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Training Preschoolers' Prospective Abilities Through Conversation About the Extended Self

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The ability to act on behalf of one's future self is related to uniquely human abilities such as planning, delay of gratification, and goal attainment. Although prospection develops rapidly during early childhood, little is known about the mechanisms that support its development. Here we explored whether encouraging children to talk about their extended selves (self outside the present context) boosts their prospective abilities. Preschoolers (N = 81) participated in a 5-min interaction with an adult in which they were asked to talk about events in the near future, distant future, near past, or present. Compared with children discussing their present and distant future, children asked to discuss events in their near future or near past displayed better planning and prospective memory. Additionally, those 2 conditions were most effective in eliciting self-projection (use of personal pronouns). Results suggest that experience communicating about the temporally contiguous, extended self may promote children's future-oriented thinking.

Keywords: prospection, extended self, preschoolers, conversation, future-oriented thinking

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The ability to plan for and envision one's future self is an important cognitive achievement. Prospection is proposed to be a uniquely human ability and critical for a variety of positive outcomes, including goal attainment and self-regulation (Atance & O'Neill, 2001). Recent work on prospection has found that prospective abilities develop rapidly during the preschool years (see Atance, 2008, 2015) and continue developing through middle childhood (e.g., Guajardo & Best, 2000; Lagattuta & Sayfan, 2011). Although the structure and developmental time line of young children's prospective abilities have received recent attention, relatively less is known about the mechanisms supporting their development.

Early indicators of prospection appear during the second year of life. Children begin to use future-oriented terms (e.g., *might, could*) around age 2 (e.g., Bowerman, 1986; Atance & O'Neill, 2005) and are able to talk about the events of "tomorrow" by age 3 (Hayne, Gross, McNamee, Fitzgibbon, & Tustin, 2011). By late preschool, children show marked improvements in action-based measures of prospection such as delay of gratification (the ability to inhibit a salient response in favor of a future reward; Mischel, Schoda, & Rodriguez, 1989), decreased temporal discounting (valuing future rewards over present rewards; Steinberg et al., 2009), planning (e.g., Atance & Meltzoff, 2005), and prospective memory (remembering to carry out intended plans at future time points; Guajardo & Best, 2000).

The research on prospection leaves open several questions regarding the coherence and mechanisms of future-oriented thinking. One recent line of work has investigated the extent to which different prospective abilities are associated with one another (Atance & Jackson, 2009; Neroni, Gamboz, & Brandimonte, 2014; Nigro, Brandimonte, Cicogna, & Cosenza, 2014). Another important question has been the extent to which prospection is critically dependent on other cognitive competencies, such as language development, memory, or theory of mind (see Hanson, Atance, & Paluck, 2014). Relatedly, recent research has proposed that cognizing about the future may be linked to cognizing about the past (Coughlin, Lyons, & Ghetti, 2014; Cuevas, Rajan, Morasch, & Bell, 2015; Schacter, Addis, & Buckner, 2007). Our work focuses on these interrelated questions through exploring both the coherence and mechanisms of prospection.

One powerful predictor of children's cognitive and linguistic abilities is their day-to-day social communicative context. For

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example, the quality of vocabulary input that parents provide to children predicts children's own vocabulary growth (see Hoff, 2006; Rowe, 2012); encouraging children and parents to talk about mental states predicts children's theory of mind (Lu, Su, & Wang, 2008; Reese, Sparks, & Leyva, 2010; Taumoepeau & Reese, 2013), and making even small changes in children's linguistic input has powerful effects on children's conceptual understanding (Rhodes, Leslie, & Tworek, 2012).

Such training studies are powerful in two respects: First, they are able to provide a basis for creating more formalized interventions targeting children's conceptual development. Second, they can uncover the causal mechanisms of conceptual development. For example, Rhodes and colleagues (2012) found that exposing children to generic talk in a short storybook task led to an increase in children's essentialist thinking, suggesting that generics and essentialism are causally related.

In the context of future-oriented talk specifically, parents' use of temporal markers predicts children's own use of such markers (Hudson, 2006). Inspired by this previous work, we were interested in whether practice with projecting oneself into the future scaffolds children's prospective abilities. We designed a short study in which we asked children to discuss and generate self-relevant future events. Prior theoretical work has suggested that practicing simulating and anticipating future events helps motivate one to better prepare for those events (e.g., Taylor, Pham, Rivkin, & Armor, 1998). We reasoned that young children, who are still developing the ability to discuss their futures and may therefore be unlikely to do so spontaneously, would be particularly likely to benefit from such an intervention.

