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Peer versus adult models: Infants immediate and deferred imitation of familiar and novel events

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PEER VERSUS ADULT MODELS: INFANTS IMMEDIATE AND DEFERRED IMITATION OF FAMILIAR AND NOVEL EVENTS

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Abstract

The present study examined the effects of different aged models (adult vs. peer) on infants' memory and imitative behaviors. Thirty infants between the age of 14- to 18-months were included in the study. Fifteen of the infants watched an adult model demonstrate two familiar three-step event sequences and two novel three-step event sequences on simple objects. The other fifteen infants observed a peer model perform the same event sequences on the same objects. Three questions were addressed: (a) Do infants learn to imitate three-step event sequences better from an adult or a peer model? (b) Do infants better recall familiar or novel events? (c) Are infants capable of recalling the event after a one-week delay? (d) Finally, if the age of the model interact with the other known determinants? The results indicated that overall, a peer model was more effective than an adult model. Second, recall for the novel events was superior to recall for the familiar events. Finally, memory was not affected by the one-week delay.

Peer vs. Adult Models: Infants Immediate and Deferred Imitation of Familiar and Novel Events

Chapter One

Theories about imitation and learning can be traced back to 1896 when Lloyd suggested in his book Habits and Instincts that imitation is a constitutional and instinctive process. More recently, the topic of learning by observing the behavior of others was addressed by two major theorists, namely Piaget and Vygotsky. Both theorists are in agreement in their views regarding the manner in which children learn via observing and interacting with others; however, they differ on the major issue of whose influence is paramount: adults or peers (Duncan, 1995).

According to Piaget (1932/1948; see also, Duncan, 1995; and Glassman, 1994) children perceive their peers as the same as themselves and conclude that their thinking about the world and understanding of one another should be similar. Children's perception of adults, on the other hand, is that adults are more knowledgeable than themselves, therefore, they perceive themselves as being "qualitatively different" from adults. As a

result, if a contradiction in ideas or in attitudes comes about with adults, the child is not disturbed and the cognitive balance stays the same. However, disagreements and misunderstandings with peers results in "cognitive conflicts" which Piaget defined as a state of mental unbalance between a childs' beliefs and thinking and the information s/he receives from the world. As a result, the child feels confused and upset and searches for answers to minimize this confusion. A cognitive conflict due to peers, therefore, motivates the child to search for answers and to change their old ways of thinking about the world and form new ones to fit better with the incoming information they are receiving. This search for answers, therefore, enables the child to reach a new and higher equilibrium, or a higher level of intellectual development. This process of seeking mental balance is what Piaget called "equilibration" (Piaget, 1975/1985). Equilibration is achieved through the process of adaptation which consists of either assimilation or accommodation. The two processes of Piaget's theory are inseparable and work at all levels of cognitive development and influence each other mutually (Piaget, 1975/1985). In short, Piaget

emphasized the importance of peer influence on children's intellectual development and understanding of the world.

In contrast to Piaget's theory, Vygotsky's theory emphasizes the influence of adults over peers on children's intellectual development and understanding of the world (Vygotsky, 1978). Vygotsy believed that adults are more knowledgeable about their culture and society and provide more verbal instructions to guide children's actions and teach them about the world. Therefore, adults serve as better role models of "enculturation" to children (Vygotsky, 1978; see also, Duncan, 1995). Children depend upon adults' assistance and supervision in novel activities of which they have limited or no knowledge. This kind of guidance and assistance cannot be provided by same-aged peers.

Vygotsky's theory focuses a great deal upon social interaction. He believed that understanding individual development cannot be accomplished without understanding the individual's social surroundings (Vygotsky, 1985). The central idea of understanding the social interaction of children's development in Vygotsky's theory is the "zone of proximal

development" (Vogotsky, 1987; 1985). It is a supported learning environment such as schooling, in which children are encouraged to perform above their individual limits by a more experienced individual. With such assistance, children are able to gain more knowledge and move up the different levels of development as their knowledge is increased. In short, Vygotsy believed that adults lead and guide children through the world and serve as more effective models than peers by providing a supported learning environment.

Similarly, Bandura and Walters (1963) believed that adults can have a powerful effect on subsequent behaviors of children as well. According to Bandura, imitation emerges from observing another person's behaviors and producing a response similar to the previously observed behavior. For example, in the now classic "Bobo Doll" experiment Bandura, Ross, and Ross (1963) clearly demonstrated the powerful effect of an adult model's behaviors on the subsequent behaviors of children. That is, children imitated an adult models' behaviors in the absence of any positive reinforcement. Specifically, the authors believed that exposing children to aggressive

behaviors of an adult model would result in children engaging in the same behaviors. To test their hypothesis, the authors exposed 3-5 year old children to an adult model whose behavior was hostile toward a 5-foot inflated Bobo doll. The model displayed the following aggressive acts: sitting on the doll, punching its nose, kicking its body, and throwing it in the air. The results indicated that children exposed to the aggressive behaviors of an adult model often remembered what they observed and later engaged in the same behavior. Thus, this experiment revealed that children do engage in imitation of adult models. As this experiment has shown that children imitate adult behaviors, it would be of interest to examine whether children imitate their peer models' behaviors and if peers or adults are more effective models.

To date, most previous research has examined the effects of either an adult or a peer model on childrens' imitating behaviors, but little research has considered both models in the same study. That is the primary focus of the present research study: to investigate whether exposure to an adult model versus a peer model produces a differential effect on infants'

imitation and memory performances.

Children and Peer Models

As discussed before, Piaget believed that children are aware of their peers, perceive each other the same as themselves, and believe their thinking of the world is similar. Therefore, children identify with each other more than they do with adults (Piaget, 1932/1948). Similarly, the research of peer tutoring indicates that children can be more effective than adults (Allen, 1976; Cicirelli, 1976; and Steward & Steward, 1974). These researchers claimed that children speak to each other at the same level of understanding and perceive each other similarly. For example, in the study by Steward and Steward (1974), parent-child and child-child (siblings) interactions were investigated. The study included first-born children who served as teachers to their younger siblings of three- to four-years of age. The teaching styles between the parent-child and child-child interactions were observed by involving a Piagetian sorting game of classifying different colors, shapes, and sizes of objects. The result of this study indicated that children accepted the task more when instructions were presented by their

sibling rather than by their parent. In addition, they were more passive to their parents' instructions than to their siblings' instructions. The authors clearly indicated that children were more affective teachers than adults.

Furthermore, other researchers have also indicated that children achieve superior learning on certain tasks when working with other children (Peach & Moore, 1990; and Howell & Kaplan, 1978). The study by Peach and Moore (1990) indicated that peer tutoring is effective in raising the spelling scores of mildly mentally handicapped elementary students. During baseline, the mean percent of correct words spelled was 65.9 percent. When a peer tutor was assigned to work with the participants the mean increased to 87.4 percent. This study showed that the mildly mentally handicapped children benefitted from the help of a peer tutor. In the study by Howell and Kaplan (1978), third, fourth, and fifth grade students were paired with a peer tutor to provide ten minutes of individual reading instructions (the tutor was to intervene when errors occurred in tutees' reading). The results indicated that children benefitted from the tutor. That is, there was an increase in the oral reading rates of tutees. Conversely,

other researchers claimed that adult tutors are more effective than peer tutors, because adults provide more verbal instructions (Ellis & Rogoff, 1982).

As well as studies that have shown that the behavior of adults has an effect on children's behavior (Bandura, Ross, & Ross, 1963; Piaget, 1962; and Ellis & Rogoff, 1982), peer interaction has also been found to have an effect on social and emotional development of children. Thus, both exposure to adult role models and peer interaction appear to be important factors that influence children's behavior. For example, Freud and Dann (1951) argued that peer interaction was important for emotional development. The authors were interested in the behavior of orphan children whose parents were eliminated in World War II and were brought to England at age three as refugees and then raised together. The children showed a strong social and emotional attachment to each other and became agitated if one of their peers was removed from the group. The authors concluded that a strong sense of peer attachment and contact is an important factor in facilitating development when proper care taking is absent.

