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The capacity to plan ahead and provide the means for future ends is an important part of human practical reasoning. When this capacity develops in ontogeny is the matter of an ongoing debate. In this study, 4- and 5-year-olds performed a future planning task in which they had to create the means (a picture of a particular object, e.g., a banana) that was necessary to address a future end (of completing a game in which such a picture was missing). Children of both ages drew more targets than children in a control condition in which there was no future end to be pursued. Along with prior findings, the results suggest a major progression in children's future thinking between 3 and 5 years. Our findings expand on prior knowledge by showing that young children cannot only identify the probate means to future ends but determine such ends and create the means to achieve them, thus offering compelling evidence for future planning.

Keywords: prospection, cognitive development, episodic foresight, future planning

One of the hallmarks of human thinking is that it encompasses the ability to ponder the future. Foresight is necessary for humans to lead healthy and fulfilled lives because their agency is uniquely extended in time. According to philosopher Michael Bratman (1999, 2014), human agency is characterized by a kind of practical reasoning that relies heavily on future-directed plans. Only by forging plans can humans organize and coordinate their activities across time in such a way that allows them to achieve their goals and meet their needs. Some psychologists and cognitive scientists even argue that the capacity to remember the past or think hypothetically are mere evolutionary by-products of the capacity to plan ahead (Klein, 2013; Klein, Robertson, & Delton, 2010; Suddendorf & Corballis, 1997; Suddendorf & Redshaw, 2013).

Given the central role of future thinking for human action and cognition, an important question is when and how it emerges in ontogeny. In the first years of life, children seem to lack foresight and caregivers are entirely entrusted with the provision of shelter and nutrition. Humanists and developmental scholars have repeatedly remarked on infants' total dependence on others (Gehlen, 1940; MacMurray, 1961; Winnicott, 1963). In John MacMurray's (1961, p. 53) words:

> Nature leaves the provision for his (*the child's, authors' addition*) physiological needs and his well-being to the mother for many years, until [. . .] he has learned to form his own intentions, and acquired the skill to execute them and the knowledge and foresight which will enable him to act responsibly.

So when do children stop relying entirely on the foresight of others and start to project themselves into the future? Two general research methods have helped to shed light on this question (see Atance & Mahy, 2016, for an overview): one assesses children's "future talk" as an indicator that they understand themselves as temporally continuous agents who can locate events in their personal future (Benson, 1997; Nelson, 2007); the other uses forced-choice tasks to examine children's future-oriented decision-making.

As part of the first method, Ames (1946) found that children begin to produce lexical time markers like "tomorrow" in their speech by 2.5 to 3 years of age. Busby and Suddendorf (2005) observed that it takes about another year before children use this adverb with considerable accuracy to anticipate likely future events (see also Quon & Atance, 2010). Children's adequate use of "tomorrow" is correlated with that of its past-oriented counterpart "yesterday" (Suddendorf, 2010), which has been interpreted in favor of a unitary faculty of mental time travel that encompasses both past recollections and future projections (Michaelian, 2016; Suddendorf & Corballis, 1997, 2007). Atance and O'Neill (2005) studied 3-year-olds' use of future tense by asking them what they would like to pack for a trip. Many answers (30–50%) contained the auxiliaries "will" and "going to" ("gonna"), and some denoted the openness ("might," "perhaps") of future events. By age 3 to 4 years, children are thus familiar with some of the common linguistic forms used to speak about the future (see also Atance & O'Neill, 2001; Harner, 1976). But constructions like "going to" are often used to refer to the present (e.g.,"I'm *going to* leave now"), and so the occurrence of these words in children's speech need not imply that they envision the future. In fact, young children often use these constructions to denote events that are just about to occur (Bloom, Lahey, Hood, Lifter, & Fiess, 1980; Weist, 1989).

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The second method uses forced-choice tasks to study children's future-directed decision-making. Atance and Meltzoff (2005) had 3- to 5-year-olds look at an array of objects and asked them which object they wanted to bring on a trip to, for example, a waterfall or the desert. Only one item was appropriate for the specific locale. Children at age 3 and older mainly selected the target (e.g., a raincoat for the waterfall story), even when geographically associated distractor items (e.g., rocks) were interspersed. Other tests were created in which children's choices actually made a difference for their achievement of some goal. Inspiration for these tests came from an Estonian tale of a girl who took a spoon to bed after she dreamt that she was unable to eat pudding at a party because she had no spoon (Tulving, 2005). The tests that were constructed in the spirit of this tale share the following structure. First, children encounter a problem, such as a puzzle board with no puzzle pieces (Suddendorf & Busby, 2005) or a locked treasure chest with no key (Scarf, Gross, Colombo, & Hayne, 2013). Then they are taken to another location where they are asked to choose one of several objects, including the solution to the problem (e.g., puzzle pieces, key). By around age 4, children choose correctly, presumably because they foresee needing this object when returning to the initial location (see Atance & Sommerville, 2014, for another version of this test and Atance, Louw, & Clayton, 2015, for a location-selection task).