Our study also allowed us to test several possibilities for how and why future-oriented talk might scaffold prospection. One possibility is that simulating oneself in any context outside the present helps children reason about themselves outside the here and now and make decisions on behalf of their extended selves (*extended-self talk hypothesis*). In support of this possibility, decontextualized talk (talk outside the here and now) in many forms (e.g., explanations, abstractions, narrative of future and past events) is shown to be a powerful predictor of children's language and cognitive development (e.g., Demir, Rowe, Heller, Goldin-Meadow, & Levine, 2015; Rowe, 2012). Yet another possibility, however, is that extended-self talk has to be restricted in content in order to scaffold prospective abilities (*future-oriented talk hypothesis*). Projecting oneself in the future specifically (rather than the past) might help anticipate future states, prepare for upcoming events, or simply bring to mind one's future self. The concept of one's "future self" is taken out of an abstract, hypothetical state and brought to mind concretely through conversation and episodic mental simulation. Work with adults has shown that even brief reminders of one's future self specifically improves delay of gratification by helping adults feel closer to their future selves (see Hershfield, 2011). On this account, one would not expect any and all forms of extended-self talk to be similarly motivating, because talk about the past does not provide the benefit of anticipating future events. Future talk may be more laden with complex linguistic hypotheticals (Hudson, 2002) and thus may serve as a better scaffold for prospective thinking. Finally, hybrid accounts are also possible: Because cognizing about the future and past are thought to rely on the same cognitive competencies (e.g., Schacter et al., 2007), discussing the extended self (in the future *or* past) might improve prospective abilities but only if the extended self is perceived as being relevant to one's present self (*self-relevant extended-self talk hypothesis;* e.g., see Bryan & Hershfield, 2012; Hershfield et al., 2011). In the context of our work, this hypothesis predicts that discussing extended-self events that are nearer in time to one's present self are more likely to feel self-relevant, would be particularly motivating for young children, and thus would serve as salient reminders to act in service of one's future self (see Oyserman & James, 2009).

To distinguish among these different hypotheses, we designed a study in which 3- to 5-year-old children were exposed to one of four different types of conversation about themselves. In our focal group (*near future talk* group), children were asked to generate events in their near future (within the next 24 hr). In a control group (*present talk* group), children were asked to talk about events in their present, contextualized context. In addition, we were interested in whether *any* future talk scaffolds children's abilities or whether future talk has to be temporally contiguous and closely related with children's present selves. We thus included a *distant future talk* group, in which children were asked to discuss events that would occur after the next 24 hr (spanning from "tomorrow" to adulthood). Prior work has found that children see themselves as fundamentally distinct from their "adult" selves (Carey, 1985). Therefore, if future talk offers specific benefits due to its linguistic complexity (Hudson, 2002), one should see improved prospective abilities in this group relative to the control (*present talk* group). If, however, future talk specifically offers benefits not due to its linguistic complexity but due to its ability to invoke notions of the extended self, one should not see improved prospective abilities, because distant future talk should not feel as self-relevant as would near future talk.

Finally, because cognizing about the future has been hypothesized to relate to cognizing about the past, we included a *near past talk* condition in which children generated events within the last 24 hr. This last condition was matched to our focal *near future* condition and thus allowed us to test whether talking about temporally proximate selves in the future or past would scaffold prospective abilities. Immediately following training, children were tested on a broad range of prospective tasks.

Our procedure allowed us to address three interrelated issues. First, we examined the types of future- (or past-)oriented talk that children produced during training. Second, we looked for coherence among the diverse prospection tasks used during the assessment phase. Finally, we looked at whether the training groups differed from one another on prospective measures. In particular, we tested for the following three mutually exclusive hypotheses:

Hypothesis 1: Extended-self hypothesis: Any conversations about the extended self, or self in the nonpresent (past or future), should boost prospective abilities. Children in the *near past, near future,* and *distant future* conditions should outperform children in the *present* condition.

Hypothesis 2: Future-oriented hypothesis: Any conversation specifically about the future should boost prospective abilities. Children in the *near future* and *distant future* conditions should outperform children in the *present* or *near past* conditions.

Hypothesis 3: Self-relevant, extended-self hypothesis: Conversations about the extended self that are *close in time* to the present self should boost prospective abilities. Children in the *near future* and *near past* conditions should outperform children in the *present* and *distant future* conditions.

Method

Participants

In keeping with minimum suggested standards in the field (Simmons, Nelson, & Simohnson, 2011), we sought to test 20 children per condition. Thus, we concluded testing and analyzed data once we achieved this minimum. Participants were eighty-one 3- to 5-year-old children (M_{age} = 4.42; range = 3.15–5.72) recruited from six separate preschool centers in the greater Boston area.[1] The sample included twenty-six 3-year-olds, thirty-seven 4-year-olds, and eighteen 5-year-olds. Forty-five of our participants were female. Demographics on individual participants were not obtained, but two centers self-identified as serving low or lower middle class families (*n* = 26 children), three served primarily upper middle or middle class families (*n* = 32 children), and one served mixed (both types of) families (*n* = 23 children).

Procedure

All children were tested in a separate room or quiet corner at their local preschool. One experimenter conducted the introduction and training phase, and a second experimenter, who remained blind to the training condition the children had just participated in, conducted the assessment phase.

