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Review

Question-asking in childhood: A review of the literature and a framework for understanding its development

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ABSTRACT

Children's ability to query others is remarkable because it attests to their coordination of a range of complex cognitive capacities and because it allows them to initiate and redirect pedagogical exchanges. It is therefore a catalyst for their ability to learn from others. However, despite its importance for cognitive developmental theorizing and its implications for educational practice, relative to other aspects of children's exploratory behavior, research on children's questions has been relatively sparse and siloed across several disciplines. The aim of this review is to provide a framework for organizing past and future research on question-asking and to use this framework to describe what development and variability in children's question asking looks like between infancy and the elementary school years. We propose that question-asking can be divided into four components: (1) initiation, (2) formulation, (3) expression, and (4) response evaluation and follow-up. Drawing on research from the fields of psychology, education, and developmental psycholinguistics we review what is known and not known about these four components between infancy and elementary school as well as describe sources of variability across development.

Introduction

The ability of children to engage in direct first-hand exploration and their ability to indirectly learn from other people allows them to quickly acquire a great deal of information about their world. On the one hand, children display an incredible capacity for learning on their own. Through observation and experimentation, they construct common sense understandings of the physical, biological, and social world. They track patterns and regularities, make inferences based on those patterns, and test out and revise hypotheses as they accumulate relevant evidence (Gopnik & Wellman, 2012). On the other hand, children rely heavily on the accumulated knowledge of their community across domains. They readily learn from direct instruction and quickly internalize, transmit, and enforce the beliefs and practices of their culture (Clegg & Legare, 2016; Kenward, 2012; Paradise & Rogoff, 2009). Indeed, through the testimony of other people, children can learn about ideas and entities they could not discover on their own (Harris and Koenig, 2006). However, children do not have to wait for the opportunity to explore or for information to be given to them. They can query other people to “gather just the information they want, on just the topic that interests them, at just the time they require it” (Baldwin & Moses, 1996, p. 1934). Thus, the ability to actively gather information from other people and to integrate it with what they are learning through exploration, observation, and testimony is one of the most powerful learning mechanisms available to children.

Despite its importance for cognitive developmental theorizing and education, we know very little about how the ability to request

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information from others develops. This is in significant part because research on this topic has been split across multiple disciplines, most prominently, the fields of psychology, education, and developmental psycholinguistics. Unfortunately, research across these different disciplines has rarely been brought together to tell a complete developmental story. As a result, we lack a coherent understanding of how children develop the ability to ask questions, the relative continuity of this process, how culture, domain-general cognitive processes and domain-specific knowledge constrain that development, and how contextual and individual factors explain variability in the questions people ask.

The aim of this review is to provide a framework for organizing past and future research and to use this framework to describe what development and variability in children's question asking looks like between infancy and the elementary school years. We focus on early childhood because question-asking as an information-seeking strategy emerges and undergoes rapid development during this period and because it is the developmental period that has been most extensively studied. By synthesizing the research conducted in early childhood using a novel developmental framework, we hope to stimulate further research across the lifespan and across diverse contexts to identify the mechanisms underlying development in the ability to ask questions. In developing our framework we drew from both child and adult research in order to identify components of the question-asking process that were broad enough to allow us to consider development from infancy to adulthood but narrow enough to capture what appear to be "necessary" sub-elements of the process (Flammer, 1981; Graesser, Person, & Huber, 1992; Mills & Landrum, 2014; Todd, Hill, & Robbins, 2012; Ram, 1991). By necessity, this framework and its components are described in relatively broad terms as the current goal is to accommodate research from diverse theoretical perspectives and disciplines across a wide range of ages – a necessary first step in motivating more targeted investigations. We begin by delineating the scope of our review. We then introduce our framework for organizing the available developmental evidence. Finally, we review developments in question asking and conclude with next steps for research.

Scope

In this review, we focus on the epistemic function of questions – the intentional use of questions to seek information that bridges a knowledge gap or resolves uncertainty (Baldwin & Moses, 1996). However, questions are used for multiple purposes. They allow individuals to maintain and control the flow of conversations (i.e., pragmatic function), to manage social relationships and coordinate action (i.e., social functions) (Graesser, Person, & Huber, 1992), to make a point (Searle, 1969; Shatz, 1979), and even to teach (Cazden, 2001; Yu, Bonawitz, & Shafto, 2017). These different functions are typically studied independently and have rarely been examined together, but are nevertheless often overlapping (Fitneva, 2012). For example, a child can ask a question to obtain information *and* to maintain and control the flow of conversation. Thus, despite our focus on the epistemic function of questions, we consider the fact that questions serve multiple functions when interpreting age-related and individual differences in question asking.

Requests for information can be directed at the self and guide first-hand exploration (e.g., reading comprehension, Palinscar & Brown, 1984) or they can be directed towards other people. In this review, we follow the preponderance of current research to focus on question-asking as an other-directed social phenomenon. There are many ways to request information from other people: interrogative expressions (e.g., what is a pistol?), commands (e.g., tell me what is inside this box), statements (e.g., I don't understand this). Indeed, requests for information can also be conveyed through different modalities and behaviors, such as looks, gestures (e.g., pointing), and intonations (de Ruiter, 2012). Given that most of the data on epistemic questions in childhood have focused on pointing and verbal questions, our review has a similar focus.

Epistemic questions can be asked about diverse topics. For example, children (and adults) request information about labels, facts, procedures, and causal mechanisms and they can do so to obtain clarification, to rule out possible hypotheses, and out of curiosity or "wonderment" (Graesser & Person, 1994; Lehnert, 1978; Luce & Hsi, 2015). Our review does not focus on a particular sub-type of epistemic question. Rather, our aim is to highlight broad developments in the ability to ask epistemic questions across age. This is partly because, at the moment, there is not enough research to look at age-related changes across sub-types of epistemic questions. Thus, our assumption, to be tested in future research, is that age-related developments highlighted in this review hold across epistemic question sub-types.