It might be argued that children can simply draw on a store of knowledge of event scripts and functional relations (e.g., between locks and keys), without having to mentally "re-experience" the past episode of encountering the problem or "pre-experience" the future episode of revisiting it. Foresight in the narrow (i.e., episodic) sense is precisely defined by such vivid imagination of oneself as having a particular experience (Tulving, 1972, 1985, 2005). By varying the item-selection paradigm in clever ways, researchers set out to show that preschool children have foresight of this, episodic, kind. Suddendorf, Nielsen, and vonGehlen (2011), for example, ensured that children had to recover a one-time experience of being unable to access an object that was secured away with a distinctly shaped lock. When later prompted to select one of several differently shaped keys, children had to recall the shape of the lock's keyhole. Russell, Alexis, and Clayton (2010) took a different approach, arguing that if young children have episodic foresight, they should be able to mentally construct future episodes from an embodied first-personal perspective (see Perrin, 2016) because experience is always cast in a particular perspective (Tulving, 1985). They had children play table soccer from one of two distinct positions before asking them to secure a tool they would need to play the game from the other, yet-to-be experienced, position. The rationale was that for children to select the tool that this particular position afforded, they must simulate the event in the perspectival way that is characteristic of episodic foresight. Both of these studies demonstrated that by the age of around 4, children have genuine prospective capacities that go beyond the use of event scripts and general instrumental reasoning.

An important mode of prospection that has not directly been addressed in earlier work is future planning (Szpunar, Spreng, & Schacter, 2016). Planning for the future implies that an agent establishes a goal and determines the means or course of action to achieve this goal (Bratman, 1999; Haith, 1997; Hayes-Roth & Hayes-Roth, 1979; Scholnick & Friedman, 1987). It demands that the agent set a future goal state (and holds it in mind until the goal is realized) and determine how it shall be reached. This is not demanded in forced-choice tests, in which children neither have to seek out nor create the means to an end, but can simply identify the solution among a set of items that are placed right under their nose. In real life, humans cannot count on passively happening upon the means to their ends or the solutions to their problems in this way. Instead, they must actively plan by specifying and providing—which might imply having to create—the means to their ends.

The Current Study

To investigate if children can plan ahead, we devised a test in which children had to create the means to a future end. More concretely, they had to draw pictures of particular objects that were needed (but missing) in the past and could be expected to be needed (but missing) again in the near future. The task started in the "Little Room," where children drew pictures and packed them in a backpack. Children then relocated to the "Big Room" where they played a picture game. In the critical condition, a particular picture was missing, preventing them from completing the game (Future Need Condition). Children were led back to the Little Room and asked "Before going back to the Big Room, is there anything you want to pack"? The dependent measure was whether children would draw the missing picture, thus enabling themselves to complete the game later. This procedure was repeated two more times. Using different objects that each arbitrarily (instead of by some general functional relation) served as targets on a given trial allowed us to examine improvement across trials while eliminating the possibility for associative learning (see Suddendorf & Corballis, 2010). The number of targets children drew was compared to a control condition in which the target was not missing but present in the game (No Future Need Condition). We also tested children's understanding of temporal displacement terms (Suddendorf & Busby, 2005) to investigate if their planning skill is related to their capacity to conceptualize time, as has been suggested (Benson, 1997; Nelson, 2007). At the end of each trial, children were asked a memory question to test if potential limitations in planning might be explained by memory decay of the nature of the problem. This was not expected in light of prior results showing that 4-year-olds' problem maintenance tolerates delays of up to 15 min or more (Scarf et al., 2013; Suddendorf et al., 2011).

In short, children received a planning task that, unlike prior tasks, did not ask of children to simply select an object that is instrumental in solving a previously encountered problem. Instead, children had to form a goal (of completing a picture game) and create the means (a picture of a particular object) that would allow them to attain this goal. They thus had to freely recall and make from scratch, rather than perceptually recognize, an object they needed for a future end.