Time line introduction. All children began by being introduced to the concept of linear time (e.g., Busby Grant & Suddendorf, 2009). Children were shown a rectangle divided into three colored squares signifying three distinct time periods ("before now," "now," and "after now"). The experimenter then placed the word *now* on the middle square and said, "This is everything that's happening *right* now" and then proceeded to list three examples of events in the present context (e.g., "like us playing this game right here or your class playing outside or my friend [referring to the second experimenter] over there working"). Examples were modified slightly to fit the present context. The experimenter then asked the child to identify which square should signify "before now" and which square should signify "after now." Corrective feedback was provided until each child correctly identified "before now" and "after now," and the experimenter affixed the words *before* and *after* to their respective squares, such that the time line showed "before now," "now," and "after now" in successive order.

Training period. At this point, children were randomly assigned to one of four conditions (described in the next four sections), in which they participated in a brief conversation with the experimenter about a specified time period. The structure of the conversations is summarized in Table 1.

Near future condition (n = 21). In the *near future talk* condition, children were told that they would be talking about events that are going to happen "after now." The experimenter then listed three examples of near future events (in the next 24 hr) in increasing temporal order ("After now are things like right after this game when you will go back to class, later today when you will go home from school, or even a really long time from now when you will go to bed tonight"). To encourage future self-projection, we used a child-friendly version of a procedure that has induced future-oriented projection in adults (Hershfield et al., 2011). In the adult version, adults were shown age-progressed portraits of themselves. In our version, the experimenter asked children to draw a picture of themselves in the last exampled future time period: "Can you draw a picture of yourself going to bed tonight?" After the child completed the drawing, the experimenter placed it on the square labeled *after now* and reaffirmed that it belonged on that square ("We're going to put this right here because this is going to happen *after* now!").

Children were then cued to generate events in their near future. The experimenter asked children to list some events that would happen in three distinct time periods, all taking place within the next 24 hr: (a) "right after" this game, when children go back to their class (e.g., "What are some things you'll do right after this game, like when you back to class?"); (b) "later today," when children go home from school; and (c) "a long time from now," when children go to bed to that night. A summary of the temporal cues used in each condition is summarized in Table 1. The experimenter asked the question pertaining to each temporal cue and then encouraged children to continually generate events (e.g., "and what are some other things you'll do later today?"). The experimenter proceeded to the next question or time period once children had either (a) repeatedly stated they could not generate further events or (b) generated five events.

Near past condition (n = 20). The *near past talk* condition was designed to match the *near future talk* condition, except that the experimenter referred to events that happened in the preceding (rather than following) 24 hr. The experimenter pointed to the square labeled *before now* and stated she and the child would be discussing things that happened "before now." She then listed three examples of near past events (in the past 24 hr) that were matched to the *near future* events ("Before now are things like right before this game, when you were back in your class; earlier today, when you first woke up; or even a really long time ago, when you went to bed last night"). As in the *near future* condition, the experimenter then asked children to draw a picture of themselves going to bed last night and placed the drawing on the square titled *before now*. Children were then asked to generate events during three time periods taking place within the past 24 hr: (a) "right before" this game, when children were in class; (b) "earlier today," when children first woke up; and (c) "a long time ago," when children went to bed last night.

Distant future condition (n = 20). The *distant future talk* condition proceeded in the same form as did the *near future talk* condition, with the following modifications: First, the experimenter listed examples taking place after the proceeding 24 hr ("After now are things like tomorrow, when you will wake up in the morning; a few weeks from now, when you will [celebrate Thanksgiving]; or even a really long time from now, when you are all grown up"). For the second example ("a few weeks from now"), we used a well-known upcoming holiday (e.g., Thanksgiv-

[1] One child was identified as being in the proper age range (3 years old), but her birth date was not provided. Her data are excluded from age calculations but included in the main analyses when possible.

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Table 1
Structure of the Training Period Across Conditions

Event sequence	Near future	Near past	Distant future	Present
		Time period		
Introduction	"We're going to be talking about some things that will happen *after now.*"	"We're going to be talking about some things that happened *before now.*"	"We're going to be talking about some things that will happen *after now.*"	"We're going to be talking about some things that are happening *right now.*"
Examples	"After now are things that will happen *right after,* like when you go back to class; things that will happen a little *later today,* like when you go home from school; or even things that will happen *a really long time from now,* like when you go to bed tonight."	"Before now are things that happened *right before,* like when you were back in class; things that happened a little *earlier today,* like when you first woke up; or even things that happened *a really long time ago,* like when you went to bed last night."	"After now are things that will happen *tomorrow,* like when you wake up in the morning; things that will happen *a few weeks from now,* like when you [celebrate Thanksgiving]; or even things that will happen *a really long time from now,* like when you are all grown up."	"Right now are things that are happening in this moment, like *what you see* around you, like this game; or *what you hear* around you, like [your class playing]; or even *what you feel* around you, like [this hard floor]."
		Child's drawing		
Request for a drawing	"Can you draw a picture of yourself going to bed tonight?"	"Can you draw a picture of yourself going to bed last night?"	"Can you draw a picture of yourself when you are all grown up?"	"Can you draw a picture of yourself right now?"
Temporal Cue 1 (child generates up to 5 events)	"What are some things you'll do *right after* this game when you go back to class?"	"What are some things you did *right before* this game when you were in class?"	"What are some things you'll do *tomorrow* when you wake up in the morning?"	"What are some things you *see* around you right now?"
		Child's event generation		
Temporal Cue 2 (child generates up to five events)	"What are some things you'll do *later today* when you get home from school?"	"What are some things you did *earlier today* when you woke up?"	"What are some things you'll do *a few weeks from now* when you will [celebrate Thanksgiving]?"	"What are some things you *hear* around you right now?"
Temporal Cue 3 (child generates up to five events)	"What are some things you'll do *a long time from now* when you go to bed tonight?"	"What are some things you did *a long time ago* when you went to bed last night?"	"What are some things you'll do *a long time from now* when you're all grown up?"	"What are some things you *feel* around you right now?"

