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Maria Shelby Jones Date

Putting Everything in its Place: The Role of Spatial Information in Personal Narratives

By

Maria S. Jones

Psychology

_____

Patricia J. Bauer, Ph.D.
Advisor

_____

Jocelyne Bachevalier, Ph.D.
Committee Member

_____

Robyn Fivush, Ph.D.
Committee Member

Accepted:

_____

Lisa A. Tedesco, Ph.D.
Dean of the James T. Laney School of Graduate Studies

_____

Date

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By

Maria S. Jones

B.A., Spelman College, 2011

Advisor: Patricia J. Bauer, Ph.D.

An abstract of

A thesis submitted to the Faculty of the

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Abstract

Reminiscing about our personal past events is an integral part of our culture. Episodic memories are personal event memories that occurred at a particular place and time with the role of the self in these memories is represented in a type of episodic memory known as autobiographical memory. The importance of place information in personal memories is clear given that it is a defining characteristic of this type of memory, however very few studies have investigated the role of location in autobiographical memory. When investigated, location is typically embedded within numerous questions surrounding the context of an event, typically a traumatic event. It was therefore the purpose of the present study to provide the first systematic investigation of how adults spontaneously used location information in their autobiographical narratives, to determine the differences in location information by event type, and to investigate whether location information would predict narrative coherence. We investigated differences in spatial location representation by examining adults' (n=29, *m* age = 37) written narratives of the following 5 memories: earliest memory, transition to school, birth of a child, their child's transition to school, and a recent event. Each narrative was coded for coherence (context, chronology, and theme) and location (type and referent). Results indicated differences in overall use of location information as well as key differences between earlier and later memories. Specifically, more global location references were used in recent memories whereas more local references were used in earlier memories. Geographic location information was related to the thematic coherence of earlier but not later memories. Together, these findings indicate that location information varies by the type of event and relates to the quality of earlier memories.

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Putting Everything in its Place: The Role of Spatial Information In Personal Narratives

Reminiscing about past experiences is an integral part of our lives. Whether recounting the events of the day to one's family or discussing a recent vacation with a friend, the act of sharing personal experiences is prevalent in our culture. In these narratives, information regarding the time and place certain events occurred play a crucial role in constructing a coherent story such that a naïve listener can easily comprehend one's story. Therefore, the telling of these narratives would not be complete without the inclusion of details of when and where the event occurred. Despite how critical it is to understanding our personal recollections, the *where* component has been largely neglected in memory research whereas the *when* aspect of personal memories has been more thoroughly investigated.

The importance of place information in personal memories is clear given that it is a defining characteristic of this type of memory (Tulving, 1983). In his definition of episodic memory, Tulving gives place information the same level of significance as time and yet little is known about which type of spatial attributes might help organize autobiographical memories. Therefore, the purpose of the current research is to investigate the role of spatial information in organizing autobiographical memories. Specifically, the current research has two principal aims: 1) to determine how individuals use spatial information in their personal narratives and 2) to use that information to predict narrative characteristics. First I will present a definition of autobiographical memory, as having a clear definition of this type of episodic memory is crucial to understand the importance of location in our past experiences.

Location in Episodic Memory

Episodic memory is defined as the memory for past events that occurred at a particular time and place (Tulving, 1985), or event memory, with autobiographical memory being the role of the self in those past events (Conway, 1992). According to William James, "Memory requires more than the mere dating of a fact in the past, it must be dated in my past" (pp. 650, James, 1890). Being consciously aware of oneself in the present actively reflecting on oneself in the past, or *autonoetic consciousness*, is an important feature of autobiographical memory (Tulving, 1985; Wheeler, 2000). According to Tulving (2002) this self-awareness allows us to travel back in time through our personal timeline and retrieve a memory through *mental time travel*. In order to consciously engage in this mental time travel, one must have adequate knowledge of the remembered event, including key event characteristics such as location. Without this information, one would not know the destination of this mental time travel and would therefore have considerable difficulty navigating back through time and knowing where to stop on one's timeline to retrieve the correct memory.

Aspects of spatial location in episodic memory have not been completely excluded from the literature. The spatial cognition literature has focused on memory for object location (e.g. van Asselen, Kessels, Kappelle, & Postma, 2008), neural activation in spatial cortices during retrieval of episodic memories (Cabeza et al., 2004), and with location cues being critical for remembering (e.g. Bahrick, 1974). Research has focused on key aspects of spatial cognition that allow humans to determine their physical location in space (i.e. body part orientation) and the location of important objects in the environment relative to oneself (Marshall & Fink, 2001). Similarly, research on the

episodic-like memories in nonhuman animals has investigated their ability to remember locations of objects across various delay periods, contexts, and species. Scrub jays, for instance, displayed spatial memory abilities for the location of different food items after a several day delay demonstrating a what, when and where memory mechanism (Clayton & Dickinson, 1998). In a similar paradigm, rhesus monkeys were able to remember the location of different foods for short delay periods but not for longer delays indicating *what* and *where* memory but not *when* (Hampton, Hampstead, & Murray, 2005). The spatial abilities of nonhuman animals can shed some light on the developmental origins of this skill in humans and further our understanding of this phenomenon. This information can be encoded using *egocentric systems* in which a location is always described in reference to the self (i.e. to my left) or *allocentric systems* that represent a focal point external to the self and can either be another person or object (Lourenco & Frick, in press). However, these studies focused more on how people orient themselves in space and not location in their personal lives.

One study investigated memory for personal location in a laboratory study with children. Bauer et al. (2012) investigated the development of memory for location in a laboratory study with preschool children. Participants included 4-, 6-, and 8-year-old children who participated in two sessions with a week delay in between. Older children had a better memory for the event, recognition of the event's location, and the combination of the event with its location indicating a developmental increase in performance. It seems that memory for personally experienced events and their locations develop across the childhood years. Given that older children were able to perform the complex task of remembering the combination of an event and its location, knowing how

adults conceptualize location is important understanding this developmental trajectory. The present study provided an initial foray into understanding the role of location in our personal memories by investigating how adults used location in expressing their personal experiences. Knowing how adults use location in their more personal autobiographical memories can provide insight into how *where* information is used in our personal experiences.

Location in Autobiographical Memory

Although there are few episodic memory studies of location, there are even fewer in the autobiographical memory literature. One method for analyzing these autobiographical memories is to ask individuals to provide narratives of certain events, which are then empirically analyzed. In this technique, participants are typically asked to provide verbal or written descriptions, in as much detail as possible, of a particular event from their past; these passages are recorded for later analysis by the researchers (McAdams, 1993). These written accounts of the events of one's life are self-generated memory representations and therefore are an ideal vehicle to begin investigating how location information is used in the recollection of our past events. Whether written or verbal, narratives are an ideal way to understand personal memories since it is argued that language and the construction of personal narrative are key aspects of autobiographical memories (Rubin, 1998). A complete canonical narrative will include key details of the who, what, where, when, why, and how of a particular event which are critical to autobiographical memory (Bauer, 2007). Given that we often use this language to interpret or convey events to others, it is important to investigate the role of location language in our personal memories.

