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Grace Bennett Pierre
gbennett@wellesley.edu

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Memory for Imagined Relationships and the Connection between Fantasy Orientation and Social

Ability

Grace Bennett-Pierre

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Abstract

Creating imaginary companions (ICs) is a common occurrence in early childhood. However, how often ICs are remembered beyond early childhood and what factors might influence that memory is an open question. Similarly, although having an IC in early childhood is associated with greater social ability; whether fantasy orientation is related to social ability later in life is unknown. I interviewed adolescents who participated in a study about ICs when they were preschoolers about their memories of those ICs. I predicted that the age at which a child created an IC, the duration of that IC, family support of the companion and the presence of a notable event related to the IC would influence whether adolescents remembered having an IC. I hypothesized that family support of an IC could be a proxy for family support of fantasy and that support of fantasy would be positively associated with fantasy orientation in adolescence. I also hypothesized that current fantasy orientation would be positively associated with Theory of Mind ability. About half of the adolescents interviewed remembered their childhood IC. Duration was positively associated with memory for ICs, while family support of an IC was marginally associated with memory. Neither family support nor having a notable event related to an IC was associated with adolescent fantasy orientation. Fantasy orientation and Theory of Mind ability were not correlated. The findings of this study suggest that many people do not remember their ICs from early childhood, but that longer duration and familial rehearsal may support recollection. In addition, the connection between fantasy and imaginative play and social ability seen in early childhood does not appear to persist into adolescence.

Memory for Imagined Relationships and the Connection between Fantasy Orientation and Social Ability

Our social lives are permeated by relationships, both real and imagined. The imaginary companions (ICs) that up to 65 percent of young children create are one example of imagined relationships. Older children and adolescents also create ICs, write diaries addressed to imaginary people, develop fantasized relationships with celebrities, and create imaginary worlds, also known as paracosms (Cohen & MacKeith, 1991; Giles, 2002; Gleason, Sebanc & Hartup 2000; Taylor, 1999; Taylor, Hulette & Dishion, 2010; Seiffe-Krenke, 1997; Shavel-Jessop & Segal, 2005). Adults may even create ICs, such as imagined relationships with deceased relatives, which occur often in later life (Dannenbaum & Kinnier, 2009; Taylor, Hodges & Kohanyi, 2003). Despite the prevalence of imagined relationships throughout the lifespan, many aspects of their creation, duration, and end remain unexplored. For example, whether imagined relationships from early childhood are well-remembered is not yet known. More broadly, whether the functions of imagined relationships are marked by continuity or change over the course of development remains unclear.

Although imagined relationships might have myriad purposes, one hypothesized function of imagined relationships in early childhood is low-risk practice of the mentalizing skills required for relationships in the real world. This social function of imagined relationships in early childhood has been borne out by research showing that having an imaginary companion in early childhood is positively correlated with social ability (Taylor, Carlson, Maring, Gerow & Charley, 2004; Taylor & Carlson, 1997). However, whether engagement in imagined relationships in early childhood is related to increased social ability later in life is as yet unknown.

Research has yet to explore whether those individuals who create imaginary relationships early in life are more or less likely than their peers to do so at other points in development. One part of understanding the continuity or change in imagined relationship creation between early childhood and adulthood is determining whether memory of those early imaginary relationships influences creation of later relationships. Continuity in imagined relationships could suggest an extended predilection for or orientation toward fantasy and imaginative activities. A further question is whether orientation toward fantasy and imaginative activities later in development remains related to social ability. In the present study, I investigated these questions using a longitudinal data set of children who created imaginary companions in early childhood and had reached adolescence. I examined adolescents' memory for imaginary companions created in early childhood, the stability of fantasy orientation from early childhood to adolescence, including environmental factors that influenced this stability, and the relationship between fantasy orientation and social ability in adolescence.

Memory for Imaginary Companions

Understanding memory of imaginary companions depends on two aspects of these memories. First, memories of imaginary companions are inherently autobiographical in nature. Second, memories of imaginary companions are about imagined individuals or events involving imagined individuals, rather than about individuals and events that take place in the physical world. As a result, nuances in both autobiographical memory and memory for imagined events are relevant to the discussion. Despite their autobiographical and imaginary nature, memories of imaginary companions could also be informed by other sources. In addition to a child's own memory of specific episodes of interaction with the IC, stories told by children's parents and siblings could also aid memory. Understanding distinctions within autobiographical memory

could help differentiate the source and quality of memories of imaginary companions created in early childhood.

Types of memory. Although we experience memory as a unitary process, memory can be separated into three subsystems. First is procedural memory, or the learned relationship between a stimulus and a response (Tulving, 1985). Procedural memory is often used to refer to behaviors that an individual can perform but may not be able to verbally acknowledge, for example, riding a bike. In contrast, semantic memory—memory for generalized, factual information—and episodic memory—memory of specific, personally-experienced events that include contextual details—can be explicitly talked about (Conway, 2000; Tulving, 1985). Episodic memory is particularly important for identifying the self and seeing the self as continuous from the past into the future (Tulving, 1985). Consequently, episodic memory might be most important for the sort of autobiographical memory accessed in questions about early childhood imaginative play. On the other hand, details about the self—derived from episodic memories—may become part of semantic memory over time (Conway, 2009).

Disagreement remains about where autobiographical memory fits within the broader tripartite categorization of memory, and whether autobiographical memory can even be separated from these general categories (Conway, 2000). The self-referential nature of autobiographical memories, and the purpose they serve in creating an understanding of a goal-oriented self may make them different from other memories (Conway, 2009). Autobiographical memories can be separated into three different types (Brewer, 1986). First are personal memories, or memories of specific episodes experienced by the individual, which include imagery of these events. An example of personal memory would be visualizing eating toast for breakfast one morning your first year of college. Next are autobiographical facts, or memories without visual imagery and

contextual detail that remain tied to particular events. Remembering that, during your first year of college, you once ate toast for breakfast, would be an example of an autobiographical fact.

Finally, generic personal memories are general mental images of an experience without a specific episode in mind. An example of generic personal memories would be visualizing what it is like to eat toast. These categories of autobiographical memory coincide with the categories of memory more generally, with personal memories sharing many features of episodic memory, and autobiographical facts and generic personal memories sharing features of semantic memory.

Other theories of autobiographical memory suggest that sensory detail and level of reflectiveness determine the type of autobiographical experience. In sum, autobiographical memories are distinguished from other memories using several criteria, including reference to the self and contextual and perceptual details (Conway, 2000).

In addition to being autobiographical, memories of imaginary companions refer to an internally experienced, imaginary being and an imagined relationship, rather than a relationship with a being who exists in the real world. Although both imagined and real event memories are formed using the same basic processes, imagined event memories have less sensory and contextual information and are less likely to result in supporting memories than real event memories (Johnson, 1988). When participants' recall for real event memories and for memories for realistic events that researchers had participants imagine were compared, additional sensory and contextual details in the real memories served as cues to the reality of the memory.