Method

Participants

This study was approved by the University Park Institutional Review Board (UP-15–00288) entitled "Future planning abilities in young children." There were 96 children in total. Half of them (n = 48, 24 female) were 4 years of age (Future Need Condition: M = 50;28, range = 47;19 – 54;17; No Future Need Condition:

M = 51;11, range = 47;06–54;13) and the other half were 5 years of age (Future Need Condition: M = 62;23, range = 58;00 – 65;27; No Future Need Condition: M = 62;04, range = 59;09 – 66;07). The choice of sample size was based on a medium effect size, as is typical for age effects in future-oriented thinking between 4- and 5-year-olds (Atance & Meltzoff, 2005, Experiment 2), and between conditions with and without the need for future planning (Suddendorf & Busby, 2005). An a priori power analysis using the software package G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that a minimum sample size of 90 would be needed to detect a medium effect (f = .30) for a 2 × 2 between-participants analysis of variance (ANOVA) with power of .80 and an alpha level of .05. To have an equal number of male and female participants in each group, this sample size was increased to 96 participants.

All children spoke English and no child was severely preterm (<35 weeks gestation). Children were tested at the University's child research facility in a large US American city and came from a wide range of socioeconomic (annual incomes between <$20,000 to >$120,000) and ethnic backgrounds, which represents the local demographics. One child was tested but excluded due to experimenter error.

Materials and Design

Each session was videorecorded. For the picture game, we used a set of hand-drawn and clip-art pictures (15 × 18 cm) showing, among other things, items children typically bring to preschool (e.g., clothing and food items). Blank pieces of paper in the same size as these pictures and crayons were used for children's drawings. A children's backpack (20 × 24 × 8 cm) served to transfer pictures between the "Little Room" (3.5 × 3.5 m) and the "Big Room" (5.4 × 3.5 m). A wicker basket (30 × 35 × 11 cm) was used for children to place pictures inside as part of the game. These stimuli are shown in Figure 1. In addition, a score card (8 × 22 cm) with four boxes was used to keep track of the completed rounds (1 demonstration, 3 experimental) in the game. For each successful round, a sticker was placed in the corresponding box; for each unsuccessful round, the box was crossed out.

Children were randomly assigned to either the future need or the No Future Need Condition. Gender was balanced within conditions. Four temporal displacement questions (Suddendorf & Busby, 2005), two pertaining to the past (earlier today/yesterday), and two pertaining to the future (later today/tomorrow) were asked prior to the planning task. The order of question pairs (past vs. future) and of questions within pairs (temporally close vs. distant) was counterbalanced. Each trial of the planning task comprised two phases: a drawing and packing phase (Little Room), followed by an unpacking and picture game phase (Big Room). There was a total of four trials: one demonstration trial followed by three experimental trials. The order in which a picture of a banana, ball, or box, was either missing (Future Need Condition) or present (No Future Need Condition) was counterbalanced.

Figure 1. Stimuli used in the experiment. See the online article for the color version of this figure.

Procedure

Once the child was acclimated, the experimenter and the child entered the "Little Room." They sat down on the floor next to the backpack, paper and crayons. Next the experimenter assessed the child's knowledge of temporal terms.

Temporal language questions. The experimenter asked the child two questions about the past, and two about the future. The past questions were: "What is something you did [yesterday/earlier today]?" The future questions were: "What is something you are going to do [later today/tomorrow]?" The experimenter recorded the child's answers live and asked the parent to judge the answers' correctness after the experiment (see *Scoring and Reliability*). Then the planning task began.

Planning task. Figure 2 depicts the task procedure for the two conditions.

Drawing and Packing Phase I. The experimenter asked the child to think of something that she wants to pack for preschool. After the child named an object, the experimenter searched through a stack of pictures of objects that children typically bring to preschool, such as a jacket or a snack. If the experimenter had a picture of the object that the child named, she gave it to the child, who placed it in the backpack. If the experimenter did not have such a picture, she asked the child to draw the object using the crayons and paper. The child then drew a picture and placed it in the backpack. If the child did not name any object, the experimenter prompted: "Do you think you might be hungry?" and "Do you ever get cold at preschool?" which resulted in children naming objects shown on a picture of the experimenter's stack. This procedure continued until the backpack contained 4 pictures, two of which were drawn by the child. The experimenter and the child traversed the lobby area with the backpack (approximately 10 m door-to-door) and entered the Big Room.

