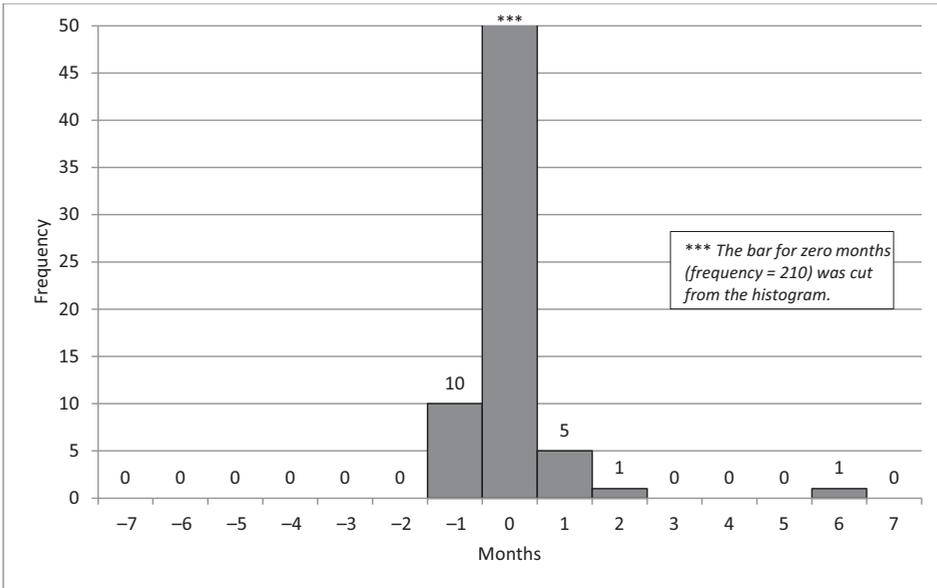


Figure 2. Months considered as identical (0), added or subtracted in transition from the referent point to the month unit.

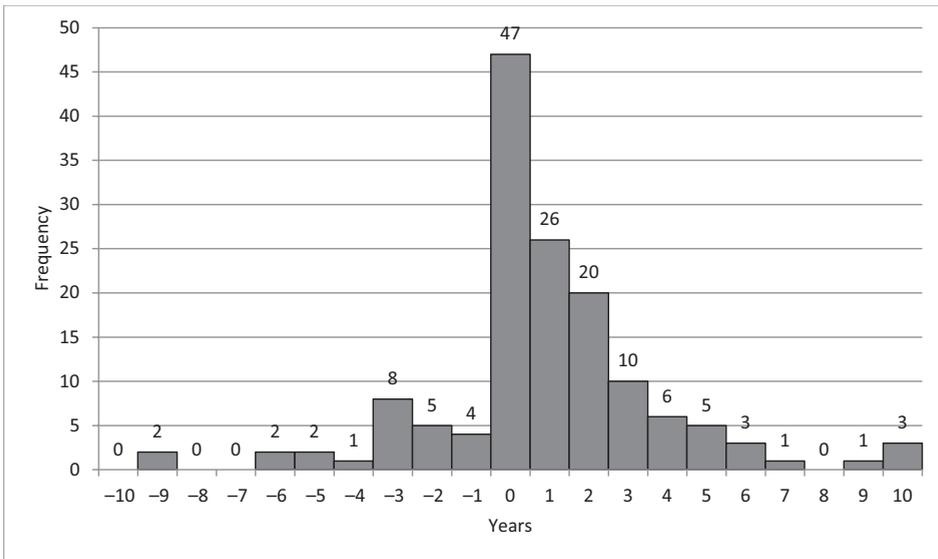


Figure 3. Years considered as identical (0), added or subtracted in transition from the referent point to the year unit.

year has far fewer transition markers ( $n = 138$ ) than either the day ( $n = 229$ ) or the month ( $n = 227$ ).

It should be mentioned, incidentally, that there were 18 cases of the week time unit

serving as a transition marker. Of these, 10 pertained to one week.

As a general summary, we can say that birth date recall commonly depends on the use of referent objects or starting points

that guide the memory access. The actual transition from a specific referent to birth date information is made possible by a logical process. Moreover, strong feelings may be associated with birth date memory. In some cases, birth date recall appeared to be immediate.

