Who is better? Preschoolers infer relative competence based on efficiency of process and quality of outcome.

Julia A. Leonard[1] (jlnrd@sas.upenn.edu), Grace Bennett-Pierre[2] (gbp@stanford.edu), Hyowon Gweon[2] (hyo@stanford.edu)
[1]Department of Psychology, 3720 Walnut Street Philadelphia, PA 19104 USA
[2]Department of Psychology, 450 Serra Mall, Jordan Hall Stanford, CA 94025 USA

Abstract

The ability to reason about our own and others' competence informs our everyday decisions. However, competence is an abstract concept which manifests in the objective properties of the task completed by an agent (i.e., task-based features, such as quality of outcome or task difficulty) as well as the subjective properties of the agent (i.e., agent-based features, such as dexterity, speed, focus). Thus, acquiring an integrated notion of competence may be a nontrivial challenge for young children. Prior work on children's understanding of competence has often used explicit verbal cues to describe the relevant features, or experimental tasks that confounded these features. Here we examine how preschool-aged children evaluate the relative competence of two agents by systematically manipulating task-based and agent-based features without explicit linguistic or gestural support. We find that 4- and 5-year-olds readily use perceptual cues to task-based (i.e., task difficulty) and agent-based (i.e., agent speed) features to infer competence (Exp.1-3) but not when when these perceptual cues are closely matched (Exp.4). These results suggest that a basic understanding of relative competence emerges earlier than previously believed, but an abstract, adult-like concept of competence may continue to develop throughout childhood.

Keywords: Social Cognition, Competence, Ability

Introduction

Beliefs about our own and others' competence are deeply ingrained in our everyday lives; we think about it, talk about it, and use it to guide our daily decisions. Even young children prefer agents who are perceived as more competent (Jara-Ettinger, Tenenbaum, & Schulz, 2015), and consider their own and others' competence to decide how to allocate tasks that vary in difficulty (Magid, DePascale, & Schulz, 2018). More generally, the way we perceive our own competence influences our motivation to learn and to choose challenging goals (Dweck & Leggett, 1988; Nicholls, 1984; Stipek & Iver, 1989; Wentzel & Wigfield, 1998).

However, it is often difficult to generate a clear definition of what it means to be *good* (competent) at something, or what makes some people *better* (more competent) than others. In fact, the meaning of competence seems to change depending on the task domain or the nature of the activity. When we say "Sally is good at math" or "Sally is a good pianist", we are referring to different dimensions on which we evaluate other people - her intellectual abilities in one, and her finesse in playing an instrument in the other. Even within the realm of sports, saying "Sally is good at gymnastics" or "Sally is a good swimmer" refers to physical abilities that vary along several dimensions, such as strength, agility, or speed. Thus, acquiring an integrated concept of competence that incorporates a coherent relationship between these dimensions may be a formidable challenge for young children.

There are broadly two ways in which one's competence can manifest. First, a competent agent might be capable of achieving goals or outcomes that are costlier, or more effortful, than what others can achieve (i.e., more difficult, more complex, or more elaborate). In this case, competence is marked by an objective property of the task or the quality of outcome achieved by the said agent (henceforth task-based features). Second, a competent agent might achieve the same outcome on the same task as others but more efficiently (i.e., spending less time, less physical effort, or less mental effort such as care or attention). In this scenario, competence manifests as a property of the agent who completes the task (henceforth agent-based features). Although there are cases in which we can expect someone to be competent even before observing anything he or she does (e.g., if someone went to Julliard, they presumably can play an instrument quite well), when we are trying to learn about an agent's competence based solely on their actions or outcomes, we usually attend to these task-based and agent-based features.

Prior work suggests that young children readily use explicit task-based features (e.g., clearly good or poor performance; frequency of successes and failures) to infer agents' competence. For instance, 3-year-olds judge that an agent who made a "tastier" cake is better at baking than an agent who made a "yucky" cake (Yang & Frye, 2016). However, a coherent, theory-like understanding of competence that integrates task-based and agent-based features seems to emerge relatively late in childhood. Given a video of two children, one of whom worked diligently on a math problem and the other who "goofed off" and worked only intermittently, children under age 7 say that the one who worked harder is more competent even if they both got the same score (matched outcome, different efficiency; Nicholls, 1978). Strikingly, it was not until age 12 that children showed an adult-like understanding that one's competence is inversely related to the total amount of effort invested when outcome is matched.