Note. Each column represents the sequence of events within that condition.

ing, the holidays, Valentine's Day, Fourth of July), which varied depending on the time of year that children were tested. The experimenter then asked children to draw a picture of themselves when they are "all grown up" and placed the picture on the square labeled *after now*. Finally, the experimenter asked children to generate events in three distinct time periods: (a) "tomorrow," when children first wake up; (b) "a few weeks from now," when children celebrate [an upcoming holiday]; and (c) "a really long time from now," when children are all grown up.

Present condition (n = 20). The *present talk* condition was matched to the other three, except that children were told they would be talking about the square labeled *now*. The experimenter then listed three examples of things in children's present context, including something that children could see around them ("things like what you see around you—like this game"), hear around them ("things like what you hear around you—like your class playing outside"), and feel around them ("things like what you feel around you—like this hard floor"). Examples were modified slightly to fit the context (e.g., the experimenter always used a prominent sound, such as children playing outside or teachers talking, that could be easily heard by both herself and the children). Children were then asked to draw a picture of themselves as they are "right now," and the picture was placed on the "now" square. The experimenter then asked children to talk about the present context and generate things that they (a) see around them right now, (b) hear things around them, and (c) feel around them. As with all the other conditions, the experimenter gave the first prompt ("What are some things you see around you right now?") and encouraged children to generate examples. The experimenter proceeded to the next prompt once children generated five examples or repeatedly stated they could not generate any further examples.

Assessment. Following the training period, a new experimenter (who was blind to the children's training condition) assessed children on a measure of prospective tasks. Tasks were drawn from prior literature and selected to reflect a broad range of prospective measures appropriate to our targeted age range. Two measures (prospective memory and mental time travel) had been used extensively in prior work and are known to measure children's planning abilities. One task (referred to here as the mental time travel task) asked children to reason about a hypothetical planning scenario (e.g., a child pretending to make a plan to walk through a forest scene); a second task (referred to as the prospective memory task) was an action-based planning measure in which children were asked to make a future plan (e.g., remind an experimenter to open a box) and remember to successfully carry out that plan.

We also created three additional measures to look at children's prospective abilities: two temporal discounting measures (sticker task and temporal discounting task), in which children were asked to choose between smaller rewards in the present or larger rewards in the future, and a task testing children's conceptual understanding of the linear nature of time (time line task). The tasks and measures are described in the next five sections.

Prospective memory task. Following a procedure adapted from Guajardo and Best (2000), children were shown a wooden box and told there was a gift inside ("I have a gift for you in this box when we are all done with this game [referring to the experimental session]"). The experimenter then mentioned that the child had to remind her to open the box at the end of the session. To increase motivation, the experimenter then told the child that she often has trouble remembering things and provided a cue that the child could use ("when I say 'we're all done!' you have to remind me to open the box and give you your gift"). At the end of the session, the experimenter stated the promised cue and waited 10 s. If the child did not make any reminders within the 10 s, she provided a second cue "Did you have to remind me of anything?" and waited 10 more s. If the child still did not remember, she opened the box and retrieved the gift for the child.

To carry out this task successfully, children had to encode an intention to remember at a future time period, hold in mind the intention during the entire assessment period, and then successfully retrieve that intention during the specified future time period (e.g., Mackinlay, Kliegel, & Mäntylä, 2009). Because we wanted to make sure all children had roughly the same time period between encoding (first being introduced to the box) and retrieval (the end of the game), we minimized counterbalancing and always presented this task either first or second (order counterbalanced). The cue to open the box ("We're all done!") was always presented at the conclusion of the session. For details on counterbalancing, see Table 2.

T2

Each child received a prospective memory score of either 0 or 1. Children were given a score of 1 if they successfully remembered to tell the experimenter to open the box during the proper cue (after the experimenter said "We're all done!") and a score of 0 if they did not remember. We note that 18 children (four in the *near future* condition, three in the *near past* condition, five in the *distant future* condition, and six in the *present* condition) remembered the gift only after the reminder ("Did you have to remind me of anything?"). Because we do not know whether these children may have been relying solely on retrospective memories (the reminder cued the children to retrospectively recall the intention), we gave these children scores of 0 to be conservative in our analyses.