Unpacking and Picture Game Phase I. In the Big Room, the experimenter and the child sat down next to a basket and an array of pictures (see Figure 1) spread across the floor. The experimenter asked the child to add the pictures from the backpack to those on the floor and announced that they would play a game in which the experimenter names objects (e.g., "frog") for which the child has to find and place in the basket the corresponding picture. The experimenter then named the first object and the child placed the corresponding picture in the basket. This was repeated with two more objects/pictures. The third picture was one that the child had drawn, so the experimenter exclaimed "It was a good thing you packed that!" to stress that the activities in the Little Room mattered for this game. The experimenter told the child that she completed the first round of the game and placed a sticker on the score card to symbolize the successful completion. This marked the beginning of the first experimental trial, which proceeded in

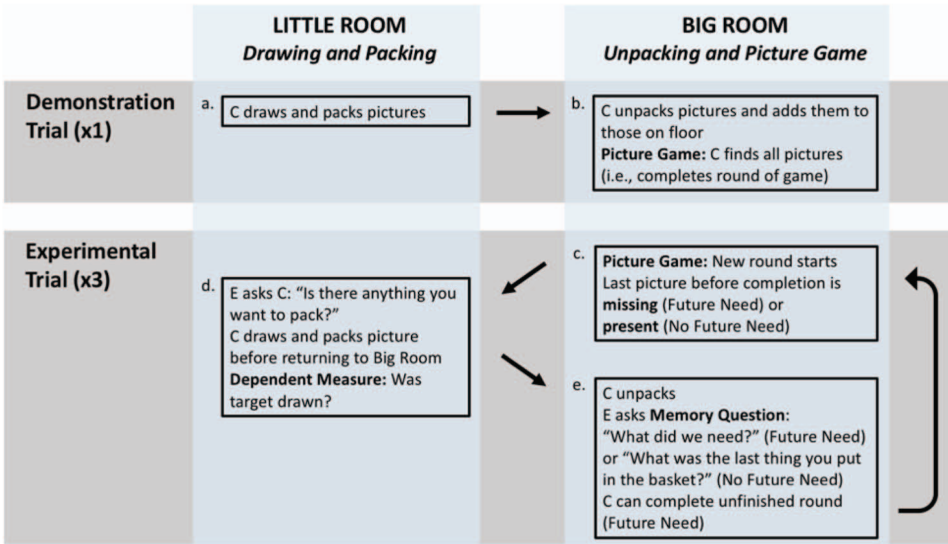

Figure 2. Sketch of the procedure of the Planning Task in the two conditions. See the online article for the color version of this figure.

the same manner until the experimenter named the final object (target). At this point, the procedures of the two conditions diverged. In the Future Need Condition, the target picture (e.g., of a banana) was missing. Once the child expressed that she could not find it, the experimenter exclaimed "We can come back later and try to finish the round." In the No Future Need Condition, the target was present, so the child completed the round and received a second sticker. In both conditions, the experimenter and the child returned to the Little Room with the (empty) backpack.

Drawing and Packing Phase II. The experimenter and the child sat down in the drawing corner. The experimenter declared that they were going to play something else next but that they would return to the Big Room later. She asked the child "Is there anything you want to pack?". If the child remained silent, the experimenter followed up with "What should we pack?". When the child was done drawing, the experimenter and the child performed an unrelated 3-min distractor activity in which they made scribbles on paper. This served to create a standardized delay of about 6 min between the child's encounter of the (missing or present) target and the memory question about the target's identity after their return to the game (see below). The experimenter and the child then returned to the Big Room.

Unpacking and Picture Game Phase II (with memory question). Back in the Big Room, the child removed the picture from her backpack and placed it next to those on the floor. Looking in the direction of the pictures and the basket, the experimenter asked the memory question, "What did we need?" in the Future Need Condition and "What was the last thing you put in the basket?" in the No Future Need Condition, respectively. If the child had drawn the target, she now placed it in the basket and the experimenter added a sticker to the score card. If the child had not drawn a target, the experimenter crossed out the corresponding box on the score card. In both conditions, the experimenter then initiated the next round by naming new objects for children to find on pictures. The procedure continued until the third experimental rounds was terminated.

Posttest drawing. After the third experimental trial, children were asked to draw all the targets that they had not drawn in the experiment. Thus, each child drew between zero and three objects. The purpose of this exercise was to rule out that children failed to draw targets at test because they did not know how to graphically represent them. With the exception of two children (who stated that they could not draw a banana), all children drew all the targets that they had not drawn in the experiment. Thus, any failure to create targets at test cannot be explained by a lack of graphic ability. Figure 3 shows a selection of drawings created by children.

Scoring and Reliability

Temporal language. The experimenter recorded children's answers during the session. After the experiment, the parent evaluated the correctness of her child's answers. An answer was scored as correct (1) if the parent affirmed that the event occurred (past) or was likely to occur (future; see Suddendorf & Busby, 2005). All other cases, including those in which children replied "I don't know" (25% of trials) or parents falsified the child's answer (13%), were scored as incorrect (0). A sum score ranging from 0 to 4 was calculated for each child.

