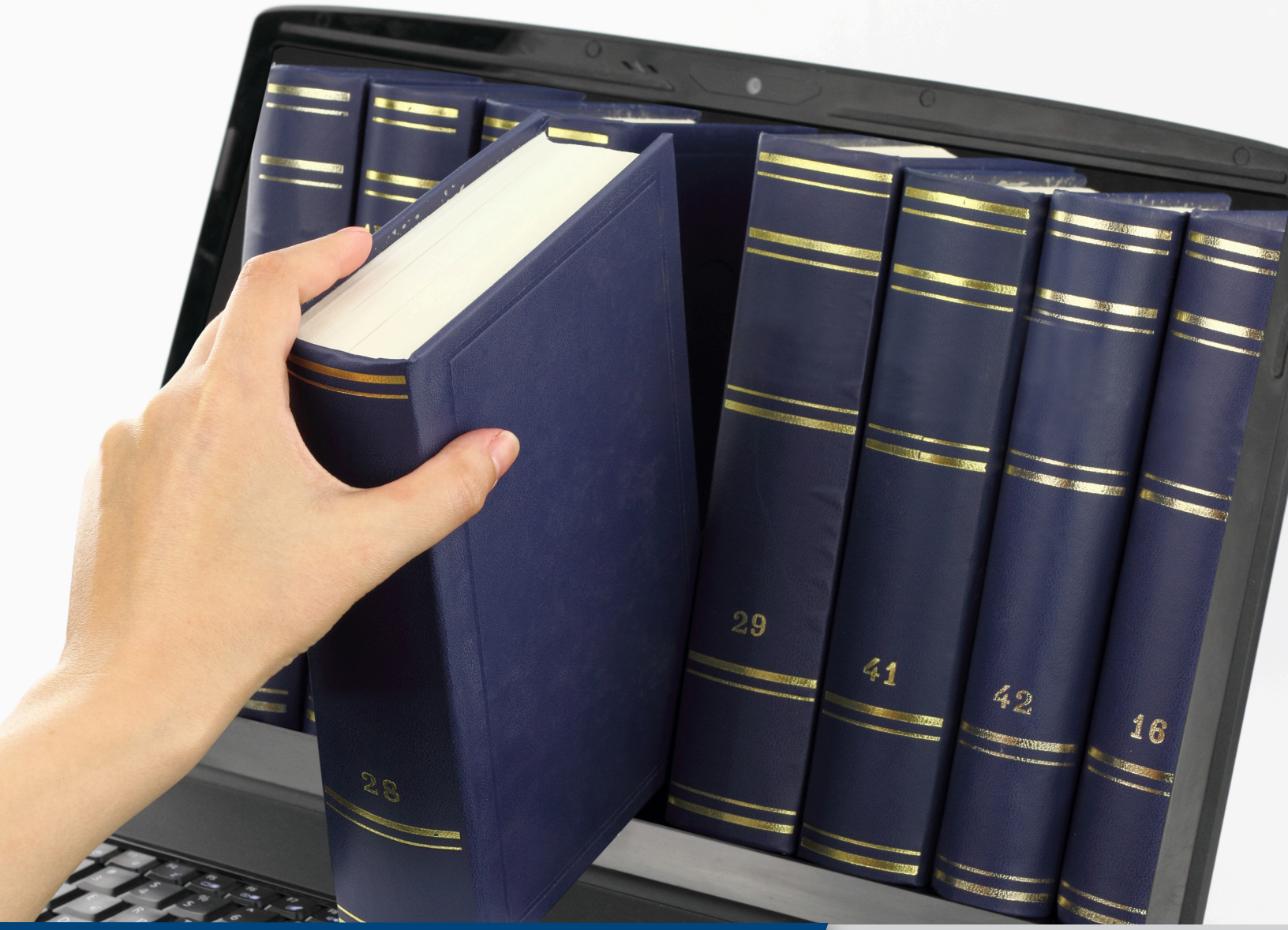
# William J. Friedman Collection

*A Bibliography*

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***Local Service.***
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## Scope

This bibliography lists many of the publications of William J. Friedman, including reports, articles, and book chapters. Links are provided to full text publications when possible.

## Organization

This bibliography is arranged in date descending order.