Saving for the future task. Children were shown five brightly colored dinosaur stickers and told they could either play with the stickers and stick them on a plain piece of paper right now or play with the stickers but wait a few minutes while the experimenter finished some work and save some stickers to stick on a cool dinosaur scene (they were shown the dinosaur scene). The experimenter then proceeded to work for 3 min and made minimal contact with the child. At the conclusion of the 3-min period, the experimenter gave the child the dinosaur scene and allowed the child to stick any remaining stickers onto it. This task was designed to test children's ability to engage in saving behaviors (Metcalf & Atance, 2011), but it differed from typical temporal discounting tasks in that it did not manipulate anticipated reward size or number (only quality). Children were given a sticker task score (0–5) corresponding to the number of stickers they had successfully saved for the dinosaur scene.

Time line task. Children were shown the time line used during the training period (with three squares labeled *before now, now,* and *after now*) and told they would be asked about some events that either happened before now or will happen after now (the experimenter pointed to each square as she narrated). The experimenter then told children that if the event happened before now, they should point to the "before now" square, and if the event will happen after now, they should point to the "after now" square. She then asked about six separate time periods: four general time periods (next season [e.g., fall if the child was tested during the summer month], previous season [e.g., spring if the child was tested during the summer month], tomorrow, yesterday) and two autobiographical time periods (when the child will be [next age], when the child was [previous age]). The experimenter stated the time period and then asked whether that period belongs in the "before now" square or the "after now" square. The events were presented in one of two possible orders (referred to as a "forward" order, in which participants were asked about the events in the following sequence: earlier season, next season, tomorrow, yesterday, next age, and previous age; and a "backward" order, in which

Table 2
List of Possible Orderings of the Assessment Tasks

Order choice	Task 1	Task 2	Task 3	Task 4	Task 5
1	Prospective memory	Saving task	Time line task (forward order)	Mental time travel task	Temporal discounting task
2	Saving task	Prospective memory	Time line task (forward order)	Mental time travel task	Temporal discounting task
3	Prospective memory	Saving task	Mental time travel task	Time line task (forward order)	Temporal discounting task
4	Saving task	Prospective memory	Mental time travel task	Time line task (forward order)	Temporal discounting task
5	Prospective memory	Saving task	Time line task (backward order)	Mental time travel task	Temporal discounting task
6	Saving task	Prospective memory	Time line task (backward order)	Mental time travel task	Temporal discounting task
7	Prospective memory	Saving task	Mental time travel task	Time line task (backward order)	Temporal discounting task
8	Saving task	Prospective memory	Mental time travel task	Time line task (backward order)	Temporal discounting task

participants were asked about the events in the reverse sequence). Children received a time line task score between 0 and 6 corresponding to the number of events they had successfully placed in the correct square.

Mental time travel task. We used two items adapted from Atance and Meltzoff's (2005) mental time travel task, in which children viewed a scene (either a forest or snow) and told to imagine themselves planning to walk through it ("Let's pretend that *you* are going to walk across this road through the forest [snow]. Let's get ready to go!"). They were then shown three items—an item needed for a possible future state (water for drinking [a jacket]; correct response), an item that was semantically associated with the scene (a plant [ice cubes]), and a distractor item (a present [bathing suit]). The items were labeled, and children were asked to provide an item selection ("Which of these things do you need to bring with you?") and a justification for their item selection ("And why do you need to bring the [chosen item]?"). The three items were presented in a pseudorandom order (items were presented in one of three possible Latin square design orders).

Children received a mental time travel correct-item-selected score between 0 and 2 corresponding to the number of times children had selected the correct item across the two trials. In addition, children's explanations were coded according to whether they appropriately referred to a functional future use of that item (e.g., "I might get thirsty so I need to drink"; "the jacket because it's so cold outside"). Children received a mental time travel planning explanation score of 0–2. Note that coding for these explanations was more lenient than that used in prior work (Atance & Meltzoff, 2005) in order to adjust for the increased variability of the verbal ability of children in our sample.

Temporal discounting task. Children were given a simplified temporal choice task at the conclusion of the study. When the experimenter opened the box to give children their gift (as part of the prospective memory task), she revealed two stickers and asked them whether they would like one sticker "right now," or two stickers "if [they] could wait until the end of the day." After children stated their choices, they were always given two stickers immediately regardless of their chosen option. This task was always presented last. Children were given a temporal discounting score of 1 if they chose to wait for the larger reward (two stickers) and 0 if they opted for the smaller, immediate reward (one sticker).

Coding

The first author coded children's responses in the assessment tasks for all videos. A coder blind to children's assigned condition then coded a subset of these videos (25%). Interrater reliability was 95%. A second research assistant, who stayed blind to children's performance on the assessment tasks, transcribed the training session for dialogue between the experi-
Fn2 menter and the children.[2] During the training session, we counted the number of children's utterances that included the use of the future tense, the past tense, and personal pronouns (*I, me, mine, my, we, us, our,* and *ours*) to determine the type of talk produced during training.

Results

Talk Produced During Training

We looked at the talk children generated during the first phase (training session). Preliminary results revealed no effects of gender, age, or school center. We therefore collapsed across these variables in the following analyses.

