National Children's Advocacy Center

Temporal Aspects in Child Forensic Interviews

A Bibliography

May 2013

The preferred citation for this publication is: National Children's Advocacy Center. (2013). Temporal Aspects in Child Forensic Interviews. Huntsville, AL: Author.

Scope

This bibliography provides citations and abstracts to literature pertaining to temporal aspects as related to children's memories. Included are articles, book chapters, and books.

Organization

This bibliography is organized in date descending order from the most recent to the oldest publication date, 2012-1977.

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Temporal Aspects in Child Forensic Interviews

A Bibliography

Wandrey, L., Lyon, T. D., Quas, J. A., & Friedman, W. F. (2012). Maltreated children's ability to estimate temporal location and numerosity of placement changes and court visits. *Psychology, Public Policy, and Law, 18*(1), 79-104. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3280883/

Research examining children's temporal knowledge has tended to utilize brief temporal intervals and singular, neutral events, and is not readily generalizable to legal settings in which maltreated children are asked temporal questions about salient, repeated abuse that often occurred in the distant past. To understand how well maltreated children can describe temporal location and numerosity of documented, personal experiences, we assessed 167 6- to 10-year-old maltreated children's temporal memory for changes in their living arrangements and prior visits to court. Small percentages of children were capable of providing exact temporal location information (age, month, or season) regarding their first or last placement or court experience, or numerosities for placements or court visits. Greater knowledge of current temporal locations did not predict better performance. However, older children's performance for several temporal judgments was better than chance, and their reports were not largely discrepant from the truth. Findings suggest caution when questioning maltreated children about when and how many times prior events occurred.

Friedman, W. J., Reese, E., & Dai, X. (2011). Children's memory for the times of events from the past years. *Applied Cognitive Psychology*, *25*(1), 156-165.

This study tested 8–12-year-olds' ability to localize in time parent-reported events from four time intervals ranging from 6 months to 4 years ago. Memory for content was very accurate, and children's time estimates showed substantial agreement with the times provided by their parents. Accuracy of year judgments declined with retention interval, with the greatest change occurring between the 1–2-year and 2–3-year intervals. Season, month and time of day accuracy were much more stable over time. There were significant improvements with age in performance on measures of conventional time knowledge, and this performance was correlated with the

accuracy of time estimates on the long time scales, controlling for age and general cognitive ability. Copyright © 2010 John Wiley & Sons, Ltd.

Pyykkonen, P., & Jarvikivi, J. (2011). Children and situation models of multiple events. *Developmental Psychology, 48*(2), 521-529.

The present study demonstrates that children experience difficulties reaching the correct situation model of multiple events described in temporal sentences if the sentences encode language-external events in reverse chronological order. Importantly, the timing of the cue of how to organize these events is crucial: When temporal subordinate conjunctions (before/after) or converb constructions that carry information of how to organize the events were given sentence-medially, children experienced severe difficulties in arriving at the correct interpretation of event order. When this information was provided sentence-initially, children were better able to arrive at the correct situation model, even if it required them to decode the linguistic information reversely with respect to the actual language external events. This indicates that children even aged 8–12 still experience difficulties in arriving at the correct interpretation of the event structure, if the cue of how to order the events is not given immediately when they start building the representation of the situation. This suggests that children's difficulties in comprehending sequential temporal events are caused by their inability to revise the representation of the current event structure at the level of the situation model.

Yan, T., Chan, R., & Shum, D. (2011). The development of prospective memory in typically developing children. *Nueropsychology*, *25*(3), 342-352.

This study aimed to use specifically designed tasks to capture time-based, activity-based, and event-based prospective memory (PM) performance in typically developing school-age children. Two PM tasks (Fishing Game & Happy Week) were used to examine the developmental patterns of PM in these children. Retrospective memory (RM) was also examined in these tasks. A total of 120 children aged between 7 and 12 years (10 girls and 10 boys in each age band) were recruited. Tests of working memory, inhibition, and IQ were also administered. The age effect on

PM accuracy was significant, with improvements identified between ages 7 to 8 and 10 to 11 years. For both tasks, performance on the time-based PM task was significantly poorer than that on the event-based PM task, which in turn was significantly poorer than that on the activity-based PM task. In terms of errors, results indicated that while errors associated with the PM component of the tasks decreased with age, errors associated with the RM component showed an inverted-U shape. The different patterns of errors suggest qualitative as well as quantitative differences in PM development in children. Finally, IQ, working memory, and inhibition were found to relate to PM when age was partialed out. Results of the study highlight the importance of contextual cues, such as activities and events, for prospective remembering in children. In addition, they have provided a general picture of PM development in school-age children and have implications for educators and parents.