Differences in the quality of memories for real and imagined events have implications for the memory of imagined relationships many years after the relationship has ended. Specifically, lack of supporting memories and fewer cues to reality may make memories of imaginary companions less likely to be remembered many years after the end of an imagined relationship.

However, both internal and external factors—such as cognitive and developmental factors relevant to memory retention, as well as partners in rehearsal of an imagined relationship—might also influence adolescents' memories for the imaginary companions they created in early childhood.

Developmental influences. Memory for events differs across the lifespan. Generally, fewer memories are recalled from time periods farther away from the present (Waldfoegel, 1948). For example, a person in their early twenties can likely think of more episodes from when they were 18 than when they were eight. In addition to this general phenomenon, few memories are retrieved from the time period between birth and three or four years of age, an occurrence known as childhood amnesia (Crovitz & Harvey, 1979). Both of these age-related trends in memory are relevant to the study of memory for imaginary companions, because ICs seem most prevalent during early childhood, or the period between 3 and 7 years of age (Hoff, 2004; Shavel-Jessop, 2005; Taylor, 1999; Taylor, 2010). As a result of the overlap between when the children in our study had imaginary companions and the age at which children begin to have memories of their experiences, I hypothesized that adolescents' memories of their ICs would be influenced by the time at which that IC disappeared. If a child's IC disappeared before age 4, I hypothesized that he or she would be less likely to remember the IC than a child whose IC disappeared after the age of four.

Cognitive influences. In addition to the age at which a child's imaginary companion disappears, the length of time that a child has an imaginary companion may also influence his or her memory for that companion. Part of the definition of an IC is that it exists for at least a month; however, many children maintain their relationships with ICs for much longer (Gleason, 2000; Taylor 1999). From the discussion of autobiographical memory above, adolescent

participants could draw upon several possible types of memory to answer whether they remember their IC from early childhood. In one case, a participant could have a personal memory of an IC, in which case they would have imagery of a specific episode during which they played with the IC. The participant could also remember their IC as an autobiographical fact, or remember that they had an IC during early childhood without remembering the imagery of a specific episode associated with that IC. A participant could also demonstrate knowledge of an IC without an experienced memory of the imagined other—perhaps the participant has heard stories about his or her IC—and therefore exhibits a generic personal memory. I hypothesized that longer IC duration would be associated with memory of an IC. Longer duration would allow for a larger number of episodes from which personal memories could occur, as well as a broader basis for autobiographical fact or generic personal memories related to having an IC to form.

I further hypothesized that participants who remembered their ICs would likely also have a notable, emotionally-salient event related to their IC. For example, sometimes particular events associated with the end of an IC (e.g., caregiver intervention) make that end memorable and perhaps subject to particularly strong emotional memories (Benson & Pryor, 1973). The presence or absence of a notable event adds complexity to our understanding of participants' memory for imaginary companions.

Environmental influences. In addition to developmental and cognitive factors that may influence adolescent participants' memories of their childhood imaginary companions, environmental factors may also play a role. Memory does not occur in a vacuum, and we have many sources of knowledge outside of our own experience. Parents generally know about the ICs that their children create in early childhood, and are accurate reporters of their child's

imagined relationship. Parents often agree with children on external factors, such as number of ICs or the physical appearance of ICs. However, overall agreement for other, less visible characteristics, such as relative age or the activities a child engaged in with his or her IC, is much lower, especially when a child has a personified object rather than an invisible IC (Gleason, 2004). Parents may thus have at least a cursory, but more likely a detailed, knowledge of their child's IC. Parents might serve as partners in rehearsal of the IC while their child actively engages with it and could provide a source of knowledge about the IC later in the child's development. I hypothesized that memory for an IC would be positively correlated with the frequency with which a child's family talks about that IC.

Environment and Fantasy Orientation

Apart from imaginary companions, many pursuits involving fantasy exist, both in childhood and in adolescence. Fantasy orientation attempts to encompass these many pursuits and refers to individual differences in preference for fantasy versus reality (Barnes, Bernstein & Bloom, 2015). Fantasy orientation has been operationalized in many ways, including presence or absence of a childhood imaginary companion, favorite types of play and toys, play observations and preference for fiction versus nonfiction, or realistic versus fantastical media (Barnes, Bernstein & Bloom, 2015; Bouldin, 2006; Gleason, 2002; Mar & Oatley, 2007; Singer & Singer, 1990; Taylor & Carlson, 1997).

Continuity in fantasy orientation from early childhood to adolescence may not only be a result of individual differences, but also a result of continuity in environmental factors that encourage engagement in fantasy-related activities. After all, environmental constraints, including cultural views towards and parental values related to the suitability of imagined relationships, influence the manifestation of children's imaginative activities (Taylor & Carlson,

1998; Gleason, 2005). For example, Carlson, Taylor, & Levin (1998) explored the influence of cultural values on the form and content of imaginative play in their study of teacher attitudes towards imaginary companions and observations of children's pretend play in a Pennsylvania Mennonite community. Although many teachers reported creating imagined companions themselves, pretend play among Mennonite children focused on roles and situations encountered in their everyday lives. More generally, the availability of time for unstructured play can influence the extent to which a child engages in pretend play or creates an imaginary companion (Taylor, 1999). Environment influences the incidence and form of imaginary play in childhood—perhaps it also has an influence on fantasy in early adolescence. Within the context of this study, an environment supportive of fantasy and imagined relationships could be represented by a household that frequently talks about an adolescent's childhood IC. I hypothesized that children with a memory of an IC supported by family stories would show greater orientation towards fantasy as adolescents than children without this type of support.

Fantasy Orientation and Social Ability

Social ability. Social ability refers to the cognitive processes required to successfully engage in interactions and sustained relationships with others. Social ability includes concepts such as theory of mind, or the ability to think about other people's thoughts, perspective-taking and empathy (Gopnik & Wellman, 1992; Taylor, 1999). Although these three concepts are related to one another in that they require understanding others' mental states, they may diverge in practice. For example, empathy requires an additional step of creating an appropriate response to another person's mental states; while different measures of theory of mind may align more or less with perspective-taking (Eisenberg, 2000).