A (brief) framework for thinking about question-asking

Before introducing our framework for thinking about question-asking, it is worth considering a few specifics about the practice of asking questions amongst adults. An intrinsic part of a question is that it builds on some conceptual starting point (Graesser & Olde, 2003; Harris, 2012). Furthermore, when someone asks a particular question, they have, at minimum, an overall idea of the information that they seek, that is, they sense the general *form* of what a satisfactory answer to that question looks like (Van der Meij, 1987). If one asks how something works, one expects a procedure or an explanation rather than a label. People ask questions because they expect to obtain reliable and relevant information from the person being queried and because they have determined that obtaining an answer to their question is valuable – people do not ask questions about everything they do not know (Flammer, 1981; Van der Meij, 1987). Finally, there is great variability in the quality and quantity of the questions people ask. For example, there is within-subject variability due to metacognitive failure; people ask imprecise, poorly worded questions about some topics rather than others, or, due to retrieval failures, ask questions for which they already know an answer (Todd et al., 2012). There is also between-subject variability; some people ask more questions, some people follow-up on their questions more often, some people ask more precise questions (Graesser & Person, 1994).

We argue that these specifics of adult question-asking as well as the occurrence of within- and between-subject variability can be explained using a question-asking model composed of four components: (1) initiation, (2) formulation, (3) expression, and (4)

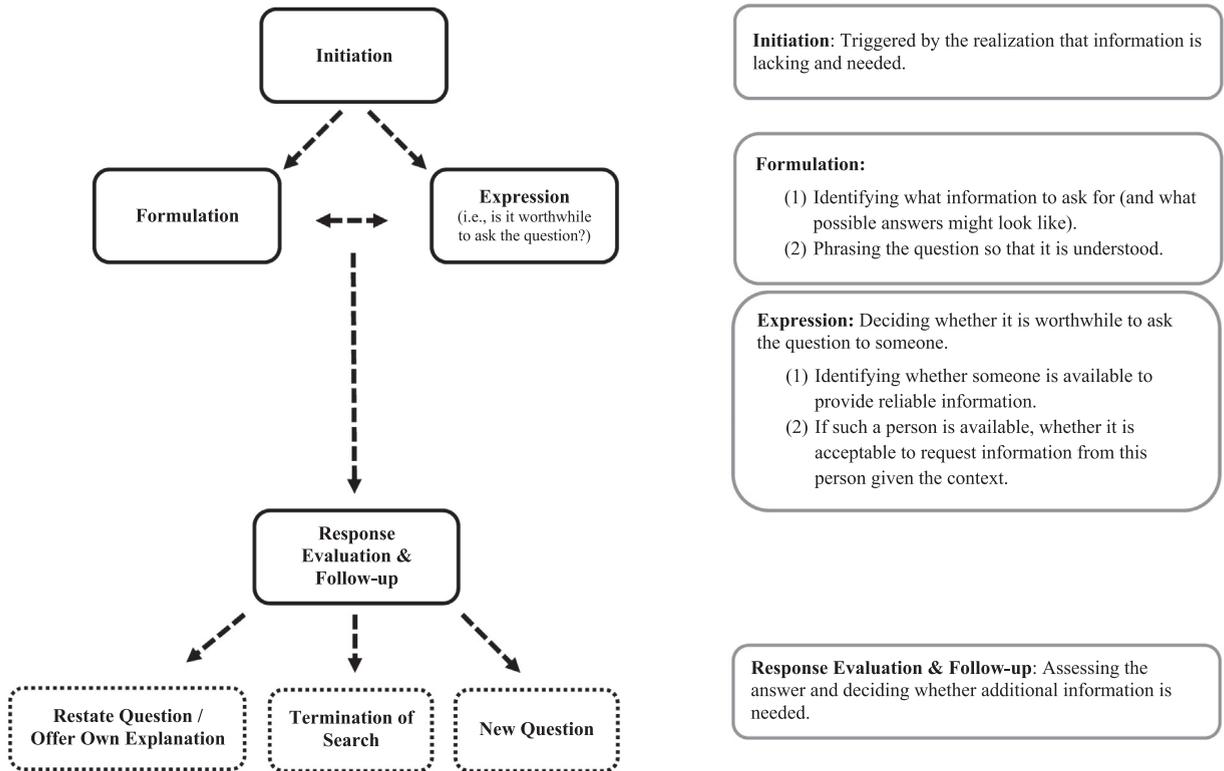


Fig. 1. Proposed model of question asking. Double arrows represent simultaneous interactive processes.

response evaluation and follow-up. We propose that these four components, detailed further below, are present throughout development and that development consists of the increasing ability to more explicitly and fully reflect on the processes involved in each of these components and to coordinate them, and, as a result to more fully and more efficiently deploy questions as an information seeking strategy (Fig. 1). While the four components of the model are presented in order, we do not claim that they necessarily occur in that order. Indeed, the process of asking a question is likely to be iterative and dynamic with different components influencing one another. Below, we outline in broad strokes the processes involved in each component. By necessity, we have kept the focus broad and emphasized general descriptions of these processes but acknowledge that each of the processes that we identify could be divided into further sub-components and processes subject to information revealed through further research.

Description of the four components in the framework:

Initiation

Throughout development, requests for information are likely to be triggered by a realization that information is not only lacking but also needed. Such realizations may be triggered by several factors. For example, a search may be triggered by an unforeseen obstacle to a goal, an anomalous event, the presence of a contradiction, ignorance, uncertainty (Graesser & McMahen, 1993). Such realizations that information is needed often reflect a degree of self-monitoring (Lyons & Ghetti, 2013), but may also occur without deep meta-cognitive reflection (as is presumably the case with infants, Goupil & Kouider, 2016). In addition, requests for information imply an appreciation that other people are knowledgeable and that their knowledge can be accessed through communication – an appreciation present in infancy (Bates, Camaioni, & Volterra, 1975; Harris & Lane, 2014; Schaffer, 1984).