Similarly, in an observational study, Bridges (1933) investigated social, emotional, and imitation behavior of institutionally reared children ranging in age from three weeks to two years. The children were grouped roughly according to their age and were placed in separate cribs with about ten infants to a room within a few feet of one another. One room had infants of 1- to 3-months-old, another 3- to 6-months-old, and so on. The author noted that around the age of 4-5 months, the infants began to develop an interest in other children's behavior. By 7-8 months, the infants were smiling and reaching out to children nearby. By 8-9 months, infants were observed imitating each other's actions and simple behaviors. By 9-10 months, infants were imitating simple vocal sounds of one another. At 11-12 months, they were patting the bed rail or sitting and rocking in imitation of each other. By the time they reached 13-14 months, they frequently laughed and smiled to reciprocate each others' behaviors. The study revealed that peer imitation can be an important factor in the social and emotional development of humans and that it starts in early infancy.

Not only is peer interaction and imitation important for humans early

in life, it has also been found to be important for animals as well. For example, Harlow (1969) studied the emotional development of infant monkeys. In particular, the author investigated the effect of peers on four-week old infant-monkeys raised as a pair but separated from their mothers. The infants clung to each other very tightly. Harlow described the strength of their affection as "so intense that the two infants looked like a single, two-headed monkey" (p.355). When placed in a new environment the monkeys displayed low disturbance and used each other for emotional security. Low disturbance was defined as the absence of any aggressive behaviors. The author concluded that peer interaction is important for normal development in new and strange environments in the absence of parental care.

In addition to research with animals and atypical populations such as orphans, others have examined the role of interaction with siblings and peers in normal or typical development (Abramovitch, Corter, & Londo, 1979; and Appoloni & Cook, 1975). For example, in the study by Abramovitch, Corter and Londo (1979) the effect of sibling interaction on

social development was investigated. The authors observed the social interaction of same-sex siblings in their own homes. They found that a high level of interaction existed among siblings with younger siblings imitating older siblings more often than vice versa. The authors concluded that sibling interaction and imitation is an important aspect of social development.

Vandel, Wilson and Buchanan (1980) in a longitudinal study investigated early infant-peer relations and their interaction capabilities along with the type of social exchanges they use during their first year of life. The same group of infants was studied at 6-, 9-, and 12-months. The infants were studied in pairs in a playroom and their interactions were videotaped. The mothers were present in the room but were asked not to suggest or initiate any social behaviors to their infants. The authors confirmed that infants as young as 6-months-old were capable of socially interacting with one another by exchanging smiles, touches, and vocal sounds.

Many investigators have assessed the extent of attraction of children

to peers rather than to adults (Bridges, 1933; Edwards & Lewis, 1979; Rubinstein & Howes, 1976; and Steward & Steward, 1974). Rubinstein and Howes (1976), for example, examined 19-month-old infants' peer interaction at home and assessed the effect of the presence of a peer on the interaction between the child and his/her mother. The investigators found that toddlers were more interested in imitating each other by playing and offering toys to each other more than to their mothers. They also paid more attention to the peer than to their mother when both were present in the room. The authors concluded that children influence and imitate other childrens' behaviors more frequently than their mothers. Specifically, children influence other childrens' behaviors by offering more objects to their peers, playing more with their peers, and paying more attention to their peers than to their mothers. Therefore, it appears that children may serve as more powerful models of imitation than mothers (Rubinstein & Howes, 1976).

A number of researchers have specifically examined the effects of peer models on cognitive development as opposed to social or emotional

development of children (Hanna & Meltzoff ,1993; and Appoloni & Tremblay, 1978). In the study by Hanna and Meltzoff (1993), the authors examined toddlers' ability to observe and imitate specific actions on objects that had been demonstrated by another peer and later tested their memory for those actions. Due to the limited verbal abilities of toddlers, elicited imitation, a method of nonverbal communication was used to test their memory. The method involved showing toddlers what to do instead of verbally explaining it to them. The peer model was a 14-month-old infant who was trained sufficiently in advance by the experimenter to demonstrate the target acts on certain objects to the participants. For example, one of the simple objects used was a "collapsible plastic cup 6.5 cm high made of a graded set of plastic bands. The target act was to collapse the cup by pushing down on the top with a flat hand" (p. 702). The peer model demonstrated the target actions on five different objects in random order while the experimenter encouraged the infant participant to pay attention to the peer demonstration. At the end of the demonstration, and after a five minute delay, the experimenter placed the objects in front of the infant

participant one at a time in the same order as demonstrated to see if the participant would imitate the target acts. The testing took place in the absence of the expert peer. The results of this experiment clearly showed that infants imitated the peer model's behaviors. Participants produced a larger number of the target acts in the peer model condition as compared to participants in the control group with no modeling. In experiment two the authors tested imitation of peers by using the same procedure with a longer delay (48-hours) and a change in context. The demonstration took place in the laboratory and the testing took place in their homes. The results showed that infants imitated their peers even after the 48-hour delay. The results of both of the experiments showed that 14-month-old infants can remember and reproduce actions modeled by a peer both after a 5-minute delay and after a 48-hour delay.

The study by Appolloni and Tremblay (1978), also examined the effect of peer models on cognitive development of young children. Specifically, the authors assessed the extent to which two-year-olds imitated the novel behaviors of a peer model in natural settings of daycare. A peer

model was trained in advance to show particular manipulations of certain toys to the children, and the childrens' imitative behaviors of the model was noted. The results of their study indicated that children 2-years of age and younger were able to reproduce previously observed novel behaviors of an age-mate.

The foregoing literature review provides evidence of the importance of peer models. Peer imitation and behavior points toward the importance of peers serving as role models (Peach & Moore, 1990; Howell & Kaplan, 1978; Vandel, Wilson & Buchanan, 1980; and Rubinstein & Howes, 1976). First, peer interaction and imitation were considered to be important for social and emotional development (Bridges, 1933; and Rubinstein & Howes, 1976). Second, Hanna and Meltzoff (1993) and Appolloni and Tremblay (1978) showed the effects of peer models on cognitive development of young children. That is young children can learn and remember specific actions on objects that they have seen demonstrated by another peer. In addition, the research of peer tutoring also indicated the important effects of peer tutors on childrens' intellectual development

(Peach & Moore, 1990; and Howell & Kaplan, 1978).

To date, few empirical investigations have compared and contrasted the effects of both adult models and peer models upon infants' imitation and learning. An example of one of the few investigations that compared the effects of an adult versus a peer confederate on young children's memory was conducted by Ceci, Ross and Toglia (1987). Ceci et al. tested the vulnerability of different aged childrens' memories to misleading post-event information that was either presented by an adult or another child. The authors tested children 3- to 12-years of age. The participants were read a short story by an adult and were also shown pictures that demonstrated the main points of the story. The story was about a little girl named Loren getting ready for her first day of school. Briefly, the story used by Ceci et al. (1987) described that Loren spends too much time getting showered and dressed and had to hurry eating her breakfast or else she would miss her bus. The next day, the children were met individually by an adult (Exp.1) who was different from day one or a child (Exp.2) who provided them with either biased or unbiased information. Children in the biased condition

were asked misleading questions pertaining to the story. Children in the unbiased condition (control) were asked general questions, such as, "Do you remember the story about Loren, who was sick?" (p. 40). Three days after the presentation of the story, one of the adult experimenters (different from day one) met with the children individually and provided them with four pictures: two of the pictures were in the actual story and two pictures were not but depicted actions that had been suggested to the children who were in the biased condition. The children were told to identify the two pictures that were actually in the story.

The authors found that when a child rather than an adult provided the biased information, the children were less affected by the misleading post-event (biased) information. That is, when tested later, they were more likely to recognize correctly the original events. This study demonstrated that the age of the confederate can significantly affect childrens' behaviors. However, to date, most empirical investigations have focused on the use of adult models to examine the imitating behaviors of young children.

Children and Adult Models

In contrast to Piaget's theory (1932/1948), Vygotsky believed that adults influence children's understanding of the world and intellectual development more than their peers. Children seek adult supervision and guidance in novel activities of which they have limited or no knowledge (Vygotsky, 1978).

The focus of much research during the past few decades, has been on the imitative behaviors of young children who use adults as models. For example, Piaget (1962), and Uzgiris (1973), after studying 12- to 14-months old children, concluded that there is clear evidence indicating the capabilities of infants to imitate familiar verbal and gestural actions of adult models.

More recently, Bauer and colleagues have used elicited imitation to test infants' memory and recall (Bauer & Mandler, 1992; Bauer & Hertsgaard, 1993; Bauer, Hertsgaard & Wewerka, 1995; and Bauer & Thal, 1990). Young infants and toddlers have limited verbal skills. In order to test their memory, nonverbal communication methods must be used.