Morris, G., Baker-Ward, L., & Bauer, P. (2010). What remains of that day: The survival of children's autobiographical memories across time. *Applied Cognitive Psychology, 24*(4), 527-544.

In this study we investigated the contributions of the content and the coherence of initial event reports to the survival of autobiographical memories during part of the lifespan eventually obscured by childhood amnesia. Over 100 children reported personal experiences when they were 4, 6 or 8 years old, enabling a determination of age-related differences in two aspects of narrative coherence: Theme and chronology. Content was assessed separately through the presentation of directed memory probes. After a 1-year delay, younger children more frequently failed to report target experiences. Multilevel modelling indicated that the survivability of a memory was predicted over and above the child's age by high thematic coherence of the initial memory narrative, but not by the memory content. It is possible that memories described in a highly thematically coherent narrative are indicative of well-integrated event memories, and thus likely to be cued more often, resulting in their long-term survival. Copyright © 2009 John Wiley & Sons, Ltd.

Ryan, R. (2010). Age differences in explicit memory of crimes and source monitoring ability: Adolescents and young adults. *North American Journal of Psychology*, *12*(2), 401-414.

In the current study an adolescent sample was compared to a young adult sample on measures of explicit memory and source monitoring. Compared to adolescents, young adults were found to recall significantly more details pertaining to person, object, and surroundings of videotaped staged crimes. There were no significant age differences pertaining to details concerning action for these crimes, implying a developmental component to our ability to recall different aspects of events. The young adult sample was also found to perform better compared to the adolescents on a source monitoring task. Findings are discussed in terms of developmental differences in memory ability and developmental neuroscience. The current study contributes to our knowledge base concerning developmental differences in these cognitive abilities and provides information that may be applied in a forensic setting.

Kulkofsky, S., Wang, Q., & Ceci, S. J. (2008). Do better stories make better memories? Narrative quality and memory accuracy in preschool children. *Applied Cognitive Psychology*, *22*(1), 21-38.

The present study examines how the quality of children's narratives relates to the accuracy of those narratives. Sixty-one 3- to 5-year-olds played a novel game with a researcher in their schools. Children were questioned in an interview that included an open-ended free recall prompt followed by a series of directed questions. Children's narratives were coded for volume, complexity and cohesion as well as for accuracy. Correlational results showed that overall, narrative skills enable the reporting of more information, while decreasing the proportion of information that was accurate. These results appeared to be driven by a quantity-accuracy trade-off; in an ensuing regression analysis with all narrative variables entered into the model, volume was associated with decreases in accuracy while narrative cohesion was associated with increases in accuracy. We discuss the results in terms of their relationship to the development of autobiographical memory as well as implications for forensic contexts. Copyright © 2007 John Wiley & Sons, Ltd.

Friedman, W. J. (2007). The development of temporal metamemory. *Child Development, 78*(5), 1472-1491.

In two studies of knowledge about the properties and processes of memory for the times of past events, 178 children from 5 through 13 years of age and 40 adults answered questions about how they would remember times on different scales, how temporal memory is affected by retention interval, and the usefulness of different methods. The adults showed quite accurate knowledge about the main properties of memory for time and the processes that underlie it. Different properties and processes were first understood at ages ranging from 8 years to 12 years or later. Knowledge of the roles of reconstruction and impressions of temporal distances appear well after children use them to remember the times of events.

Lindblad, F. (2007). Reflections on the concept of disclosure. In M.-E. Pipe, M. E. Lamb, Y. Orbach, & A.-C. Cederborg (Eds.), *Child sexual abuse: Disclosure, delay and denial* (pp. 291-301). Mahwah, NJ: Lawrence Erlbaum Associates.