Few studies have examined the role of location information in personal memories; those that have tend to focus on traumatic events. Studies of flashbulb memories typically ask the participant to record the "who, what, when, where, why, and how" details of the particular memory (e.g. Talarico & Rubin, 2003). Brown and Kulik (1977) found that the most consistently reported aspects of memories for highly public emotional events, specifically the assassination of President Kennedy, were the respondents' location (e.g. at work), activities (e.g. in a meeting), and source (e.g. on the news). A later study of memory for emotional events found that 97% of adults reported their location, 92% provided their interrupted activity, and 100% provided information on the source of the emotional interruption (Christianson, 1992). Although there is some debate, several researchers have indicated that the inclusion and consistency of reporting one's location, activity, and source relative to a particular event are crucial in identifying highly elaborate and emotionally salient yet often inaccurate past events known as *flashbulb memories* (McCloskey, 1992; Neisser & Harsch, 1992). These paradigms embed location questions in with other contextual details of a particular event. The importance of the spectrum of contextual details in a given memory representation are clear, however pulling out location is critical to further understanding the role it plays in organizing our memories. Interestingly, location plays a key role in categorizing flashbulb memories and yet researchers have rarely investigated how adults represent location in their personal memories. By expanding our knowledge in this area, researchers could provide a better understanding of why certain aspects of location are remembered better in certain situations than others.

To our knowledge, only one study has investigated adult's memory for their personal location. Talarico (2012) examined undergraduates' recall of their personal spatial location during a specific previously experienced event: a photograph of their entire incoming freshman class taken during orientation. Participants viewed an obscured version of this freshmen class picture and were asked to indicate which shape was them. Freshmen, sophomores, juniors, and seniors were included in the sample to determine if a delay affected their memory for their location (e.g. 0-3 years). Results indicated a ceiling effect of personal location with high accuracy for location information demonstrated over 4 years and some evidence of exact recall of location for seniors. The author suggests that memory for one's personal location may be better preserved than generic spatial information (eg. I am in the classroom vs. the classroom is in the school). The location coding scheme developed for the present study aims to further explore the difference between specific types of locations as well as if and how they are represented in different narratives. More systematic investigations on the role of location in our personal memories are crucial as it may play a key role in the reconstructive process of remembering.

The Current Study

Although evidence suggests that location information is important in episodic memory phenomenon (Rubin, 2006), there is little information in the literature on the nature of location's role in our personal memories. The current study's purpose was to fill the gap in the literature by providing information on how adults use location information in their autobiographical narratives. Since adults performed quite well in the lone study of personal location memory (Talarico, 2012), a systematic investigation of

how adults use location in their personal narratives could provide further information on how personal location is conceptualized. The present study also allowed for a comparison of location information use within various different life events. Since humans have an early sensitivity to spatial information (Lourenco & Frick, in press), knowing how this information is utilized in adulthood could tell us the type of information most frequently used in personal narratives and if this type of information is conceptualized differently during different types of events. Additionally, investigating how adults use spatial details in their narratives can tell us if and how they are related to or predictive of narrative characteristics.

We investigated differences in spatial location representation by examining adults' written narratives of the following 5 memories: earliest memory, transition to school, birth of a child, child's transition to school, and a recent event. Earliest memory was of interest as it typically plays a special role in autobiographical memory, particularly that narrative abilities and quality develops over time (Bauer, 2007). We investigated the birth of a child to determine location use in an emotional and more personally significant event for which location information is often included in the memory report (Brown & Kulik, 1977). The recent event was of interest to determine how adults conceptualize the events of their everyday lives. Investigating transitions to school were of interest as it is an important milestone in a parent-child relationship. The current sample was a sample of convenience and was an appropriate choice for this investigation as it not only allowed for an investigation of how location information was used in autobiographical narratives but to determine if this representation was different based on the type of event being remembered. We expected the frequency and type of

location information to vary by life event. Specifically, we hypothesized that more location information would be used in the most recent event relatives to the earlier memories given that there may be differences in earlier and later memories and emotionally charged events (Talarico &Rubin, 2003; Bauer, 2007).

In order to determine how adults use location in their personal narratives, we developed a coding scheme to capture the type and frequency of location information. This coding was unique since it classified each instance of location information as a particular location type and also provided a location referent as opposed to only investigating general versus specific use of location. This approach was ideal since it took into account the most global (e.g. in Atlanta) to the most local (e.g. at my desk) representations of location. Since different aspects of location are used as landmarks to help guide navigation and orient ourselves in space (Sadalla, Burroughs, & Staplin, 1980), it is important to investigate various types of locations to determine how more global and local indices of location are represented in memory. This approach treated location as a unique and important feature of the memory as opposed to being intertwined with various other contextual details, including who, what, and where information. Given that place is one of the defining characteristics of autobiographical memory, we can expect this attribute to play a key role in organizing these memories.

We also hypothesized that the frequency of location information would predict the narrative's coherence. Narrative coherence measures the structural organization of a given memory representation **(**Fivush, 2007). Reese et al. (2011) developed a comprehensive coding scheme to capture narrative coherence. The following three dimensions were assessed: context (inclusion and specificity of temporal-spatial

information), chronology (logical temporal organization), and theme (clear focus). Findings indicated that the chronology and theme dimensions were significantly related to later event recall (Reese et al., 2011). Since narrative organization can lead to better memory, being able to predict the narrative quality is very important (e.g. Black & Bern, 1981). If location can predict the quality of a narrative, it would indicate that spatial information plays a role in making a memory more cohesive. We hypothesized that location information would predict narrative context, chronology, and theme. In summary, the present study aimed to extend what little is known about how adults conceptualize the *where* aspects of their personal narratives, how the representations of location may differ based on the type of event, and whether that information could predict narrative coherence.

Method

Participants

A total of 30 adults participated (Mean age = 37 years, SD= 2.39). All participants were mothers who brought one of their children into the laboratory to participate in a related study of autobiographical memory. Therefore, each participant had at least one child who was between the ages of 4-and-8-years-old. Participants were recruited over the phone and were asked if they were interested in participating in a study investigating adults' written reports of their autobiographical memories. Calls were made only to those who, at the time of their child's birth, expressed interest in becoming involved with research. One mother did not complete all of the memories and was therefore excluded from data analysis. Therefore a total of 29 participants comprised the final sample. Written informed consent was obtained from all participants as approved by

the Institutional Review Board (IRB). In thanks for their participation in this study, each participant was given a $10.00 gift card to a local merchant at the completion of their session.