Elicited imitation is a method of nonverbal communication that can be used with infants. It involves showing young participants what to do by demonstrating and modeling of tasks rather than verbally explaining it to them. For example, Bauer and Mandler (1992) investigated 11- and 13-month-old infants' immediate recall of two-act-event sequences presented by an adult. One of the event sequences involved "making a rattle", in which the experimenter showed the child the steps involved in making the rattle. The items used to make the rattle were a clear plastic box with a flexible diaphragm covering the opening and a large plastic button. The experimenter modeled to the young subject how to put the button into the box by pushing it through the diaphragm, then shook the box. Immediately after modeling, the objects were given to the child and the child was encouraged to imitate. If the child did not produce the target acts, the events were modeled again. The results indicated that infants as young as 11-months-old were capable of accurately remembering specific two-act sequences presented by an adult model.

In another study, Bauer and Hertsgaard (1993) used elicited imitation

to examine 13-month-old children's immediate and long-term recall of two-act sequences. Children were tested immediately and after a one week delay. The results clearly showed that children as young as 13-months can recall familiar and novel two-act sequences for at least one week. The importance of this study was that immediate and delayed (one week) recall was examined as opposed to only immediate recall as in Bauer and Mandler (1992).

In another, more recent experiment, Bauer, Hertsgaard, and Wewerka (1995) reported that 1- to 2-year-old children can recall information after a much longer delay (one month). The authors used elicited imitation to assess several factors of children's memory during the second year of life. In the first part of their experiment, the authors wanted to test the effects of verbally reminding children of the events to be remembered on their memory and recall after a delay of one-week between stimulus presentation and testing. Each child was presented with six three-step event sequences (two familiar, two novel enabling, and two novel arbitrary). The experimenter verbally explained and demonstrated each of the event

sequences twice in a row. Then the objects were given to the child to imitate. This was the immediate measure. The participants were asked to return one week later for the testing of delayed recall. Neither the participants nor their parents were informed that the same objects would be used. During the delayed recall session, the child was provided with the objects along with verbal reminders to cue the events. For example, on "make a rattle", along with giving the objects to the child, the experimenter also said, "show me how to make a rattle." The results indicated that providing verbal reminders during modeling improved 15-month-old childrens' recall. In addition, childrens' performance was equivalent both at the immediate and delayed testing regardless of the sequence type presented. In part two of their experiment, the children were reminded verbally and also non-verbally. Nonverbal information consisted of showing the child either the first or the last step in the sequence. Here, the effect of additional nonverbal information was not any greater than that of verbal information alone. In part three of their experiment, the authors assessed the efficacy of (1) reminding over a longer interval (one-month

delay), (2) the influence of the number of times the event was experienced (one to three times exposed to the test), and (3) the level of participation (if the participants were allowed to imitate or if they just observed). The results of this experiment indicated that children recalled better if they had repeated exposure to the test sequences, and if they were allowed to imitate rather than to just observe. The authors concluded that "the strength of organization of an event representation, rather than retention interval per se, is a major determinant of remembering and forgetting during the second year of life" (Bauer, Hertsgaard, and Wewerka, 1995, p. 294).

To date, by using elicited imitation, no direct research has been done that compares the role of peer and adult models on infants' learning and memory. The current study was designed to examine the effects of different aged models on infants' imitation and memory performance. More specifically, this study investigated whether exposure to an adult model versus a peer model produces a differential effect on infants' imitation and memory performance.

The present study is similar to the Hanna and Meltzoff (1993) study

discussed earlier. Hanna and Meltzoff (1993) showed that 14- to 18-month-old infants can and will imitate a peer model's behavior. However, they did not test imitation of an adult model. The present study extends that research by including both adult and peer models to explore their effects on young infants imitation and memory. Specifically, the current study was designed to use the elicited imitation paradigm to investigate whether exposure to an adult model versus a peer model produces a differential effect on 14- to 18-month-old childrens' imitation and memory performance. Because age of the model has not been examined in previous studies it is unclear if this variable will interact with the other independent variables in the study such as the time of testing (immediate vs. delayed) or the type of sequence (familiar vs. novel).

A second goal of this study was to replicate Bauer and Hertsgaard's (1993) findings with regard to immediate versus delayed memory performance of children. Delayed recall performance would indicate that young children are able to encode information that lasts over (1 week) time and can be accessed on a later situation. In their study, the authors found

that children can recall events immediately and after a one-week delay. As expected, at the delayed testing, childrens' recall performance was lower than at the immediate testing.

The third goal of the present study was to examine whether familiar or novel events have differential effects on childrens' memory performance. Bauer and Hertsgaard (1993) found that childrens' memory was superior for familiar event sequences as opposed to novel event sequences. This may be because familiarity with certain objects facilitates recall. In contrast to the other studies of Bauer and colleagues, the result was the exact opposite for the type of sequences presented (familiar/novel). That is, childrens' recall for the novel event sequences was superior to the familiar event sequences (Bauer & Mandler, 1992 and 1989; and Bauer & Thal, 1990). The authors concluded that this was due to novel events being more appealing and fun to observe, therefore, more "memorable" resulting in better recall of them. This is also the prediction of the present study, that childrens' memory will be superior for the novel events as opposed to the familiar events. Novel events are new and fun to observe because of their interesting outcomes (e.

g., strings of spaghetti). Therefore, they will be remembered better. The novel event sequences are used to ensure that participants are able to recall events that are new or unfamiliar to them.

In the present study, children were randomly divided into two groups. One group of children observed an adult model demonstrate certain acts on simple objects. The other group of children observed a peer model manipulate the same objects. The peer model was the primary investigator's 3-year-old son. The experimenter trained the peer model in advance by explaining and demonstrating the proper acts on the objects until he felt comfortable demonstrating the target acts to the participants himself.

The specific questions and predictions of the present study were: (a) Do infants 14- to 18-months-old learn to imitate three-step-event sequences better from an adult model or a peer model? It was predicted that children would learn to imitate three-step-event sequences better from a peer model. As noted earlier, Piaget believed that through interaction with same-aged peers children will learn better and reach higher levels of intellectual development (Piaget, 1932/1948). Propensity to imitate the actions of their

peers is predicted to be a factor for their better recall in the peer group. (b) Do infants recall familiar or novel events better? It was predicted that childrens' recall would be better for novel events than for familiar events. The reason was that the novel events are new and more interesting to observe, therefore, they will be remembered better. The novel event sequences are used to ensure that familiarity with the events is not required in order to reproduce the events in the correct order. (c) Are infants able to retain information in memory after a one-week delay? It was predicted that children would retain memory of the events at the delayed testing. However, their memory performance was predicted to be superior at the immediate testing than at the delayed testing. Evidence of recall over a one-week delay interval would indicate that infants as young as 14-months-old have the ability to remember specific events that happened in the past. According to Piaget the ability to remember specific past events is a "fundamental cognitive capacity"(Piaget, 1932/1948). (d) Does the age of the model interact with the other known determinants such as, time of testing and/or sequence types?

Chapter Two

Method

Participants

A total of thirty participants was used in this experiment. A nearly equal number of males and females was included in the study, specifically, 14 boys and 16 girls participated. The participants were between the age of 14- to 18-months (six 14-, two 15-, ten 16-, five 17-, and seven 18-month-olds). An additional six participants were tested but were not included in the final sample due to failure of the peer model to cooperate and/or to follow directions. The participants were recruited by placing an advertisement in the local newspapers. Twenty-seven participants were accompanied by their mothers during testing sessions, and three by their fathers. All of the children were accompanied by the same parent at the delayed testing as were at the immediate testing. The participants were predominantly Caucasian and of middle socioeconomic (SES) families. Participants free of any physical or mental disabilities were allowed to take

part in the study. At the completion of each testing sessions (immediate and delayed) the participants received a free toy of their choice.

Description of Models and Training Instructions

The peer model was the primary investigators 3-year-old son. He had brown hair and brown eyes with olive color skin . He was trained in advance on proper manipulation of the objects used in the study by the primary investigator. A few pilot subjects were tested and videotaped to ensure his ability to perform the target acts and his ability to cooperate with naive participants and follow the experimenter's verbal instructions.

The adult model was a Caucasian female college student of average build, with blond hair, fair skin, and who wore glasses. The adult model was also trained on proper manipulation of objects. In addition, she was allowed to observe the pilot studies conducted with the peer model and was instructed to match her behaviors to the peer model's behaviors as much as possible. For example, if the peer model engaged in off-task behaviors (such as, tapping or pounding on the table, not sitting still in the chair, or making noise) the adult model was instructed to engage in similar manor as

the peer model. This was to ensure that the two conditions were as identical as possible.