Children generated a mean of 23.97 utterances (SD = 18.39) and nine events (SD = 4.43) during the training session. Neither the number of utterances nor the number of events that children generated varied across conditions (both $ps > .15$), confirming that condition did not systematically affect children's overall verbal production.

We then looked at the proportion of utterances (out of total utterances) employing the future and past tense (see Figure 1). F1
Note that for all events, children could use either the proper tense to which the time period referred (e.g., "I will sleep") or could answer without using the proper tense (e.g., "sleeping").[3] An Fn3
analysis of variance (ANOVA) on the proportion of children's utterances containing the future tense revealed significant condition effects, $F(3, 75) = 3.63$, $p = .02$, $\eta_p^2 = .13$. In particular, children in the two future conditions (*near future* and *distant future*) produced a greater proportion of future tense utterances than did children in the *near past* and *present* conditions: linear contrast $t(75) = 3.26$, $p = .002$, $d = .75$. Similarly, an ANOVA on the proportion of past tense utterances revealed a significant effect of condition, $F(3, 75) = 15.97$, $p < .0001$, $\eta_p^2 = .39$. In particular, the *near past* condition differed significantly from the other three: linear contrast $t(75) = 6.90$, $p < .0001$, $d = 1.59$. Therefore, although overall use of future tense was low (comprising less than 10% of the utterances children produced), children nonetheless used it, and use differed across conditions.

We also looked at the extent of children's self-projection when generating events. As a proxy for self-projection, we looked at children's use of personal pronouns (e.g., *I, me*) during the training session. Note that children could generate events either without self-projecting ("go to sleep") or by self-projecting ("I [will] go to sleep"). In particular, we were interested in whether the two conditions in which children were asked to discuss their close-in-time extended self might produce greater self-projection. An ANOVA on the proportion of utterances containing personal pronouns revealed significant differences across conditions, $F(3, 75) = 2.79$, $p = .05$, $\eta_p^2 = .10$. Children in the *near past* and *near future* conditions used a greater proportion of personal pronouns in their utterances than did those in the *distant future* or *present* condition, $t(75) = 2.75$, $p = .008$, $d = .64$. Therefore, although all conditions elicited some amount of self-projection, talking about the close-in-time, extended self elicited a greater amount of self-projection.

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[2] Two children's training sessions could not be recorded (or transcribed) due to a video recording error.

[3] Task-irrelevant uses of pronouns that were not specific to generating events (e.g., "I don't know"; "I wanna play the next game") were not included in the total calculations.

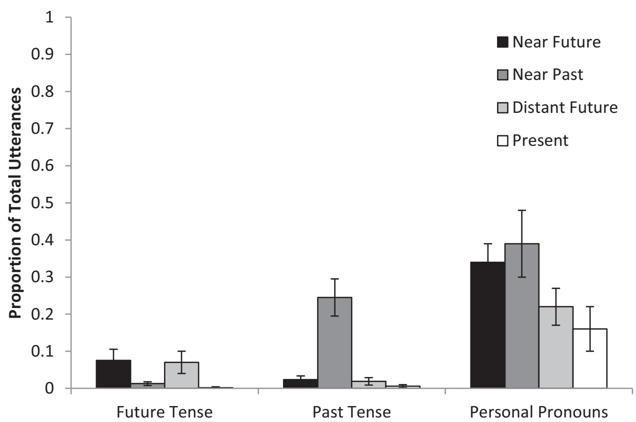

Figure 1. Proportion of utterances containing future tense, past tense, and personal pronouns across conditions. Bars represent standard errors.

Coherence of Prospection Tasks

Turning to children's performance on the prospective tasks, we first looked at coherence among the various tasks used in the assessment phase. We conducted a factor analysis using varimax rotation on scores from prospective tasks in the assessment phase (prospective memory score, saving task score, time line task score, mental time travel correct-item-selected score, mental time travel planning explanation score, and temporal discounting task score; see the online supplemental materials for raw means of all item scores across age groups). The results revealed two primary factors - a Planning Factor and a Linear Time/Temporal Discounting Factor (see Table 3). Notably, the Prospective memory task cohered with the two mental time travel task scores (i.e., the correct item selected and the planning explanation score), mimicking prior work that has found that prospective memory and planning abilities are related (Mackinlay et al., 2009). Moreover, the two temporal choice tasks (temporal discounting, saving task) were related to one another and related to children's understanding of the linear nature of time (time line task).[4]

Effects of Training

Finally, we looked at the effect of our training on children's prospective abilities. Analyses revealed no effects of gender or task order, so data were collapsed along these variables. We did, however, find significant effects across ages and between preschool centers. We therefore controlled for age (as a covariate) and preschool center in all of our analyses. Descriptives of performance on prospection tasks across ages are provided in Table 4.