Formulation

We propose that the process of formulating a question can be divided into two broad steps: identifying what information to ask for and phrasing the question so that it can be understood and answered.

Identifying what information to ask for. When children and adults formulate a question, they have a general sense of what information is sought and thus a general sense of what an answer might look like (Harris, 2012). Depending on one's motivation to acquire information, one's metacognitive abilities, and one's prior knowledge, the process of identifying what information to ask for may range from minimal (e.g., a cursory scan of one's prior knowledge or a feeling of confidence about a domain that involves little to no explicit reflection, see Balcomb & Gerken, 2008; Coughlin, Hembacher, Lyons, & Ghetti, 2014) to extremely thorough (Johnston, Johnson, Koven, & Keil, 2016; Lombrozo, 2016; Todd, Hills, & Robbins, 2012). In the minimal case, the process of identifying what to

ask generates information about the general form of the information that is needed (e.g. a name, a category property, a procedure, an explanation) and thus provides only enough information to formulate a relatively unspecified question. For example, in such a minimal case, someone who asks a “why” question will expect to receive an explanation rather than a label in response to their query but may not have an expectation about whether the explanation they will receive is causal or teleological in nature or what the specific content of that explanation should be. This may be true even as pre-existing intuitive framework theories might provide a general sense that, for example, a psychological rather than a physical-causal explanation (or vice versa) is more relevant (e.g., Keil, Stein, Webb, Billings, & Rozenblit, 2008). In contrast, specific and highly targeted questions with concomitant specific expectations about plausible answers will be formulated when the process of identifying what to ask for is more explicit (Gopnik & Wellman, 2012; Horn, Ruggeri, & Pachur, 2016; Johnson & Keil, 2014; Ruggeri & Lombrozo, 2015; Ruggeri et al., 2016). For example, the sixth-grade student who asks, “how can [trees on the sides of mountains] get their seeds in there” (Luce & Hsi, 2015, p. 79), has identified a set of constraints that a possible answer must account for, for example, a mechanism for adhering to the slope of the mountain.

Note that these two examples are not meant to imply that development necessarily leads to increases in the depth of processing that occurs prior to asking questions. Developments in cognitive skills and increases in prior knowledge may allow for deeper processing and more precise questions but whether such deeper processing occurs at all is unlikely to be related to developmental factors alone. For example, as detailed below, the presence of an available and friendly informant may reduce the amount of effort put into formulating a precise question because the perceived social cost of asking a question is low and there is the possibility of asking multiple questions to the informant. On the other hand, knowing that only one question can be asked to a particularly knowledgeable informant may increase the amount of effort put into formulating a precise question.

Phrasing a question. Having scanned for or identified plausible answers, the next step is to phrase the request for information. Phrasing a question requires syntactic and pragmatic knowledge (de Ruiter, 2012). A question needs to be worded in such a way that what is being requested can be clearly understood given the communicative context. By implication linguistic knowledge constrains one’s ability to formulate precise questions as well as one’s ability to obtain an answer. In addition, the phrasing of a question must conform to cultural norms and conventions – an informant may not respond to a question or may not be as helpful as they could be if a question is asked in a way that violates these norms and conventions. Thus, the phrasing of a question is influenced by the identity of the person that has been identified as the target of the question – a point we return to below.

Expression

While the formulation component focuses on the ability to create a question, the expression component focuses on the process of deciding whether to share that question with other people - whether it is worthwhile to actively articulate a question (i.e., social editing, Graesser & Person, 1994). This process of determining whether it is worthwhile to express one’s questions can be broadly divided into two types of considerations: (1) identifying whether someone is available to provide reliable information; (2) and if such a person is available, whether it is acceptable to request information from this person given the context.

Identifying whether someone is available to provide reliable information. Deciding whether someone is available to provide reliable information can be broken down into two sets of considerations. First, one must identify who possesses the expertise needed to answer the question (see Keil et al., 2008). Second, one needs to decide whether the person identified as knowledgeable is likely to answer the question and to provide reliable information, for example, whether they are nice or mean, likely to be truthful or deceitful (Harris, 2012; Keil et al., 2008; Lane, Wellman, & Gelman, 2013; Mills & Landrum, 2014).

Assessing the social context. Different social contexts have different conventions and expectations regarding what topics can be investigated, who can ask questions, and when such questions can be asked (e.g., at home, at school). As a result, even if someone is available and able to answer a question, it may not be appropriate to ask that particular question at that particular moment in that particular setting (Cazden, 2001). In addition, the number of people present and who those people are may influence whether the question is asked because displaying one’s ignorance can lead to embarrassment and a drop in social standing, for example with peers (Graesser & Person, 1994; Van der Meij, 1988), and because the person to whom the question is asked may not be willing to provide an answer (Van der Meij, 1988).

In the end, however, the final decision to express a question will also include considerations of how important it is to obtain an answer and whether there exist alternative means to obtain the desired information. Thus, sometimes questions might be a low-cost high-value option, while at other times, independent explorative behaviors might be the preferred low-cost high-value option, for example, when acquiring information on one’s own is quicker than seeking out an informant and waiting for their response. Thus, for descriptive purposes, it is possible to talk about the decision to ask a question as reflecting a cost-benefit analysis that balances the importance to the questioner of getting an answer, the availability of reliable informants, the social context, and alternative means of obtaining the desired information.