Test Sequence Events and Materials

The materials used in this study were store-purchased items. All of the participants were tested on the same four three-act event sequences: two familiar and two novel. The event sequences were taken from Bauer and colleagues' studies with slight variations (Bauer & Hertsgaard, 1993; and Bauer & Mandler, 1992). The following indicates the event sequences used, objects in the parentheses were given to the participants.

1) Familiar: Put teddy to bed (12-inch stuffed bear, a proportional sized cradle, and an infant receiving blanket). The model (adult/ peer) showed the participant how to put the teddy in the cradle, cover it with the blanket, and rock the cradle.

2) Familiar: Clean the table (small waste basket, paper towel, and an empty plastic spray bottle). The model (adult/peer) showed the participant how to spray the table with the empty spray bottle, wipe the table with a towel, and throw the towel in the wastebasket.

3) Novel: Make a rattle (a large plastic Easter egg, and a small ball). The model (adult/peer) showed the participant how to put the ball in the egg, close the egg, and shake the egg to make it rattle.

4) Novel: Make spaghetti: (commercial Play-Doh extruder, ball of Play Dough, and a plastic knife). The model (adult/peer) showed the participant how to put the dough into the extruder, press the handle to make strands of spaghetti come out, and cut the spaghetti with the knife.

To ensure that the novel and familiar events used in this experiment were actually novel and/or familiar to the participants, the parents were asked before the session if their children had any prior experience with any of these activities. All of the props for the experiment were store-purchased items.

Procedure

The procedure was similar to Bauer and Hertsgaard (1993) and Hanna and Meltzoff (1993) studies with slight variations. Children were seen individually in a small laboratory room containing the toys, apparatus, and furniture necessary for the experiment. The participants were randomly

divided into two groups. Fifteen of the children observed the adult model, perform two familiar three-step event sequences and two novel three-step event sequences. Each participant saw a total of four event sequences demonstrated. During the procedure, the infant participant was seated on his/her parent's lap across a table from the experimenter and the model (adult/peer). The peer model was the primary investigator's three year old son. The investigator trained the peer model in advance on how to properly manipulate the objects until he became comfortable in demonstrating the target acts to the participants. In the peer-model condition, the procedure was the same as the adult-model condition except that the peer interacted with the participant during the warm up session and modeled during the testing session. For consistency, in both of the model conditions (adult/peer), the experimenter provided all verbal information describing each individual acts of the sequences as they were being demonstrated. The parents were instructed not to direct or assist their childrens' behaviors. The testing sessions were video-taped for later analysis.

Upon the participants' arrival, the parent and the child were taken to

the laboratory where the testing took place. The first five minutes were used to familiarize the infant with the room, the experimenter, and the model. While their parents filled out consent and information forms, the model (adult/peer) performed two practice sequences to familiarize the child with the elicited imitation procedure. The practice sequences were as follows: (a) Roll a ball across table, place it in a box and cover the box with the lid; (b) Pick up a toy ball, place it on top of a box with holes in it, then strike the ball to make it fall into one of the holes.

For the practice sequences, the proper manipulation of the sequences were demonstrated by the (adult/peer) model. The props were then returned to the child and s/he was encouraged to imitate. If the participants failed to produce the target actions, s/he was encouraged to do so with specific prompts, such as, "You roll the ball and put it in the box just like s/he did." The child's efforts were rewarded with social praise such as, "good job", "good boy/girl", and clapping.

Performance of the test sequences was similar to that of the practice sequences except that the specific actions were not prompted. Prior to

modeling, all of the props for a given sequence were presented to the child and s/he was allowed to manipulate them. The spontaneous occurrence of the target actions and sequences provided the baseline measure. The baseline measure was necessary to determine whether or not infants were capable of spontaneously producing the target acts before the introduction of any modeling. During the baseline period, the child was given 2 ½ minutes to manipulate each set of objects. If the child pushed the props off the table, the experimenter or the model put them back in front of the child. At the end of that time period the props were taken away. The model (adult/peer) demonstrated the test sequences twice in a row with specific verbal instructions of each of the target acts provided by the experimenter. Immediately after modeling, the experimenter return all of the props to the child and encouraged exact imitation with statements such as, "Now you put the teddy in bed just like s/he (referring to the model) did " These statements were to cue the event, not the specific target acts. The imitation period was also 2 ½ minutes long. This was sufficient time for the child to manipulate or produce the target acts. If the time limit was increased it

would have been hard to maintain the child's attention and interest in the objects. If the child produced all of the target actions before this time, the session ended. If the child failed to produce all of the target actions s/he was encouraged to imitate the model's actions. The child's post modeling performance was the immediate recall measure.

All the children were asked to return to the laboratory one-week later. Neither the child nor his/her parent were led to expect that the same tasks would be presented again at session two. Upon the participants arrival, the child was seated on his/her parent's lap at the testing table across from the experimenter. Note that the model (adult/peer) was absent during the delayed testing. The same two practice sequences were performed by the experimenter to remind the child of the elicited imitation procedure. Immediately after the practice sequences, for each test sequence in turn, the child was given all the props by the experimenter with statements such as "do you remember what to do with this stuff ". Their spontaneous production of the target actions and sequences provided the delayed recall measure. The delayed recall period was also 2 ½ minutes. Note that during

the delayed recall there was no modeling of the test sequences and no model present. Due to the absence of the model and the modeling of test sequences, the childrens' performance would indicate that they were able to imitate and reproduce from memory the actions of a model which they observed a week ago. The only cue to recall was the experimenter and the objects used.

To ensure consistency across all participants, the test sequences were modeled in the following manner: 'Put the teddy to bed' was presented first, followed by 'clean the table' then 'make a rattle', and finally 'make spaghetti'. This order of sequence presentation created a confound. That is, the familiar sequences were presented first followed by the novel sequences. The reason for this order of presentation was the difficulty encountered with the peer model's willingness to cooperate. The peer model showed more interest in the novel sequences than familiar sequences. Therefore, the novel event sequences were presented last because, once introduced, the peer model would refuse to give them up and would not cooperate with the subsequent sequences. However, if he was allowed to demonstrate the

familiar sequences first, then he looked forward to the novel sequences and cooperated in demonstrating them.

Coding Participants' Behavior

All testing sessions were videotaped for later analysis. One individual rater, who was kept blind to the specific hypothesis under investigation, was selected and trained to note the occurrence and order of the target behaviors produced. The rater coded all of the tapes and made a list of all of the behaviors the children produced and the order they occurred. The experimenter recoded 25 percent of the tapes for the purpose of reliability. The reliability between the two coders for the individual target actions and pairs of actions was 89 and 95 percent respectively. Target behaviors produced following a reminder by the parents were not included.

The total number of different target actions produced and the number of different pairs of actions produced in the target order were calculated. For example, in the put the teddy to bed sequence, if the child produced all three components: (1) put teddy in the cradle; (2) cover it up with blanket;

and (3) rock the cradle; not necessarily in the correct order as modeled, s/he received one credit for each of the target actions and a maximum score of three points. For the pairs of target actions maximum score of two points, the child had to reproduce the three-step sequence in the correct order as modeled in order to receive credit. Again, in the put the teddy to bed example, events (1) put teddy in cradle and (2) cover it with blanket are considered one pair. Events (2) cover it with blanket and (3) rock the cradle are considered the second pair. If the child produced the event sequences in reverse order, s/he received credit for production of three different target actions. However, no credit was given for the pairs of actions in the target order because s/he did not produce the actions in correct target order. Note that the number of target actions produced affects the production of pairs of actions in the correct order. Thus, the two dependent measures are not independent of one another. The number of individual target actions measures each component of the event sequences. The number of pair of actions measures recall of temporally ordered events. In other words, it provided information about the recall of events in the order in which they

were presented.

Coding Models' Behavior

Two individual adult raters, who were kept blind to the specific hypothesis under investigation, were selected to code the behaviors of the models displayed during modeling. The raters observed and coded (on a scale of one to five, five being the highest) all the tapes and made a note of the models' specific behaviors, such as, the amount of noise, movement, talking, off-task behaviors and distracting behaviors the models engaged during the modeling of the test sequences. In addition, the coders noted the models' level of interest displayed for demonstrating each of the test sequences. The experimenter measured the duration of the demonstrations for each test sequence demonstrated by the models.