Procedure

All of the procedures for the present study were approved by the IRB of the university where the data were collected as well as the university where the data were analyzed. Data were collected during individual 1½ hour sessions. Upon arrival, each participant was given a packet including a demographic questionnaire, narrative prompts, and rating scales for each narrative. The participants remained in the same room as their children participating in the related memory study. Participants were asked to write in as much detail as they could remember about the following 5 memories: their earliest memory, transition to school, birth of a child, that same child's transition to school, and a recent event. If the participant had more than one child, the prompt instructed them to only record the birth of the child participating in the related study. The instructions also cautioned participants against using events that they have viewed photographs of or that have been frequently discussed as to avoid possible practice effects. The order of the event type was counterbalanced yielding sixty-five possible orders; 30 of these orders were randomly selected. After providing all of their memories, the participants provided the ratings for each event.

Coding

All narratives were transcribed verbatim from the participants' written packets into Microsoft Word documents. After initial transcription, all narratives were checked for accuracy before the coding began. Narrative length was measured using the word

count function in Microsoft Word to determine the number of words per narrative. All of the transcripts were coded using separate coding schemes: narrative coherence and location information. Each coding scheme will be discussed at length separately. For each coding scheme, there was a primary and a secondary coder who reviewed the transcripts. Coders were trained to an acceptable level of reliability (>.85 intraclass correlations) for each dimension of the coding schemes. Each narrative was then coded for coherence and location by each coder. Whenever a disagreement occurred, the codes from the primary coder were used for analysis.

Coherence Coding

The Narrative Coherence Coding Scheme (NaCCS) developed by Reese et al. (2011) was used in the present study. Coherence coding captured the overall quality of the narratives based on the types of information included, which fall into the following three dimensions: Context, Chronology, and Theme. Each dimension was scored on a scale of 0-to-3 on the amount and specificity of the information provided. See Table1 for classification criteria for each dimension. The context dimension of the scheme reflected information about locating the specific event in space and time. Information about location that did not identify a specific referent was coded as general (e.g. at school) since there was no indication of a single location (e.g. at my school).

Only time information specific to autobiographical lifespan time was coded as location (as opposed to conventional calendar time) to be more inclusive and incorporate portions of the lifespan as time (e.g. when I was a child; when I was in high school). Location words used to describe an activity, person, or event were not sufficient alone to define location (e.g. We were *on vacation*); references to spatial location were required. The

chronology dimension of the coding scheme reflects the ability of a naïve listener to place the sequence of events on a timeline. Only actions that occurred within the defined event parameters (e.g. *Matt's birthday party*) were placed on the timeline; digressions were not penalized they were just not coded for this dimension. The theme dimension assessed the narrative's maintenance and elaboration on a specific topic. If the participant referenced self-concept or identity then they received a score of 3. Approximately 25 percent (*n*=11) of the transcripts were randomly selected for use in monitoring reliability in coding coherence; all intra class correlations were greater than .85.

Location Coding

The Location in Autobiographical Memories (LAM) Coding Scheme was adapted from the Narrative WH-coding scheme for use in this study **(**Bauer, Burch, Scholin, & Guler, 2007). This coding scheme was developed in order to capture not only location information related to the setting of the event but to classify various types of location information used in autobiographical memories. Locations were classified as one of three major categories: Geographical, Transportation, or Event Related. Geographical location was further broken down and classified as one of five subcategories: Country, Neighborhood, Building, Room, and Within the Room. Excluding the first category, since it is the most global level, the remaining four categories were also classified as being either indoors or outdoors. References to modes of transportation were classified as transportation (e.g. in the car) and if the event itself (e.g. at a leadership retreat) was used to describe the location it was classified as event related. In addition to the location type, the entity that was being located, or the referent, of the specific type of location was also coded. Each location code was classified as self, other person, object, or event

referent. Since adults have the ability to recognize different points of view, knowing what focus point adults use to determine location can potentially inform the type of information found in our memory representations and whether it is remembered later (Shelton & McNamara, 2001). When the place information referred to the participant's specific role, it was coded as self. If the location was about another person's role in the event, it was coded as other person. If the participant described the location of an object, it was coded as object focus. If the participant uses the location of an event then it was coded as event focus. See Table 2 for examples of each subcategory in classifying location information.

The primary coder provided additional general guidelines involved in the coding of spatial information. In cases where the participant provided more than one event for a given memory prompt, the first one was coded. If the participant mentioned the same location more than once, it was coded only one time unless the focus was different. If the provided information could not answer a specific "where" question, then it was not coded as location. For instance, vague or abstract locations (i.e. *They went out to celebrate New Year's Eve*) were not coded as no specific location information was provided. In location focus, since self and other were exclusive to humans, any location information related to animals was classified as object. Approximately 25 percent (n=11) of the transcripts were randomly selected for use in monitoring reliability in coding location. There was a primary and a secondary coder; intraclass correlations were .87 for location type and .92 for location referent. Whenever disagreement arose between coders, codes from the primary coder were used for analyses.

Results

Descriptive Analyses

We first addressed the question of how location information was used in personal narratives. Each of the participants included in the final sample were asked to provide 5 total memories resulting in a sum of 145 possible narratives for analysis. A One-Way Repeated Measures Analysis of Variance was conducted to determine differences in the overall use of location information. Results indicated a significant difference in the use of different types of location information, $F(6,23)= 36.25$, $p<.001$. Follow up Bonferroni corrected comparisons were conducted to determine which aspects of location were differentially represented in personal narratives (see Figure 1). All location types of interest (in the coding scheme) were represented across all memories with the building level used more frequently than all other types of location, all *ps*<.001. Country was used more than event-related information, $p<.05$, neighborhood information was used significantly less than building, room, and within-room information, all *ps*<.01, room information was used more than event-related and transportation information, *ps*<.001, and within-room information was used more often than transportation and event-related location information, $p<.01$. See Table 3 for descriptive statistic values.

Similarly, a One-Way Repeated Measures Analysis of Variance was conducted to determine differences in overall location referent information. Results indicated a significant difference in location referent use, $F(3,26)= 71.42$, $p<.001$. Follow up Bonferroni corrected comparisons indicated that the self was used significantly more than all other reference points, all *ps*<.001. Other-referent was used more than object and event, all *ps*< .001, and object-referent was used significantly more than event-referent,

p<.001. Figure 2 shows that self-referent was used the most across all memories followed by other, object, and event. To determine if there were differences in the use of location in different life events, differences in the use of location type and referent were also assessed within each type of memory. The remaining analyses will assess differences between life events.

We conducted bivariate correlations to ensure we did not conflate use of location information with the length of the narrative. Narrative length was significantly related to the location type, r= .48, *p* = .008 and self-referent, r=.44, *p*=.02, in the Mom's transition to school event. For birth of a child, narrative length was positively correlated with location type, *r*= .78, self-referent, *r*=.67, other-referent, *r*= .53, and event-referent, *r*= .50 (all *ps*< .01). Location type, *r*= .72, self-type, *r*= .59, and other-referent, *r*= .58, were related to narrative length in a recent event (all *ps*< .001). In reports of earliest memory, narrative length was related to all domains of location information except event-referent (all *ps*<.01). Since narrative length is an important variable to take into account in investigating differences, we controlled for it in both the analyses of variance and regression models.