### *Assessment of memory performance*

We evaluated memory performance in the following two ways. In one instance, memory performance was related to some family variable (role, position, etc.); in the other, it was connected to the outcome of phenomenological analysis, especially the role played by the referent-rule category. The criterion for recall assessment, it should be noted, was the date of birth provided by the participants themselves. Hence, in considering recall performance, only participants who had provided their date of birth were taken into account. In the first analysis, correct recall was inclusive of all three date units, in the second it varied—inclusive of all three or each taken separately.

Turning first to the family variables, the spouses recalled each other's birth date with perfect accuracy. The image of a forgetful husband was obviously not to be seen in these data. However, a difference did appear in the parents' recall of their children's date of birth. Whereas mothers' recall was again perfect (100%), fathers were correct in 80% of cases.

Children's recall of parents' birth dates—collapsed across fathers and mothers because the two were relatively the same—was significantly better in the case of daughters than sons, 51% versus 34%, respectively,  $\chi^2(1) = 4.41, p < .05$ . On the other hand, children's recall of siblings' birth dates

was better overall than of parents', but also offered a more complex picture. Brothers' and sisters' recall of each other's birth dates was gender-specific. Thus, correct recall of birth dates for brother to brother was 65%, but for brother to sister only 61%, whereas that for sister to sister was as high as 88%, for sister to brother 58%. Clearly, as the apparent closeness within the family unit increases, correct recall of the other's birth date becomes more likely: between same gender siblings (75%) > between different gender siblings (63%) > children to parents (42%). But notice also that the girls in the family were much better at recalling birth dates than the boys.

Next, we looked at the order in which parents recalled children's birthdays relative to their birth order, that is, if a child was born first, was his or her birthday also recalled first, etc. To explore the correlation between order of recall and birth position, the children were grouped into three categories: first for first born, middle for those born between first and last child, and last for last born. Since the orders of recall of father and mother were basically the same, the data were combined for both parents. The contingency coefficient ( $C$ ) revealed a high degree of correlation between the two variables,  $C = .73, \chi^2(4) = 191.84, p < .001$ . When asked to recall their children's birth dates, parents tended to start with the oldest child (first born) first and work towards the youngest. Interestingly, even children showed a strong sensitivity for birth position as they recalled each other's birth dates,  $C = .47, \chi^2(4) = 53.48, p < .001$ .

We might point out that the observed contingency helps explain the negative skewness found for the recall of the year

unit (Figure 3). Since most often recall started with the first born, participants ended up adding years as they figured the years of the younger family members. Hence, there are more additions than subtractions.

The final analysis explored the possible effect that the referent-rule might have on birth date recall. It was carried out in two ways. In the first case, the average number of referent-rules was calculated for mothers, fathers, daughters, and sons. Their means, respectively, were 6.36, 3.73, 3.33, and 2.48. Interestingly, this mean referent-rule alignment was perfectly correlated with the likelihood of correct recall of children's birth dates (all three units together): respectively, 100%, 80%, 74%, and 63%.

In the second case, brothers' and sisters' use or non-use of the referent-rule was related to the recall of each of the three birth date time units: month, day, and year. The results of this analysis are shown in Table 4. As can be seen, when the referent-rule was present, recall performance was outstanding. Recall of month and day time units hovers just below the ceiling. Notice that the year unit lags behind, but this could be an artifact of the greater prevalence of referent-rule statements that pertain to month and day (see Figures 1–3). When cases of the referent-rule statements that only mention month and day are set aside, the proportion of correct recall for the year increases dramatically: .93 for brothers and .90 for sisters. If an error occurred, it was more likely an incorrect recall rather than an omission. Notice also that recall performance for brothers and sisters was practically identical. On the other hand, when the referent-rule was absent, both brothers and sisters showed a noticeable decline in recall across all three time

units, with best recall for the month unit, second best for the day unit, and worst for the year unit. In the case of errors, omissions by far predominated relative to incorrect recall. Interestingly, in this situation sisters' recall performance exceeded that of brothers across all three time units. Given that incorrect recall was almost equivalent for the two groups, the difference in recall would appear to be driven by failure to recall since omission errors were far more common for brothers than for sisters.

