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# Moving beyond "Spoon" tasks: When do children autocue their episodic future thought?

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**Abstract**

Much developmental (and comparative) research has used Tulving's Spoon test (i.e., whether an individual will select an item needed to solve a future problem) as the basis for designing tasks to measure episodic future thinking, defined as the capacity to mentally pre-experience the future. There is, however, intense debate about whether these tasks successfully do so. Most notably, it has been argued that children may pass (i.e., select an item with future utility) by drawing on non-episodic, associative processes, rather than on the capacity to represent the future, per se. Although subsequent developmental tasks have sought to address this limitation, we highlight what we argue is a more fundamental shortcoming of Spoon tasks: they *prompt* future-directed action making it impossible to determine whether children have used their episodic future thinking to guide their behavior. Accordingly, we know little about children's thought about the future that is independently generated (i.e., without prompting), or *autocued*, and is subsequently reflected (and measurable) by children's actions. We argue that this capacity is a critical, and heretofore overlooked, transition in future-oriented cognition that may not occur until middle childhood. We further hypothesize that it is reliant on children developing richer and more detailed future event representations, along with the necessary cognitive control to transform these representations into actions that serve to benefit their future selves. The time is ripe for researchers to explore this aspect of cognitive development and we suggest several novel approaches to do so.

This article is categorized under:

Cognitive Biology > Cognitive Development

**KEYWORDS**

autocueing, cognitive development, episodic future thinking, mental representation, mental time travel, Spoon test

## 1 | INTRODUCTION

We routinely cast our minds forward in time to imagine or "pre-experience" upcoming events, such as dinner with friends or a weekend getaway with family. Mentally pre-experiencing our personal futures in a rich and detailed way is termed "episodic future thinking" (Atance & O'Neill, 2001) and is part of our broader capacity for mental time travel (Suddendorf & Corballis, 2007; Tulving, 2005). Episodic future thinking supports various aspects of human cognition and behavior (e.g., D'Argembeau & Demblon, 2012) and, during childhood, specifically, abilities that rely on the capacity to think ahead (e.g., planning, delaying gratification) are argued to be critical components of adaptive and healthy development (Atance, 2015; Mazachowsky & Mahy, 2020; Moffitt et al., 2011). It is thus imperative to have sound methods to measure children's foresight and its development and, importantly, how it guides their behavior.

By about 4–5 years of age children can report something they will do tomorrow (Busby & Suddendorf, 2005), or talk about the next time they will engage in a specific activity (Quon & Atance, 2010). But, a challenge with such "verbal" measures is whether they accurately reflect young children's capacity to mentally represent the future (Suddendorf & Busby, 2005). Children may use temporal terms without understanding their meaning (e.g., Busby Grant & Suddendorf, 2011) or, conversely, lack the verbal skills to express their conceptual experience. A solution to such interpretive problems is to assess whether a particular *behavior* reflects episodic future thinking (Suddendorf & Busby, 2005; Tulving, 2005)—in this case, actions may speak louder than words. Most influential in this respect is Tulving's "Spoon test":

> ... a young girl dreams about going to a friend's birthday party where the guests are served delicious chocolate pudding, her favorite. Alas, all she can do is to watch other children eat it, because everybody has to have her own spoon, and she did not bring one. So the next evening, determined not to have the same disappointing experience again, she goes to bed clutching a spoon in her hand. (Tulving, 2005, p. 44)

According to Tulving, one can only pass this test by "pre-experiencing" the future—it is this capacity that *drives* the subsequent action (i.e., retrieving the spoon). Different versions of Tulving's Spoon test have become the "gold standard" to test episodic future thinking in human development (e.g., Scarf et al., 2013; Suddendorf et al., 2011) and in nonhuman animals (e.g., Kabadayi & Osvath, 2017; Mulcahy & Call, 2006).