One way to interpret these results is that young children consider competence as a globally positive construct, and do not yet understand the specific relationship between task-based and agent-based features in reasoning about an agent's competence. Instead, young children might resort to explicit verbal or perceptual cues, and associate anything positive (e.g., better outcome, higher effort, being more diligent) with higher competence. Consistent with this idea, some studies suggest that focusing on task-based features such as quality of outcome can lead children astray. Heyman, Gee, & Giles (2003) found that after being told stories about characters that varied in how much they tried and how well they did on schoolwork, children were more likely to remember situations where high effort led to a positive academic outcome than a poor academic outcome. Similarly, 3-4-year-olds only attended to positive task outcome (e.g., who won the race), and not process (e.g., the faster agent tripped on an obstacle), to infer future competence (Yang & Frye, 2016).

However, another possibility is that young children do possess a coherent yet preliminary understanding of competence that manifests only with additional contextual support. For instance, one study used a paradigm similar to Nicholls (1978) but with explicit labeling (e.g. this person is "lazy", this person paints "very well") and found that even 4-year-olds have a mature understanding of the causal relationship between ability, effort, and outcome: They understand that an agent with high ability and a poor outcome probably didn't try hard, whereas an agent with low ability and a good outcome probably did try hard (Wimmer, Wachter, & Perner, 1982). In a similar paradigm, Heyman & Compton (2006) found that 5-year-olds correctly inferred that a faster agent was smarter, but only when primed to focus on difficulty (whether actors thought the test was hard or easy), and not effort (whether the actors tried hard or not).

These two possibilities have been challenging to tease apart particularly because prior work has used different ways of presenting information about competence, making it difficult to compare results across studies. Many studies used narratives that are rather high in verbal or working memory demands, or required extensive domain knowledge about what constitutes better quality or outcome. Thus, studies that are high in verbal or memory demands might have underestimated children's abilities. On the other hand, there are reasons to believe that some of the tasks used in prior work provided ample (and rather generous) behavioral and linguistic cues that are superficially associated with competence. For instance, some prior studies simply required mapping valenced cues of quality (e.g., success vs. failure; good vs. bad outcome) to agents' competence on a similarly valenced scale (e.g., who is smarter?).

However, the quality of outcomes in many real-world activities are usually not clearly marked nor necessarily positive or negative. Therefore, a test of a genuine understanding of competence must ask whether children can integrate information about the expected time or effort required to complete a given task (i.e., difficulty) and the actual time or effort an agent needed to complete the task. For instance, if two people took the same amount of time to build two block towers, one of which clearly looks harder to build than the other (e.g., a tall vs. short tower), a child might simply associate the agent who built the taller tower with higher competence. If, however, the towers are the same height and shape but nonetheless vary in the actual effort required for building (e.g., one is made of many more smaller blocks than the other), judging the competence of agents requires an abstract understanding of competence that goes beyond the use of perceptual cues. Whether children have such an abstract notion of competence remains an open question.

Here, we ask whether 4- and 5-year-olds use task-based features (i.e., difficulty of the completed goal) and agent-based features (i.e., speed) to infer an agent's underlying competence. While competence can be assessed in a variety of domains, our experiments focus on children's inferences about agent competence in building block structures. We choose this domain because 1) previous work has shown that even 4-year-olds can accurately judge the relative difficulty of building different block structures (Gweon, Asaba, & Bennett-Pierre, 2017) and 2) unlike more abstract forms of competence (e.g., mental ability, intelligence), agents' competence on physical tasks often manifests in ways that are more concrete and visually accessible. Thus, we can use simple perceptual features to manipulate task-based and agent-based indicators of competence without relying on explicit verbal cues. Across four experiments, we systematically vary a task-based feature (task difficulty, marked by perceptual properties of the block structures) and an agent-based feature (building speed, marked by duration of total build time) to see if 4- and 5-year-olds can use these features to infer others' relative competence.

Experiment 1

Methods

Participants & Materials We recruited 30 4- to 5-year-old children at a local children's museum (mean: 59.70 months (range: 48 - 70), 47% girls). One additional child was excluded from analyses due to failing the practice question (n = 1, see Procedure). Participants viewed laminated pictures and watched videos on a laptop.