Analysis

A 5 (age: 14-, 15-, 16-, 17-, and 18-months) x 2 (model type: adult vs. peer) x 2 (sequence type: familiar vs. novel) x 3 (time of recall: baseline, immediate, and delayed) mixed analysis of variance (ANOVA) was calculated on each of the two dependent variables: the mean number of

individual target actions and the mean number of pairs of actions produced in the target order. Sequence type and time of recall were within-subject variables while model type was a between-subject variable. Post-hoc tests were used to determine the significant differences between the means. All effects described as significant in this study involve an alpha level of less than 0.05, unless otherwise specified.

Chapter Three

Results and Discussion

The present experiment investigated 14- to 18-month-old childrens' ability to recall specific event sequences demonstrated either by an adult or a peer. Four separate yet interrelated questions were addressed: (1) Do infants learn to imitate three-step event sequences better from an adult or a peer model? (2) Do infants better recall familiar or novel events? (3) Are infants able to retain the information presented to them and capable of recalling the events after a one-week delay? (4) Finally, if the age of the model interact with the other known determinants? To address these questions, a 5 (age: 14-, 15-, 16-, 17- and 18- months) x 2 (model condition: adult vs. peer) x 2 (sequence type: familiar vs. novel) x 3 (recall time: baseline, immediate and delay) mixed analysis of variance (ANOVA) was conducted on each of the two dependent variables: the mean number of individual target actions produced and the mean number of pairs of actions produced in the target order. The initial data analysis also included gender, number of siblings in the household, and care status (day care vs. home)

which had no effects and were excluded from subsequent analysis. Sequence type and recall time were within-subject factors while model condition was a between-subject factor. In addition, separate (ANOVAs) were conducted on the behavior displayed by the models during testing sessions. The specific models' behaviors noted were, noise level, movement, talking, off-task behaviors, and distracting behaviors. In addition, the models' level of interest displayed for each test sequence was also noted and the duration of each sequences demonstrated. Tukey tests of significant difference were used to determine the specific differences between the means when multiple means were involved. All effects described as significant in this study involve an alpha level of $p < 0.05$, unless otherwise specified.

Individual Target Actions

The analysis of variance on the individual target actions data indicated main effects of recall time, $F(2, 40) = 33.06$, $p < .01$, age, $F(4, 20) = 3.29$, $p = .03$, and sequence type, $F(1, 20) = 11.88$, $p < .01$. The ANOVA also revealed a significant two-way interaction between recall time and

model condition, $F(2, 40) = 6.35$, $p < .01$, and a marginal two-way interaction between sequence type and model condition, $F(1, 20) = 4.19$, $p = .054$. In addition, a marginal three-way interaction was obtained between sequence type, model condition, and age, $F(4, 20) = 2.81$, $p = .053$.

For the main effect of recall time (baseline, immediate, and delay), the results for children in both peer and adult model conditions collapsed provide strong evidence for recall after modeling. Children exposed to both peer and adult models' demonstrations produced significantly more of the individual target actions after modeling compared to the baseline. The number of individual target actions produced at baseline was significantly lower than the number of individual target actions produced both at the immediate and delayed conditions, which did not differ significantly (M = 1.2, 2.1, and 2.0 respectively). Thus, it is clear that children in this age range were not only able to recall specific event sequences immediately, but also after an interval of one-week between stimulus presentation and testing.

The main effect of age indicated that childrens' performance

improved in both model conditions with the older children performing better than the younger children. That is, the 18-month-old childrens' performance was significantly higher than the 14- and 15-month-old children (M = 2.08, 1.56, and 1.50, respectively). The other age groups were not significantly different from each other.

Finally, the main effect of sequence type (familiar vs. novel) indicated that, overall, children in both model conditions produced significantly more of the novel sequence actions than the familiar sequence actions (M = 1.95 vs. 1.61, respectively). However, the order of sequence type presentation created a confound. That is the familiar sequences were presented first followed by the novel sequences, the obtained results for this manipulation may be either recency or novelty effect. Many of these main effects were subsumed by two-way interactions between recall time and model condition and between sequence type and model condition and by a marginally significant three-way interaction between sequence type, model condition, and age.

Descriptive statistics for the mean number of individual target actions

produced at the different recall times by children in both model conditions are provided in Table 1. The recall time by model condition interaction indicated that at baseline, children in the adult model condition produced a higher number of individual target actions than children in the peer model condition. In contrast, at both the immediate and delayed testings, children in the peer model condition produced a higher number of individual target actions than children in the adult model condition. Although the main effect of recall time was significant for both groups, because of this reversal in the pattern of recall, the difference between baseline and both the immediate and delay conditions was larger for the peer model condition than the adult model condition.

It is of interest that children in both model conditions performed similarly at the immediate and delayed testings, with no significant loss of information over the one-week delay. This finding of no decline in memory of children over time is in contrast to Bauer and Herstgaard's (1993) findings. The authors found a significant decline in memory of 13-month-old children after a one-week delay between the stimulus presentation and

recall period. This difference in finding between the two studies may have been due to the number of different event sequences used, the present study used only four different event sequences, however, Bauer et al. used six different event sequences. Therefore, in the present study, children may have been able to remember just as much information after the one-week delay as immediately because there were fewer number of event sequences to encode and recall. However, this finding is similar to Meltzoff's (1988) study that tested 9-month-old childrens' memory after a 24-hour delay between the stimulus presentation and recall test. The author found that 9-month-old childrens' memory was not affected by the 24-hour delay.

The sequence type by model condition interaction showed that children in both model conditions performed equally well in the production of familiar sequences (M = 1.6). However, children in the peer model condition performed better on the novel sequences than children in the adult model condition (M = 2.1 and 1.8, respectively). The sequence type by model condition interaction was therefore due to the fact that the magnitude of recall for children in the peer model condition was higher than for

children in the adult model condition for the production of novel event sequences. This may indicate that the novel event sequences were more interesting to observe, when presented by a child than an adult. That is, when children observed a peer model demonstrate the target actions they were able to remember and recall better than when children observed an adult model demonstrated the target actions. Therefore, the magnitude of recall was higher for children in the peer model condition than for children in the adult model condition, Furthermore, childrens' magnitude of recall was higher for novel event sequences than for the familiar event sequences.

Although only marginally significant, the three-way interaction between age, sequence type, and model condition is interesting and deserves mention. As can be seen in Figure 1, this finding suggests that the effect of the age of the model depends on both the type of sequence, and the age of the child. Different pattern of age by model condition interactions were evident in the two different sequence types. This was confirmed by conducting separate two-way ANOVAs on each sequence type, for familiar sequences, $F(4, 20) = 2.32$, $p = .09$, and for novel sequences, $F(4, 20) = .47$,

$p = .76$. This finding indicates that, for novel event sequences, overall, the magnitude of recall was higher for children in both model conditions (adult/peer) than for familiar event sequences.

Specifically, for the production of familiar sequences, younger children (14- to 16-month-olds) performed better in the adult model condition than the children in the peer model condition. In contrast, the older children (17- and 18-month-olds) performed better in the peer model condition than in the adult model condition. This finding may indicate that as children grow older the influence of peers become more important than that of adults. For the production of novel sequences, children demonstrated better recall in the peer model condition than in the adult model condition overall.

Pairs of Actions

The analysis of variance for the pairs of actions indicated main effects of age, $F(4, 20) = 3.21$, $p < .05$, recall time, $F(2, 40) = 18.49$, $p < .01$, and sequence type, $F(1, 20) = 25.87$, $p < .01$. The ANOVA also revealed a significant two-way interaction between recall time and sequence type, F(2,

40) = 4.28, $p < .05$, and a marginal two-way interaction between sequence type and model condition, $F(1, 20) = 3.10$, $p = .094$. In addition, a significant three-way interaction was revealed between recall time, sequence type, and model condition, $F(2, 40) = 5.42$, $p < .01$.

With regard to the main effects of age, recall time, and sequence type, the results for the production of pairs of actions was similar to the production of individual target actions. Overall, older children produced more pairs of actions than younger children. Specifically there was a significant difference in performance between 15-month-old children and 17- and 18-month-old children (M = .29, .88, and .88, respectively). The other age groups were not significantly different from each other.

With regard to the main effect of recall time, performance immediately after modeling (M = .93), and one-week later (M = .88) was significantly higher than performance at baseline (M = .31). There was a slight decline in memory performance between the immediate and delayed testing, however the difference was not significant.

Finally, the main effect of sequence type revealed that overall,

children produced significantly more of the novel sequence action pairs than of the familiar sequence action pairs (M = .96 and .46 respectively). However, the order of sequence type presentation created a confound. That is familiar sequences were presented first followed by the novel sequences, the obtained results for this manipulation may indicate either recency or novelty effect. Many of these main effects, however, were subsumed by significant two-way interactions of sequence type by model condition and recall time by sequence type and by a significant three-way interaction between recall time, sequence type, and model condition.