## 2 | DOES THE SPOON TEST MEASURE EPISODIC FUTURE THINKING?

Studies with young children (and nonhuman animals) drew inspiration from Tulving's (2005) Spoon test (see also, Suddendorf & Busby, 2005) by implementing laboratory-based measures—often called *Spoon*, *Item-choice*, or *Two-rooms* tasks (e.g., Atance & Sommerville, 2014; Scarf et al., 2013; Suddendorf et al., 2011). In these tasks, children are (1) presented with a problem for which they have no solution, (2) given a delay period in another location, (3) told (or learn) that they will return to the original location, and (4) presented with items (including one that will solve the problem) in a forced-choice format and asked/prompted which to bring back. For example, Suddendorf et al. (2011) showed 3- and 4-year-olds a locked box with stickers—but no functional key—in one location and, after a delay in another location, told them they would return to the first location. Children were presented with a set of items, including a functional key, and asked to select one to take back with them. Only 4-year-olds chose the correct item significantly more often than chance. Results from this and other Spoon tasks (e.g., Atance & Sommerville, 2014; Redshaw & Suddendorf, 2013; Scarf et al., 2013) led researchers to conclude that, by age 4, children have acquired the kind of foresight described in Tulving's Spoon test. Spoon tasks have also become an important means of examining links between future thinking and other developing cognitive and linguistic capacities (e.g., Atance et al., 2019; Miller et al., 2020; Opriş et al., 2021). Critical to this work is the assumption that Spoon tasks measure children's capacity to act upon their mental representation of a future event.

Yet, recent data and theory challenge this claim (e.g., Caza et al., 2021; Dickerson et al., 2018; Hoerl & McCormack, 2019). The crux of the argument is that children may pass Spoon tasks by forming an association between the correct item (which is visible at test) and the past problem (e.g., "keys open locks"). It has similarly been argued that associative learning could account for nonhuman primates' performance in Spoon tasks (e.g., Mulcahy & Call, 2006). For example, Suddendorf (2006) points out that success could be driven by the fact that subjects are rewarded over a number of trials to select and bring a particular tool to the room where the task with the reward was placed (though, see, Osvath & Osvath, 2008, and Boeckle et al., 2020, for important controls).

A critical difference between developmental Spoon tasks and Tulving's (2005) original scenario is that children select from a set of items (that includes the correct one) in a forced-choice format, rather than independently seeking out the item with future utility. This difference may be precisely what allows children to succeed through associative means. Even when tasks are structured to block a salient preexisting association by, for example, having children select between keys of different shapes (e.g., Suddendorf et al., 2011), children could still form a new/one-time association between the shape of the keyhole (e.g., square) and the shape of the key (i.e., square) that they subsequently see at test. Indeed, 4-year-olds can be led to *fail* a Spoon task when presented with an item (at test) that held past, but not future, utility (Dickerson et al., 2018). Similarly, in a study in which children did not have visual access to the items and, instead, needed to verbally "generate" the required item in response to an open-ended question (e.g., "What would be a good fruit to bring back to the other room?"), only 5-year-olds performed significantly above chance (Atance et al., 2019; see also Moffett et al., 2018). Although removing visual access to the correct item at test may reduce the likelihood of children passing by using associative processes, children are nevertheless prompted (i.e., through questioning) to act with the future in mind (Atance et al., 2019; Martin-Ordas, 2020). That is, children need not *independently* generate or "autocue" (Donald, 2004; Lyons et al., 2014; Suddendorf et al., 2018) a future event representation that is deliberately acted upon.

## 3 | THE IMPORTANCE OF AUTOCUEING AND DELIBERATE ACTION

Donald (2004) uses the term "autocueing" to refer to memories that we voluntarily bring to mind independently of our environments—in other words, in the absence of external cueing. We use this notion here to make our central argument that Spoon tasks and their variants fail to tap children's capacity to autocue their episodic future thinking to deliberately (or, of their own volition) act with the future in mind. Similar to other authors (e.g., Atance et al., 2019; Brinums et al., 2018), we use the term *deliberate* to mean an action occurring in the absence of external cueing (i.e., item choices visible) and/or verbal prompting (e.g., "Which one of these do you want to bring back with you?"). The tasks discussed to this point test children's future thinking in highly supportive contexts (i.e., external cues and/or prompts) that might not require children to autocue their episodic future thinking to guide their intentions and actions. Yet, Tulving's (2005) Spoon test is such a compelling example of foresight precisely because the child deliberately seeks out the spoon that will allow her to eat the pudding. No one lays out items from which she can select, nor prompts her to select one in anticipation of returning to the original scenario. This point is critical given that episodic future thinking is functional and adaptive in so far as it guides the individual to *act* to fulfill their future needs, goals, and intentions. Indeed, adults routinely autocue episodic simulations of the future to guide their actions (Suddendorf et al., 2018) and this capacity may mark *the* critical milestone to full-fledged episodic future thinking and the advantages it affords, including increased autonomy and independence (see Figure 1).[1] When does children's behavior begin to reflect this important shift?