Procedure Children were tested individually in a private testing room. To make sure that children understood the word "better", the experimenter first asked children "Who is better at writing letters - you or your parents?" and then "Who is better at playing on the playground – you or your parents?". If children answered incorrectly (i.e., choosing themselves for writing, their parents for playing), they were corrected. Next, children were given a detailed explanation with visual aids of what would happen in the following videos.

Children first watched a practice video where two agents drew shapes (a star and a flower) and finished at different times (counter-balanced for side; agents throughout were matched on ethnicity and physical build). While the agents were drawing, a screen was lowered to block visual access to their progress. One of the agents indicated she was done drawing (saying "all done" with her hands raised above the screen and then moving to the side of the screen to read a book). A few seconds later, the other agent indicated she was done in the same manner. Then the screen lifted to reveal what they made. Children were asked to indicate which agent

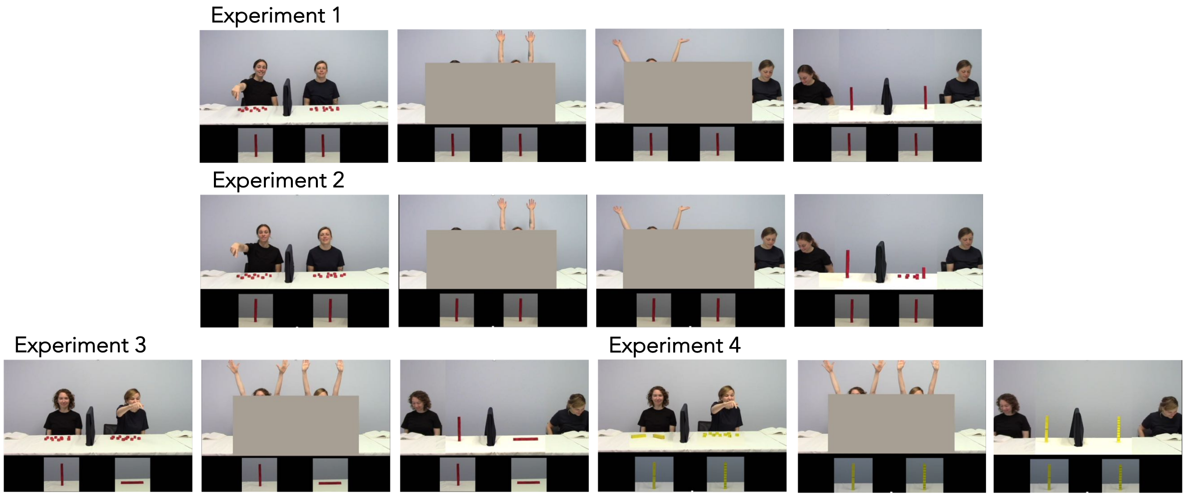

Figure 1: Still images from video stimuli for Experiments 1 through 4. In the first frame of each experiment, agents take turns pointing to the picture below them and saying "I'm going to make this". In the next frame, visual access to their building progress is blocked by an occluder. In Experiments 1 and 2, the agents finish at different times (marked by reaching up their hands, saying "all done", and moving to the side to read a book). In Experiments 3 and 4 agents finish building at the same time. Finally in the last frame, the occluder is lifted to reveal what each agent made.

finished first. If they answered this question incorrectly, they were excluded from analyses.

In the test video, children watched two agents build block structures. Below each agent was a picture of a 10-block vertical tower (see Figure 1, Experiment 1). The agents first indicated that they wanted to build the tower in the picture: One agent first said, pointing to the picture below her, "I'm going to make *this*", then the other agent repeated the same action. Next, the agents said "Ready? Go!" and began to build at the same time. As in the practice video, a screen was lowered to block the child's visual access to the agents' building actions. One agent finished building the tower in 10 seconds, indicating she was done in the same way as in the practice video (raising hands, saying "all done", and moving to the side of the screen to read); 5 seconds later, the other agent indicated she was done in the same manner (building time 15 seconds; side counter balanced). Critically, there were no verbal cues to indicate that one agent was "faster", or "found building easier" - children had to infer the agents' relative competence solely from the perceptual information in the video. The screen then lifted up to reveal what each agent made. At the end children were asked the critical test question, "Who is better at building blocks?"