To reduce the overall number of comparisons, we first ran our ANOVAs on each of the two extracted factor scores (Planning Factor and Linear Time/Temporal Discounting Factor). The results revealed significant condition and age-related changes for the Planning Factor: There was a significant effect of condition type, $F(3, 69) = 2.96$, $p = .04$, $\eta_p^2 = .11$; a significant effect of school center, $F(5, 69) = 5.61$, $p = .002$, $\eta_p^2 = .29$; and a significant effect of age (with children receiving better scores as they aged), $F(1, 69) = 13.81$, $p = .0004$, $\eta_p^2 = .17$. There were no significant condition type or age effects for the Linear Time/Temporal Discounting Factor (both $ps > .08$), although there was a significant effect of school center, $F(5, 69) = 2.98$, $p = .02$, $\eta_p^2 = .18$.[5] Therefore, children's planning ability but not temporal discounting ability varied across training conditions. Thus, further analyses examined effects on planning ability.

We next tested for each of our three hypotheses using planned linear contrasts. We ran three separate linear contrasts to test for (a) *extended-self talk* hypothesis by contrasting the *present* condition with the other three, (b) *future-oriented talk* hypothesis by contrasting the *near future* and *distant future* conditions with the other two, and (c) *self-relevant extended-self* hypothesis by contrasting the *near future* and *near past* conditions with the other two.

Planned linear contrasts on the Planning Factor supported the self-relevant extended-self hypothesis: The *near future* and *near past* conditions differed significantly from the other two (*present* and *distant future*), $F(1, 69) = 7.03$, $p = .01$. Linear contrasts testing the other two hypotheses were not significant (both $ps > .20$). Results were consistent when analyzing the three tasks constituting the Planning Factor separately (see Figure 2). For prospective memory, planned linear contrasts once again supported the self-relevant extended-self hypothesis, $F(1, 69) = 9.45$, $p = .003$. Similarly, for the mental time travel planning explanation scores, planned linear contrasts supported the self-relevant, extended-self hypothesis, $F(1, 71) = 7.81$, $p = .007$. However, there were no significant contrasts for the mental time travel forced choice scores (all $ps > .50$).

The overall pattern of results supports the self-relevant, extended-self hypothesis: Children in the two temporally contiguous conditions (*near past and near future*) showed better planning abilities (*better prospective memories and future-oriented explanations*) than did children in the other two conditions (*present and distant future*).

Discussion

Our results replicate prior work showing age-related changes in children's planning abilities during the preschool years (Atance & Meltzoff, 2005). However, recent work in developmental psychology has called for examining the mechanisms that drive these developmental changes in prospection (Atance, 2015). Here we found that a short conversation about one's "extended self" primed children's prospective memories and planning ability. Our work suggests that experience communicating and thinking about one's extended self promotes the ability to make decisions on behalf of that extended self.

Across several measures, we found support for our self-relevant, extended-self hypothesis. Conversation about the temporally contiguous extended self (near future and near past) showed better planning ability and encouraged higher self-projection. Our results mimic those of prior work showing that adults' ability to engage in delay of gratification tasks was predicted by how closely related they believed their future selves were to their present selves (Bryan

[4] To make sure that our factor analysis was not unduly affected by the fact that we used two scores from the same task, we reran this analysis using a combined mental time travel score (adding scores from children's forced choice and explanation responses). Results remained nearly identical.

[5] See the online supplemental materials for analyses of descriptives of the other tasks.

Table 3
Factor Loadings for Tasks Administered During the Assessment Phase

Variable	Planning	Discounting and Time Line
Variation explained	29.97%	20.26%
Eigenvalue	1.80	1.22
Tasks		
Mental time travel correct-item-selected score	.89	−.06
Mental time travel planning explanation score	.82	.05
Prospective memory score	.55	.27
Time line task score	.07	.72
Temporal discounting task score	.04	.65
Saving task score	−.008	.47

& Hershfield, 2012). Brief visual reminders of one's extended self (age-progressed portraits of one's future self) also helped improve delay of gratification (Hershfield et al., 2011). Our work suggests that a similar mechanism may also account for children's prospective ability—discussion about one's extended self may help activate concepts about the future self or may make the extended self appear closely related to one's present self.

Our approach offers an important method for studying individual differences in and consequences of how frequently children conceive of their extended selves. Prior work has found important cultural and individual differences in the specificity of future thinking in adults (Wang, Hou, Tang, & Wiprovnick, 2011). Even a few directives helped children to think about their future selves, but the extent to which children engaged in true future-oriented thinking (used future tense) and self-projection (e.g., "I'll be sleeping" vs. "sleep") varied across conditions. In our work, we used a laboratory-based task, although we note that we attempted to create a natural conversation with children through prompting them to focus on script-based everyday events (e.g., going to bed). Prior work has found that parents employ some of the tactics that we used in our conversations (e.g., use of prompts, use of simple future tense; Hudson, 2006); however, there are important individual differences in the extent to which they do so. We believe that one fruitful avenue for future work would be to focus on how individual differences in naturally occurring conversation between parents and children relate to individual differences in prospection.