Multivariate Analyses of Variance

In order to determine the relations between the type of event and use of location information, we conducted a Multivariate Analysis of Variance (MANOVA). For location type, using Pillai's trace we found memory type was significantly related to the type of location type information participants used for country, $F(4, 135)= 12.09$, $p<.001$, neighborhood, , $F(4, 135)= 9.72$, $p<.001$, building, , $F(4, 135)= 6.62$, $p<.001$, within room, $F(4, 135)= 12.09$, $p<.001$, and transportation, $F(4, 135)= 2.57$, $p<.001$, but not for

the room or event related information. Univariate analyses and pairwise comparisons of the mean differences revealed different patterns of type use based on the type of event (See Figure 3). Country level information was used significantly more in the recent event relative to all other events, $F(4,135)=12.08$, $p<.001$; the same effect was found for the neighborhood level, $F(4,135)= 9.72$, $p<.001$. There was also a main effect of the building level, $F(4,135)=6.62$, $p<.001$, with recent event having more references to the building level than mom's transition to school and earliest memory; Birth of a child used more building information than mom's transition to school. For the within room level, there was a significant effect, $F(4,135)=4.90$, $p<.01$, where the birth of a child was significantly higher than earliest memory, recent event was also higher than earliest memory, and earliest memory was significantly higher than mom's transition to school; there was a trend toward significance in that Mom's transition to school was higher than recent event, $p=.05$. There were no significant main effects for the room, transportation, or event related information.

A separate MANOVA was conducted to see the relationship between location referent and memory type. Using Pillai's trace, there were significant differences by event type in the self-focus, $F(4,135)=9.76$, $p<.001$, other-focus, $F(4,135)=3.75$, $p<.01$, and object-focus conditions, $F(4,135)=3.02$, $p<.001$, but not for event focus (See Figure 4). Univariate analyses for location focus revealed significant main effects of self-focus, $F(4,135)=9.77$, $p<.001$, other-focus, $F(4,135)=3.75$, $p<.01$, and object-focus, $F(4,135)=3.03$, $p<.05$, but not for event focus (See Figure 3). Pairwise comparisons of the mean difference revealed that the self was referenced significantly more in all events except for the child's transition to school.

Regression Analyses

We used Multiple Regression analyses to determine if the dimensions of location type and location referent predicted context, chronology, and theme. Due to the relatively small instances of each sublevel of the geographic type, they were collapsed to create one geographic variable. Narrative length was entered into the model as a controlling variable and then geographical, transportation, and event-related information. The overall regression model was significant for context, $F(4,134)=5.19$, $p<.01$, and chronology, $F(4,134)=2.95$, $p<.05$.

However, this relationship was driven by the narrative length, as there was no significant effect of location information on either context or chronology. For location referent, there was a significant effect of the overall model for context, $F(4,134)= 3.12$, $p<.01$, and chronology, $F(4,134)=2.33$, $p<.05$. Similar to location referent, the effects in both dimensions of narrative coherence were driven by narrative length and not location information.

Ordinal regression modeling was used to investigate whether location information predicted narrative theme since each level is qualitatively different from each other in a step-like ranking. As with the linear regressions, a single geographic variable was used in the model in addition to transportation and event related location dimensions after controlling for narrative length. Ordered probit regression modeling was used. The statistically significant chi-square statistic for mom's transition to school, earliest memory, and the child's first day of school, all $ps< .01$, indicated that the final model was a good fit for this data. For location type, after controlling for narrative length the geographic location was a significant predictor of narrative theme in the earliest memory

(Wald Chi-Square=4.83, $p<.05$) and mom's transition to school (Wald Chi-Square=3.92, $p< .05$). The odds ratio for earliest memory was .60 and for mom's transition to school the odds ratio was .72. Since these ratios are less than one, it indicates a decrease in the likelihood of having a higher level of thematic coherence with an increase in the amount of geographical information. Therefore, having a higher thematic coherence score was related to having less location information in these earlier memories (See Figure 5). Location referent was not a significant predictor of narrative theme.

General Discussion

In this investigation, the use of location information in personal narratives was examined. Overall, this investigation was primarily exploratory given that location has not been systematically investigated in autobiographical narratives. Not only were we interested in determining how adults used location language in their personal narratives, but also if this information differed based on the type of memory being discussed. Additionally, we wanted to see if the use of location information would predict narrative coherence. Adults spontaneously generated information about various different types of locations. Since participants were not specifically prompted to provide any location information, the inclusion of this information suggests its importance in providing an account of an event. Results indicated different patterns of this location information both overall and within each type of event. In general, adults used information about buildings and themselves most frequently in their personal narratives. However, there were differences based on the type of event being reported. Similar patterns were observed for the earlier memories, the more emotionally significant memories, and the recent

memories. In terms of the relationship between location and narrative coherence, only geographical information was related to thematic coherence.

Location across Life Events

In the present study, location type and referent were represented quite differently in the narratives of different events of our lives. It is interesting to note that the building and room domains are the only types of locations that were present in all 5 events of interest. This suggests that these aspects are better represented in our personal narratives. Also, there was no significant difference in the amount of room information included in any event recalled, indicating that this information maintains a consistent presence throughout the different types of events. In research on reference points in our ability to orient ourselves in space, buildings are the most frequently used landmarks (Sadalla, Burroughs, & Staplin, 1980). These landmarks are often used to organize and facilitate navigation in our spatial environment. The fact that these are the most well represented in our personal narratives is perhaps why people tend to navigate through their environments or give directions relative to surrounding buildings as reference points (Shelton & McNamara, 2001). Future research should investigate whether these specific types of location or location in general, are predictive of later remembering.

Although there were relatively small averages of each type of location , they differed significantly based on the type of event being represented. In participants' earliest memory and their own transition to school, a similar pattern was seen with relatively small total use of location but a wide variety of different types present in the narrative. For birth of a child and that child's transition to school, there was less of a variety in the types of location information present but what few that were present were

used more frequently than in the narratives of the earlier memories. The recent event was similar to both patterns discussed earlier in that there were a wide variety of locations present in these narratives but with a variety of frequencies. The recent event included more information about country and neighborhood than any other memory. Interestingly, several of the recent events reported by participants were from various trips they had taken. In these narratives, they mentioned information about the country or state they were visiting and any relevant cultural landmarks (e.g. the Eiffel Tour in Paris, France); this was not the case in recent events near the participants' home country/neighborhood. The inclusion of more references to the country and neighborhood when outside of one's own area of residence points to the importance of cultural context in autobiographical narratives. Perhaps this cultural background information, location or otherwise, helps to make the retelling of these events more complete; this may not be necessary for the everyday recent events.