The concept of theory of mind has diversified over time, and shows the developmental trajectory of many of these social abilities. Instead of a single skill acquired in early childhood, theory of mind is now thought to develop throughout childhood and into adolescence as children's views of the world broaden and initial assumptions about others' mental states are elaborated (Dumontheil, Apperley, & Blakemore, 2010; Wellman & Liu, 2004). Young children first acquire the ability to understand others' desires, are then able to understand that others hold beliefs different from their own, and then understand that others can hold false beliefs (Gopnik & Wellman, 1992; Wellman & Liu, 2004). An additional ability related to belief understanding is distinguishing between reality and appearance (Taylor, Carlson, Maring, Gerow & Charley, 2004). The ability to infer the emotions of another person in reaction to an event based on stable personality characteristics does not develop until the beginning of middle childhood (Taylor, Carlson, Maring, Gerow & Charley, 2004). Likewise, performance on perspective-taking tasks continues to improve between adolescence and adulthood (Dumontheil, Apperley & Blakemore, 2010). The progression of understanding others' thoughts, desires and beliefs is grounded in the growing understanding that mental states are mere representations of the world, and, as such, are not necessarily accurate reproductions of the world (Onishi & Baillargeon, 2005). Although most typically-developing children are able to pass verbal tests of false belief understanding by their fourth year, other skills related to theory of mind, and even effective use of theory of mind skills acquired earlier in development, do not appear until later in childhood or even adolescence (Dumontheil, Apperley & Blakemore, 2010; Taylor, 1999).

Fantasy orientation and social ability in childhood. Early childhood abounds with activities that require a suspension of reality and engagement in other possible worlds, namely, pretend play and the creation of imaginary companions. Theory of mind requires understanding

that the internal states of others and ourselves are representations of the world—that these representations could match reality or could not. Both theory of mind and imaginative activities seem to require similar skills: suspending one’s own reality or mental states in order to consider other possible states of the world. As a result, many researchers have theorized a relationship between fantasy orientation and theory of mind, suggesting that practice in fantasy-related activities may improve children’s ability to engage in theory of mind tasks (Davis, Meins & Fernyhough, 2011; Davis, Meins & Fernyhough, 2014; Taylor & Carlson, 1997; Taylor, Carlson, Maring, Gerow & Charley, 2004).

To test this a priori assumption, Taylor & Carlson (1997) assessed 3- and 4-year-old children’s fantasy orientation using IC status and an array of 20 other measures, including laboratory tasks, interviews of children and their parents, and observations of children at play. The researchers then assessed theory of mind ability using four tasks: false belief, representational change, appearance/reality and interpretative diversity. Children’s performance on all four Theory of Mind tasks were highly correlated and were collapsed into a single social ability measure, which was then correlated with fantasy orientation. When age and verbal ability were controlled, 4-year-old high fantasy children scored higher than low fantasy children on social ability. These findings suggest that fantasy orientation is related to social ability and that the creation of ICs could be one indicator of fantasy orientation in preschool-aged children.

The relationship between the creation of ICs in early childhood and social ability has been well-explored. Davis, Meins & Fernyhough (2011) assessed theory of mind ability and attributions of self-knowledge—aspects of the self that are not externally apparent and have to be explicitly communicated to others—in 4- to 7-year-old children who did and did not have ICs. Although theory of mind ability was not associated with IC status, children with ICs assigned

less knowledge of their own internal states to adults than children without ICs did. In other words, children who had created ICs seemed to understand the boundary between self and other, particularly in terms of mental states, better than children who had not created ICs. In a further study (2014), these authors again found that 5-year-olds with ICs did not differ in performance on theory of mind tasks from children without ICs. However, Davis et al. (2014) did find that children with ICs used more mental state terms to describe their real friends than children without ICs did, which suggests greater orientation towards and perhaps some greater understanding of mental states. Similarly, Taylor, Carlson, Maring, Gerow & Charley (2004) found that having an IC or routinely impersonating a character at age three or four was positively correlated with theory of mind performance and that theory of mind performance at three or four predicted emotion understanding at age seven. From current research, social ability and IC creation could be related; however, some disagreement remains about the exact nature of the relationship between these two variables. Furthermore, although the heightened social ability associated with creating an IC continues to be relevant into middle childhood, the relationship may or may not continue to be relevant in adolescence and adulthood.

Fantasy orientation and social ability in adulthood. To the extent that fantasy orientation and social ability are linked in childhood, the relationship between the two might continue into adulthood. Fantasy orientation has been conceptualized in multiple ways in adults. One method uses retrospective reports of imaginary companions in early childhood to determine current fantasy orientation. In a study of young adults who retrospectively reported whether they had an IC in early childhood, adults who reported having an IC as a child were more oriented towards others and had greater awareness of their own mental states than adults who did not report having an IC (Gleason, Jarudi, & Cheek, 2003). However, adults who reported having an

IC in childhood differed on level of absorption and achievement but not on social closeness, or commitment to social ties and use of social ties for comfort (Kidd, Rogers & Rogers, 2010). In addition to retrospective report of imaginary companions, genre preference, conceptualized as overall life exposure to fiction versus nonfiction books, has been used as a measure of fantasy orientation in adults. Adults with more print exposure to fiction score higher on self-reported measures of empathy and perspective-taking, and are better at identifying emotions associated with facial expressions than adults with more print exposure to nonfiction (Mar & Oatley, 2007). These findings suggest that fantasy orientation in adulthood may be related to social ability.

Given that fantasy orientation is associated with social ability in both childhood and adulthood, the relationship likely holds in adolescence as well. Most of the children in the current study had ICs in early childhood, and I hypothesized that they would be generally high in fantasy orientation in adolescence. In addition, to the extent that this group showed variability, I predicted that fantasy orientation in adolescence would be positively correlated with social ability.

Method

Participants

Twenty one adolescents (14 females) between the ages of 13 years, 10 months and 16 years ($M = 14$ years, 10 months) and their parents participated in the study. Families were part of a study on the function of imaginary companions (ICs) and had been recruited when the children were in early childhood. A total of 32 families from this original sample were eligible; of these, 5 declined participation and 5 could not be contacted. Sixteen adolescents had reported ICs when they were between the ages of 3 and 5 (12 girls, 3 boys, 1 gender-nonconforming individual), 5 had not (2 girls, 3 boys). Nine to 11 years had passed since participants were first interviewed (M

= 10 years, 5 months; $SD = 8$ months). Parents signed an informed consent form before their child participated in the study and adolescent participants read and signed an informed assent form. Participants were originally recruited from several preschools in an upper-middle class suburb of a Northeastern city, and all but one of those who participated in the current study remained in the same geographic area.

Adolescent Measures

Verbal ability. Adolescent participants completed the Mill Hill Vocabulary Scale to assess their verbal ability. The Vocabulary Scale consists of 31 words for which participants must choose a synonym from a list of six possible words; scores thus range from 0 to 31.

Memory. Adolescents' memory of their ICs from early childhood, as well as their reports of later ICs or paracosms (imaginary worlds), were assessed using a structured interview. Adolescents were interviewed using the Imaginary Companion and Paracosm Interview (Taylor, Mottweiler, Naylor, & Levernier, 2015), which assesses adolescents' memory for ICs and paracosms they created between early childhood and adolescence. Participants were asked an open-ended question about having an IC in early childhood, as well as questions about their IC, such as its name, age and form. If participants had reported an IC when they were in preschool and did not have memory of their IC as an adolescent, they were then prompted with the name of the IC given in the previous study. Among adolescents who had reported an IC in early childhood, responses were coded as having memory of that specific IC or as having no memory of that IC.