Importantly, as mentioned earlier and detailed in Fig. 1, we conceptualize the process of determining whether it is worthwhile to express one’s questions as operating in conjunction with the formulation process. Assessments of the social context and of the availability of potential informants are likely to shape how much effort is put into refining questions. Conversely, knowing who is available to answer a question will impact how a question is phrased.

Response evaluation and follow-up

Having asked a question and received an answer, individuals are then faced with the task of assessing the answer they have been

given. Assessments of answers to a question are likely to be modulated by whether the question derived from a cursory or deep analysis of prior knowledge. For example, a deeper analysis of prior knowledge during the formulation stage may increase the likelihood that a counter-example is proposed in response to the explanation provided to one's question because constraints on what would be an appropriate answer have already been identified during the formulation process. Having evaluated the response generated by their question, individuals must subsequently decide whether and how to follow-up. A satisfactory response may yield various responses from the questioner, for example, the generation of a novel question that builds on the information that was obtained, the decision to seek more information through autodidactic exploration rather than by asking a follow-up question because one is unlikely to obtain an answer (e.g., the response received was clearly dismissive), or the end of the search for information. An unsatisfying response may lead individuals to restate or rephrase their initial question, to direct their initial question to another informant, to stop questioning all together, or to share their own explanation in the hope of obtaining alternative feedback on it (Chouinard, 2007; Frazier, Gelman, & Wellman, 2009).

Cognitive resources underlying this model of question asking

The processing involved in the individual components we have described as well as their coordination requires the manipulation of significant amounts of information and involves several cognitive skills: for example, metacognition (that is, the ability to search reflectively through memory and sense prior knowledge), attention, executive function (EF) resources (especially inhibitory control), as well as Theory of Mind (ToM). Development in each of these abilities should allow children to more effectively and efficiently search for information using questions by reducing processing constraints. Of course, the impact of these domain general cognitive processes on question asking is likely to depend on the domain being queried. This is because domain specific knowledge will moderate the cognitive resources required to determine whether information should be sought, what information is needed, how to request that information, and how to evaluate the answers that one receives (see Ruggeri, & Feufel, 2015).

Although we recognize the important role of domain general processes and their interaction with domain specific knowledge as central to both the developmental trajectory of question-asking and to observed individual differences, we do not aim to specify the processes involved in each component of the model we have outlined nor do we offer a detailed consideration of how specific cognitive processes might affect the question-asking performance of each of the age groups that we describe. Indeed, to preview a conclusion, we believe that determining the contribution of age-related and individual differences in domain-general cognitive skills to age-related and individual differences in question-asking represents an important future step for research. To date, almost no studies have examined these relations.

Review structure

The remainder of this paper is divided into five parts. The first three parts review extant research on question asking from infancy to the elementary school years using the framework we have just introduced: Part 1 – Infancy & Toddlerhood (9- to 35-months-old); Part 2 – Preschool (3- to 5-years-old); Part 3 – Elementary School (6- to 10- years-old). For each of these age groups, we describe current research findings, and examine what they reveal about the four question-asking components of: (1) initiation, (2) formulation, (3) expression, and (4) response evaluation and follow-up. At the end of each section we identify limitations in the existing research and raise questions for future research that are specific to that age-group. Given that it reflects the concentration of research on question-asking, these three parts form the bulk of this paper and serve the goal of highlighting areas of continuity and change. For this reason, we focus on largely cross-sectional data and age-based trends rather than on longitudinal or individual difference data and individual variability. In Part 4, we look across age groups to provide a synthesis of age-based trends for each of the four components of our question asking model. In Part 5, our concluding section, we turn to consider sources of individual variability in question asking such as education, culture, and curiosity and outline key questions for future research without emphasis on any particular age group.

Part I: Infancy and toddlerhood (12- to 35-months-old)

Research on question-asking behaviors in infancy and toddlerhood has mostly focused on the factors that lead children to request information (i.e. Initiation) and on the influence of the social context on their decision to express their questions (i.e., Expression). Very little work has examined how infants and toddlers identify the information they should ask for (i.e., Formulation) or how they evaluate the responses they receive (i.e., Response Evaluation and Follow-up).

Initiation

There is some evidence that very young children request information when they lack knowledge and when they are uncertain about the knowledge they possess. The earliest evidence that infants seek information from an adult in response to a lack of knowledge comes from work by Kovács, Tauzin, Gergely, and Csibra (2014). Using a between-subjects design, they found that 12-month-old infants increased the frequency of their points across trials when interacting with an experimenter who provided them with novel labels for atypical members of familiar object categories (e.g., labeling a cat in boots as a “dax”) relative to a condition where the experimenter offered them a familiar label in response to their points (e.g., labeling a cat in boots as a “kitty”). This suggests that infants increased their pointing because they realized that there was new or unexpected information to be learned from the experimenter whose responses were novel. Begus and Southgate (2012) found that 16-months-old infants were more likely to

point to a novel object when interacting with a knowledgeable informant who had correctly labeled objects known to the child than when interacting with an incompetent informant who had mislabeled these familiar objects (Begus & Southgate, 2012). This is particularly strong evidence for the claim that infants request information when they do not know something because infants' pointing behavior was moderated by the knowledge of the informant, that is, the probability that they would receive an informative reply.

Around 20-months-old, infants also begin to seek information not just when they are ignorant but when they lack confidence about what they know (Goupil, Romand-Monnier, & Kouider, 2016). Goupil et al. (2016) introduced 20-month-old infants to a search game in which they had to remember the location of a hidden toy. In some trials infants saw where the toy was hidden (possible trials) and had to wait for 3-, 6-, 9-, or 12-seconds before pointing to indicate where they believed the hidden toy to be. In other trials, infants could not see where the toy was hidden (impossible trials). Half of the infants were taught that they could seek help by turning towards and looking at their parents on impossible trials. The caregiver waited until their child looked at them and then provided a correct response. Infants who received training in how to seek help were more accurate at the finding task than infants who did not receive such training. Crucially, analyses revealed that infants who received training selectively sought help and thus reduced their proportion of incorrect guesses. They asked for help more often in the impossible than in the possible trials and generalized the help seeking strategy to the most challenging of the possible trials, requesting assistance more often when they had to wait for a longer amount of time before being able to pick a hiding location. This suggests that by 20-months of age, infants can gauge their own confidence (at least implicitly), use this information to elicit information, and use that information to improve their performance.