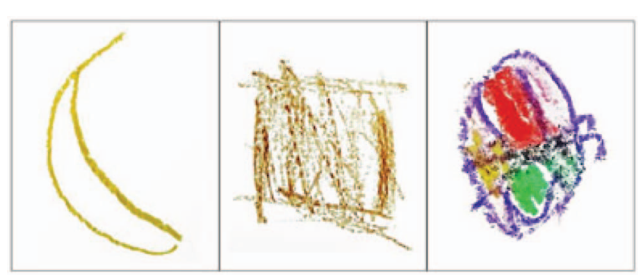

Figure 3. Sample of target objects (banana, box, and ball) children drew in the experiment. See the online article for the color version of this figure.

Planning Task

Target drawings. On each trial, the experimenter recorded children's response to the question of what she wanted to pack. A response was scored as correct (1), if the child named the target ("box," "banana," "ball," possibly with a qualifier, e.g., "soccer ball") and then drew an object that resembled the target. No child named an object but then failed to draw it. A child's response was scored as incorrect (0) if she either (a) named and drew a different object (14 trials), or (b) did not name or draw any object, but said "I don't know," "I forgot," and so forth (six trials), or (c) named the target at first but then changed her answer and explicitly drew something else (two trials). Sum scores ranging from 0 to 3 were calculated.

Memory questions. The experimenter recorded during the session if children named the object that was needed to complete the round (Future Need Condition) or last placed in the basket (No Future Need Condition). If the child named the target, her response was scored as correct (1). All other responses (naming other objects, "I don't know," "I don't remember") were scored as incorrect (0). Sum scores ranging from 0 to 3 were calculated.

To measure interrater reliability for the responses in the planning task and the memory questions, a second rater, who was unaware of condition, scored the responses of 25% of the children (12 per age group) based on the video material. Agreement between raters was substantial for both the planning task ($\kappa = .93$) and children's answers to the memory question ($\kappa = 1$). Disagreements were resolved by discussion.

Results

Temporal Language Questions

The mean number of children's correct answers as a function of age and temporal direction (past vs. future) are shown in Table 1. An ANOVA with number of correct answers as dependent measure, age as independent factor and direction as repeated measurement factor was conducted. It showed that 5-year-olds gave more correct answers than 4-year-olds, $F(1, 94) = 4.75$, $p = .034$, $\eta_p^2 = .05$, and children gave more correct answers about past than about future events, $F(1, 94) = 11.32$, $p = .001$, $\eta_p^2 = .11$. There was a marginally significant interaction between age and direction, $F(1, 94) = 3.49$, $p = .065$, $\eta_p^2 = .04$, and post hoc tests (with p values that were adjusted with the Holm-Bonferroni method, see Holm (1979), which was likewise done for post hoc tests reported below) revealed that 5-year-olds were better than 4-year-olds in answering questions about the past, $t(94) = 2.82$, $p = .012$, $d = 0.58$, but not the future, $p > .250$.

Table 1
Mean Number of Correct Responses to Temporal Language Questions Broken Down by Age and Direction of Temporal Displacement

Participants	Past (range = 0–2)	Future (range = 0–2)
4-year-olds	1.17 (.12)	1.04 (.11)
5-year-olds	1.60 (.10)	1.16 (.11)

Note. Standard errors are in parentheses.

Planning Task

Target drawings. Logistic regression analyses yielded no effects of gender, $p > .250$, or target identity (ball, banana or box), $p = .227$. Figure 4 shows the mean number of targets drawn as a function of condition and age. An ANOVA with number of drawn targets as dependent variable, and condition (future need vs. no future need) and age (4 vs. 5 years) as independent variables was conducted. Results showed that children drew more targets in the future need than in the No Future Need Condition, $F(1, 92) = 45.80$, $p < .001$, $\eta_p^2 = .33$. Five-year-olds drew more targets than 4-year-olds, $F(1, 92) = 14.13$, $p < .001$, $\eta_p^2 = .13$. There was a significant Age $\times$ Condition interaction, $F(1, 92) = 11.96$, $p < .001$, $\eta_p^2 = .12$, with 5-year-olds creating more targets than 4-year-olds in the future need, $t(46) = 3.92$, $p < .001$, $d = 1.13$, but not in the No Future Need Condition, $t(46) = 0.39$, $p > .250$, $d = 0.11$. Importantly, 4-year-olds created more targets in the future need than the No Future Need Condition, $t(46) = 2.90$, $p = .014$, $d = 0.84$, revealing that despite the overall low performance level, 4-year-olds were sensitive to future needs.