Additional questions assessed whether the participant had memory of a notable event related to their IC and the frequency with which the IC was discussed within their family. Presence of a notable event was scored as either 1 = present or 0 = not present. The frequency

with which the IC was discussed in the household was scored as 0 = never, 1 = once a year, 2 = every 6 months, 3 = once a month, 4 = weekly, 5 = daily.

Fantasy orientation and absorption. Two aspects of involvement with fantasy were measured. First, I developed the Books Fantasy Orientation Scale to assess fantasy orientation, or preference for fantasy over reality. Second, I used the fantasy subscale of the Interpersonal Reactivity Index to assess absorption into fantasy (Davis, 1980). Although both preference and absorption are related to the general concept of involvement with fantasy, preference may be more influenced by environmental factors, while absorption may be more a matter of personality. Both scales were used to measure these different aspects of fantasy orientation, and performance on the two were expected to diverge.

Books Fantasy Orientation Scale. The Books Fantasy Orientation Scale requires participants to read 12 sets of 4 short book descriptions. Each set consists of book descriptions that fall into four genres: fantastical fiction, realistic fiction, narrative nonfiction, and expository nonfiction. Plot and characters are kept constant across all descriptions for a set, and each set has a developmentally appropriate theme that differs from all other sets (for example, sports or road trips). Each description was 67 words in length and had a 6.9-7.0 grade reading level as assessed using the Flesch-Kincaid Grade Level test (Kincaid, Fishburne, Rogers, & Chissom, 1975). Participants were presented with one set of book descriptions at a time and were asked to choose the one description of a book they would most like to read. Participants received a fantasy orientation score based on the total number of each type of narrative they chose across all 12 trials. For the most fantasy-oriented book choice (fantastical fiction), a participant received a score of 3, realistic fiction received a 2, narrative nonfiction received a 1 and expository nonfiction received a 0. Thus, participants received a score between 36 (choosing all fantastical

fiction) and 0 (choosing all expository nonfiction). Reliability on the Books Fantasy Scale was acceptable ($\alpha = .76$).

Interpersonal Reactivity Index—Fantasy Subscale (Davis, 1980). The Interpersonal Reactivity Index is a 28 question survey assessing social ability on four subscales: empathy, fantasy, perspective-taking and personal distress. Each subscale of the IRI includes seven questions that are answered on a scale from 1 (“Does not describe me well”) to 5 (“Describes me very well”), with two reverse-coded questions per subscale. Fantasy scores could be between 6 and 30. (One question from the Fantasy subscale was left off of the participant survey due to experimenter error.) Cronbach’s alpha for the Fantasy subscale was .69.

Social cognition. Adolescent participants’ social ability was assessed using three measures of social cognition: self-report measures of perspective-taking and empathy, as well as a behavioral task measuring theory of mind in adolescents. Performance on the self-reported perspective-taking and theory of mind measures were expected to correlate with one another, while performance on the self-reported empathy measure was expected to diverge from the other two measures.

Interpersonal Reactivity Index—Empathy and Perspective-Taking Subscales (Davis, 1980). The empathy and perspective-taking subscales of the IRI were used to assess adolescent participants’ social ability. Items from both subscales were presented in randomized order to all participants, who responded to each item on a five point Likert scale from “1 = describes me very well” to “5 = doesn’t not describe me very well.” Cronbach’s alphas for the Empathy and Perspective-Taking subscales were .63 and .72 respectively.

Theory of Mind Task (Dumontheil, Apperley & Blakemore 2010). The Adolescent Theory of Mind Task is a behavioral task in which participants are presented with pictures of 3x4

shelving units in which some of the boxes in the units have a shaded background and others have a clear background. Different objects (e.g., a candlestick, a toy truck) are placed in the boxes of the shelving units. In the “Director” condition, a man is depicted on the opposite side of the shelving unit from the viewer. The man cannot see the objects in the boxes with the shaded background. In the “Director” condition, participants were asked to follow the instructions given by the Director about how to move the objects in each picture by taking the Director’s perspective. In the “No Director” condition, the man is absent and participants are asked to follow instructions about how to move objects in each picture by simply ignoring the items in shaded boxes. To prevent any carryover effect from the simpler exclusion criteria given in the “No Director” condition, participants were always presented with the “Director” condition first.

In both the “Director” and “No Director” conditions, there are 16 pictures which are the same in both conditions, with three verbal instructions for how to manipulate the objects in the shelving units given to the participant per picture. For example, a participant could be told to “Move the top truck to the left,” and he or she would be expected to move the top truck in the array one box to the left. All participants completed 32 trials, which took approximately 8 minutes. Each image was presented for 2 seconds, after which instructions were given for 10 seconds and 4 seconds of silence were given for participants to finish their responses.

Participants gave their responses by moving their mouse to the box where objects in the shelving unit should go according to the instructions. Responses were recorded using a screen video recording software.

Three types of verbal instructions were given: filler, control, and experimental. Each picture included two filler instructions and either a control or an experimental instruction, for a total of 32 filler trials, 8 control trials and 8 experimental trials per condition (“Director” and

“No Director”). Filler instructions asked participants to move an item that only appeared once in the shelving unit and was placed in a clear box. Control instructions asked participants to move one of two same-type items in the shelving array, both of which were placed in clear boxes (e.g., a small cup and a large cup). Control trials assessed participants’ ability to discriminate between two similar items (for example, a large candlestick and a small candlestick). Experimental instructions asked participants to move one of three same-type items in the shelving array (e.g., two small candles and a large candle). Two of the items could fulfill the instruction given, however, one of the items was placed in a clear box and the other was placed in a shaded box. Experimental trials assessed participants’ ability to either take the perspective of the Director into account when following instructions (“Director” condition) or to use the blocked boxes as an exclusion criteria (“No Director” condition).

The order of images was counterbalanced: images were arranged into three random orders. Each participant saw two different orders of images for the “Director” and “No Director” conditions. The order of control and experimental instruction trials was also pseudo-randomized, with no more than two of the same type of trial appearing next to one another. The task was scored for accuracy in two ways. First, the proportion of correct responses in Experimental trials under the “Director” condition was calculated, and is referred to as the “Director Score.” Next, the proportion of correct responses during the experimental trials in the “Director” condition was subtracted from the proportion of correct responses during the experimental trials in the “No Director” condition, and is referred to as the “Composite Score.” The first score assessed performance in the critical condition, in which participants were asked to take the Director’s perspective when following directions, and assumed that error resulted as a result of failure of theory of mind. The second score provided a measure of theory of mind, but also accounted for

errors in the critical condition that occurred as a result of perceptual demands of the task rather than perspective-taking demands by subtracting performance on the perceptually-similar “No Director” experimental trials from the performance on the critical condition. Due to technical error, data from the Director condition in the Theory of Mind task was available for 14 participants and data from both Director and No Director conditions was available for only 12 participants.