Formulation

Very little work has examined how infants' and toddlers' prior knowledge, intuitions, and explanatory biases influence the questions they formulate. This is partly a methodological problem: In order to assess what infants and toddlers want to know, we need to assess how they respond to different types of answers. With older children we can look at how confused children are by the answers they are given, whether they persist in asking questions (and if they do, how they phrase their follow-up questions), and whether they ask for clarification. Such data are harder to collect in infants and toddlers because they are limited in their ability to communicate what they are thinking and their ability to engage in turn-taking conversations with others.

Nevertheless, there is some evidence that when infants and toddlers ask a question they have some (implicit) ideas about what would constitute an appropriate answer. Chouinard (2007) reports that, as early as 18-month-old, infants more often persist in asking a question if they are not provided with an informative reply than if they do. Frazier et al. (2009, Study 1) replicated this pattern with slightly older children. They found that, after asking explanatory questions, two-year-olds were more likely to seek additional information following the receipt of non-explanations than explanations. These two sets of data provide converging (albeit very limited) evidence that even infants and toddlers monitor the responses they receive to their queries.

What factors constrain the questions that infants and toddlers ask? What factors lead very young children to have expectations about the general form or the specific content of answers to their questions? While we lack experimental data, we do possess circumstantial evidence that very young children's questions are informed by their prior knowledge and intuitive theories in that these knowledge representations are giving them some content to ask about. The content analysis by Chouinard (2007) of questions asked by 1- and 2-year-old infants suggests that their questions increasingly reflect a concern about other people's beliefs, desires, knowledge, mental states, and personality at the same time as their Theory of Mind (ToM) undergoes rapid development (Bartsch & Wellman, 1995; Wellman & Liu, 2004). In her sample, Chouinard (2007) found that children go from never asking questions about such ToM topics in the first year of life (0%) to asking about them about 10% of time by the end of the second year and about 15% in the third year (Chouinard, 2007). Thus, as children's ToM-skills emerge, they are increasingly interested in seeking out information on that topic. This suggests that conceptual developments in infancy and toddlerhood may influence the content of infants and toddlers' questions. However, more research is required to assess the extent of this influence.

Do developments in children's linguistic abilities also explain changes in children's question asking behaviors? During the first year, Chouinard (2007) found that nearly 100% of the questions she could analyze (i.e., only for one out of four children) were requests for facts, for example, requesting labels. This changed towards the end of the second year when 25% of the children's questions were requests for explanations and 75% were request for facts (Chouinard, 2007). This shift in the kind of information children ask for is paralleled by developments in children's mastery of the syntax of wh-questions. In general, children master "what", "where", and "who" before mastering "why", "when" and "how" (Bloom, Merkin, & Wooten, 1982). Importantly, this developmental sequence occurs whether children are learning their first language (i.e., during the first and second year of their life) or a second language (i.e., at a later age) (Felix, 1976; Lightbown, 1978). Given that the ordering of children's acquisition of these interrogative forms remains constant across second language acquisition in older children whose cognitive abilities are presumably greater, it must reflect linguistic rather than cognitive development (Bloom et al., 1982; Valian & Casey, 2003). It is true that children are not restricted to using wh-forms when asking questions. For example, when asking for the location of an object they can say, "here?" and when asking how to do something they can say "like this?". However, it is harder to imagine how children could request function information or causal information using such simplified forms. Because infants as young as 11-month-old increase their exploration in response to observing an object that violates causal physical laws (e.g., when a dropped object does not fall, Stahl & Feigenson, 2015) and thus have some physical causal theory, the lack of causal questions from infants and toddlers is likely to reflect linguistic rather than purely cognitive restrictions.

Expression

While a growing body of research has demonstrated that infants and toddlers are capable of distinguishing between more and less reliable sources of information (see Poulin-Dubois & Brosseau-Liard, 2016 for review), much less work has examined how very young children use these abilities to selectively decide whom to question. In the only study to explore this issue, Begus and Southgate (2012) found that 16-month-old infants pointed more frequently to novel objects when interacting with an informant who previously labeled familiar objects correctly than when they interacted with an informant who had incorrectly labeled these familiar objects. Importantly, infants in these two conditions were equally willing to take objects from the experimenter, to smile at the experimenter, and to engage in social referencing to a parent. This supports the claim that even in infancy the decision to request information is shaped by evaluations of whether it is worthwhile to do so – the likelihood of obtaining an informative reply.

Response evaluation and follow-up

Few studies have examined children's evaluations of, and responses to, the answers they receive. Two sets of data from Chouinard (2007) suggest that the ability to monitor responses is present early in development but develops between the first and the second year of life (see also Frazier et al., 2009). The minimal data that exists suggests that by 18-months-old, children persist in asking a question if they do not receive an informative response, but rarely do so when they receive an informative response that contains the target information (Chouinard, 2007). Importantly, this pattern is specific to questions and does not apply to statements. Infants and toddlers almost never repeat a non-answered statement. However, while in the first year, almost all of children's questions are one-off, between the first and second year, children's questions increasingly arise as part of a set of questions (Chouinard, 2007). This suggests that towards the end of their second year, children are asking questions in prolonged turn-taking sequences in which they use the answers that they receive to their initial questions to inform their later questions. Indeed, Chouinard (2007) finds that among children around 2 years of age, over 50% of follow-up questions are requests for explanation. This raises questions about the function of initial queries and whether children open by asking about a fact they do not know and then requesting an explanation to account for this fact or whether they are asking the informant about a fact they do know in order to generate common ground (i.e., to demonstrate the topic that they want to talk about) and then requesting an explanation.