The sequence type by model condition interaction indicated that, regardless of which model condition the children were in, they performed equally for the familiar sequences (M = .46). However, for the novel sequences, children in the peer model condition performed significantly better than children in the adult model condition (M = 1.14, and .77, respectively). The sequence condition by model condition interaction was therefore the result of the higher production of the novel sequence pairs by children in the peer model condition.

Examination of the recall time by sequence type interaction is shown in Table 2 and reveals that, for the novel sequences, the magnitude of recall at the delayed testing was slightly greater than at the immediate testing (M = 1.28, and 1.13, respectively). In contrast, for the familiar sequences, the magnitude of recall at the immediate testing was greater than at the delayed testing (M = .72, and .48, respectively). This two-way interaction was the result of the reversal in the pattern of recall.

Finally, source of the three-way interaction can be seen in Figure 2, the patterns of interaction between model condition and recall time were very different for the two sequence types. This was confirmed by conducting separate two-way ANOVAs on both familiar and novel sequence types, $F(2,56) = .91$, $p < .41$, and $F(2, 56) = 7.62$, $p = .01$, respectively. Different pattern of recall time by model condition interactions were evident in the two different sequence types. Specifically, across different recall times, overall, the magnitude of recall for children in both model conditions was higher for novel sequences than for familiar sequences. For the novel sequences, at baseline, children in the peer model

condition produced fewer pairs of actions than children in the adult model condition (M = .40, and .50, respectively). At the immediate and delayed testings, the pattern of recall was reversed. That is, children in peer model condition produced significantly greater number of pairs of actions than children in the adult model condition (see figure 2). Specifically, the novel behaviors of the peer model were reproduced significantly more often than the familiar behaviors both immediately and after a one-week delay. This finding may demonstrate that children were interested more in observing the novel object manipulations performed by a peer than an adult. These findings provide clear evidence that young childrens' behaviors are more influenced by the peer model than the adult model. In addition, children were able to retain information and reproduce it after a one-week delay. They were able to encode the novel behaviors of their peer model and recall after a long delay. This finding clearly indicates that peers can serve as effective role models of cognitive development.

Models' Behaviors

The analysis of variance on the models'(adult/peer) behavioral data

indicated main effects of model condition for noise level, $F(1, 28) = 15.86$, $p < .01$, movement, $F(1, 28) = 4.48$, $p < .05$, talking, $F(1, 28) = 8.40$, $p < .01$, distracting behaviors, $F(1, 28) = 22.39$, $p < .01$, a marginal main effect of model condition for off-task behaviors $F(1, 28) = 1.83$, $p = .187$, and a main effect of sequence type for off-task behaviors $F(1, 28) = 13.23$, $p < .01$. In addition, a marginal two-way interaction was obtained between model condition and sequence type for noise level, $F(1, 28) = .121$, $p = .73$.

For all the main effects mentioned above, the results indicate that the peer model engaged in higher levels of noise, movement, talking, and distracting behaviors than the adult model. For the main effect of off-task behaviors, both models engaged in off-task behaviors, however, a higher percentage was noted for novel sequences than for familiar sequences.

The marginal interaction between model condition and sequence type indicated that the amount of noise the adult model engaged in during modeling was the same for both familiar and novel sequences ($M = 1.17$). However, the amount of noise the peer model engaged in during modeling was slightly different for the two types of sequences. That is, the peer

model was noisier when he demonstrated the familiar sequences than the novel sequences (M = 1.9, and 1.8, respectively). The model condition by sequence type interaction was therefore the result of higher noise level of the peer model, especially for familiar sequences.

Taken together, these results indicate that, even though the peer model was engaged in more irrelevant behaviors mentioned above, the performance of children was superior observing the peer model's demonstration than the adult model's demonstration. This is strong evidence for peer imitation despite the irrelevant behaviors of the peer model. That is, children imitated the peer model more than the adult model, despite the fact that the peer model was making more noise (such as banging on the table) and talking to the experimenter (saying things such as "lets go", "give me stickers") etc. In addition, the peer model was more distracting by not being able to sit still in the chair during testing sessions. At times, he would get impatient and walk around the room or to the door, which distracted the participants from the test sequences.

Despite all these behaviors displayed by the peer model, the

children's performance was higher after observing the peer model demonstrate the target actions than children observing the adult model and especially, observing the novel behaviors of the peer model than the familiar behaviors.

The analysis of variance on the amount of interest level displayed by the models indicated main effects of model condition, $F(1, 28) = 62.0$, $p < .01$, and a marginal main effect for sequence type, $F(1, 28) = 3.50$, $p = .07$, and a significant two-way interaction between model condition and sequence type, $F(1, 28) = 11.49$, $p < .01$.

For the main effect of model condition, the results indicate that overall, the peer model showed a higher level of interest in modeling the test sequences than the adult model ($M = 3.5$, and 2.5, respectively). For the main effect of sequence type, the peer model's level of interest was marginally significant for demonstration of novel sequences than for familiar sequences ($M = 3.13$, and 2.91, respectively).

The model condition by sequence type interaction showed that overall, the peer model's level of interest was higher than the adult model's

level of interest for demonstrating both types of sequences. Furthermore, the peer model showed more interest in demonstrating the novel sequences than the familiar sequences.

The analysis of variance on the duration of the models' demonstration data indicated main effect of sequence type (familiar/novel), $F(1, 28) = 72.22$, $p < .01$, and a significant two-way interaction between model condition and sequence type, $F(1, 28) = 8.88$, $p < .01$. In addition, the analysis revealed main effect for each of the four sequence types (put teddy to bed, clean the table, make a rattle, and make spaghetti), $F(3, 84) = 158.73$, $p < .01$, and a significant two-way interaction between model condition and each of the four sequence types, $F(3, 84) = 11.00$, $p < .01$.

For the main effect of sequence type (familiar/novel), the results for children in both model conditions indicated that the children were exposed to the demonstration of the novel sequences longer than of the familiar sequences ($M = 29.23$, and 21.53 seconds, respectively). For the main effect of the individual sequences, the data indicated that the duration of demonstration for both models was longest for the make spaghetti ($M =$

40.87 seconds), followed by put teddy to bed (M = 24.67 seconds), followed by clean the table and make a rattle which were almost equivalent (M = 17.80, and 17.60 seconds, respectively). Again, this indicates that the modeling duration of the event sequences was the longest for the make spaghetti, next put teddy to bed, followed by clean the table, and make a rattle.

The model condition by sequence type (familiar/novel) interaction indicated that the duration for the adult model's demonstration of the familiar sequences was significantly higher than the duration for peer model's demonstration (M = 23.8, and 19.3 seconds, respectively). For the novel sequences, the duration was about the same for both the adult model and peer model (M = 28.8, and 29.7 seconds, respectively).

The model condition by the individual sequence type interaction revealed overall, the adult model's demonstration was longer for put teddy to bed, clean the table and make a rattle than the peer model's demonstration. However, for the make spaghetti sequence, the peer model's demonstration was longer than the adult model's demonstration.

Chapter Four

Summary

In general, the findings in the present study provide evidence that young children are influenced more by the behaviors of a peer model than an adult model (even though the peer model displayed more distracting behaviors such as talking, making noise, and moving around than the adult model). This finding was consistent with the prediction that children will pay more attention to their peers than adults. This may be because the peer model showed more interest than the adult model in demonstrating the sequences. Furthermore, childrens' behavior was influenced by the type of stimulus events presented. Overall, childrens' recall of novel event sequences was superior to their recall of familiar event sequences. This may be due to the fact that novel events were more interesting to observe and therefore more memorable or perhaps that the peer model showed more interest in modeling the novel sequences than the familiar sequences. Therefore, children were eager to imitate the novel actions of the peer model more than the similar actions of an adult model. In addition, the

findings were consistent with the third prediction, that children will be able to retain the presented information over a delay of one-week. This recall of information over time indicated that children have the ability of encoding information and bring it back from memory at a much later time.

The present investigation used the elicited imitation paradigm to investigate the effects of different aged models on young childrens' imitating behaviors of familiar and novel events both immediately and after a one-week delay between stimulus presentation and testing. This study extends previous studies of young childrens' memory and imitative behaviors by using both adult and peer models.