### 3.1 | The path toward children's deliberate future-directed actions

Data from several Spoon tasks suggest that children's unprompted actions/performance do not parallel their (prompted) performance on the item choice and, importantly, are later emerging. For example, Dickerson et al. (2018) assessed whether after bringing their chosen item back to the room with the problem, children—without prompting from the Experimenter—used it to obtain the reward. Whereas children between 3 and 6 years only did so between 9% and 37% of the time, 7-year-olds did so 70% of the time. Similarly, Martin-Ordas (2018) showed that after a 15-min delay, only 14% of children aged 3–5 years thought to grab a bag containing items (they had earlier chosen) to solve a future problem. In contrast, 75% did so after the Experimenter explicitly asked them what they should bring (see also, Caza & Atance, 2019, who found that only 5%–19% of 3- to 5-year-olds spontaneously solved a problem about resources needed in another location). Although these response patterns could be used to support the claim that children are not using their mental representations of the future to guide their current behavior, they may also reflect children's uncertainty about the "pragmatics" of the situation (e.g., whether they needed

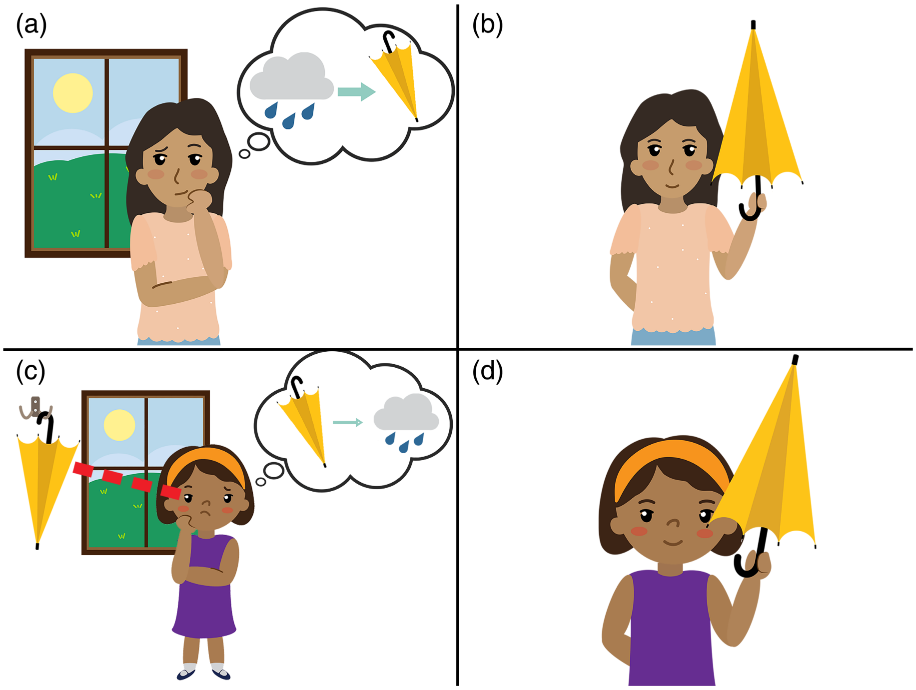


FIGURE 1 The same future-directed action—in this case, getting an umbrella (b and d)—can either be driven by autocueing one's episodic future thinking (a, adult) or external cueing and/or prompting (c, young child). The tasks that exist to test episodic future thinking in children cannot distinguish between these two possibilities.

permission to use the item; Dickerson et al.). As such, it is important to explore children's behavior in the context of tasks for which such a limitation does not apply.

Research on children's saving (e.g., Atance et al., 2017; Kamawar et al., 2019), deliberate practice (e.g., Brinums et al., 2018), and information seeking (e.g., Brinums et al., 2021) sheds light on children's emerging capacity to autocue their episodic future thinking as reflected in their subsequent behaviors. Common to this research is a departure from forced-choice measures to ones that are increasingly unprompted. However, as we argue at the end of this section, these tasks may still not require children to autocue a future event representation to guide their action.

In saving tasks, children are presented with a limited resource (e.g., 5 marbles) and two apparatuses in which to use it—for example, a small, less desirable marble game to be accessed first and a larger, more desirable game to be accessed second (e.g., Atance et al., 2017). Children are given no indication/prompt that they should save and, instead, must independently decide whether to do so. In such contexts, 3- to 5-year-olds save very little but, importantly, save significantly more when prompted to consider saving as an option (Atance et al.) or when given the opportunity to state in advance (i.e., "budget") how many marbles they intend to save (Kamawar et al., 2019). In other words, children's saving behavior varies depending on whether it was prompted.