Another question related to children's response evaluations and follow-ups concerns whether the responses they have requested actually facilitate knowledge gains. Are infants and toddlers learning from the responses they receive to their questions? Correlational and experimental evidence suggests that they are. There is a robust correlation between the onset and frequency of children's pointing and their subsequent vocabulary size (Camaioni, Castelli, Longobardi, & Volterra, 1991; Fenson et al., 1994; Rowe, 2008) suggesting that children might learn labels from receiving informative replies to their points. Lucca and Wilbourn (2016) examined this notion experimentally and found that 18-month-olds but not 12-month-old infants showed greater memory for labels of novel objects provided in response to their points (see also Begus, Gliga, & Southgate, 2014). One possibility is that children's expectation that their points will elicit information develops between 12-months and 18-months-old and that knowing that they will receive an answer allows them to prepare to encode this answer into memory. Alternatively, it could be that this expectation is present in 12-month-old children but that they lack the memory capacities to harness the power of this expectation.

Summary and questions

During the first and second year of life, children are quickly developing their abilities to request information. Between 12- and 24-months, children begin to ask questions in response to uncertainty and begin to consider the availability of reliable informants when posing their queries. However, results from Goupil et al. (2016) suggest that children are still learning how to coordinate what they know with what other people know. In their control condition, untrained infants unsystematically looked to their caregivers across trials. They were equally likely to look towards their caregiver in possible and impossible trials and across various delay lengths (i.e., 3-, 6-, 9-, or 12-seconds). This suggests that, without training, 20-month-old infants did not think to seek information in response to uncertainty in their knowledge state (Harris, Bartz, & Rowe, 2017). This performance by 20-month-olds in the control condition points to the importance of cognitive skills like metacognition, ToM and executive function skills (EF) for question-asking. Advances in metacognition might facilitate children's recognition that help is needed and that pointing is an appropriate strategy for soliciting that help. ToM advances might facilitate children's ability to reflect on their own and other people's knowledge, while EF might allow them to coordinate the two.

We currently have very little information about how infants and toddlers' prior knowledge and intuitions shape the questions they ask, the expectations they have for the kinds of answers they might receive, and therefore how they evaluate the answers they do receive. We know that infants and toddlers track whether they receive a response but we do not know very much about the factors they consider when assessing whether such responses are "good". All that is known comes from two studies, namely Chouinard (2007) and Frazier et al. (2009), and these studies only provide evidence that infants and toddlers expect to receive a reply rather than a non-reply (e.g., a dismissal). It is likely that infants and toddlers' questions reflect a general sense of the type of information they need, for example, a fact versus a label versus an explanation. However, this claim has not been directly tested. For instance, are toddlers more likely to restate their question if they receive a label rather than an explanation in response to a why question?

If future research demonstrates that infants and toddlers do have such expectations about what *form* potential answers to their questions should generally look like, an informative next step would be to probe whether infants and toddlers also have expectations about the actual *content* of those answers. It is unclear whether infants and toddlers have the requisite cognitive skills and domain-

specific knowledge necessary to generate such content related expectations – for example, expecting to receive a specific type of explanation (e.g., causal vs. teleological) given the domain of knowledge or phenomena they are investigating. The ability to form expectations about the content as well as the form of possible answers to a question may require a deeper level of processing prior to formulating a question than infants and toddlers can produce. It may also require more domain specific content knowledge than infants and toddlers have at their disposal. However, it could be that there are some specific settings in which infants and toddlers are able to form expectations about the content of answers to their questions. For example, eighteen-month-olds can use an informant's prior accuracy (when labeling familiar words) to learn *new* words and actions (Brooker & Poulin-Dubois, 2013) and two-year-old children spontaneously correct mislabeling when talking with adults (Wellman, Song, & Peskin-Shepherd, 2017). Thus, infants and toddlers can actively monitor what other people say and can identify when responses are inconsistent with their existing knowledge. As a result, in specific cases, they may have general expectation about the content of answers to their queries.

Part II: Preschool (3- to 5-years-old)

Research on question-asking behaviors in preschool reveals important developments in preschoolers' ability to request information in response to uncertainty (i.e., Initiation) as well as concomitant developments in their monitoring of the responses they receive and in their follow-up to these responses (i.e., Response Evaluation & Follow-up). Less work has examined how preschoolers' draw on their prior knowledge and intuitive theories to formulate questions (i.e., Formulation) or on their ability to adjust their question-asking behaviors in response to social and contextual factors (i.e., Expression).

Initiation

Research with 3- to 5-year-old children reveals important developments in their ability to request information when they are uncertain. Relative to infants and toddlers, there is clear evidence that preschoolers increasingly use queries to search for information when they are not confident in their own knowledge or when they are faced with a problem of a different sort than they have encountered before.

Coughlin et al. (2014) presented 3- to 5-year-old children with degraded line drawings of two items, for example an onion and a lemon, and asked them to identify one of them (e.g., which one is the lemon?). Children were asked to do this twice: independently and once with the opportunity to ask an informant for help. Children requested help from the informant more often for trials where they had expressed lower confidence in their answer when forced to answer on their own.

Analyses of conversations between children and their parents reveal that preschoolers also seek information in response to uncertainty about their understanding of a concept or idea. For example, Tizard and Hughes (1984, p. 124) report a conversation between Beth (3 years and 10 months) and her mother:

Child: Is our roof a sloping roof?

Mother: Mmmm. We've got two slopping roofs, and they sort of meet in the middle.

Child: Why have we?