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Friedman, W. J. (2013). The development of memory for the times of past events. In P. J. Bauer & R. Fivush (Eds.), *The Wiley Handbook on the Development of Children's Memory* (pp. 394-407). Wiley.

This chapter describes what has been learned about the processes underlying the ability to place remembered events in time and when the processes develop. It reviews the different ways that theorists have explained humans' chronological sense of the past. This is followed by a consideration of what has been learned from studies of adults about the processes posited by theorists. Other important information about the processes involved in memory for time comes from the developmental literature. The chapter focuses on this set of studies that provides important insight into the complexity of adults' abilities. It discusses the components that are present in early childhood, those that emerge during middle childhood, and components that appear during late—middle childhood and adolescence. Finally, the chapter provides a summary of what has been learned from the literature on adults and from studies of children about the processes underlying memory for the times of events.

Wandrey, L., Lyon, T. D., Quas, J. A., & Friedman, W. J. (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.

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.

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.

Friedman, W. J. (2007). The meaning of “time” in episodic memory and mental time travel. *Behavioral and Brain Sciences, 30*(3), 323-323.

The role of time in episodic memory and mental time travel is considered in light of findings on humans' temporal memory and anticipation. Time is not integral or uniform in memory for the past or anticipation of the future. The commonalities of episodic memory and anticipation require further study.

Friedman, W. J. (2005). Developmental and cognitive perspectives on humans' sense of the times of past and future events. *Learning and Motivation, 36*(2), 145-158.

Mental time travel in human adults includes a sense of when past events occurred and future events are expected to occur. Studies with adults and children reveal that a number of distinct psychological processes contribute to a temporally differentiated sense of the past and future. Adults possess representations of multiple time patterns, and these representations take several different forms. Memory for the times of past events is built upon reconstruction of temporal locations, impressions of distances in the past, and order-codes. The times of future events are understood primarily as locations in represented time patterns, but propositions active in memory contain information that particular events are coming soon. Young children have difficulty distinguishing the past–future status of some events, showing that basic memory processes do not make the distinction clear. Concepts of the past and future may be required for differentiating these two categories of experience.

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.

Friedman, W. J. (2004). Time in autobiographical memory. *Social Cognition, 22*(5: Special issue), 591-605.

Research on memory for the times of past events has revealed ten main phenomena that constrain theoretical accounts of time in autobiographical memory. These findings do not support a uniform time-tagging mechanism or a temporally organized memory store. Instead, a combination of processes, most notably the reconstruction of past times, underlies our chronological sense of the

past. We are especially adept at remembering "locations" in the many temporal patterns that structure our lives, but some information about the order of related events, distances in the past, and specific dates is also available. These processes contribute to our sense of a personal past, a shared past in close relationships, and a coherent sense of the lives of other people.

Friedman, W. J. (2003). The development of a differentiated sense of the past and the future. Advances in child development and behavior. In R. V. Kail (Ed.), *Advances in Child Development and Behavior* (Vol. 31, pp. 229-269). New York: Academic Press.

Friedman, W. J. (2002). Children's knowledge of the future distances of daily activities and annual events. *Journal of Cognition and Development, 3*(3), 333-356.

Two studies with 92 children were conducted to describe 4- through 8-year-olds' knowledge of the distances of daily activities and of annual events in the future. Children were tested on a task that used a linear representation of the future. At each age, a substantial number of children responded on the daily-activities task as if they ignored the present reference time and judged the cards according to their earliness within the waking day. However, when separated from this morning-reference group, the remaining 4- and 5-year-olds significantly differentiated events according to their distances in the future. In this present-reference group, 7- and 8-year-olds showed greater differentiation of the future distances of daily activities than of annual events. Results demonstrate that a sense of the future depends on the specific representations available for each of a number of different time patterns.

Friedman, W. J. (2002). Arrows of time in infancy: The representation of temporal–causal invariances. *Cognitive Psychology, 44*(3), 252-296.

Many transformations that take place over time can only occur in one temporal direction, and adults are highly sensitive to the differences between forward and backward presentations of such events. In seven experiments using two selective-looking paradigms, 4- and 8-month-olds were shown forward and backward videotapes of events involving the effects of gravity on liquids and solid objects and of the separation of whole objects into pieces. Four-month-olds showed a significant preference for the forward version of liquid pouring from a beaker to a glass. Eight-month-olds looked longer at the forward versions of this and four other gravity-related events but showed no directional preferences for the separation events. Several experiments indicate that

longer looking at the forward versions of the gravity stimuli is not a product of attraction to specific perceptual features of the stimuli. A model based on the development of representations of types of events is presented and evaluated.