This study attempted to answer four separate yet interrelated questions regarding young childrens' imitative behaviors and memory. The primary question asked concerned the effect of different aged models on young childrens' memory. Specifically, do young children learn to imitate three-step event sequences better from an adult or a peer model? Second, do children better recall familiar or novel events? Third, are children able to retain the presented information over time and reproduce it after a one-

week delay? Finally, because age of the model has not been examined in previous studies it was unclear if this variable would interact with the other independent variables in the study such as, the time of testing (immediate vs. delayed) or the sequence types (familiar vs. novel).

Pervious research has indicated that by using the elicited imitation procedure young children will imitate an adult model's behaviors (Bauer & Hertsgaard, 1993; Bauer & Mandler 1992 and 1989; and Bauer & Thal, 1992). Other research has shown that young children are capable of imitating a peer model's behaviors (Hanna & Meltzoff, 1993; and Appolloni & Tremblay, 1978). However, to date, there has been no research that used the elicited imitation procedure to compare the effect of different aged models on young childrens' memory and imitative behaviors.

The first question addressed was the effect of different aged models on young childrens' memory and imitative behaviors. The findings clearly indicated that both adult and peer models have an impact on childrens' imitative behaviors, however, in some circumstances, the impact of the peer model was greater than the adult model (despite the fact that the peer model

displayed more distracting behaviors such as talking, moving, and making noise than the adult model).

With regard to the second question, children clearly demonstrated superior recall for the novel event sequences than compared to the familiar event sequences. This finding was similar to Bauer and colleagues' findings, in which the authors found that children recalled better the novel event sequences than the familiar event sequences (Bauer & Mandler, 1992 and 1989; and Bauer & Thal, 1990). This superior recall of novel events as opposed to familiar events may suggest that children were more interested in observing demonstration of new or novel objects, therefore, children were able to remember them better.

With regard to the effects of the different aged models and different types of sequences, the results indicate a different pattern of recall of sequence type for children in the two model condition. Overall, children in the peer model condition showed better recall for novel event sequences. Specifically, children produced more individual target actions of novel event sequences in the peer model condition than children in the adult

model condition. This finding supported the hypothesis, that children pay more attention to their peers and are influenced by their actions more than by adults especially when the task involved novel activities.

For the production of familiar event sequences, the findings across the two model conditions were mixed. Specifically, younger children in the adult model condition did better than children in the peer model condition. This was in direct contrast to the performance of older children. That is older children in the peer model condition did better than children in the adult model condition. These findings may indicate that as children grow older the importance of peers influence is more significant than adults, therefore, they pay more attention to their peers and are eager to imitate their behaviors. Previous research has indicated that children pay more attention and interact with their peers than with adults (Bridges, 1933; Edwards & Lewis, 1979; and Rubinstein & Howes, 1976).

With regard to the third question, the results clearly showed that children were able to reproduce the target actions both immediately and after a one-week delay. This finding of immediate recall abilities of

children was similar to previous research of Bauer and colleagues (Bauer & Hertsgaard, 1993; and Bauer & Mandler, 1992 & 1989). The authors found that young children were capable of recalling event sequences immediately after the presentation of the stimulus. This information indicates that these young children have developed abilities of immediate recall. This finding is interrelated with the first two questions. This result was obtained based on the type of model presenting the information and the type of information that was presented. Specifically, children produced significantly more of the novel event sequences in the peer model condition both immediately and after one-week delay period than children in the adult model condition, even though, the peer model was more distracting than the adult model. This finding clearly indicates that young childrens' behaviors were greatly influenced by observing a peer model perform novel behaviors on objects. In addition, at the delayed testing, there was no decline in memory performance of children in both of the model conditions. This finding of no decline in memory over time was in contrast to Bauer and Hertsgaard's (1993) findings. The authors found a significant decline in memory of 13-

month-old children after a one-week delay. There is one major difference between Bauer and Hertsgaard's study and the present that may account for the different findings about the effect of time delay on young children' memory. In the present study each child was exposed to a total of four different sequenced events. In the study by Bauer et al., each child was exposed to a total of six different sequenced events. Therefore, the children in the present study showed no decline in memory because there were fewer event sequences to retain and recall. In other words, young children have the abilities to form long lasting memories of previously observed events. Specifically, this indicates that children can observe the behavior of others, retain the information for one-week and bring it back from memory on a later occasion.

The beneficial effects of peer imitation and learning has been demonstrated in other areas of peer interaction, such as, peer-tutoring. A number of peer-tutoring research indicated the positive impact of peers on intellectual development of typical children (Howell & Kaplan, 1978; and Harris & Sherman, 1973) and mentally handicapped children (Peach &

Moore, 1990). These researchers have indicated that peer-tutoring can increase academic scores of children.

The better recall of target actions in the peer model condition compared to the adult model condition can be best interpreted within Piaget's theory of "equilibration" (Piaget, 1985). According to Piaget, children perceive their peers the same as themselves and conclude that their thinking about the world and understanding of one another is similar. Therefore, the impact of peer interaction is considered to be greater than the interaction between different aged individuals. Similarly, this finding is congruent with Hanna and Meltzoff's (1993) study, in which the authors found strong evidence for peer imitation among young children.

Implications

The present study showed that young infants 14- to 18-months-old imitated simple (familiar and novel) actions with objects presented both by an adult model and a peer model. However, children observing a peer model's demonstration performed better than children observing an adult model's demonstration, even though the peer model displayed more

distracting. In addition, childrens' recall was better for objects depicting novel actions than familiar actions. Furthermore, the study indicated that the memory performance of these young infants was not effected by the one-week delay between the presentation of the stimulus and the testing. Infants' performance indicated that they were able to reproduce previously observed actions of another person from memory even after a one-week delay. Thus, this study enhances our understanding about infants' early imitation and memory performances. The implications of the overall findings are for sibling relationships, for children who attend day care or home care settings, and for children who are delayed in learning and attend special programs such as, "Infant Stimulation Programs".

Previous research of sibling interaction indicated that siblings engage in high levels of interaction with each other with younger siblings imitate their older siblings more often than vise versa (Abramovitch, Corter & Lando, 1979). In order to encourage appropriate interaction between siblings, parents should encourage and teach their older children how to play and interact with their younger siblings. For example, older siblings

should be taught how to provide information and assistance to their younger siblings in a positive, encouraging manor instead of criticizing. Older siblings should praise their younger siblings on performance of specific tasks and encourage learning and imitation. As a result, younger siblings may attain more attention, cooperation, and engage in fewer disputes with their older siblings. They may view the interaction with their siblings as more friendly and play type than interaction with parents which can be viewed as more directive and authoritative. Therefore, it is important for parents to direct and encourage appropriate sibling interactions which can be beneficial to younger siblings for leaning new tasks and appropriate skills such as, cooperation, sharing toys and objects, turn taking and following directions. The same principal should apply to children who attend daycares and those attending special programs.

The opportunity for peer interaction has increased recently, due to larger number of infants and toddlers enrolled in child care center (Howes, 1996). This creates an excellent chance for children to interact with peers more than adults and to establish "stable peer groups" in which new

learning takes place everyday (Howes, 1996). Teachers and care providers should sufficiently train one or more child to interact with their peers in certain ways to produce desired behaviors on infants' performance as a result of their interaction. The peer model should be extensively trained by an adult to ensure his/her ability to properly manipulate and perform the desirable behaviors. Once the peer model is sufficiently trained, the infants should be placed together and their interactions should be monitored.

It would be of interest to investigate the effects of different stimulus events other than the ones used in the present study. It would also be of interest to investigate what the long term effects would be providing infant peers the chance for daily interactions on a continuing basis.

The findings of the present study indicated that children do pay more attention and imitate specific actions performed by a peer model more than similar actions performed by an adult model. Especially, when those actions were something novel that they have not previously seen. Therefore, it seems viable to indicate that providing a situation or an opportunity for young children to interact and learn through imitation of a

trained peer, should drastically increase infants' cognitive and learning abilities of certain activities, and especially activities that are new to them.