Mother: Oh, it's just the way our house is built. Most people have slopping roofs so that the rain can run off them. Otherwise, if you have a flat roof, the rain would sit in the middle of the roof and make a big puddle, and then it would start coming through.

Child: Our school has a flat roof you know.

Mother: Yes it does actually, doesn't it?

Child: And the rain sits there and goes through?

Beth's exchange with her mother illustrates how preschoolers' metacognitive and comprehension monitoring abilities (Coughlin et al., 2014; Wellman et al., 2017) catalyze their ability to learn from other people by allowing them to initiate and extend question-asking exchanges about topics that interest them.

Preschoolers are also able to reflect on their knowledge to identify situations that differ from ones that they have encountered in the past and to use this information to strategically seek information. Was and Warneken (2017) taught 3- to 5-year-old children how to operate one kind of puzzle box. They then presented children with novel puzzle boxes. Some of the new puzzle boxes were like those on which they had just received instruction while others were a different kind. They found that children sought information and help from others more frequently when presented with novel puzzle boxes of a different kind than puzzle boxes of a similar kind to the ones on which they had initially been taught.

Formulation

Research on preschoolers' ability to formulate precise questions – their ability to constrain their search for information – comes from two bodies of research. One body of research has focused on understanding how children's questions are constrained by their domain knowledge and intuitions (Callanan & Oakes, 1992; Greif, Kemler Nelson, Keil, & Gutierrez, 2006; Kelemen, Callanan, Casler, & Pérez-Granados, 2005) and has mostly relied on naturalistic and semi-structured adult-child conversations. The second body of research has focused on examining developments in children's ability to generate and select questions that narrow down possible answers (Herwig, 1982; Legare, Mill, Souza, Plummer, & Yasskin, 2013; Mosher & Hornsby, 1966; Ruggeri & Feufel, 2015; Ruggeri & Lombrozo, 2015). This line of research has typically relied on variations of the Twenty Questions game – a game where children must

identify a target object or category of objects by asking as few yes-no questions as possible (e.g., Moshier & Hornsby, 1966). These two research programs reveal that children's ability to constrain their search for information at this age is limited and that they tend to ask questions that do not clearly specify the kind of information that they are looking for.

Analyses of naturalistic exchanges between parents and their children show that children ask questions about diverse topics. For example, they request information about their own behaviors and the behavior of other people (e.g., "why are we going out?"), cultural and social conventions (e.g., "does Santa Claus make Christmas?"), natural phenomena (e.g., "why can we see stars?"), biology (e.g., "how do eyes work?"), artifacts and physical mechanisms (e.g., "how do electric wheelchairs work?"), as well as other topics (Callanan & Oakes, 1992; Kelemen et al., 2005). At the moment, however, it is unclear how and with what effect children's domain knowledge and intuitions shape these questions. For example, experimental data demonstrates that 4- and 5-year-old children request different kinds of information for unfamiliar artifacts (i.e., function) than for unfamiliar animals (e.g., eating habits, habitat) (Greif et al., 2006; Chouinard, 2007). However, other research using experimental methods and analyses of spontaneous parent-child conversations finds that when children ask questions they often ask ambiguous questions that do not clearly specify the kind of information they are looking for – even if they have a particular kind of information in mind. For example, Kemler Nelson, Chan, and Holt (2004) presented 3- and 4-year-old children with novel artifacts and gave them an opportunity to inquire about them. Children in both age-groups mostly asked ambiguous questions, "What is it?" rather than specifying whether they wanted to learn the name of the artifact or its function. However, additional analyses showed that they were more interested in obtaining information about the function of the artifacts rather than their names. Specifically, having asked an ambiguous question, children were more likely to seek additional information if the informant responded by providing only the object's name than if the informant only provided its function. Thus, despite a clear preference for one kind of information, children often failed to communicate this preference (see also Kelemen et al., 2005 for evidence that 3- to 5-year-old children ask ambiguous "why" questions across domains). Preschoolers' failure to communicate their preference may reflect limitations in their abilities to reflect on the informational needs of the person that they are querying, that is, a failure to recognize that their request is ambiguous and that they need to provide disambiguating information in their question to help the person they are querying identify the information they want. Indeed, Kemler Nelson et al. (2004) found that 3- and 4-year-old children reduced the number of ambiguous questions they asked, (i.e. "what is it?") and switched to asking more explicitly for function information when they consistently received undesired name information in response to their ambiguous questions.

Preschoolers' difficulty with formulating questions that allow them to obtain the information they need has also been documented in research using "20 questions" paradigms. In these studies, children's questions are often coded into two categories: Constraint-seeking questions are questions that target a category of objects or a feature shared by multiple objects (e.g., "Does it have four legs?") and are initially more effective because they tend to rule out multiple hypotheses. By contrast, hypothesis-scanning questions are questions that target a single object within a given set (e.g., "Is it a dog?") and only rule out one hypothesis at a time. Children as young as 4-years-old can ask constraint-seeking questions but typically ask hypothesis-testing questions instead (Herwig, 1982; Legare et al., 2013; Mills, Legare, Bills, & Mejias, 2010). One reason preschoolers may ask more hypothesis-testing questions than older children is because they think they know more than they do – hypothesis-testing questions are high-risk high-reward questions and are a good choice if one feels confident that one knows the answers. Indeed, kids are generally overconfident in their knowledge (Finn & Metcalfe, 2014; Salles, Semelman, Sigman, & Calero, 2016) and overestimate the detail and depth of their explanatory knowledge (Mills & Keil, 2004). Another reason is that preschoolers may have trouble generating constraint-seeking questions because such questions are more cognitively demanding – they require a person to identify and mentally represent the various dimensions that items can be categorized into. These dual challenges suggest that preschoolers should be better at selecting informative questions (i.e., constraint seeking questions that efficiently narrow down the possible answers) than at generating them and this should be especially true for 5-year-old children relative to 3- and 4-year-olds who have less developed cognitive processing skills. This is indeed what Ruggeri, Sim, and Xu (2017) found.