A similar pattern obtains when examining the extent to which children deliberately practice a skill that reaps future rewards (Brinums et al., 2018; Davis et al., 2016). For example, Brinums et al. let 4- to 7-year-olds try three separate games and then informed them that they would later return for a test with one of them (i.e., the "target") and that each success (e.g., knocking a ball into a goal) would be rewarded. Children were led to another room that contained replicas of the three games and were allowed to briefly play with them. Half the children were prompted to practice ("If you like, you can use this time to prepare for the test"), whereas the other half was not ("If you like you can use this time to play with any of the games"). Regardless of prompting, 7-year-olds chose to first play with the target game significantly more often than chance. In contrast, 6-year-olds did so only when prompted, suggesting that they required external support in their future-oriented decision-making. It is also around age 6 that children begin to spend a sustained amount of time studying information that will be useful to them in the future (Brinums et al., 2021).

The findings in this section suggest that only children older than about 5 or 6 years show future-directed behavior when provided with less prompting. Yet, in these tasks, the *intention to act* is still heavily scaffolded by the experimenter and the task context such that, in most cases, children have little choice but to act. The particular course of action does not stem from a forced-choice format (e.g., "Which of these games do you want to play with?"), but it is not yet fully deliberate because it often occurs in the context of an experimenter guiding or suggesting a future course of action (e.g., "playing with games"). Importantly, these tasks were not specifically designed to assess children's episodic future thinking and deviate substantially from what Tulving's (2005) Spoon test was meant to capture. For example, it is difficult to discern the specific future event representation that guides children's decision-making in the saving, practice, and information-seeking studies just described. In contrast, in Tulving's Spoon test, the future event representation is taken to be one's *imagining* of being in a *specific* context (i.e., party) with a *specific* item (i.e., spoon) that fulfills one's goal (i.e., eating pudding). A Spoon task that shares this structure but, critically, that requires children to autocue this event representation and deliberately act on it is needed (see Box 1 for a proposed task).

## 3.2 | Arriving at our destination: Mechanisms underlying children's deliberate future-directed actions

We hypothesize that deliberate future-directed actions rely on children's capacity to generate (i.e., autocue) and sustain episodically rich and detailed future event representations that are used to guide their actions. While 4- and 5-year-olds can provide verbal accounts of future events, these tend to lack episodic detail and are often generated after substantial questioning and prompting (e.g., Hayne et al., 2011; Suddendorf & Busby, 2005). In contrast, Coughlin and colleagues (Coughlin et al., 2014; Coughlin et al., 2019; see also Wang et al., 2014) have shown that future event representations develop substantially during middle childhood (i.e., ages 5–9 years) with children providing more episodic and detailed accounts about a future event, while requiring fewer prompts to do so. It is likely that these richer and more robust event representations also lead to shifts in how children use them to guide their behavior. Thus, children who begin to deliberately act with the future in mind may also be those whose future event representations are comparatively more detailed and episodic.

Yet, such rich and robust event representations may not suffice without the accompanying capacity to use them to independently and proactively guide one's actions. Most notable in this context is the shift in cognitive control described by Munakata and colleagues (e.g., Barker & Munakata, 2015; Munakata & Snyder, 2012) from "externally driven" to "self-directed." The argument is that prior to about 7 years of age, children's behavioral "successes" often occur in response to exogenous or externally-driven goals—for example, a child who brings a toy to a friend's house when directly asked by a parent. In contrast, beginning around age 7 (with continued development into adolescence), children begin to enact such behaviors without prompting—or, through the use of endogenous or "internally generated"

**BOX 1 An "unprompted" Spoon task**

Existing Spoon tasks cannot tell us whether children's future-directed action (i.e., item choice) stems from their having autocued their episodic future thought or from external cueing and/or prompting. We thus propose the following: In Room 1, Children are shown three items (e.g., key, glue, and ruler) and learn in which box they are stored (mirroring the girl in Tulving's, 2005, Spoon test who knows where to find spoons). Children are also trained on the set sequence of traveling from Room 1 to Room 2 (cf. Miller et al., 2020). As in classic Spoon tasks, children encounter a problem (e.g., locked box containing a reward) in Room 2. After a delay in Room 1 (with children knowing a return to Room 2 is imminent), the Experimenter notes whether participants deliberately seek out, bring, and use the correct (hidden) item (i.e., key). If not, increasingly directive prompts are given (e.g., "Is there anything you should do before we go to Room 1?"), ending with a final forced-choice question [e.g., "Which one of these (*three items presented*) should you bring with you?"]. Although we expect 4-year-olds to pass the forced-choice question, only beginning around ages 6–7 would we expect children to deliberately retrieve the correct item from the box. Although we recognize that the box in which the item is hidden may still serve as a cue to action, this methodology brings us closer to what we believe Tulving's (2005) Spoon test was meant to measure.