Orbach, Y., & Lamb, M. E. (2007). Young children's references to temporal attributes of allegedly experienced events in the course of forensic interviews. *Child Development, 78*(4), 1100-1120.

Developmental differences in references to temporal attributes of allegedly experienced events were examined in 250 forensic interviews of 4- to 10-year-old alleged victims of sexual abuse. Children's ages, the specific temporal attributes referenced, and the types of memory tapped by the interviewers' questions significantly affected the quantity and quality of temporal references produced. The findings documented age-related increases in 4- to 10-year-olds' references to temporal attributes, using the appropriate relational terminology, both spontaneously and in response to temporal requests. More references to temporal attributes were elicited from recall than from recognition memory, highlighting spontaneous reporting capabilities. Implications for theories concerning the developing understanding of temporal concepts and for the design of effective, age-appropriate, forensic interview techniques are discussed. [Author Abstract]

Lyon, T. D., & Saywitz, K. J. (2006). Post-mortem to preventive medicine: Next steps for research on child witnesses. *Journal of Social Issues, 62*(4), 833-861.

Five directions for future child witness research are proposed by the authors, inspired by recognition of the day-to-day realities of the legal system and the opportunities of psychology to react proactively to challenges child witnesses face. These directions include (1) the refinement of developmentally sensitive questioning aids that increase completeness without increasing suggestibility, (2) the development of approaches to non-disclosure and recantation, including understanding of the reasons underlying non-disclosure and the potential for building rapport and increasing trust, (3) the construction of interventions that meet mental health needs of child victim witnesses without creating false memories or tainting testimony, (4) a focus on details of children's narratives that are often lacking, including temporal information and emotional reactions, and (5) expanding our attention beyond child sexual abuse allegations in criminal court and considering the many contexts in which child witnesses are questioned, including areas in which preferences rather than memories are elicited.

Friedman, W. J., & Lyon, T. D. (2005). Development of temporal-reconstructive abilities. *Child Development, 76*(6), 1202-1216.

In a study of the ability to reconstruct the times of past events, 86 children from 4 to 13 years recalled the times of 2 in-class demonstrations that had occurred 3 months earlier and judged the times of hypothetical events. Many of the abilities needed to reconstruct the times of events were present by 6 years, including the capacity to interpret many temporally relevant cues, but there were substantial changes well into middle childhood in the availability of temporally useful episodic information. Children were poor at remembering the events' proximity or order with respect to a major holiday, but the order of the 2 target events was well recalled by 6 years.

Bastin, C., Van der Linden, M., Michel, A. P., & Friedman, W. J. (2004). The effects of aging on location-based and distance-based processes in memory for time. *Acta Psychologica*, *116*(2), 145-171.

Retrieving when an event occurred may depend on an estimation of the age of the event (distance-based processes) or on strategic reconstruction processes based on contextual information associated with the event (location-based processes). Young and older participants performed a list discrimination task that has been designed to dissociate the contribution of both types of processes. An adapted Remember/Know/Guess procedure [Can. J. Exp. Psychol. 50 (1996) 114] was developed to evaluate the processes used by the participants to recognize the stimuli and retrieve their list of occurrence. The results showed that aging disrupts location-based processes more than distance-based processes. In addition, a limitation of speed of processing and working-memory capacities was the main predictor of age-related differences on location-based processes, whereas working-memory capacities mediated partly age differences on distance-based processes.

Nelson, K., & Fivush, R. (2004). The emergence of autobiographical memory: a social cultural developmental theory. *Psychological Review*, *111*(2), 486-511.

The authors present a multicomponent dynamic developmental theory of human autobiographical memory that emerges gradually across the preschool years. The components that contribute to the process of emergence include basic memory abilities, language and narrative, adult memory talk, temporal understanding, and understanding of self and others. The authors review the empirical developmental evidence within each of these components to show how each contributes to the timing, quantity, and quality of personal memories from the early years of life. The authors then consider the relevance of the theory to explanations of childhood amnesia and how the theory accounts for and predicts the complex findings on adults' earliest memories, including individual, gender, and cultural differences.

Westcott, H. L., & Kynan, S. (2004). The application of a 'story-telling'framework to investigative interviews for suspected child sexual abuse. *Legal and Criminological Psychology, 9*(1), 37-56.