The earlier memories in this study showed a similar pattern in terms of the types of location information used. Specifically, the within room information was used more in both earliest memory and mom's transition to school than the more recent event. One explanation could be differences in the development of memory processes based on the age at the time the event was experienced. For the earliest memory and transition to school, participants were on average 3.5-and-5-years-old respectively while they were approximately 36 at the time of the most recent event. Perhaps within room information was encoded automatically during childhood and more global aspects of location required more effortful processing; this could explain why more global aspects are also mentioned more in the more recent events. With the maturation of memory processes across

development, more information about these locations becomes available for processing. Although previous research did not find any differences between earlier and later memories in terms of emotional content (West & Bauer, 1999), perceptual information, and perspective, it seems that these memories do differ on the type and frequency of location information represented.

Results for the representation of location referent also varied across event type. In the recent event, significantly more self-references were included than in any other type of event. Inclusion of more self-focused language in more recent narratives could be related to more effective communication and a deeper understanding of self found in more well developed (Reese, Haden, Baker-Ward, Fivush, & Ornstein, 2011). Since narratives are a representation of the self-story, it is logical that inclusion of the self would occur more often than references to other entities. This is true for all events except for the child's transition to school. Since this is the only event where its very title is centered on another person, is logical that references to another person would supersede the self.

Location and Narrative Coherence

Location information was not a significant predictor of narrative context or chronology. In the regression models for context and chronology, the issue of multicolinearity likely explains the lack of significant effects. The regression diagnostics showed almost complete collinearity in these dimensions of coherence indicating that the predictors are correlated which led to problems in estimating the regression coefficients (Cohen, Cohen, West, & Aiken, 2003). This is likely due to the fact that the locations were a function of each other. Location was a significant predictor of theme but only in

earliest memory and mom's transition to school. Specifically, having more location information was significantly related to having a less thematically coherent narrative. In these two memories, there was a relatively low average in how often the different types of locations were included in the narratives but a lot of different types were present. Perhaps having only brief details about so many different locations contributed to having a less clear theme in that narrative. These results also suggest that the geographic information is related to the thematic content of earlier memories, but not to more recent or personally significant events.

For the theme dimension it is important to note that not only did it involve the amount of information but how well it was organized. This is different from the context and chronology dimensions and may be why the effects only came out in that regression analysis. Perhaps location predicts something more than just the frequency and specificity of information but may be related to how elaborate and complete a narrative is. Morris, Baker-Ward, and Bauer (2010) found that narrative theme predicted later recall but not context or chronology in children. Perhaps there is something about that dimension that is quite different from context and chronology that explain its prediction of narrative characteristics and this difference seems to be evident across development.

Conclusions

In summary, the present study added to the very limited body of literature on how adults represent location in their personal memories. This was one of the few investigations that isolated location information from "what" and "when" information in individual memories. We now know that aspects of location on a geographical type are represented differently across with more global aspects remembered in recent events and

more local aspects remembered in earlier memories. Future investigations should further examine the nature of location information in individual's memory representations. In so doing, researchers could reveal the relationship between location type and referent in subsequent memories and shed light on why differences occur in earlier and more recent memories.

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	Context	Chronology	Theme
Level 0	No information about time or location is provided.	List of actions with minimal or no information about temporal order.	Substantially off topic and/or the topic is difficult to identify.
Level 1	Partial information is provided; there is mention of time *or* location at any level of specificity.	Can place some but not most of the events on a timeline. Fewer than 50% of the relevant actions can be ordered on a timeline.	An identifiable topic is present. May include minimal development of the topic through causal linkages, or personal evaluations and reactions.
Level 2	Both time and place are mentioned but no more than one dimension is specific.	Can place between 50-75% of the relevant actions on a timeline but cannot reliably order the entire story from start to finish.	Substantial topic development. Several instances of causal linkages, and/or interpretations, and/or elaborations.
Level 3	Both time and place are mentioned and both are specific.	Can order almost all (> 75%) of the relevant actions. This includes cases in which the speaker marks deviations from	Includes all the above and a resolution to the

		temporal order or repairs a violated timeline.	story, or links to other autobiographical experiences including future occurrences, or self-concept or identity.

Table 1. Adapted from Reese et al. (2011) to reflect the coding criteria for the context, chronology, and theme dimensions of narrative coherence.

Location Type				
Categories	**Sub-Categories**	**Definition**	**Indoors Example**	**Outdoors Example**
Geographical (A)	Country/State/City (1)	Most global spatial level	"**We** went on vacation to **Russia**"	
	Neighborhood (2)	Can be subdivided in some way	**"I had** so much fun in **the airport"**	"Their wedding was in **Kiawah Island"**
	Building (3)	Larger subdivisions of the neighborhood level	"They were heading **to the hospital"**	"The kids were playing football **in the backyard"**
	Room (4)	Entities within the building level	" My sister ran **to the bathroom**"	"We rode on the **Superman** 4 times"
	Within Room (5)	Relational within the room level	"I found my medicine **on my desk**"	"Mikey was playing **on the swingset**"
Transportation (B)	N/A	Any mode of transportation	"We went on **the train**"	

Event Related (C)	N/A	When the name of the event is used as location information	"I had so much fun **at basketball camp** that I went every year"
Location Referent			
Self (S)	N/A	Location in relation to one's self	***"I** went **to the airport."***
Other (OTH)	N/A	Location in relation to other people	***"He** went to **the school."***
Object (OBJ)	N/A	Location in relation to an object (s)	***"**I remember the **TV** in **my room**"***
Event (E)	N/A	Location in relation to a particular event	***"The party** was in **my friend's house"***

Table 2: The classification of location information as defined by the Location in Autobiographical Memories coding scheme.

Location Type							
	Country	**Neighborhood**	**Building**	**Room**	**Within Room**	**Transportation**	**Event Related**
Mean	1.97	1.41	6.62	3.52	3.14	0.79	0.31
SD	2.26	1.45	2.83	2.13	1.83	1.37	0.54
SE	.42	.27	.53	.40	.34	.25	.10
Minimum	0.00	0.00	3.00	0.00	0.00	0.00	0.00
Maximum	7.00	5.00	14.00	8.00	8.00	5.00	2.00

Location Referent				
	Self	**Other**	**Object**	**Event**
Mean	2.55	.77	.29	.03
SD	2.39	1.20	.67	.21
SE	.20	.10	.06	.02
Minimum	.00	.00	.00	.00
Maximum	21.00	5.00	5.00	2.00

Table 3. Descriptive statistics across all memories for aspects of location type and location referent.