**BOX 2 The importance of a naturalistic approach**

A promising means to tap when children begin to autocue their episodic future thinking is to systematically observe them in their "natural" environments. For example, do children deliberately seek out items that will be useful to them in the future (e.g., grabbing a book for a long car ride) or initiate talk that pertains to their future goals or plans (e.g., asking their parent to prepare their favorite snack for a weekend picnic)? This kind of naturalistic approach has been used in comparative work to uncover future-oriented behaviors that would otherwise not be observed in the laboratory, including spontaneous planning in a zoo-housed chimpanzee (Osvath, 2009). There have also been renewed calls from developmentalists (e.g., Dahl, 2017) to pay closer attention to children's everyday experiences outside of the laboratory context. In this case, a naturalistic approach can inform us about the breadth of children's future-oriented behavior allowing researchers to broaden laboratory tasks to better reflect the contexts and concerns children face in their day-to-day lives. We have taken a first step in this direction by asking parents to observe and report on their 4- to 9-year-old children's future-oriented actions and statements in the home. We have found that, like adults (e.g., Szpunar et al., 2014), these pertain to future goals and plans. However, children also engage in a great deal of "information-seeking" about what the future may hold (Ayson & Atance, 2023), which may be a particularly important function that could be targeted in more controlled laboratory settings.

goals. As such, their behavior becomes less externally-driven, more self-directed, and more proactive (Munakata & Snyder, 2012). In other words, advancements in executive functioning and cognitive control, more specifically, may be precisely what is required for children to transform their (sufficiently rich and detailed) future mental event representations into concrete actions.

## 4 | CONCLUSION

Most developmental research places the emergence of episodic future thinking around 4 years; a conclusion largely based on when children pass Spoon tasks (e.g., Scarf et al., 2013; Suddendorf et al., 2011). Yet, these tasks measure children's future-directed actions in highly supportive and scaffolded contexts in which children are *prompted* to act. While we have described our ideas using the Spoon task as our springboard, we note that other tasks to measure children's episodic future thinking (e.g., Atance & Meltzoff, 2005; Russell et al., 2010) are similarly structured. As a result, we know very little about how—and more importantly *whether*—children can act with the future in mind in less supportive contexts that lack external cues and prompts. It may be best to reconceptualize passing Spoon tasks as reflecting children being better able to hold in mind a representation of the original (past) episode (e.g., a locked box that requires a key; cf. Atance & Sommerville, 2014; Scarf et al., 2013) which then allows 4- and 5-year-olds to connect this episode with the correct item that is later presented to them in a forced-choice format (e.g., Dickerson et al., 2018). In this sense, the child's action (i.e., selecting the correct item) is "future-directed," but may not reflect the child having represented the future (cf. Caza et al., 2021; Hoerl & McCormack, 2019). Indeed, as we pointed out earlier, when tasks are structured such that associative processes are "blocked," it is only by age 5 that children succeed (e.g., Atance et al., 2019). Though, it is important to note that whereas traditional Spoon tasks may overestimate children's episodic future thinking/deliberate behavior, there is always the danger that unprompted tasks may underestimate it.

Nonetheless, a growing amount of data suggest that it is only at 6–7 years of age that children begin to engage in more deliberate forms of future-directed behavior (e.g., practice; Brinums et al., 2018). Importantly, it is still an open question at what age children might pass Spoon tasks that require them to autocue a future event representation and then act on its basis. Developing new behavioral tasks to tap this capacity is critical to moving the field forward as it will allow researchers to determine when (and eventually, how) children's episodic future thinking assumes the adaptive function that many have argued has led our species to thrive (e.g., Suddendorf & Corballis, 2007). We have already suggested using the Spoon task as a springboard for developing these measures (see Box 1) but also advocate for the importance of new approaches to answering this question (see Box 2).

## AUTHOR CONTRIBUTIONS

**Cristina Atance:** Conceptualization (lead); funding acquisition (lead); resources (lead); writing – original draft (lead); writing – review and editing (lead). **Gladys Ayson:** Conceptualization (supporting); writing – original draft (supporting); writing – review and editing (supporting). **Gema Martin-Ordas:** Conceptualization (supporting); funding acquisition (supporting); resources (supporting); writing – original draft (supporting); writing – review and editing (supporting).

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## CONFLICT OF INTEREST STATEMENT

The authors have declared no conflicts of interest for this article.

## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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## ENDNOTE

[1] We recognize that a substantial portion of adults' future-directed actions may result from some form of external cueing (e.g., seeing a grocery bag by my back door makes me think of the food I need to buy for dinner). Yet, we nevertheless have the capacity to autocue our episodic future thought in the absence of such cues to guide our future-directed actions (e.g., walking home from work, I think about the dinner I will cook that night, hence leading me to the grocery store).

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