This study investigated the usefulness of a 'story-telling' approach to understanding investigative interviews with children suspected of being sexually abused. Method. An innovative framework for understanding children's allegations of sexual abuse was devised from the 'story-telling' literature, which examined the degree to which essential elements of a story, as well as order or disorder of narrative, were present in accounts of alleged abuse. Other features of the interview, such as the presence of free narrative, reliance on specific questions to elicit an account and bizarre or 'off-topic' responses from the child, were also recorded. Transcripts of 70 interviews with children aged up to 12 years, from England and Wales, were coded using a scheme devised specifically for the purpose of the study. Results. The results suggest that although, superficially, the accounts adhered to a story structure, they were often incomplete, ambiguous and disordered to a degree which would impact on understanding. Reliance on specific questions, and other digressionary or non-verbal responses from the child also compounded difficulties. Age differences in responding were noted, with the youngest children responding differently from their older peers. Conclusions. Implications for practice include the importance of careful questioning and the value of a second interviewer monitoring the interview. The story-telling framework was a useful tool in suggesting where difficulties may arise for the child in presenting his/her account, and for an observer (e.g. juror) in making sense of the child's experience as elicited in the interview.

Curran, T., & Friedman, W. J. (2003). Differentiating location-and distance-based processes in memory for time: An ERP study. *Psychonomic Bulletin & Review, 10*(3), 711-717. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1350916/pdf/nihms-5609.pdf

Memory for the time of events may benefit from reconstructive, location-based, and distance-based processes, but these processes are difficult to dissociate with behavioral methods. Neuropsychological research has emphasized the contribution of prefrontal brain mechanisms to memory for time but has not clearly differentiated location- from distance-based processing. The present experiment recorded event-related brain potentials (ERPs) while subjects completed two different temporal memory tests, designed to emphasize either location- or distance-based

processing. The subjects' reports of location-based versus distance-based strategies and the reaction time pattern validated our experimental manipulation. Late (800–1,800 msec) frontal ERP effects were related to location-based processing. The results provide support for a two-process theory of memory for time and suggest that frontal memory mechanisms are specifically related to reconstructive, location-based processing.

Friedman, W. J. (2003). The development of children's understanding of the past and the future. In R. Kail (Ed.), *Advances in Child Development and Behavior* (Vol. 31, pp. 229-269). San Diego, CA: Academic Press.

Lamb, M. E., Sternberg, K. J., Orbach, Y., Esplin, P. W., Stewart, H., & Mitchell, S. (2003). Age differences in young children's responses to open-ended invitations in the course of forensic interviews. *Journal of Consulting and Clinical Psychology*, *71*(5), 926

To elucidate age differences in responses to free-recall prompts (i.e., invitations and cued invitations) and focused recognition prompts (i.e., option-posing and suggestive utterances), the authors examined 130 forensic interviews of 4- to 8-year-old alleged victims of sexual abuse. There were age differences in the total number of details elicited as well as in the number of details elicited using each of the different types of prompts, especially invitations. More details were elicited from older than from younger children in response to all types of prompts, but there were no age differences in the proportion of details (about 50%) elicited using invitations. Cued invitations elicited 18% of the total details, and the number of details elicited using cued invitations increased with age. Action-based cues consistently elicited more details than other types of cues. (PsycINFO Database Record (c) 2012 APA, all rights reserved)

Larsson, A. S., Anders Granhag, P., & Spjut, E. (2003). Children's recall and the cognitive interview: Do the positive effects hold over time?. *Applied Cognitive Psychology*, *17*(2), 203-214.

Most studies investigating how the Cognitive Interview affects children's recall have employed short retention intervals (a week or less). In our study children (10–11 years old) saw a film

picturing an extraordinary performance by a professional fakir. Half of the children were interviewed after seven days ($n = 24$) and the other half after six months ($n = 25$). At each test session, half were interviewed according to the Cognitive Interview (CI), and half according to the Structured Interview (SI). We found that: (a) the children in the CI condition recalled significantly more correct information than the children in the SI condition (both after seven days and after six months), and (b) the children interviewed after seven days recalled significantly more correct information, and less confabulations, compared to the children interviewed after six months. The results suggest that the CI can be used as an investigative tool both after short and long retention intervals. Copyright © 2002 John Wiley & Sons, Ltd.