Parent Measures

Memory. Parents’ memory of their child’s IC from early childhood, as well as their reports of later ICs or paracosms, was assessed using a structured interview. Parent reports were used to help determine details about children’s ICs. Parents were interviewed about the age at which the child’s IC disappeared, the duration of the IC, the frequency of family discussion of the IC and the presence of any notable events related to the IC. The age at which the parent reported a child’s IC disappearing (rather than the age reported by the child) was used as the child’s age at IC disappearance. In conjunction with the age at which parents reported their child’s IC beginning in the previous study, the parents’ report of when their child’s IC disappeared was used to calculate the duration of each child’s IC. Parent reports of family support and notable events were coded in the same way as adolescent reports of the same variables.

Procedure

All interviews and measures were administered in two separate quiet, undisturbed rooms in participants’ homes or in interview rooms in a psychology laboratory during a single session. One interview was conducted over the phone due to geographic separation of the participants and researchers. Adolescent and parent participants completed the study separately; two researchers

administered the interviews. Each parent and child was interviewed by an undergraduate researcher and each interview lasted from 10 to 60 minutes. Interviews were audio-recorded and later transcribed. Adolescents completed the theory of mind task first, using Power point software on a laptop computer, with their responses recorded using software that recorded mouse movements on the screen. Adolescents were then interviewed and completed the Interpersonal Reactivity Index, Mill Hill Vocabulary Assessment, and Fantasy Orientation Scale online using Qualtrics software. Parent participants were first interviewed and then completed an online survey whose results are not reported in this study.

Reliability

Inter-rater reliability was calculated for all of the variables related to the memory hypotheses, including child's age at IC disappearance, duration of the IC, presence of a notable event related to the IC as reported by both adolescent and parent and level of family support of the IC as reported by both adolescent and parent. An undergraduate research assistant coded these variables for seven of the 16 participants with childhood ICs, while the author coded these variables for all 16 participants. The two raters had 100 percent agreement on responses for all variables except for IC duration, for which they had 57 percent agreement, and parent-reported notable event, for which they had 71 percent agreement. Poor reliability on IC duration resulted from one coder's errors. As a result, the second coder coded the rest of the participants' IC duration ($n = 9$). The second coder also coded seven additional parent reported notable events, with no further discrepancies. Coders resolved disputes by consulting interview transcripts, at which time it was clear which coder was correct.

Similarly, two raters coded responses for the theory of mind task for eight of the 14 participants who completed the task. Inter-rater reliability was calculated using Kappa statistics

for each participant's filler, control and experimental trials in both the "Director" and "No Director" conditions. Kappa values were above .62 for all trial types. The low Kappa scores obtained for the eight participants coded by both raters occurred because of coder error. By resolving disagreements through discussion, we were able to determine which rater's original score was correct. In light of this issue, the second rater coded the remaining six participants' trials. Inter-rater agreement was higher for the full sample, with Kappa values above .77 for all trial types. Disagreements were resolved by watching the videos to determine which coder was correct.

Results

I began by conducting statistical analyses on the hypotheses related to memory for an IC, continued with those related to family environment and fantasy orientation, and concluded with analyses examining fantasy orientation and social ability. In addition to conducting analyses related to my main hypotheses, I also investigated relationships between scales that measured similar constructs, and the relationship between parent and child reports of the same factors. Before proceeding with any analyses, I first checked for group differences in verbal ability in order to eliminate the possibility that differences in memory, social ability or fantasy orientation were influenced by differences in verbal ability. Adolescent participants scored between 17 and 28 ($M = 22.85$, $SD = 2.76$) on the Mill Hill Vocabulary Scale. Performance did not differ significantly between adolescents who had ICs and those who did not have ICs in early childhood ($U = 26.50$, $p = .26$, $r = .25$), nor between adolescents who did and did not remember their ICs ($U = 28$, $p = .71$, $r = .09$). Correlations between verbal ability and the variables of interest, including fantasy orientation, fantasy absorption, perspective-taking and empathy scores, were also not significant, $r_s(20) = .15$, $.34$, $.16$, and $.18$, respectively (all $ps > .13$). Given

that verbal ability did not relate to any of my variables of interest, it was not included in any further analyses.

Memory for Childhood Imaginary Companions

A primary question addressed by this study was the nature of adolescents' memories for imagined relationships they created in early childhood. I did not have a hypothesis about the proportion of adolescents who would remember their imaginary companions, as the incidence of remembering ICs had not previously been explored. Of the 21 adolescents interviewed, 16 had imaginary companions (ICs) that they reported earlier in childhood. Of those 16, 44% ($n = 7$) had no memory of the IC they reported earlier. Of the 56% ($n = 9$) adolescents who did remember childhood ICs, 4 correctly remembered the name, age and form of the IC, 4 correctly remembered only the IC's name and form, and 1 correctly remembered only the IC's age.

I predicted four factors that might influence whether adolescents remembered their ICs. The first factor was the child's age at IC disappearance. I hypothesized that children who were under the age of four when their IC disappeared would be less likely than children who were over the age of four at IC disappearance to remember their IC. Child age at IC disappearance fell between 53 and 108 months ($M = 72$, $SD = 15.16$), meaning that all of the adolescents were older than four years at the time that their IC disappeared. As a result, a comparison of the memory scores of participants with ICs that disappeared before and after age four could not be conducted. Instead, I compared the median age at IC disappearance for adolescents who remembered their IC ($Mdn = 66$), and the median age at IC disappearance for adolescents who did not remember their IC ($Mdn = 66$). No difference emerged, $U = 25.5$, $p = .52$, $r = .16$ (see Figure 1).

The second factor was the duration of the child's IC. I predicted that children with longer lasting ICs would be more likely to remember them than children with shorter duration ICs,

which was supported by the data. IC duration ranged from 6 to 90 months ($M = 34$, $SD = 21.65$); the median duration for adolescents who remembered their IC was 21.75 months, while the median duration for adolescents who did not remember their IC was 36 months (see Figure 2). IC duration was positively associated with memory score, $U = 12.5$, $p = .04$, $r = .50$. The third factor was the presence of a notable event associated with the IC. I predicted that adolescents whose parents associated a notable event with the IC would be more likely than those whose parents did not associate a notable event with the IC to remember their IC. This hypothesis was not supported, $U = 30$, $p = .84$, $r = .05$. Of the nine adolescents who remembered their IC, three (33%) had a notable event associated with their IC, while six (67%) did not; of the seven adolescents who did not remember their IC, two (29%) had a notable event associated with their IC, while five (71%) did not.

The fourth factor was frequency of family discussion of the IC, or family support. I predicted that family support would be positively associated with memory for an IC, which was marginally supported by the data, $U = 15$, $p = .07$, $r = .46$, (see Table 1). The median family support score was 0 for adolescents who remembered their IC and was 1 for adolescents who did not remember their IC. When family support was collapsed into two categories (support or no support), parent and child reports were relatively consistent, with only two disagreements over the 16 participants ($Kappa = .65$).