Friedman, W. J. (2001). Memory processes underlying humans' chronological sense of the past. In C. Hoerl & T. McCormack (Eds.), *Time and memory: Issues in philosophy and psychology* (pp. 139-167). Oxford: Clarendon Press.

Friedman, W. J. (2000). The development of children's knowledge of the times of future events. *Child Development, 71*(4), 913-932.

Four studies with 261 children were conducted to describe 4- through 10-year-olds' ability to differentiate the future distances of events. Distances ranged from later the same day through nearly a year in the future. Judgment methods included pointing to parts of a spatial scale representing future distances and answering open-ended questions. Although 4-year-olds failed to differentiate future distances, 5-year-olds were able to distinguish events that would occur in the coming weeks and months from those that would not occur for many months. However, like young children in earlier studies of memory for time, they confused the near future with the recent past. Children 6 through 8 years of age made more differentiated judgments but collapsed the distances of events more than a few months in the future. By 8 to 10 years of age, children accurately judged distances by using mental representations of the times of events in the annual cycle.

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.

This study investigated the ability of 4- to 9-year olds to retrieve memories from specific temporal locations in the past, including yesterday, last weekend, last summer, and several holidays from the past year. When children's recollections were validated by teachers and parents, it was found that even 4- and 5-year-olds were able to produce accurate memories from nearly all of those times. Many of the recollections were specific to the occasion in question, showing that these categories of the past are both differentiated and updated. However, the ability to retrieve memories by temporal location does not imply an understanding of where the locations fell relative to one

another. It was not until 8 to 9 years that children could order a set of locations from the past year, and even children in this oldest age group were unable to determine which of a pair of locations from the past year occurred in the more distant past. Furthermore, memory accuracy was unrelated to success on these temporal judgment tasks. These findings show that there are multiple levels in the development of a sense of the locations of autobiographical events.

Friedman, W. J. (1996). Distance and location processes in memory for the times of past events. In D. L. Medin (Ed.), *Psychology of Learning and Motivation: Advances in Research and Theory* (Vol. 35, pp. 1-41). Oxford: Academic Press.

Friedman, W. J., Gardner, A. C., & Zubin, N. R. (1995). Children's comparisons of the recency of two events from the past year. *Child Development*, *66*(4), 970-983.

Research on memory for time has been limited by the difficulty of disentangling several of the fundamentally different processes that contribute to a chronological sense of the past. This study used a developmental approach to isolate one of these processes, impressions of distances in the past. Large samples of children between 3 and 12 years were asked to judge which was longer ago, their birthday or Christmas (and, in one study, Halloween and Thanksgiving). Even children under 6 years of age were able to discriminate the recency of their birthday and Christmas with great accuracy when the events were widely separated and one was within the past several months. The ability to discriminate recency on these scales appears to be a basic property of human memory that changes little with development. Other information about the locations of the events and their relative times of occurrence could only be interpreted correctly by children older than 9 years.

Friedman, W. J. (1993). Memory for the time of past events. *Psychological Bulletin, 113*(1), 44-66.

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. (PsycINFO Database Record (c) 2016 APA, all rights reserved).

Friedman, W. J. (1992). Children's time memory: The development of a differentiated past. *Cognitive Development, 7*(2), 171-187.

This study investigated the ability of 4- to 9-year olds to retrieve memories from specific temporal locations in the past, including yesterday, last weekend, last summer, and several holidays from the past year. When children's recollections were validated by teachers and parents, it was found that even 4- and 5-year-olds were able to produce accurate memories from nearly all of those times. Many of the recollections were specific to the occasion in question, showing that these categories of the past are both differentiated and updated. However, the ability to retrieve memories by temporal location does not imply an understanding of where the locations fell relative to one another. It was not until 8 to 9 years that children could order a set of locations from the past year, and even children in this oldest age group were unable to determine which of a pair of locations from the past year occurred in the more distant past. Furthermore, memory accuracy was unrelated to success on these temporal judgment tasks. These findings show that there are multiple levels in the development of a sense of the locations of autobiographical events.