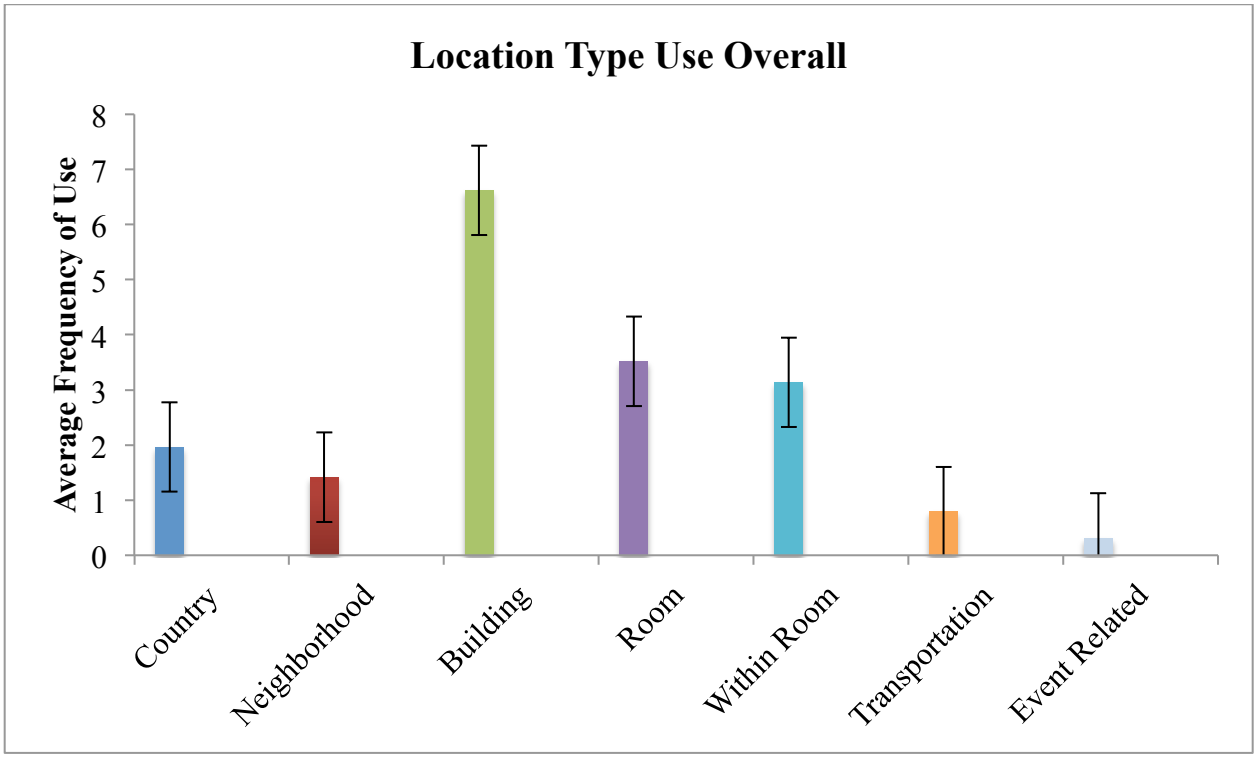


Figure 1. The average use of each specific type of location across all types of events.

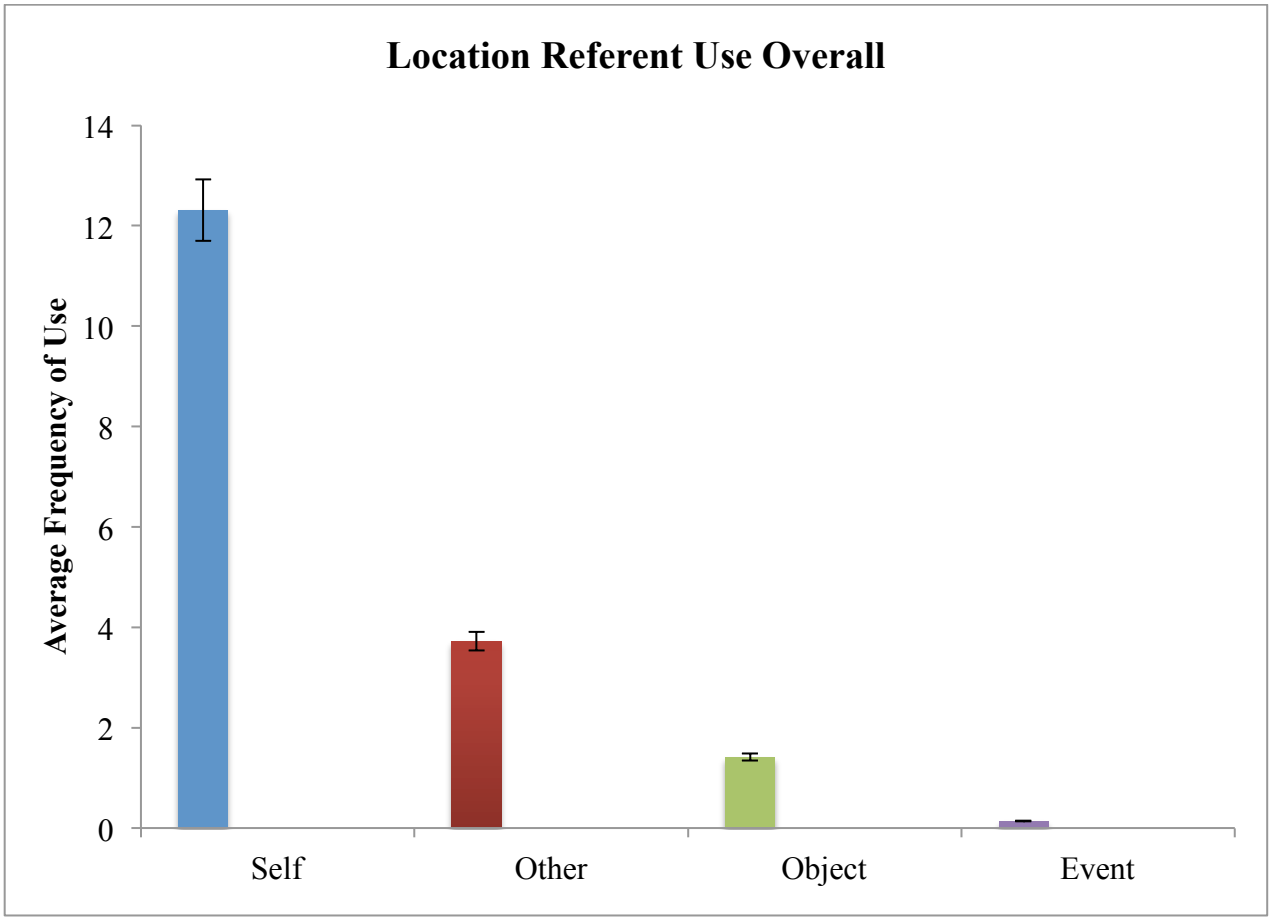


Figure 2. The average use of the different location referents across all types of events.