Family Environment and Fantasy Orientation

My next hypothesis was that for those adolescents who had an IC, family support (frequency of discussion) of that IC would be positively associated with fantasy orientation in adolescence. This hypothesis was not supported. The frequency with which adolescents' families

talked about their ICs was not correlated with fantasy orientation, $r_s(15) = -.32, p = .23$ and was negatively associated fantasy absorption, $r_s(15) = -.55, p = .03$.

Fantasy Orientation and Social Ability

The next set of hypotheses addressed a posited relationship between social ability—including skills such as perspective-taking, empathy and theory of mind—and orientation towards fantasy. I first compared fantasy absorption to fantasy orientation, and empathy and perspective-taking with performance on the theory of mind task. These comparisons were used to determine whether the two measures of fantasy orientation assessed different constructs as expected and whether perspective-taking and theory of mind were correlated and empathy diverged from the other two factors as predicted. Fantasy orientation and fantasy absorption were not correlated, and the relationship between the theory of mind composite score and perspective-taking approached significance. However, perspective-taking and empathy were strongly correlated with one another, and empathy was not correlated with either Theory of Mind score, in partial contrast to my prediction (see Table 2).

I hypothesized that orientation towards fantasy would be positively associated with social ability in adolescence, but this hypothesis was not supported. Fantasy orientation was not correlated with theory of mind nor was theory of mind related to fantasy absorption (see Table 2). Similarly, neither perspective-taking nor empathy were associated with fantasy orientation (see Table 2). Perspective-taking and empathy were also not associated with absorption in fantasy (see Table 2).

Discussion

The main purpose of this study was to determine the incidence of remembering imaginary companions created in early childhood, to explore the influence of family

environment on fantasy orientation, and to understand the connection between fantasy orientation and social ability in adolescence. Patterns in memory for imaginary companions and key factors influencing that memory suggest that imaginary companions are part of the everyday lives of the young children who create them, are more enduring than previously suggested and remain discussed in families through early adolescence. Furthermore, adolescence may be a time when family environment is not associated with involvement in fantasy. Additionally, the lack of a relationship between fantasy orientation and social ability in adolescence suggests that it is an exceptional period in development when it comes to these two constructs.

Memory for Childhood Imaginary Companions

Of the four factors hypothesized to relate to adolescents' memories for childhood ICs, only duration was significantly related to memory, while family support was marginally related. The fact that duration related to memory suggests a cognitive contribution to memory of imaginary companions. Current theory surrounding autobiographical memory suggests that information from episodic memories makes its way into semantic memory and helps form the basis of conceptual knowledge, including concepts of self (Conway, 2009; Piolino, Desgranges, & Eustache, 2009). A longer lasting IC would allow a child greater opportunity to form personal memories of that IC, and to incorporate the relationship into his or her sense of self through the inclusion of the IC into autobiographical facts or generic personal memories.

The marginal relationship between family support and memory reflects the modest importance of environment to memory, and suggests that parents and other family members might act as partners in rehearsal of imagined relationships. In turn, rehearsal might increase the likelihood that the adolescent will remember his or her IC. The role of rehearsal in recollection found in this study is supported by the broader literature on the effects of rehearsal on memory in

general as well as autobiographical memory specifically. Rehearsal of items (e.g. words) improves recollection of those items over short periods of time (Racsmány, Conway, & Demeter, 2010). Within the context of autobiographical memory, rehearsal increases the vividness of a memory for an event (Svoboda & Levine, 2009). From this study, family members may play a role as sources of rehearsal of an imaginary companion from early childhood, which, in turn, could increase the likelihood of a child remembering that companion. Caveats to this relationship include the differences in duration and frequency of rehearsal seen in the context of memory for imaginary companions and the laboratory contexts in which episodic memory and rehearsal are usually studied. The longer time span over which memories of imaginary companions are retained, as well as gaps as long as a year between family discussions of imaginary companions imply that family rehearsal may have less of a contribution to memory than the more frequent rehearsals over shorter durations present in laboratory studies of memory.

Neither the child's age at IC disappearance nor the presence of a notable event related to an IC were associated with memory for ICs. All parents reported that their child's IC disappeared after the age of 4, a critical time for memory formation and access. Most individuals lack reliable memories before the age of 4, due to a phenomenon known as childhood amnesia (Crovitz & Harvey, 1979). However, people generally have less memory for autobiographical events further away from the present (Piolino, Desgranges, & Eustache, 2009; Waldfogel, 1948). As a result, one would expect memory of events far away from the present to be degraded, even if those events occurred after the period covered by childhood amnesia. Given that all of the participants had ICs that disappeared 5 to 60 months after the age of four, and that a little under half of the participants did not remember their ICs, the absence of a relationship between the child's age at

IC disappearance and memory of the IC is consistent with current theory of memory in early childhood.

The presence of a notable event associated with the IC was not related to memory for that IC. Notable events were relatively uncommon, with only 31% ($n = 5$) of all parents reporting one. Notable events were evenly distributed between adolescents who remembered their ICs and those who did not remember; 33% ($n = 3$) of parents with children who remembered their IC reported one, and 29% ($n = 2$) of parents with children who did not remember their IC reported one. The relative lack of notable events related to ICs could be explained by theory regarding the relative deterioration of episodic memories versus semantic memories over time. Episodic memories, including personal memories, generally have a shorter retention interval than semantic memories like autobiographical facts and generic personal memories (Conway, 2009). Between 9 and 11 years had passed since adolescent participants initially reported their imaginary companions; as a result, episodic memories would be expected to be rare. Furthermore, the transfer of information from episodic memories to semantic ones suggests that adolescents could remember their ICs from early childhood using generic personal memories or autobiographical facts (semantic memory) without having personal memories (episodic memory) of the ICs.

Taken together, the relationship (or lack thereof) between age at IC disappearance, duration of IC, family support and presence of a notable event and memory for an IC has implications for our understanding of the nature of imaginary companions. First, imaginary companions seem the subject of personal memories that are forgotten with the passage of time and are typically unassociated with notable, emotionally salient events. This pattern of memory suggests that ICs are part of the everyday events in a child's life. Next, parent reports of

children's age at IC disappearance suggest that the children in this sample sustained imaginary companions for over two years on average. In contrast, one study found that, of a sample of 12 young children, just under half had ICs that lasted for seven months or fewer (Taylor, 1999), while other studies have suggested IC duration to range from 9 to 17 months (Gleason, Sebanc, & Hartup, 2000). The findings of this study suggest that duration of these imagined relationships might be much longer than previously established. Finally, imaginary companions are not only shared with family members in early childhood, they remain a topic of conversation within some families through children's adolescence.