To examine the role of learning, we first analyzed children's performance on the first trial only using a logistic regression model with "target drawn" (0 = not drawn, 1 = drawn) as binary dependent variable, and condition and age as predictors. The model provided a significantly better fit to the data than the intercept-only model, $\chi^2(2) = 8.24$, $p = .016$. As Figure 5 shows, children drew more targets in the first trial of the Future Need Condition than the No Future Need Condition, $z = 2.26$, $p = .024$. There was no effect of age, $z = 1.25$, $p = .210$, and inclusion of the interaction between age and condition did not improve the model fit, $p > .250$. To test if children's planning improved across trials, a mixed-effects logistic regression with "target drawn" (1 = yes, 0 = no) as the binary dependent variable, trial and age as fixed effects, and subject as random effect was run. The model provided a significantly better fit to the data than the intercept-only model, $\chi^2(3) = 22.82$, $p < .001$. Age was a significant predictor, $z = 3.43$, $p < .001$, and children were significantly more likely to draw targets in the second and third trials than in the first trial (1st vs. 2nd: $z = 2.20$, $p = .027$; 1st vs. 3rd: $z = 2.60$, $p = .009$). Including the interaction between trial and age did not significantly improve the model fit, $p > .250$. However, mixed-effects logistic regression models can drastically underestimate the size of interactions for repeated measures designs (Landerman, Mustillo, & Land, 2011). Separate McNemar's tests for the two age-groups were therefore conducted, showing that 5-year-olds', $\chi^2(1) = 4.27$, $p = .004$, but not 4-year-olds', $\chi^2(1) = 0.01$, $p > .250$, planning improved between Trial 1 and Trial 3.

Memory questions. Figure 4 shows the mean number of targets children remembered as a function of condition and age. To compare how well children in the different groups remembered the targets' identity, we conducted an ANOVA with mean number of remembered targets as the dependent variable, and condition and age as independent variables. Children in the Future Need Condition remembered targets better than children in the No Future Need Condition, $F(1, 92) = 78.03$, $p < .001$, $\eta_p^2 = .45$, and 5-year-olds remembered targets better than 4-year-olds, $F(1, 92) = 18.47$, $p < .001$, $\eta_p^2 = .16$. A significant interaction effect, $F(1, 92) = 11.96$, $p < .019$, $\eta_p^2 = .05$, revealed that 5-year-olds' memory for targets was only superior in the Future Need Condition, $t(46) = 3.98$, $p <$

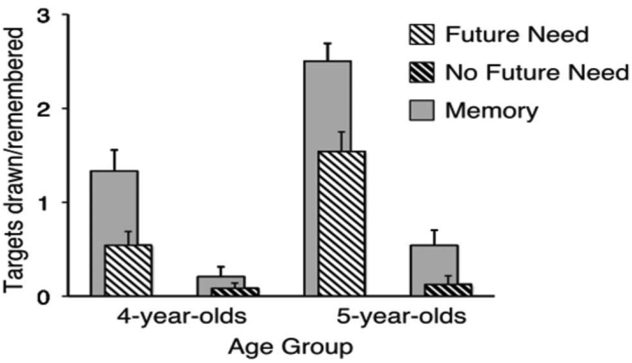

Figure 4. Mean number of targets drawn (striped bars) and remembered (gray bars) as a function of age and condition. Error bars represent standard errors of the mean.

.001, $d = 1.15$, but not in the No Future Need Condition, $t(46) = 1.75$, $p = .086$, $d = 0.51$. In contrast to children's creation of targets in the future planning task, their memory for the targets' identity did not improve across trials, $p > .250$.

Importantly, even the 4-year-olds' memory for targets in the Future Need Condition significantly exceeded the rate with which they created them, $t(23) = 4.16$, $p < .001$, $d = 0.66$; 92% of them achieved a memory score that was as good (42%) or greater (50%) than their planning score, suggesting that memory loss was not the main factor that limited their future planning skills.

Relation between temporal displacement language and planning skill. Correlational analyses showed that children's performance in the planning task was unrelated to their knowledge of temporal displacement language—both overall (past and future questions), $r_s = .10$, $p > .250$, and when the analyses were limited to future questions, $r_s = -.01$, $p > .250$.

Discussion

In this study, 4- and 5-year-olds successfully planned ahead by creating the means necessary to address future needs. More specifically, they drew pictures of particular objects to complete an unfinished game at a later time. Although 4-year-olds planned less consistently than 5-year-olds, they displayed at least an inchoate planning capacity, as shown by the fact that they created more drawings of target objects when these served to complete the game than when they lacked instrumental value because the game was already completed.