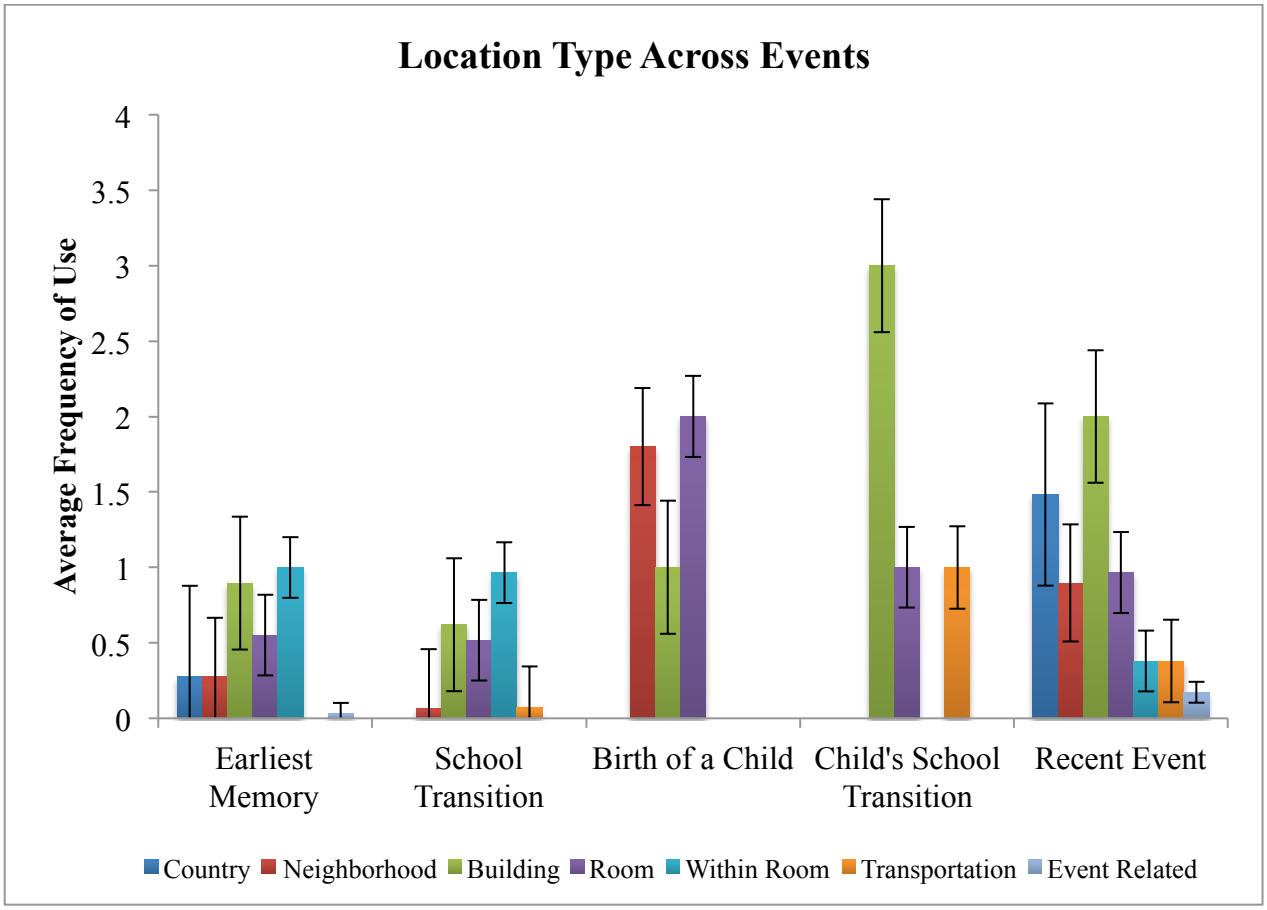


Figure 3. Differential patterns of the average frequency of using each different type of location based on the type of event being described.

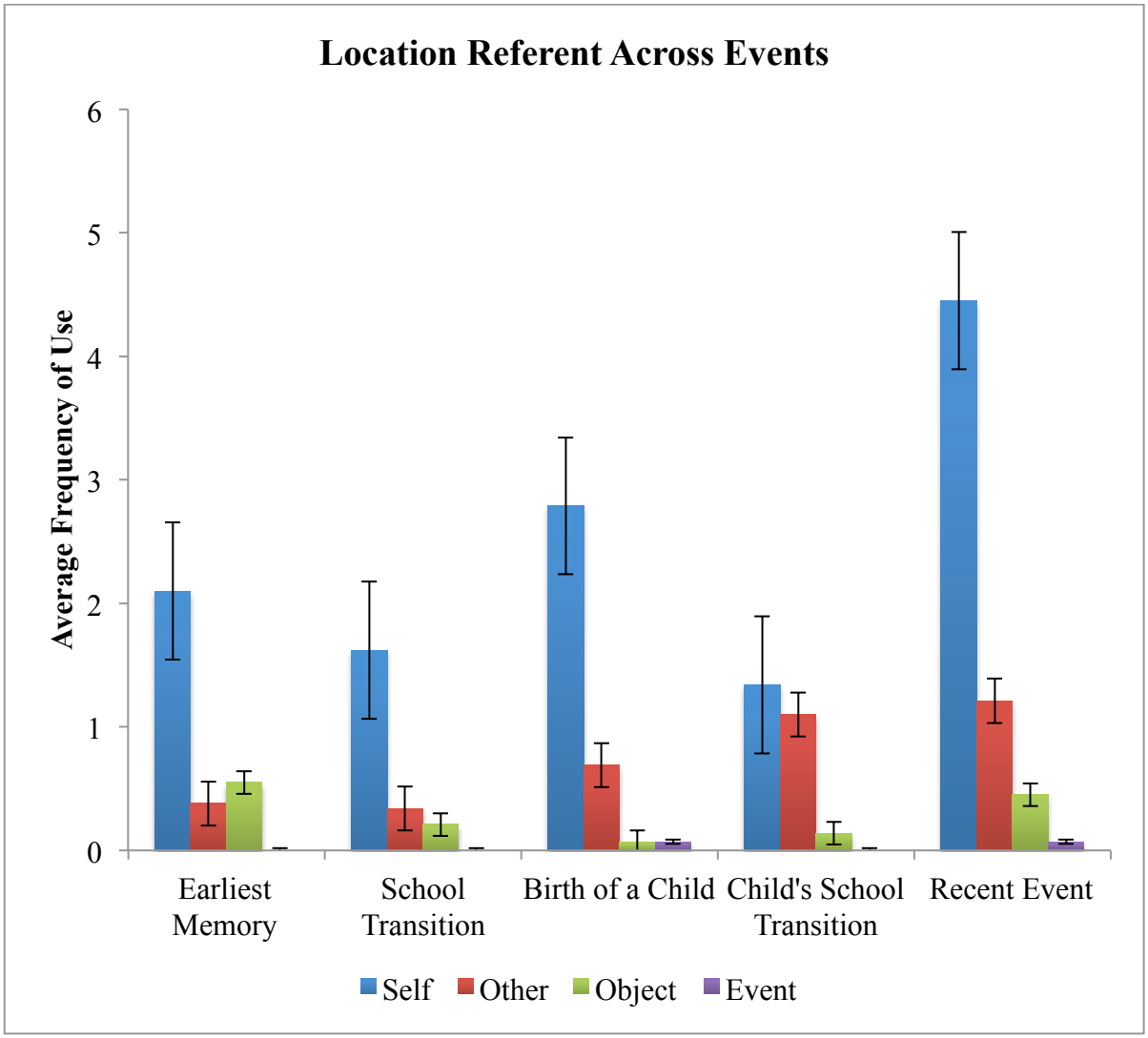
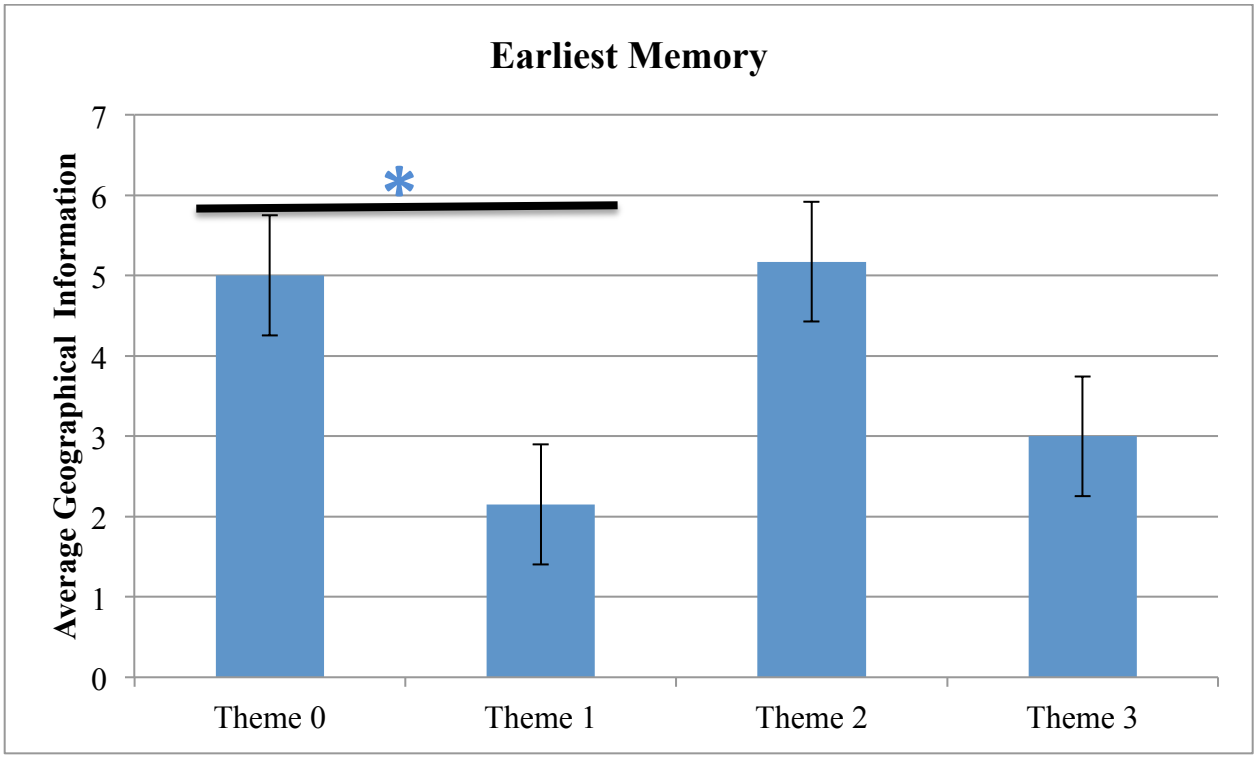