Friedman, W. J. (1992). The development of children’s representations of temporal structure. In F. Macar, V. Pourthas, & W. J. Friedman (Eds.), *Time, Action and Cognition* (pp. 67-75). Springer, Dordrecht.

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.

Friedman, W. J. (1989). The representation of temporal structure in children, adolescents and adults. In *Advances in Psychology* (Vol. 59, pp. 259-304). North-Holland.

Friedman, W. J., & Laycock, F. (1989). Children's analog and digital clock knowledge. *Child Development*, 60(2), 357-371.

Understanding the clock system requires knowledge of several distinct components, including reading displays, transforming times, and understanding their temporal referents. Two experiments were conducted to determine the ages at which children can read and transform times given in analog and digital displays, can link times to activities, and can judge the order of hours in the day. Altogether, 240 children from first to fifth grades were tested. Digital time reading was well developed by the first grade. Analog time reading was equivalent only for whole-hour problems,

with some other times proving difficult even for the oldest children. However, there was no overall digital advantage for tasks requiring the addition of 30 min, and the relative difficulty of analog and digital displays varied by problem type. Reported methods indicated that children used a number of different processes in solving the problems. In spite of the gradual development of reading and transformation skills, even the youngest children knew the times of many activities and understood the order in which daily activities occur. However, clock times were not incorporated in the earliest representations of the order of daily events.

Friedman, W. J., & Brudos, S. L. (1988). On routes and routines: The early development of spatial and temporal representations. *Cognitive Development, 3*(2), 167-182.

Despite apparently fundamental differences, time and space pose similar challenges for representational development. In both cases, children must code relationships between elements that are experienced one at a time. Two influential models of spatial and temporal knowledge in early childhood place considerable emphasis on the coding of sequential relations. These parallels led us to compare the operations that a group of preschool children (M age = 4, 7) could perform on their representations of their nursery school routine and a novel unidirectional route that we taught them. We found that for both contents, the children could describe the order of elements, arrange cards depicting the elements in forward order, and place the cards in backward order. When groups were equated on the basis of their forward-order competence on the route and routine tasks, similar levels of accuracy were shown on the two backward-order tasks. These findings support the existence of representational similarities, but additional research will be required to determine the extent of the overlap. Such research should also help us evaluate the adequacy of existing models of early spatial and temporal representation.

Friedman, W. J. (1987). A follow-up to "Scale effects in memory for the time of events": The earthquake study. *Memory & Cognition, 15*(6), 518-520.

This study is a follow-up to Friedman and Wilkins's (1985) experiments on memory for the time of past events. That research showed that judgments of the time of past news events are often more accurate on finer than on grosser time scales. This finding is consistent with a reconstructive model but troublesome for models emphasizing judgments of the age of a memory. The present study was designed to control for the possibility that scale differences in Friedman and Wilkins's study

were due to the use of general time knowledge to infer when events of a given sort were likely to have occurred. Ninety-nine subjects estimated the time of an earthquake that had occurred 9 months prior to recall and that they reported having actually experienced. Separate estimates were given on each of five time scales ranging from year to hour. Recall of hour was extremely accurate in spite of the relative inaccuracy of the next three grosser time scales. This and other results support Friedman and Wilkins's original interpretation.

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. Three 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 judgement task, whereas older groups shifted to a process with more rapid access to information about the position of remote items. The results as interpreted as supporting the 2-stage model and appear inconsistent with a number of alternative models.

Friedman, W. J., & Wilkins, A. J. (1985). Scale effects in memory for the time of events. *Memory & Cognition, 13*(2), 168-175.

This study addressed the question of how people remember the time of past events. Stimuli were 10 news events that had occurred from 6 months to 20 years before the study. In contrast to previous studies of memory for time, subjects were asked to provide estimates of the stimulus events on multiple time scales, including year, month, day of the month, day of the week, and hour. If judgments are based on direct information about the age of the memory, accuracy should decrease monotonically as one moves to finer scales. Alternatively, if subjects reconstruct the time from fragmentary information associated with the event, one would expect that estimates on finer time scales would often exceed grosser scales in accuracy. Results for accuracy, confidence, and number of recall cues supported the latter position. In addition, subjects reported a variety of types

of recall cues, the most common being memory for personal experiences or events that were contiguous with the news event.

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 mainly 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. Sixty-two 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.