Talking about near future or past events boosted prospection, but talk about the distant future did not. One possibility would have been that talking about the distant future was more cognitively complex for young children. We found, however, that children were just as adept in discussing their distant selves as their future selves (they did not differ in the number of words, utterance, mean length of utterance, or use of future or past tense) when discussing their near future or distant future selves. In fact, the only difference in children's verbal production that we found between the distant future relative to the near future or past condition is their use of personal pronouns (self-projection). We thus propose that the distant future may have felt less personal to young children than did the near future or near past. Close-in-time events may have been more readily recognizable to children as closely associated with their present selves, whereas temporally distant events (e.g., "adulthood") may have felt fundamentally distinct from and incompatible with children's present selves (see Carey, 1985). Work with adults has also suggested that distant future events are represented more abstractly (Trope & Liberman, 2003), and thus in our study distant future events may have felt less self-relevant to the children. Future work may focus on further refining the relationship between self-projection and prospective ability as well as focus on which types of situations do and do not elicit self-projection (e.g., distant past selves).

We also found coherence among several prospection tasks. The term *prospection* is often used broadly to refer to a host of subcomponent capacities, each drawing upon distinct cognitive competencies. To this end, many tasks have been developed to assess prospective ability, ranging from action-based tasks (e.g., delay of gratification); fully verbal tasks (e.g., articulating the concept of "tomorrow"); and tasks that draw upon a mix of explicit, conceptual knowledge of the future as well as implicit, action-based knowledge. Our work found that two tasks associated with planning ability (prospective memory and mental time travel) were closely related to one another, even though the two tasks drew upon different cognitive abilities. One task (prospective memory) was action-based and relied on explicit memory, and another task was fully verbal and involved articulating the use of an item for a hypothetical future plan. Despite the fact that these tasks were distinct in form, children's performance on these remained correlated, even after controlling for age (r = .32, p = .004). This suggests that children's planning ability may be linked together and uniquely distinct from other forms of prospective thinking.

Children's planning ability was also affected by the type of training that they received, whereas other abilities (e.g., temporal discounting) did not show any differences across training groups. Although similar manipulations with adults have been successful in inducing improvements on temporal discounting tasks (Hersh-

Table 4
Raw Means (and Standard Errors) for Each Item Across Age Groups

Task	3-year-olds (n = 26)	4-year-olds (n = 37)	5-year-olds (n = 18)
Mental time travel correct-item-selected score (0–2)	1.15 (.14)	1.49 (.13)	1.78 (.10)
Mental time travel planning explanation score (0–2)	.92 (.17)	1.38 (.14)	1.39 (.18)
Prospective memory score (0–1)	.42	.44	.72
Time line task score (0–6)	3.34 (.28)	3.70 (.24)	4.72 (.28)
Temporal discounting task score (0–1)	.50	.42	.67
Saving task score (0–5)	1.73 (.45)	1.78 (.35)	3.0 (.55)

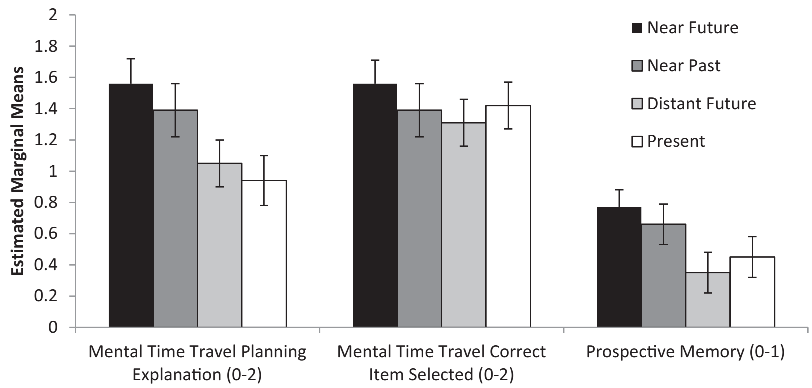

Figure 2. Estimated marginal means of planning explanation, mental time travel correct-item-selected items, and prospective memory across conditions. Bars represent standard errors.

field, 2011; Peters & Büchel, 2010), prior developmental work has found that preschoolers have a difficult time engaging in "saving" behaviors (Metcalf & Atance, 2011) without any prior practice. Notably, our training did not give children practice with either thinking about or practicing saving behaviors. Thus, our finding that training did not change these discounting behaviors is not surprising. We also note that we did not observe condition differences in the time line task. We believe two potential reasons may have contributed to this. First, children in all conditions were introduced to the time line and thus may have had similar experience with it. Second, the events that constituted the time line task tended to focus on the distal future or past (e.g., the child's next or previous birthday), and thus discussing near future or past events may not have been particularly helpful in reasoning through distal future events. Instead, we found that the training session may have been particularly effective in helping children think about and act on future plans.

Overall, we propose an important approach to studying the development of prospection. More generally, our work suggests that there is a strong role of the communicative social context in activating children's ability to engage in future-oriented thinking and planning. These results have implications for caregivers' day-to-day interactions with preschoolers, because even brief conversations with adults can help scaffold, shape, and activate concepts about one's extended self. Critically, engaging young children in conversations where they are provided with opportunities to cognize, remember, and discuss their extended selves may ultimately help them make future-oriented decisions that benefit those extended selves.

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