Figure 4. Location Referent across the different types of events.


Earliest Memory
Average Geographical Information
7
6
5
4
3
2
1
0
*
Theme 0
Theme 1
Theme 2
Theme 3

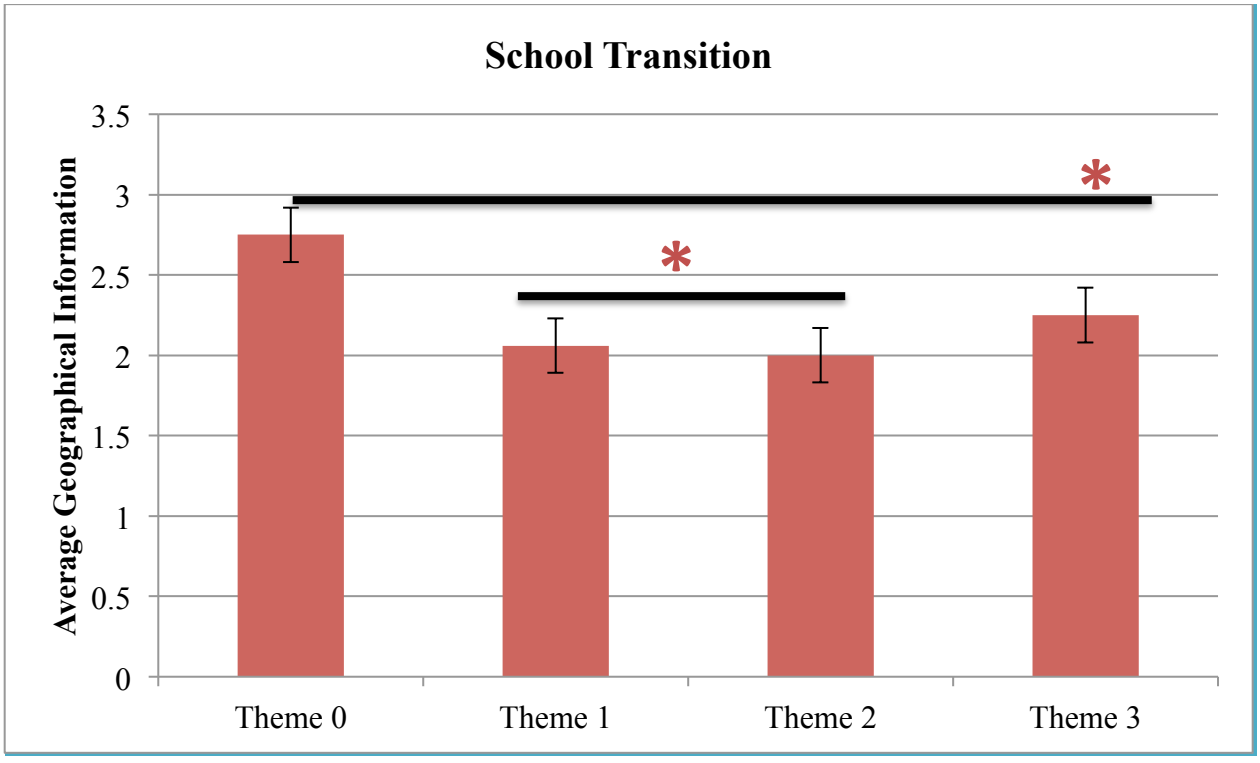

School Transition
Average Geographical Information
3.5
3
2.5
2
1.5
1
0.5
0
*
*
Theme 0
Theme 1
Theme 2
Theme 3

Figure 5. The relationship between the use of geographical information and thematic coherence in the earliest memory and transition to school.