Attempts to relate some of the other categories of psychological meaning—indefinite referent, attitude, and direct recall combined with memorization (Table 1)—to recall performance simply replicated the general finding that parents were far more accurate in birth date recall than children. Proportion correct for parents ranged from .92 to 1.00 and for children from .45 to .59 across the three categories. The only result of note, perhaps, was the finding that almost twice as many children ( $n = 65$ ) as parents ( $n = 38$ ) claimed to have recalled birth dates immediately (direct recall and memorization). But claims of immediate recall, apparently, do not necessarily imply accuracy. Proportion correct for children was only .56, but for parents it did stand at 1.00.

## Discussion

The most striking feature of these results, no doubt, is the enormous dependence of birth date recall on reference objects. Approximately three-fourths of recall attempts took place in relation to some referent. In contrast, spontaneous recall of birth dates only accounts for about 12% of cases, including partial date recall where the subject's certainty is limited to the month or the day.

**Table 4. Proportion Correct Recall and Errors for Brothers and Sisters in Relation to the Presence or Absence of the Referent-Rule**

	Referent-rule							
	Present				Absent			
Siblings	<i>n</i>	Correct recal	Incorrect recall	Omissions	<i>n</i>	Correct recall	Incorrect recall	Omissions
Brothers	74				77			
Month		.99	0	.01		.59	.05	.36
Day		.92	.05	.03		.47	.08	.45
Year		.76	.16	.08		.34	.18	.48
Sisters	101				58			
Month		.97	.03	0		.78	0	.22
Day		.99	0	.01		.59	.15	.26
Year		.78	.15	.07		.50	.17	.33

Turning first to the role that referents play, one can readily notice a close parallel between the memory for time-of-past-events literature and the birth date memory findings. Both cases appear to be dependent on temporally based reference systems. That is not surprising, of course, since in both cases subjects try to capture a moment in conventional time. In doing so, as one might expect, they relate the time units to various temporal reference points that can later serve as cues to make the time units available.

One common strategy subjects use in reconstructing the time of past events is to connect them with some landmark within a cyclical time period such as season, holiday, and so on (Belli, 1998; Friedman, 1993; Kurbat, Shevell, & Rips, 1998; Thompson, Skowronski, Larsen, & Betz, 1996). As we can see in Table 2, our participants also made extensive use of the “season,” “calendar,” and “holiday” referents to set the stage for birth date recall. Another strategy that helps with reconstruction is use of landmarks within linear time, that is, something

outstanding that has occurred at some point in the past, such as graduation from high school (Belli, 1998; Fradera & Ward, 2006; Shum, 1998; Thompson et al., 1996). Birth date recall, too, was dependent on linear landmarks as evidenced by the “significant events” referent category (Table 2), where we encounter such entries as wedding anniversaries, death of a child, birth of twins, and others. In the third case, events may be located on the basis of time sequences that have a beginning and an end (Friedman, 1993; Kurbat et al., 1998; Thompson, Skowronski, & Lee, 1988). In the case of birth date recall, the same phenomenon was observed in the “position effect” referent category (Table 2). Here, the position salience mediates the date recall process.

The family-centered categories, which may also be regarded as temporal type referents, do not seem to play a prominent role in memory for the time of past events. However, their role in birth date recall is very important. As we see in Table 2, use of one’s own and family members’ (even those of close friends) birth date time units was

one of the most common reference points for recalling date of birth.

Birth date recall, however, also differs from the task of trying to remember the time of past events. This is evident in the use of non-temporal type referents. Again, these referents are self-standing units of knowledge that guide the birth date recall process. In Table 2, we find these referents in the “meaningful fact” and “relation” categories. Thus, the lucky number 55 may stand as a beginning point for recalling the year of birth.