Results & Discussion

Children's performance on the test question was significantly above chance (binomial test against chance (50%): 86.7% correct, CI = [76.7%, 100%][1], $p < .001$). Thus, children were able to understand that if two agents build the same structure, the agent that completes it earlier is more competent than the one who finishes later. This suggests that, when outcomes were matched (i.e., task-based feature kept constant), children can use differences in building time (an indicator of an agent's speed, an agent-based feature) to infer relative competence. However, another possibility is that children simply associated being faster with being better, without considering outcomes. In Experiment 2, we sought to rule out this alternative. If the agent who finishes first actually does not complete her goal, a simple association would still favor this agent as more competent. However, if children consider speed as an indicator of competence only when the agents have achieved the same goals, they should favor the agent who completed her goal even though she finished later.

Experiment 2

Methods

Participants Using data from Experiment 1, we ran a simulated power analysis using 10,000 binomial tests (bootstrapped samples with replacement) and set the sample size at n = 20 for a simulated power of .96.[2]. We recruited 4- and 5-year-olds at a children's museum (mean: 59.90 months (range: 48 - 71), 50% girls); 5 additional children were excluded from analyses due to failing the practice question (n = 2) or the inclusion criteria question (n = 3, see Procedure).

Procedure The procedure was similar to Experiment 1, except for the final outcome revealed at the end of the test video. While both agents indicated that they'd build a 10-block vertical tower, the agent who finished first (in 10 seconds) actually only built a 3-block tower whereas the agent who finished

[1]All reported CIs are 95% confidence regions estimated through a basic non-parametric bootstrap of the data using 500,000 samples.

[2]Experiments 2 and 3 were pre-registered on Open Science Framework (OSF): https://osf.io/pc945/registrations.

second (in 15 seconds) completed her goal (10-block tower). The test question was the same. To ensure children remembered the key event in the video, we asked: "Which agent didn't finish making her tower?" Children who gave incorrect answers were excluded from analyses.

Results & Discussion

Children's performance on the test question was significantly above chance (binomial test against chance = 50%; 90% correct, CI = [80%, 100%], $p < .001$). These results suggest that children do not indiscriminately use speed or time-to-completion as a cue to competence; when one person did not complete her goal, children resisted saying she was more competent even though the agent claimed to be done before the other agent. This complements our finding from Experiment 1, providing evidence that children's successful use of time-to-completion is not based on a simple heuristic "faster = better".

In Experiment 3, we now ask whether children can use a task-based feature (task difficulty) to infer relative competence when an agent-based feature (time to completion) is held constant. Critically, going beyond prior work that provided children explicit verbal cues to the task difficulty or outcome, we had children simply observe two agents building two different structures–10 blocks stacked vertically vs. lined up horizontally–and use the inferred difficulty of the two tasks to reason about competence. We chose these structures based on findings from (Gweon et al., 2017) showing that 4-year-olds readily judge the 10-block vertical structure as harder to build than the 10-block horizontal structure based on static pictures of the initial states (i.e., scattered blocks) and final states (finished towers), without seeing the building process. Given these results, we predicted that 4- and 5-year-olds would be able to use their understanding of task difficulty to infer the relative competence of two agents, even when total building time is matched.

Experiment 3

Methods

Participants We preregistered this experiment using the same power analysis as in Experiment 2 (see Footnote 2). We recruited 30 4- and 5-year-old children at a local children's museum (mean: 62.25, months (range: 49 - 71) 50% girls); 10 additional children were tested but excluded due to failing the practice question (n = 3, see Procedure) and inclusion criteria question (n = 7, see Procedure).

Procedure The procedure was similar to Experiment 1 with a few changes. To help children understand that the two agents might complete different goals, they were asked to indicate if the agents drew the same or different pictures after watching the practice videos. For the test video, agents had pictures of different block structures below them; one agent had a picture of a 10-block vertical tower and the other had the picture of a 10-block horizontal tower. As in Experiment 1, the agents pointed to the picture and said "I'm going to build this"; however, it was clear that agents were simply pointing to the structure that was depicted below them rather than making an active choice about which one to build. Furthermore, they never explicitly mentioned the physical properties of the structures nor their expected difficulty. Critically, the agents finished building their structures at the same time. Children were asked: "Who is better at building blocks?" followed by the inclusion question "Which tower is better?" Those who answered the inclusion question inaccurately[3] were excluded from analyses.