Tartas, V. (2001). The development of systems of conventional time: A study of the appropriation of temporal locations by four-to-ten-year old children. *European Journal of Psychology of Education*, *16*(2), 197-208.

The research is about the construction of conventional time through the appropriation of different tools used to locate events in time by 200 children between the ages of 4 to 10 years old. Temporal locations are examined through an interview task and the children's ability to construct order of different temporal frameworks (daily, weekly, yearly) is studied using a card arrangement task. The same children took part in these two tasks. The results show that the tools children use to locate events in time change with their age and school experience: the youngest use relative locations or scripts (events are used as tools to locate other events) whereas older children use absolute locations (hours, days, months then become tools for locating events in time). Moreover, children use conventional temporal tools to locate events before being able to use them to put different events into the same temporal sequence. The study highlights developmental phases between the use of temporal locations and the construction of their meanings.

Bradburn, N. M. (2000). Temporal representation and event dating. In A. Stone, J. S. Turkkan, C. A. Bachrach, Jobe, J. B., Kurtzman, H. S., & V. S. Cain (Eds.), *The science of self-report: Implications for research and practice* (pp. 49-62). Mahwah, NJ: Erlbaum.

Thompson, L. A., Gomez, R. L., & Schvaneveldt, R. W. (2000). The salience of temporal cues in the developing structure of event knowledge. *American Journal of Psychology, 113*(4), 591-620.

Two experiments used a novel method called Pathfinder to examine whether the salience of temporal cues embedded in event structure increases developmentally and whether people link event actions by simple adjacency relationships or embed them in an organized whole. A sequential format for eliciting knowledge was compared with a less structured format for dinner and bedtime events. Adults and their 8- and 10-year-old children demonstrated well-developed script organizations regardless of format, and organization improved across this age range. In Experiment 1, temporal cues were not a salient basis of comparison for 6-year-olds, but in Experiment 2 they could use temporal cues when instructed to do so. The results suggest that temporal salience increases between 6 and 10 years and that temporal knowledge of event actions is highly organized in this age range. Furthermore, children's event knowledge functions partly in the interaction between their developing event knowledge and the support provided by sequential constraints in the environment.

Buckner, J. P., & Fivush, R. (1998). Gender and self in children's autobiographical narratives. *Applied Cognitive Psychology, 12*(4), 407-429.

In this study, we examined relations among gender, self-concept and children's autobiographical narratives. Twenty-two white middle-class children 8 years of age (50% female) were administered the Children's Self-View Questionnaire (CSVQ). In addition, children were asked to recall a specific experience associated with each of the nine self-concept dimensions assessed by the CSVQ, including Achievement, Alienation, and Social Closeness. Consistent with previous research with adults, girl's autobiographical narratives were longer, more coherent and more detailed than were boys' narratives. Girls were also more likely to place their autobiographical narratives in a social context, to refer to more affiliative themes, and to mention

more people and more emotions than were boys. In all these ways, girls' narratives were more socially contexted and relational than were those of boys. However, no relations were found between specific dimensions of self-understanding and children's autobiographical narratives. Theoretical implications of these findings are discussed. ©1998 John Wiley & Sons, Ltd.

Friedman, W. J., & Kemp, S. (1998). The effects of elapsed time and retrieval on young children's judgments of the temporal distances of past events. *Cognitive Development, 13*(3), 335-367.

Young children have very limited knowledge of long-term time patterns, but recent studies show that impressions of temporal distances provide them with some sense of the times of past events. These studies were investigations of (a) the function relating subjective to objective distances in the past for events whose ages range from less than 1 month to 1 year and (b) the effects of retrieving events on their subjective recency. In Study 1, 825 children (5-, 6-, and 7-year-olds) compared the recency of two school events from many months in the past shortly after one of the events was retrieved. In Study 2, 162 children (mean age 4.9 years) judged the distances in the past of their birthdays, summer, and 4 holidays by placing cards on a spatial continuum. In Study 3, 148 children (mean age 4.8 years) performed a similar task after the prior retrieval or priming of some of the events. Subjective temporal distance increased with real distance up to about 5 months, with no evident increase thereafter. Retrieval and priming had no effect on subjective recency. These findings show that early developing characteristics of memory provide young children with a differentiated sense of the times of events from past months. However, simple strength models cannot explain this ability.