The use of different referents between subjects seeking to locate past events in time and those trying to remember birth dates is not at all surprising. In the first instance, we are typically dealing with an open-ended event that is remote and indeterminate. As a result, subjects need to engage in a process of reconstruction, drawing connections and resorting to inferences in order to approximate the time the event took place. No doubt one would expect referents with temporal bearing to play a prominent role—as they do—in the reconstruction process. And, quite possibly, many of these referents, as Friedman (1993) argues, carry a type of information that is location-based. In the case of birth date memory, we encounter a task which calls for veridical mastery of a set of time units that we can take into the future. What is important here is to be specific and precise. To this purpose, any referent that helps position a time unit can prove to be useful; both temporal reference formats and number or identity based referents can be helpful in this regard. Thus, when it comes to capturing a moment in time, any referent that bears a meaningful relationship to a given time unit may be an effective prompt for its later recall.

Although the reference formats may vary as we move from timing past events to recalling birth dates, the process of engendering memory for time appears to be the same. In both cases subjects utilize contextual or self-generated insights as a basis for making logical inferences or meaningful connections in order to ascertain or access a particular time unit.

Additional convergence between the two areas of research—timing of events and birth date memory—can be seen in the presence of scale effects. Note that, if scale effects are present, one can then argue that time is represented uniquely in each of the time units; if there are no scale effects, then time can be thought of as having a common abstract basis. Friedman and Wilkins (1985) have shown that in remembering the times of past events, subjects represent the various time units such as day, month, and year, in a manner that is different in each case (see also Friedman, 1993; Huttenlocher & Prohaska, 1997). Similarly, the birth date memory results point to the existence of scale effects. Independent processing of time units is especially evident in the three graphs that depict time calculations for day, month, and year. The day scale (Figure 1) clearly has a quantitative character. The day difference scores are distributed normally around the target value. The month scale (Figure 2) appears almost qualitative in nature, with the difference scores showing little departure from the normative middle. The year scale (Figure 3) is marked by negative skewness.

One referent that has attracted special attention is the self. In their investigation of birthday memory, Rathbone and Moulin (2010) found that subjects recall their

friends' birthdays better if these happened to be in close proximity to their own birthday. On the basis of these findings they concluded that the self has a unique effect on the process of birthday retrieval. A contrasting view is offered by Bower and Gilligan (1979). Finding that the "self" and "mother" concepts are equally effective in promoting retrieval, they conclude that "there is nothing special about the self-schema as a mnemonic peg" (p. 429). According to them, any well-developed system of knowledge can serve as a basis for retrieval from memory. Our own data are more in line with Bower and Gilligan's interpretation. The self, certainly, is the context within which all memory takes place. However, the role it plays is not that of some abstract reference system, but as a source of knowledge that may have bearing on the task at hand. Some of this knowledge may pertain to the self, as in the case of the referents "myself"—knowing one's own birth date, "meaningful fact"—having a lucky number 55, and others. But even a greater portion of this referent knowledge pertains to various other aspects of the person's life: knowing one's sister's birthday, that Christmas is near, and so on. At least within the confines of this study, it is the known object as such irrespective of its origin that plays the vital role in prompting birth date recall.

Also of interest is the general finding that females are better at recalling birth dates than males. Thompson et al. (1996) had discovered a similar relationship. In fact, Harris (1980) suggests a possible reason why females (mothers, wives) are so good at birth date recall: they view the task of remembering birthdays as their responsibility. Although females outperformed

males in general, this study also harbors a caveat. When it comes to siblings, recall of each others' birth dates for brothers and sisters showed an interesting interaction. Within-gender recall of birth dates exceeds between-gender recall. Thus, in this limited respect, female superiority in recalling dates of birth breaks down: brothers are better at remembering birth dates of male siblings than sisters are. Harris (1980) is possibly right in speculating that motivational differences drive the difference in recall performance. But the more immediate source of this difference, as the results of our study suggest, may be due to the more prevalent use of the referent-rule.

However, as mentioned before, the special feature of the birth date recall task is that it calls for the accurate retrieval of a specific target item. In order to attain the appropriate date unit, as we have seen, subjects often resort to referents or certain starting points. In a similar way, when dating events, subjects rely on referents to infer the approximate time of a particular event. As for recalling a specific time unit, however, approximation will not suffice; what is needed is complete accuracy. To achieve accuracy, apparently, the referent needs to be provided with a bridge or a linkage (the "rule") by means of which the date unit can be attained. As can be seen in Table 3, these rules, seemingly, have a logical basis.