Results & Discussion

Children's performance on the test question was significantly above chance (95%, CI = [90%, 100%], $p < .001$). This result held even after including the 7 children who failed to answer the inclusion question accurately (74%, CI = [60%, 93%], $p = .02$). Thus, children were able to tell that when two agents take the same amount of time to build block structures, the agent that built the more difficult structure is more skilled. Critically, children were able to do so from their own assessment of the tasks, in the absence of any explicit information about the task difficulty.

While task difficulty was never mentioned explicitly, one might wonder if children still picked up on the fact that the 10-block vertical tower is taller than the 10-block horizontal structure, and simply associated building a"taller" tower with being "better" at building. Prior work provides some evidence against this possibility, showing that simple heuristics such as height or size do not fully explain children's inferences about task difficulty on a range of structures that vary along different dimensions. (Gweon et al., 2017).

However, whether children can infer the relative competence of two agents in the absence of any physical cues for agent-based (Experiment 1) or task-based features (Experiment 3) remains an open question. Experiment 4 provides a test of this ability, by asking children to judge the relative competence of two agents who take equal amounts of time to make towers that look identical in overall shape and height; critically, despite their near identical appearances, the towers differ in their building difficulty because one is made of 10 cubes and the other is made of 2 long blocks (and thus takes fewer steps, and is easier to build; see Figure 1). We chose these structures because Gweon et al. (2017) have shown that 4- and 5-year-olds can reliably identify the 10-block vertical structure as harder to build than the two-block structure given static pictures of the initial and final states, even without seeing the intermediate building process.

Unlike Experiments 1 - 3 where we hypothesized successful performance given explicit perceptual cues, one might entertain different predictions for Experiment 4. To succeed in this task, children must first infer that one tower is harder than the other, and spontaneously use this understanding to reason

[3]While the correct answer was the vertical 10-block tower, the wording of this question was confusing and potentially problematic; we thus also present results that include these children. In Experiment 4, we used a different question.

about the agents' competence; both of these inferences must be made based on the initial and the final states of the towers, without direct visual access to the actual building process. Thus, on the one hand, 4- and 5-year-olds may struggle with this task; prior work suggests that an abstract, coherent understanding of competence does not emerge until later in childhood, and our stimuli provide no superficial perceptual cues that children could use to judge relative competence. On the other hand, given that our task involves minimal verbal and memory demands, children might show an earlier success than previously believed. Thus, we did not preregister this experiment, allowing ourselves to explore a broader age range.

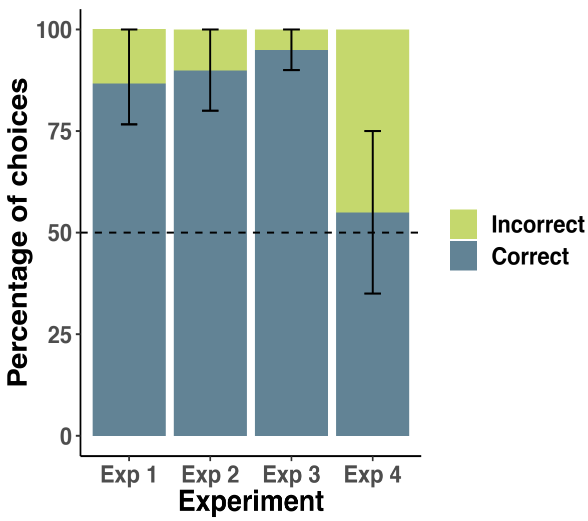

Figure 2: Results from Experiments 1 - 4: The percentage of children who correctly chose the more competent agent Error bars represent bootstrapped 95% confidence intervals. Dashed line indicates chance performance.

Experiment 4

Methods

Participants We used the same sample size as Experiments 2 and 3 (n=20). However, given the more difficult nature of this task, we extended our age range to include 6-year-olds (mean: 62.25 months (range: 48 - 83) 30% girls). Seven additional children were excluded due to failing inclusion criteria question (see Procedure). We also tested 25 adults on Amazon Mechanical Turk.

Procedure The procedure was similar to Experiment 3, with a few changes to minimize task demands. First, we removed the practice trial (more than 93% of children passed in Experiments 1 - 3) because this might bias children to focus on completion time. Additionally, to ensure that children paid attention to the fact that the two agents used different blocks to make similar-looking final structures, children were presented with physical examples of the 10 cubes and 2 long blocks, which were placed next to the side of the screen that matched the tower on the screen. In the test video, one agent had 10 cubes in front of her and pointed to the vertical tower below to indicate that she wants to build that tower; the other agent had 2 long blocks and also pointed to the tower below her (as in other experiments, the pointing was casual and did not indicate any active choice to construct a particular tower). Critically, the agents finished building their structures at the same time. Again, children were asked, "Who is better at building blocks?" followed by a inclusion question, "Which tower is harder to make?" Children were excluded if they incorrectly said that the 2-block tower was harder than the 10-block vertical tower.