Thompson, C. P., Skowronski, J. J., Larsen, S. F., & Betz, A. (1996). *Autobiographical memory: Remembering What and Remembering When.* Mahwah, NJ: Erlbaum.

Friedman, W. J. (1993). Memory for the time of past events. *Psychological Bulletin, 113*(1), 44-66.http://www.jwalkonline.org/docs/Grad%20Classes/Fall%2007/Cog%20Surv/class%205/Friedman%201993.pdf

Laboratory and autobiographical studies of normal adults' memory for the time of past events are reviewed, and the main phenomena that have been discovered are described. A distinction is introduced among several kinds of information on which this knowledge could be based: information about distances, locations, and relative times of occurrence. The main theories of memory for time are classified in these terms, and each theory is evaluated in light of the available evidence. In spite of the common intuition that chronology is a basic property of autobiographical memory, the research reviewed demonstrates that there is no single, natural temporal code in human memory. Instead, a chronological past depends on a process of active, repeated construction.

Friedman, W. J. (Ed.). (1992). *The Development of Children's Representations of Temporal Structure*. New York: Kluwer Academic/Plenum Publishers.

Friedman, W. J. (1991). The development of children's memory for the time of past events. *Child Development*, *62*(1), 139-155.

Previous research on adults' and children's memory for the time of past events has generally overlooked the fundamental distinction between knowledge of temporal distance in the past and knowledge of temporal locations. This study applied the distinction to the development of time memory. Children of 4, 6, and 8 years of age experienced 2 target events, one 7 weeks and the other 1 week before testing. They were asked to judge the relative recency of the 2 events and to localize the older event by time of day, day of the week, month, and season. Even the 4-year-olds were successful in judging the relative recency of the 2 events and localizing the older event by time of day. However, on the 3 longer time scales, only the 6- and 8-year-olds could localize the older event, reason about possible times that it could have occurred, or tell the present time. The great accuracy of the time-of-day judgments at all 3 ages is almost certainly not due to distance-type information. The results show the separate development of distance and location judgments.

Friedman, W. J. (1990). Children's representations of the pattern of daily activities. *Child Development, 61*(5), 1399-1412.

An important part of humans' knowledge of time depends on forming mental representations of recurrent temporal patterns. This study was an attempt to characterize the representations of one such pattern—the relative times of occurrence of daily activities such as waking, lunch, dinner, and going to bed in 4–9-year-old children. The results of 3 experiments showed that by 5 years of age children can judge the backward order of daily activities, judge the forward order from multiple reference points within the day, and evaluate the lengths of intervals separating daily activities. By about 7 years, children can also judge backward order from multiple reference points. These findings impose constraints on the types of representational models that can explain young children's knowledge of this pattern. The results also show that certain operations can be performed on this content about 6 years earlier than on 2 other temporal contents—the patterns of days of the week and months.

Strube, G., & Weber, A. (1988). The development of memory for dates and the reconstruction of the temporal order of past events. *Zeitschrift fur Entwicklungspsychologie und Piadagogische Psychologie, 20,* 225-238.

Friedman, W. J. (1986). The development of children’s knowledge of temporal structure. *Child Development, 57*(6), 1386-1400.

Adults have a rich understanding of a number of time systems, but little is known about how this knowledge develops. 3 experiments were conducted to test a model in which the first representations of the days of the week and months of the year have verbal-list properties, and these are later supplemented by image representations. In Experiments 1 and 2, fourth or fifth graders could judge forward relative order for these contents, but not until adolescence could backward order judgments be made accurately. In Experiment 3, fourth graders used a serial process to solve a categorical distance judgment task, whereas older groups shifted to a process with more rapid access to information about the position of remote items. The results are interpreted as supporting the 2-stage model and appear inconsistent with a number of alternative models.

Fivush, R., & Mandler, J. M. (1985). Developmental changes in the understanding of temporal sequence. *Child Development, 56*(6), 1437-1446.