Of course, the idea that logic (thinking) and memory are somehow related is not new. It reaches back at least to Aristotle and, amongst others, was developed further by Thomas Aquinas who thought that "recollection is like reasoning" (Carruthers, 2008, p. 80; see also Brennan, 1941). In the modern period of psychology, the most pointed

reference to the close relationship between logic and memory was offered by William James (1900) when he argued that memory functions best when “merely contiguous associations” are replaced “by the logical ones of identity, similarity or analogy” (p. 126). An explicit investigation into the role that logic might play in memory processes was first initiated by Albert Michotte (Gavin, 1975) under the heading “logical memory.”

In a broad sense, the referent-rule unit may be seen as operating within the framework of the encoding specificity principle (Tulving, 1979; Tulving & Thomson, 1973). What the referent-rule unit tells us, more specifically, is that the product of encoding is a complex entity, consisting of a referent and a rule combination that is needed to provide access to a target event. The referent is some object that serves as a starting point from which to initiate memory access, telling us, in a sense, from where to look. The rule serves as a linkage created by a logical process that points the way to the memory event, in a sense, telling us how to look. Both working together make recall possible.

The actual implementation of the referent-rule unit takes place by way of an inferential process that consists of two phases: induction and deduction (Casey, 1987; Stein, Wade, & Liwag, 1997). In the induction phase, the subject intakes (encodes) a referent-rule unit that points to some target event. This intake process, it is assumed, is carried out as a conscious

deliberative mental activity (Dulany, 1997) that involves judgment. On the one hand, there is the selection of a referent that may be potentially connected with the memory target. On the other, and probably in tandem, there is the creation of a bridge that enables movement from the referent to the object of memory. The bridge, as we saw, seems to be based on some kind of logical connection, for example, identity, between the referent and the target. The establishment of these logical connections, some would argue (e.g., Braine, 1994), depends on mental logic that characterizes cognitive activity. In the end, the subject sets up a kind of scaffolding with a structure and a walkway that makes memory access possible.

In the deductive phase, the subject, so to speak, makes use of the scaffolding that they have constructed. When challenged to remember a particular event—in our case, a person’s birth date—they can turn to a well established item of knowledge, for example, Mother’s Day, and infer from there that this person was born in May.

The results of this study, of course, are limited in time and place. However, they do point to questions that could be investigated further. For example, how might references change in response to changes in the cultural environment? Over a person’s lifetime, which referent-rule units stay steady and which might tend to alter? How does direct birth date retrieval develop? Is it a byproduct of reference-based retrieval or does it possibly arise independently?

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## GIMIMO DATŲ ATSIMINIMAS: ATMINTIS KAIP NUOSEKLUS SAMPROTAVIMAS

Algis Norvilas, Jeffrey Miller

### S a n t r a u k a

Straipsnyje pristatomi aprašomojo pobūdžio (kokybine analize grįsto) epizodinės atminties – artimųjų gimimo datų atsiminimo – tyrimo rezultatai. Tyrimo dalyviai turėjo prisiminti savo šeimos narių gimimo datas ir aprašyti šio atsiminimo patirtį. Buvo atliktos atsiminimo patirties protokolų fenomenologinė ir atliktos analizės. Fenomenologinė analizė parodė, kad gimimo datos atsiminimas dažniausiai buvo lemiamas pradinio atskaitos taško, kuris loginiu ryšiu siejosi su data, kurią stengtasi prisiminti.

Atlikties matavimas atskleidė sąsajas tarp taisykle grįsto atskaitos objekto naudojimo ir gimimo datos atsiminimo tikslumo (atitikimo tikrovės). Straipsnyje šie rezultatai aptariami juos susiejant su literatūra apie laiko ir įvykių atmintį, ypač atkreipiant dėmesį į atskaitos objektų panašumus ir skirtumus bei skalės efekto pasireiškimą.

**Pagrindiniai žodžiai:** atmintis, atsiminimo atitikties tikrovės, autobiografinė atmintis, loginė atmintis, loginės išvados.

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