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Table 1

Mean Number of Ind. Target Actions as a Function of Model Condition

	Recall Condition					
	Baseline		Immediate		Delay	
Model Cond.	M	SD	M	SD	M	SD
Adult	1.33	.59	1.92	.54	1.92	.57
Peer	1.07	.61	2.28	.61	2.17	.70

(Maximum.= 3)

Table 2

Mean Number of Pairs of Actions as a Function of Sequence Condition

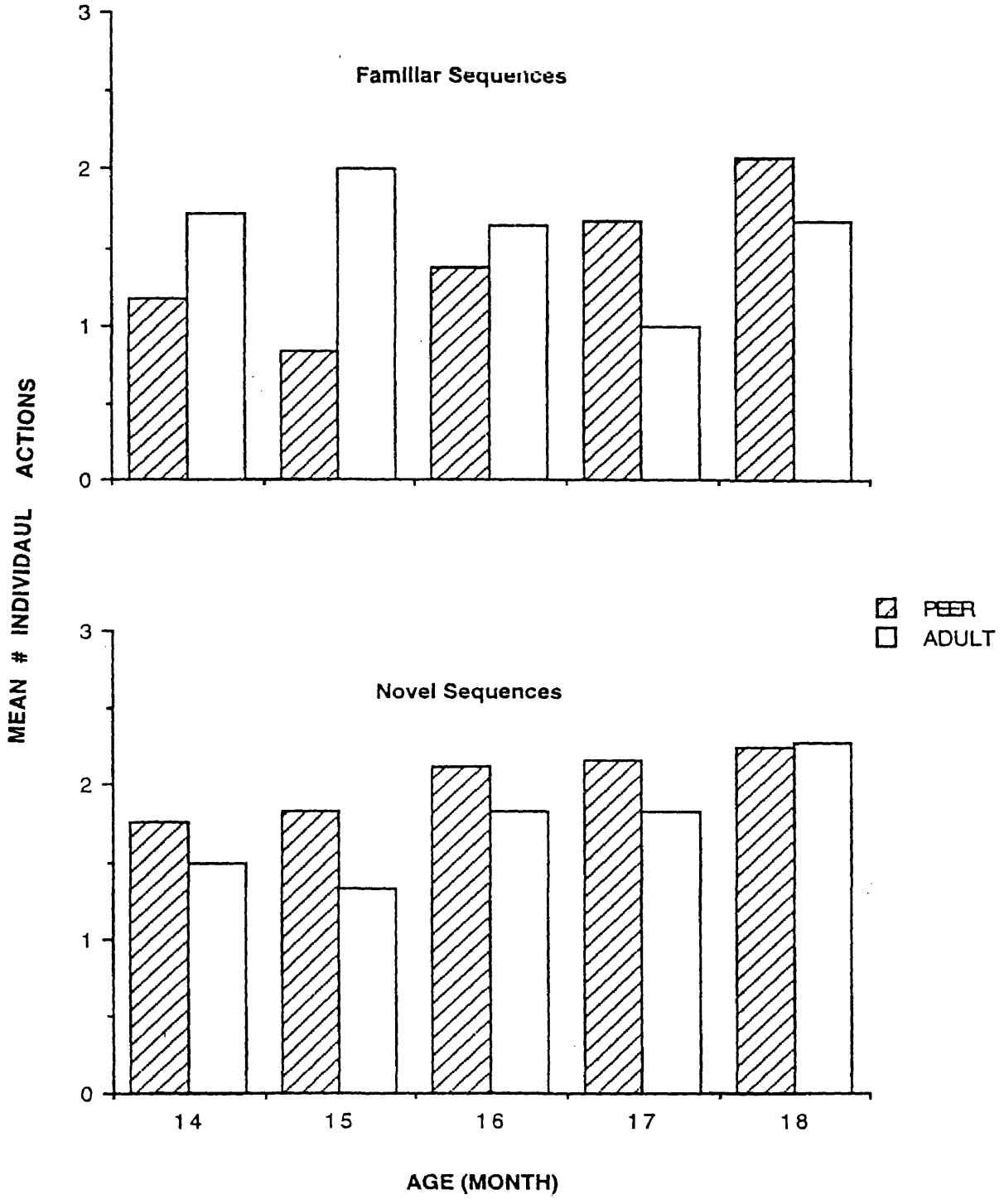
	Recall Condition					
	Baseline		Immediate		Delay	
Sequence Cond	M	SD	M	SD	M	SD
Novel	.45	.40	1.13	.52	1.28	.69
Familiar	.17	.30	.72	.58	.48	.48

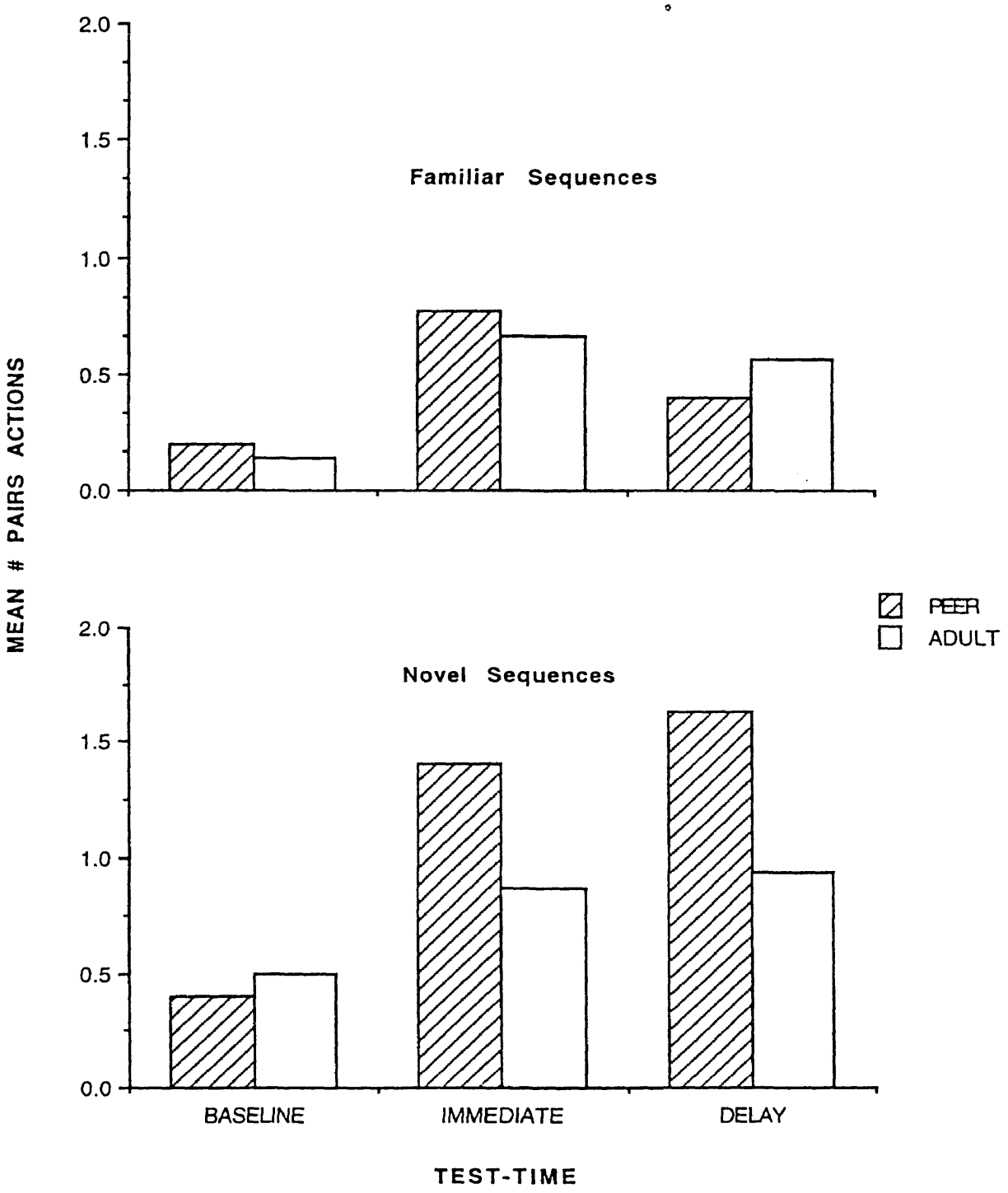
(Maximum= 2)

Figure Captions

Figure 1. Mean number of individual familiar and novel target actions produced by children in the two model conditions as a function of age.

Figure 2. Mean number of pairs of familiar and novel target actions produced by children in the two model conditions as a function of test time.


Familiar Sequences
Novel Sequences
MEAN # INDIVIDAUL ACTIONS
3
2
1
0
PEER
ADULT
14
15
16
17
18
AGE (MONTH)


2.0
1.5
1.0
0.5
0.0
Familiar Sequences
MEAN # PAIRS ACTIONS
PEER
ADULT
2.0
1.5
1.0
0.5
0.0
Novel Sequences
BASELINE
IMMEDIATE
DELAY
TEST-TIME