Results & Discussion

We first verified that adults can infer relative competence accurately from these videos: 100% of the adults said the agent who built the 10-block tower was more competent than the agent who built the 2-block tower. However, children's performance was not significantly different than chance (55% correct, CI = [35%, 75%], $p = .82$), suggesting that when perceptual markers of difficulty and completion time are matched, children do not distinguish the agent who built the 10-block tower from the agent who built the 2-block tower. However, there was some evidence for a developmental change: Proportionally more 6-year-olds (6/7) than 5-year-olds (3/8) and 4-year-olds (2/5) answered the test question correctly. A logistic regression found a trend for an effect of age in years on children's success on this task ($B = 1.08$, $p = .1$).

General Discussion

Here we asked whether preschool-aged children can use a task-based feature (i.e., difficulty of the task) and an agent-based feature (i.e., agent speed) to infer the relative competence of agents. Critically, these cues were never verbally communicated by the experimenter or the agents in the video. As is the case in many real world situations, children had to spontaneously pick up on these cues and use them to infer relative competence. The difficulty of the tasks had to be inferred from the visual properties of the block structures (such as size or height), and the agents' speed or efficiency had to be inferred from their completion time on a given task. Our results suggest that children not only detect the perceptual cues that signal both types of features, but also readily use them to draw accurate judgments about the relative competence of two agents.

We found near-ceiling performance in 4- and 5-year-old children when one feature was matched and the other clearly varied across agents, marked by explicit perceptual cues. If two agents made the same block tower, the agent who completed her tower first was judged as more competent (Experiment 1), but not when this agent did not complete her goal (Experiment 2). If both agents completed their towers at the same time, the agent who built the more difficult tower was judged as the more competent agent (Experiment 3). However, in a more conservative test where the two agents spent the same amount of time building towers that varied in difficulty but were matched in their final shape and height, children's accuracy dropped to chance-level (Experiment 4). While there is suggestive evidence that 6-year-olds are able to respond accurately in this scenario, overall children struggled without clear perceptual cues.

What explains children's difficulty with Experiment 4, given their robust success in Experiments 1-3? It is unlikely that children's failure is due to their inability to infer task difficulty; the structures used in the stimuli here have been verified to elicit accurate judgments of difficulty among 4-year-olds in prior work (Gweon et al., 2017). Furthermore, we only included children who were accurately able to tell which tower was "harder". One possibility is that children's success in Exp.1 - 3 simply reflects their use of superficial cues associated with "being better", such as one person finishing the task earlier than the other (Experiment 1) or one tower being larger than the other (Experiment 3). By contrast, Experiment 4 required integrating time and task difficulty in the absence of these cues. Some anecdotal support comes from pilot data for Experiment 4 where children were asked both (1) which tower was "harder" and (2) which tower was "better". While 4- and 5-year-olds correctly judged the 10-block tower as "harder" than the 2-block tower, they did not judge this tower as "better". By contrast, most children in Experiment 3 picked the vertical 10-block tower as "better" than the horizontal 10-block tower, suggesting that children relied primarily on perceptual cues such as relative time or size/height to judge who (or what) is "better".

One way to interpret these results is that children's concept of competence is quite different from that of adults, and that it continues to develop beyond age 5. This interpretation is largely consistent with what previous studies have proposed (Heyman et al., 2003; Nicholls, 1978; Yang & Frye, 2016). However, another possibility is that children's failure on Experiment 4 reflects the developmental change in the semantics of "better", rather than a genuine conceptual change in their understanding of competence. If children strongly associate the word "better" with positive perceptual features of objects or agents, this might bias children's judgments of "who's better at bulding" to whoever finishes first, or whoever builds something larger. When these explicit cues don't differ between the two agents, as in Experiment 4, children are thus at chance.