The difference in incidence of ICs found when using retrospective reports instead of current reports suggests that there are four possible groups of people: those who had an IC and remember it, those who had an IC and do not remember it, those who did not have an IC and do not remember, and those who did not have an IC and have a (false) memory. The results from this study suggest that the fourth option is unlikely: none of the adolescents who did not have an IC in early childhood reported having one in early childhood when interviewed in adolescence. As a result, instead of comparing individuals who created imaginary companions in early childhood to individuals who did not, studies using retrospective reports are comparing individuals who had ICs and remembered them to a mixed group of those who did not have ICs and those who did but forgot them. An important aspect of understanding the implications of such retrospective studies, then, is understanding what distinguishes those who forget their ICs from those who remember them. The findings of this study suggest that comparing individuals with and without ICs based on retrospective reports is not a comparison based on IC status, and is instead a comparison based on duration of an imagined relationship and, to some extent, a family environment supportive of fantasy.

Family Environment and Fantasy Orientation

The absence of a relationship between family support and fantasy orientation suggests that family support of imaginative activities is unrelated to adolescents' preference for fantasy over reality as a theme in books and other media. In young children, family environment plays a large role in the content of imaginative play (Gleason, 2005; Taylor & Carlson, 1998; Taylor, 1999); however, the findings from this study suggest that the relationship between family environment and fantasy orientation is attenuated in adolescence. Rather than interpreting the lack of a relationship between family environment and fantasy orientation in adolescence as indicative of a lack of relationship between environment and fantasy orientation as a whole during this developmental period, perhaps a different social environment gains relevance to fantasy orientation in adolescence. Developmental factors, such as the growing importance of peer relationships in early adolescence (Steinberg & Silverberg, 1986), could explain the absence of a correlation between familial environment and fantasy preference. Perhaps peer environment, rather than family environment, is related to fantasy orientation in adolescence.

The negative correlation between family support and absorption in fantasy suggests that family support is related to decreased absorption in fantasy. Absorption refers to singular attention to a specific stimulus, heightened reality of that stimulus, and a decrease in reality monitoring (Parra, 2006). Absorption is often thought of as a cognitive style, or a personality trait, both conceptions suggesting that absorption is not influenced by environment (Tellegen & Atkinson, 1974). Although fantasy absorption itself might be a personality trait, environmental feedback may play a role in the expression of that trait. Perhaps adolescents who appear less absorbed in fantasy garner more encouragement of fantasy—in the form of reminders of early childhood imaginary companions—from parents. Alternatively, adolescents may have self-

reported lower levels of absorption in fantasy after interpreting frequent family reminders of early childhood imaginary companions negatively.

Fantasy Orientation and Social Ability

The final hypothesis was that greater orientation towards fantasy would be associated with higher scores on measures of social ability. However, no relationship emerged between either of the fantasy orientation measures and any of the three measures of social ability. This result suggests that the link between theory of mind ability and fantasy orientation found in early childhood does not persist into adolescence. Studies conducted with young children have found that theory of mind ability is associated with imaginative activities and fantasy orientation (Davis, Meins & Fernyhough, 2011; Davis, Meins & Fernyhough, 2014; Taylor & Carlson, 1997; Taylor, Carlson, Maring, Gerow & Charley, 2004). Likewise, adults' self-reported absorption into fantasy predicts self-reported perspective-taking and empathy, and preference for fiction over nonfiction is positively associated with performance on a behavioral perspective-taking task (Mar, Oatley, Kirsh, dela Paz & Peterson, 2007). The relationship between social ability and imaginative play in early childhood or reading fiction in adulthood could occur because both imaginative play and reading fiction serve as practice in theory of mind, perspective-taking and empathy.

One interpretation of the lack of connection between fantasy orientation and social ability in adolescence comes from the creativity literature, which suggests cognitive differences in adolescents when compared to both younger children and adults. Cognitive theory associated with the development of creativity suggests that there are three stages in the trajectory of creativity development. First, there is the pre-conventional stage, in which children focus on their own thoughts, wishes and desires (Runco & Pina, 2013). In early childhood, children have

difficulty understanding others' beliefs, desires and other mental states. Similarly to the creativity literature, understanding of other people's minds during this stage in development is often described as egocentric, as children often ascribe their own knowledge and beliefs about the world to others (Gopnik & Wellman, 1992; Wellman & Liu, 2004). As a result, young children may have little understanding of others' mental states, and may thus give little weight to others' perspectives on their creative and imaginative pursuits. Restricted understanding of others' mental states during early childhood could then allow young children to pursue imaginative play unrestricted by others' opinions of those past-times. Next, older children in the conventional stage focus on social conventions, at the expense of individual thought (Runco & Pina, 2013). Perhaps in early adolescence, when basic theory of mind abilities are already established and more complex theory of mind abilities are developing, social conventions are more salient and have a greater connection to adolescents' creative and fantasy behavior than they did in early childhood. Finally, the post-conventional stage in creativity involves the adult-like ability to balance conformity to conventions while maintaining individual thought (Runco & Pina, 2013). Adults possess both basic and more complex theory of mind ability (Dumontheil, Apperley, & Blakemore, 2010), but according to creativity theory they are less constrained than adolescents by social conventions.

When related to social ability and fantasy orientation in adolescence, creativity theory suggests that adolescents may be more cognitively and socially bound to conventions than both children and adults, impeding their ability to freely engage in imaginative and fantasy pursuits. Adolescence is also a time of social and cognitive development, during which more complex perspective-taking and Theory of Mind abilities emerge after the development of basic theory of mind abilities in childhood (Dumontheil, Apperley, & Blakemore, 2010; Taylor, Carlson,

Maring, Gerow & Charley, 2004). While adolescents gain more complex theory of mind ability, their range in fantasy and imaginative ability may be temporarily constrained, resulting in the lack of relationship between social ability and fantasy orientation found in this study.

Future Directions

In order to understand the nature of early childhood imaginary companions, future research must include assessments of memory for imaginary companions and family support of imaginary companions in the period between early childhood and early adolescence. Imaginary companions appear to be the subject of personal memories based on the pattern of memory observed in adolescents. However, the type of memory imaginary companions are subject to, and by extension the nature of their role in children's lives, could be elucidated using children's reports of IC memory from middle childhood. If ICs are the subject of personal memories, one could expect a higher proportion of individuals to remember their ICs in middle childhood than adolescence, as less time would have elapsed between IC disappearance and report. Furthermore, frequency of family support of an imaginary companion in middle childhood could be compared to frequency of family support in adolescence to determine whether familial rehearsal plays a larger role in memory for younger children.

Moving forward, further exploration of the family environmental factors that influence fantasy orientation in adolescence is needed. The lack of a relationship between family support of a childhood imaginary companion and fantasy orientation, coupled with the changing importance of parent-child relationships in adolescence (Steinberg & Silverberg, 1986), suggests that understanding peer attitudes towards and support of fantasy might be more important than parent support for this age group. Future research could address the relationship between peer support of fantasy activities and fantasy as a genre and adolescent fantasy orientation. Even in

the assessment of family attitudes towards fantasy in adolescence, a measure more sensitive to the fantasy-related pursuits of adolescents specifically—rather than a measure of recollection of childhood pursuits—could help elucidate the relationship between family support and fantasy orientation.