This study demonstrates that preschoolers have foresight in situations where the solution or answer is not directly offered to them. Previous studies relied on children's choices of objects that could be used to address previously encountered problems. Being able to make such identifications is a crucial requisite for any future-directed activity. It shows that preschool children can remember a physically absent problem's affordances and recognize effective ways to address it. We expanded on this existing knowledge and focused on the ability to plan ahead. Such planning requires more than recognizing the solution to a given problem. It affords that the agent form a goal to address a problem and come up with probate means to solve it. At times, such means are not readily available but first have to be sought out or even crafted. To succeed in our task, children had to realize and maintain a problem (picture is missing), form the goal to address it (provide picture), and supply the necessary means to do so (draw, e.g., a banana). Importantly, as in Suddendorf et al. (2011), the arbitrary relation between the target's identity (e.g., picture of a banana) and its instrumental role in the game's completion, made it impossible for children to use general knowledge of functional relations, for example, of locks and keys. Children instead had to plan for a "specific autobiographical future event or goal state," which implies that the planning they had to do was of the episodic kind (Szpunar et al., 2016, p. 28).

Suddendorf and Corballis (2010) lay down the "single trial criterion" according to which foresight should be tested with only one trial to prevent that children simply associate specific targets with rewards without recalling particular autobiographical events (see Scarf, Smith, & Stuart, 2014, for a discussion). We circumvented this problem by using novel and arbitrary targets each time, thus creating a sequence of distinct one-time events. This methodical novelty revealed that children's planning ability at age 5 improved across trials while excluding associative learning as a possible explanation because the missing object's identity was never the same. The improvement of planning over time is important because it suggests that the "single trial rule" could lead to an underestimation of the planning skills of young children, who might only reliably exercise a capacity for planning after having been confronted with the consequences of omission and feeling propelled to endorse a proactive strategy (Chevalier, Martis, Curran, & Munakata, 2015).

The 5-year-olds' rapid learning raises the question of what instigated their behavior change. What did they pick up on that escaped them in the first trial or two? We can rule out the possibility that children learned to better remember what was missing in the game: their cued recall of missing targets at the end of the trial did not improve over time and was good throughout (the findings of children's memory are further discussed below). Perhaps failure on early trials provoked disappointment or regret, which urged children to recruit greater cognitive resources on subsequent trials, such as more focused goal orientation. Consistent with this idea, disappointment over negative outcomes has been shown to lead to more adaptive decision-making "down-

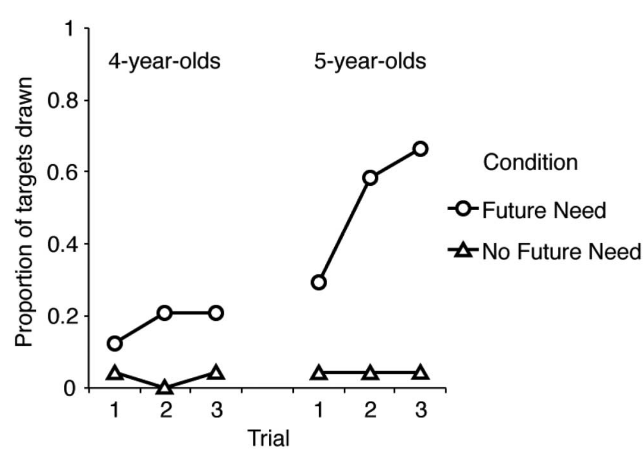

Figure 5. Proportion of targets drawn by trial, condition, and age.

stream" in children (O'Connor, McCormack, Beck, & Feeney, 2015). It is also possible that it took children one or two trials to causally connect the activities in the two rooms and come to realize that the drawing activity performed in one room held the key to success at the game played in the other. Witnessing the symbolic act of crossing-out a box on the score card to mark the round as closed without completion may have helped children to realize that it was in their own power to determine the game's outcome by providing the missing object. Why the 5-year-olds, but not the 4-year-olds, profited from these experiences remains to be explained.

Beyond the ability to plan, children verbally referred to temporally displaced events at a level similar to what was previously reported (Busby & Suddendorf, 2005; Suddendorf, 2010). This verbal competence, however, was not related to children's future planning skills. This dissociation challenges the view that children's verbal future constructions offer a window into their prospective capacities more generally (Benson, 1997; Hudson, 2002, 2006; Nelson, 2007). It corresponds with other reports of weak or no relations between children's verbal skills of temporal displacement and foresight (Atance & Jackson, 2009; Hanson, Atance, & Paluck, 2014). Perhaps this reflects a genuine dissociation between the abilities to linguistically refer to future states and to plan for such events. But perhaps the "tomorrow" task is not an ideal index of children's ability to conceptualize time. False positives seem likely because children can name activities that occur and perhaps even get repeated on any regular day (e.g., sleeping, eating). Conversely, false negatives are likely because legitimate expressions of ignorance about what will happen ("I don't know") are rated as failures of prospection. This might be one reason why children were less often correct about the future than the past. A comprehensive measure that integrates productive and receptive knowledge of both lexical and grammatical time markers may be better suited to systematically explore the developmental link between temporal language and future-directed action.