In 3 experiments, 4-, 5-, and 6-year-olds' ability to sequence events was examined. We hypothesized that children initially construct temporal sequences by relying on the organization of their world knowledge instead of inferring logical relations among actions. In the first experiment, children generated picture sequences of familiar and unfamiliar events in forward and backward order without having seen the pictures in their correct sequence. In the second experiment, children reconstructed previously seen sequences, and in the third experiment, children were shown forward and backward sequences and reconstructed them in the opposite direction. Across experiments, the same pattern of performance was found; familiar events in forward order were the easiest to sequence, then unfamiliar events in forward order, familiar events in backward order, and finally unfamiliar events in backward order. These results are discussed along with other findings suggesting a similar pattern of performance across a wide developmental age span.

Winograd, E., & Soloway, R. M. (1985). Reminding as a basis for temporal judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 11*(2), 262-271.

In the normal course of events, some events bring to mind earlier events. This reminding or, in the context of list learning experiments, study-phase retrieval can serve as a basis for the accurate judgment of the relative recencies of the two events in question. In this article, evidence for this position is presented in three experiments. By manipulations of encoding using visual imagery instructions and word associations, appropriate conditions were arranged for reminding to occur. The results of all three studies support the position that reminding provides a direct basis for later judgments of the relative recency of events.

French, L. A., & Nelson, K. (1981). Temporal knowledge expressed in preschoolers' descriptions of familiar activities. *Papers and Reports on Child Language Development, 20*, 61- 69.

Forty-three children, 2;11 to 5;6, described six familiar activities: making cookies, going to the grocery, having a birthday party, going to a restaurant, getting dressed, and having a fire drill. They described each event three times. The descriptions were elicited by initially asking "What happens when...?" or "What do you do when...?" and then providing non-directive probes such as "Can you tell me more?" and "Anything else?" Reviews of the children's descriptions indicate that the request for description of events divorced from the immediate context elicits a sophistication in temporal structure and relational vocabulary that is often not accessed in either experimental or free-play settings with preschoolers. Performance in such settings can considerably expand what is known about preschoolers' cognitive and linguistic abilities. The baseline competency demonstrated in these settings can provide the foundation for more controlled research that attempts to establish how experimentally based competency gradually develops into the more abstract, decontextualized knowledge that characterizes adults' understanding of relational terms. (Author/JK)

Tzeng, O. J., & Cotton, B. (1980). A study-phase retrieval model of temporal coding. *Journal of Experimental Psychology: Human Learning and Memory*, *6*(6), 705-716.

Two experiments were conducted to evaluate three different theories of temporal coding. In the first experiment, subjects learned a list of categorizable words presented in a random fashion. In the second experiment, similar categorical instances were presented block by block. After list presentation, subjects were asked to make recency judgments on 10 pairs of intracategory items and 10 pairs of intercategory items. A strength theory predicts no performance difference between these two types of test pairs. A tape-recorder theory predicts a difference favoring the intercategory pairs. On the contrary, a study-phase retrieval model of temporal coding predicts better performance for the intracategory pairs than for the intercategory pairs. The results of both experiments strongly support the last model. The conceptualization of automaticity in temporal coding is also discussed with respect to developmental data.

Friedman, W. J. (1978). Development of time concepts in children. In H. W. Reese, & L. P. Lipsitt (Eds.), *Advances in child development and behavior* (Vol. 12, pp. 267-298). New York: Academic Press, Inc.

Friedman, W. J. (1977). The development of children's understanding of cyclic aspects of time. *Child Development*, *48*(4), 1593-1599.

Developmental psychological approaches to the study of time have fallen into 3 categories: studies of time perception; studies of logical, reconstructive abilities; and studies of the understanding of conventional time systems. The present work examines problems spanning the latter 2 categories--the development of children's understanding of temporal cycles and the relationship between cyclic concepts and cognitive development. 62 children, ranging in age from 4 to 10 years, were administered Piagetian tests of classification and seriation and a variety of specially designed cyclic tasks. Results show major progress in the representation of cyclic order and recurrence during the age period examined. For a variety of particular cycles, order responses were shown before continuity responses. The ability to produce a correct order is related to seriation performance but not classification performance when the variance attributable to age is partialed out. Continuity responses appear to be unrelated to performance on either of the Piagetian tasks tested when age is controlled.