In addition to understanding the relationship between environment and fantasy orientation, future research could address the relationship between family environment and fantasy absorption. Given the negative correlation between family support and fantasy absorption and an understanding of fantasy absorption as a stable personality trait, perhaps self-reported fantasy absorption is influenced by the social desirability of fantasy absorption within the family. In order to understand whether all family support of fantasy and imagination is negatively associated with fantasy absorption, or whether the type of family support matters, a more careful examination of the valence of family stories surrounding imaginary companions could be conducted. In addition, adolescent reports of their perceived valence of family stories could be collected and compared to parent reports.

Conclusion

Although fantasy and imaginative activities remain part of adolescents' lives, the function of these pursuits might have changed from early childhood. Adolescence represents a potentially unique time in development when fantasy is unrelated to social ability; a discontinuity when contrasted with both early childhood and adulthood. Despite the lack of a relationship between these two areas of cognition, imaginary companions from early childhood, particularly those that were long-lived, are remembered by many adolescents, hinting at the routine nature of imaginary companions within young children's lives. Furthermore, discussion of these creations of early childhood remain relevant within some families into adolescence, suggesting that family

environment plays a small role in memory for imaginative activities from early childhood. However, family environment is not connected to fantasy orientation and absorption in adolescence, suggesting that changes in adolescents' social structures extend to the realm of imaginative pursuits.

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Table 1.

Relationship between Family Support and Memory for ICs (Y/N)

	Family support					
	Never	Once a Year	Every 6 Months	Monthly	Weekly	Daily
	Parent report					
No Memory	71%	14%	0	14%	0	0
Memory	22%	33%	11%	11%	0	0
	Adolescent report					
No Memory	100%	0	0	0	0	0
Memory	33%	33%	22%	11%	0	0

Note. For No Memory, $n = 7$; for Memory, $n = 8$.

Table 2.

Correlations among Measures of Social Ability and Measures of Fantasy

	Books Score	Fantasy	Perspective- Taking	Empathy	ToM Director	ToM Composite
Books Score	--	--	--	--	--	--
Fantasy	0.22 _a	--	--	--	--	--
Perspective-Taking	0.16 _a	0.20 _a	--	--	--	--
Empathy	0.08 _a	0.23 _a	0.70 _a *	--	--	--
ToM Director	0.26 _b	0.02 _b	0.35 _b	0.22 _b	--	--
ToM Composite	0.14 _c	-0.07 _c	-0.54 _c ⁺	-0.44 _c	--	--

Note. ToM = Theory of mind. ^a*df* = 20. ^b*df* = 13. ^c*df* = 11. ⁺*p* < .07. * *p* < .001.

Figure 1.

Age at IC Disappearance in Relation to Memory of IC (Y/N)

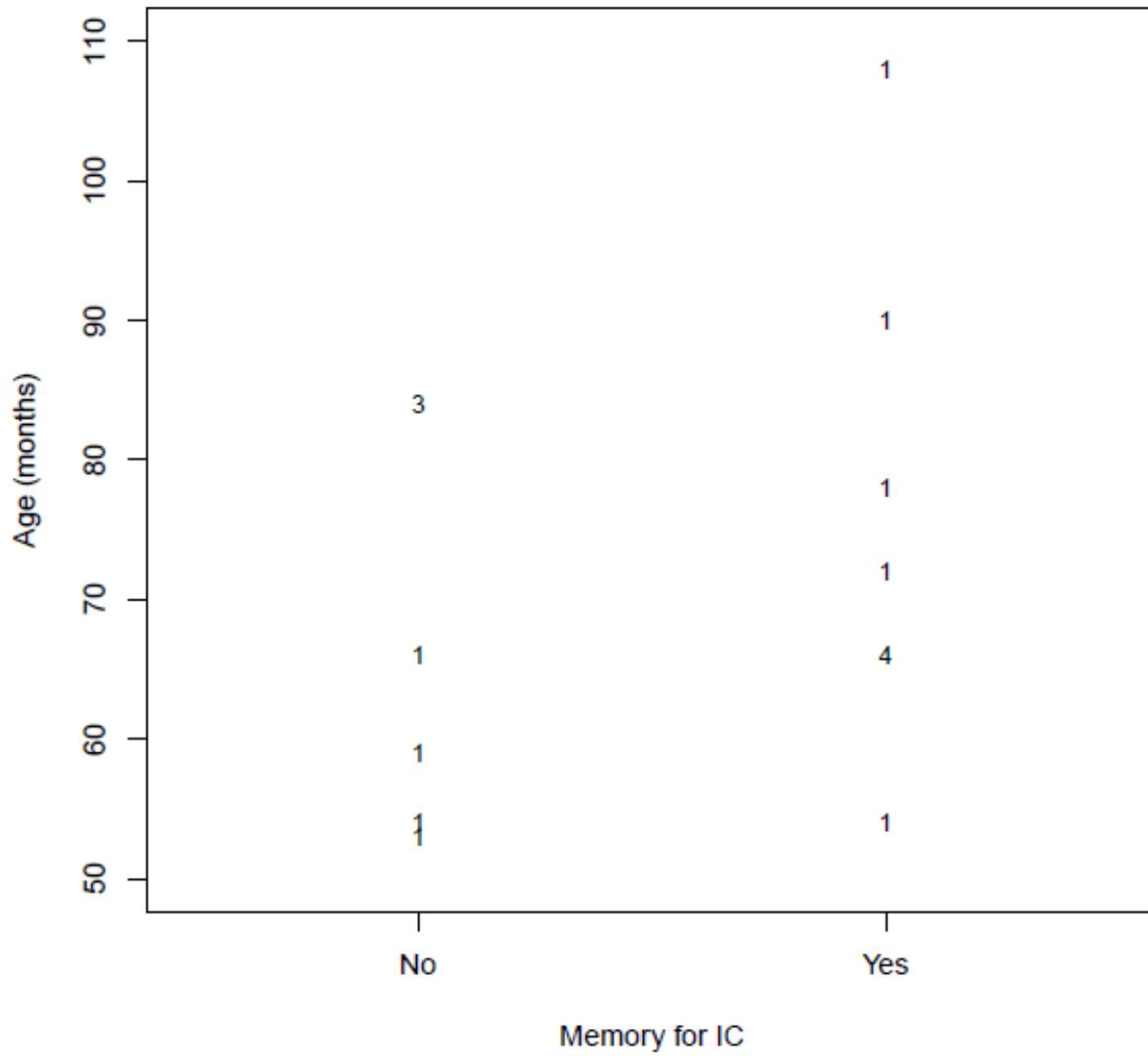


Figure 2.

IC Duration in Relation to Memory of IC (Y/N)