Proper planning requires that one can remember what was needed or what one wanted to do. When asked at the end of each trial which object had been missing, the vast majority of children recalled the absent object (71% of 4-year-olds and 92% of 5-year-olds knew the answer on at least one trial). Five-year-olds' stronger memory for targets echoes their greater ability to recount past events in the temporal displacement task and probably contributed to their superior performance in planning. But even the 4-year-olds' memory for the missing objects was fairly robust, which is consistent with their tolerance for relatively long delays between the problem phase and selection phase in forced-choice tasks (Scarf et al., 2013; Suddendorf et al., 2011). Yet, children were less proficient at addressing the problem of the missing object by future planning than they were at later recalling what had been missing. This underscores that future planning has cognitive and motivational components that go beyond mere remembering. Besides maintaining the problem, children had to form the goal to provide the missing object and spontaneously generate it "from scratch." One might say that they had to remember to create a drawing of, for example, a banana, rather than simply remember that one was missing. Another important finding about children's memory was that they were superior at retaining objects that were missing (Future Need Condition) instead of present (No Future Need Condition) in the game. This corresponds with literature suggesting an enhanced memory effect for emotionally charged—especially negative—compared to neutral or "unproblematic" events (Kensinger, 2007; Kensinger & Corkin, 2003). Our study suggests that even young children have a mnemotic bias for problem-laden in contrast to "uneventful" instances of otherwise identical activities.

Certain limitations of our task prevent us from judging the precise reach of preschoolers' planning skills. For example, our task does not speak to children's ability to sequence activities over time—a skill that is important for planning (Scholnick, Friedman, & Wallner-Allen, 1997). Because it tested a single-step activity of drawing, our study does not shed light on the question of whether children can temporally coordinate multiple steps toward a goal. Relatedly, the adult in this study structured the activities that preceded and followed the drawing activity. Children were led to the drawing corner of the Little Room and asked if they wanted to pack anything; they were also led back to the Big Room and prompted to empty their backpack. One can imagine less defined scenarios, in which it is left up to the child to decide whether he or she wants to (a) enter the Little Room, and, if so, what activity he or she wants to take up there—with drawing being just one of several options (besides, e.g., building towers), (b) return to the Big Room, and (c) remove the item from the backpack with the goal of completing the game. Such a less predefined test situation would afford a lot more independent planning, from realizing the problem all the way to fully executing the action plan. We see at least two problems with such a procedure in which multiple parameters are left unset. First, a large variety of answer patterns would be obtained, and it is uncertain how to continue with a child who fails to plan in the early stages (e.g., will she be allowed "back on track" for the later stages, and how would this be accomplished?). Second, young children are generally not used to, and even discouraged from, leading the course of action in unfamiliar situations like lab or office visits, making the execution of an open test procedure like the one envisioned problematic. Nonetheless, future research is needed to work toward a more nuanced view of the scope and degree of independence of young children's future planning.

To conclude, the current study suggests that 5-year-olds and, to a lesser extent, 4-year-olds can plan for near-future events. Future planning is a distinct mode of foresight in which one's prospective capacities are closely tied in with action. This practical aspect makes future planning the prime capacity for which the ability to imagine hypothetical states has most likely evolved (Corballis, 2016; Klein, 2016; Klein et al., 2010). Planning demands that the agent settle on a goal and determine the means that she deems instrumental in attaining this goal. At times, such means are not available but must first be created. The fact that preschoolers in our study went ahead and crafted the means to address future needs shows that they have begun to act as "planning agents" (Bratman, 2014) who shape and design their own future.

By acknowledging the human need to forge plans, we might revive the idea of "homo faber," that is, the characterization of humans as makers of their own world. This notion fell out of favor when basic forms of tool-use and tool-craft were discovered in primates and other animals (see Sanz, Call, & Boesch, 2013). However, animals' ability to fashion present material in a way that satisfies their ever-recurrent needs for shelter (e.g., nest building) and nutrition (e.g., food extraction) differs significantly from humans' ability to fabricate from scratch the solutions to ever-changing problems or to construct the means to self-determined ends (see Suddendorf, 2006). It might be worthwhile to revisit the thesis of "homo faber" by studying the interplay of the manufacture of artifacts and future planning.

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