The current study cannot tease apart these possibilities, as the critical test question involves verbally asking children "who is better". Thus, it still leaves open the possibility that children do have an abstract understanding of competence as a subjective quality that is determined by both task-based and agent-based features. One promising future direction is to try eliciting competence judgments without using the word "better". In addition to non-verbal measures, future work might capitalize on a previous finding that toddlers' friend choice reflects representations of agents' competence (Jara-Ettinger et al., 2015).

Despite the limitation of using a verbal prompt in our outcome measure, our stimuli had lower verbal demands relative to earlier work that involved heavy-handed manipulations of competence with explicit verbal information. The words used in these tasks often implied evaluative judgments (e.g., "lazy", "smart", see Heyman et al., 2003; Heyman & Compton, 2006; Nicholls, 1978), raising the possibility that children in these studies succeeded by matching the valence of these words with "being better", instead of engaging in genuine inference based on the features of the event. On the other hand, while verbal cues may help make these features easier to detect, verbally presented scenarios can also hinder performance by increasing processing demands, taxing verbal knowledge and working memory. This may have led to either underestimation or overestimation of children's understanding of competence depending on the paradigm (Nicholls, 1984; Heyman et al., 2003; Yang & Frye, 2016), producing discrepant findings across studies and age ranges. The fact that children in Experiments 1-3 successfully used task-based and agent-based features suggests that young children are adept at picking up on non-verbal cues embedded in observed events to infer relative competence, in addition to using verbal cues (Wimmer et al., 1982; Heyman & Compton, 2006).

While not quite at the level of adults (note that adults are near-ceiling on Experiment 4), children's robust performance on most of these experiments suggests that some basic notion of competence based on quality and efficiency may emerge early in life. Indeed, infants have a sophisticated understanding of physical events (Stahl & Feigenson, 2015) as well as agent's actions and outcomes (Liu, Ullman, Tenenbaum, & Spelke, 2017). Furthermore, infants can use information about other's effortful actions to inform their own (Leonard, Lee, & Schulz, 2017). In order to employ this sort of social learning about effort, children presumably need some basic understanding of how effort relates to outcomes, scales with difficulty, and is constrained by competence. The ability to go beyond superficial cues to infer who is more competent than others can be especially beneficial for early learning, as the learner can make better decisions about who to learn from or ask for help. Future work could further explore when children begin to use task-based and agent-based features using similar stimuli as the current study with nonverbal dependent measures in a younger age range.

An open question is whether young children's inferences about competence generalize to domains outside of physical ability. One possibility is that children develop a stronger sense of physical competence before mental competence, due to its overt perceptual cues and children's more salient experience in this domain early in life. Furthermore, the paradigms tested here only looked at how task-based and agent-based features relate to inferences about competence, yet many other features are surely involved in this calculation. For example, if someone was unmotivated to play basketball and failed to shoot a 3-pointer, we wouldn't necessarily conclude that they were unskilled. In other words, we also consider how much people *want* to achieve their goals when inferring their competence. Future work should probe the range of additional features that affect competence judgments broadly.

While we show that preschoolers are fairly accurate at reasoning about other's competence (at least with adequate perceptual cues), a great deal of work has shown that young children are out of touch, and in fact overly optimistic, about their own competence. However, most of these studies looked at how children predict how they would do in the future given their past performance, which might have led to wishful thinking (Schneider, 1998; Parsons & Ruble, 1977; Harter, 2012). Just as children were able to use observed evidence to infer others' competence, they may similarly evaluate their own competence based on observed outcomes. In fact, recent work suggests that children are even sensitive to the discrepancy between their own belief about their actual competence (i.e., the child successfully activates a toy after a few failures) vs. others' beliefs (i.e., an adult only observed the child's failures) and demonstrate their success to others to change these beliefs (Asaba & Gweon, 2018). Collectively these results are consistent with the recent proposal that children's understanding of competence is not "irrationally" optimistic (Cimpian, 2017), and calls for better tasks that tap into their underlying cognitive processes.

More generally, this work highlights the importance of reexamining old topics in a new light. The current work conceptually replicates prior results (including some from the 70's) while also raising new questions about what these results mean. Children's perception of competence in the early years is crucial as it likely informs their achievement beliefs and mindsets, which in turn impacts their academic outcomes (e.g. Dweck, 2006). Thus, understanding the ways in which children conceptualize competence early in life allows us to potentially help set children on the path towards a learning-focused mindset even before they enter formal schooling. We hope a new wave of interest from the broader community will shed more light on this important topic.

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