Expression

To obtain useful information, preschoolers should request it from individuals who are likely to be reliable informants. Preschoolers are able to reason about the expertise and reliability of informants but struggle to put that knowledge to use when they must reason about these aspects while managing other aspects of the question asking process, such as formulation. They do, however, adjust the number of questions they ask as a function of the social context (i.e., home vs. school).

Targeting knowledgeable and reliable informants

Much recent work has demonstrated that children consider various cues when deciding whose information to trust and to whom they should address questions (Harris, Koenig, Corriveau, & Jaswal, 2017; Mills, 2013; Sobel & Kushnir, 2013). However, most of this research has investigated children's selectivity by putting two informants together who differ on one or multiple dimensions (e.g., prior accuracy, accent) – a scenario which separates the act of generating a question from deciding to whom it should be addressed. Notwithstanding, the conclusion that children direct their questions to individuals whom they believe to be more knowledgeable is supported by analyses of children's spontaneous question asking. For example, Lapidow et al. (2017) recorded four-year-old's conversations at preschool and coded whether children directed questions to an adult, another child, or themselves. Analyses revealed that while children spent about the same amount of time talking to these three groups, questions took up a greater proportion of children's adult-directed speech, compared to their speech to other children and to themselves. Future analyses of the Lapidow et al. (2017) data will provide important information about whether four-year-olds asked for different types of information when querying

adults rather than children. Indeed, Davis (1932) found, after analyzing 3650 parent-recorded questions, that children tended to ask more questions about causal relations to adults than to other children. These findings are consistent with those of VanderBorgh and Jaswal (2009) who found that 3- to 5-year-old children direct food questions at adults but toy questions at children. Thus, preschoolers are attentive to what people are likely to know and not know and adjust the kinds of questions that they ask or whether to ask questions at all based on this information.

However, there may be limits to children's ability to direct their questions in ways that maximize the likelihood that they will get an informative answer. Experimental paradigms that ask children to do more than just identify the target of a question consistently find that preschool children struggle to do so when they also have to consider other aspects of the question-asking process. Mills et al. (2010) asked 3- to 5-year-old children to identify which of four novel objects could open a box and reveal a prize. Children were then introduced to two informants: one who could answer questions about the shape of the correct key and one who could answer questions about the color of the correct key. Consistent with the research reviewed earlier, they found that most 3-year-old children's questions were ineffective. They generally asked vague and irrelevant questions that did not help them identify the correct key. Moreover, they often directed their question to the wrong expert. In contrast, 4-year-old children were better able to target their questions to the right informant but still struggled to ask effective questions, asking a similar number of effective and ineffective questions. By five-years of age, children predominantly asked effective questions to the right experts (Mills & Landrum, 2016; Mills, Legare, Grant, & Landrum, 2011). Using a different paradigm, Aguiar, Stoess, and Taylor (2012) reached the same conclusion. The authors found that despite being able to identify which expert (e.g., a firefighter, farmer, or doctor) would know how to answer a question, (e.g., "what type of wood burns faster?"), children often failed to select the right expert if they were also simultaneously required to decide whether to answer the question themselves or to ask for help (Fitneva, Lam, & Dunfield, 2013; Robinson, Butterfill, & Nurmsoo, 2011).

Assessing the social context

In addition to showing some sensitivity to informants' knowledge, preschoolers also appear able to consider the conversational norms of a setting when deciding whether to ask their questions. Tizard and Hughes (1984) found large differences in the number of questions children asked at preschool to their teacher relative to the questions that they asked their parents at home. This was true of children coming from families of higher and lower socio-economic status. One possibility is that children inferred that school was not a place to ask questions but rather a place where one is asked questions. Indeed, Tizard and Hughes (1984) report that whereas conversations at home were balanced with parents and children both contributing to conversations, at school, conversations between children and adults were unbalanced with adults speaking more often and controlling the conversation – asking quick bursts of questions to one child and then moving on. In line with this, extensive analysis of classroom discourse has shown that teachers often engage with children using an Initiation-Response-Evaluation (IRE) pattern where the teacher controls the conversation by asking questions and evaluating children's answers – a pattern that implicitly teaches children that school is a place where one answers rather than asks questions (Cazden, 2001; Michaels, O'Connor, & Resnick, 2007).

Response evaluation and follow-up

Preschoolers display much more sophisticated response evaluation and follow-up abilities than infants and toddlers. Of note is their ability to reflect on the explanations they are given and to assess whether they explain the phenomena under consideration.

Analyses by Chouinard (2007) demonstrate that, like infants and toddlers, preschoolers are persistent in their requests for information: They continue to ask a question when they do not receive an informative reply. Indeed, at this age children more often provide their own explanation or ask a follow-up question when they do not receive an explanation to their causal questions than when they do (Frazier et al., 2009; Kurkul & Corriveau, 2017).

One limitation of these analyses, however, is that they only tell us that children differentially respond to explanation and non-explanation. Of course, 3- to 5-year-old children can distinguish between different kinds of explanations. For example, when presented with two informants one of whom provided non-circular explanations and one of whom provided circular explanations, children prefer to learn from an informant who provided non-circular explanations (Corriveau & Kurkul, 2014; Mercier, Bernard, & Clement, 2014). In addition, like adults, preschoolers favor the explanatory "virtues" of simplicity and breadth (Lombrozo, 2016). However, it is not clear that 3- to 5-year children make a fine-grained distinction between responses to their questions as long as those responses are somewhat informative. Frazier et al. (2009) coded the kinds of explanations children received from their parents into five categories: mechanisms (e.g., "because the springs are all wound up"); prior causes (e.g., "because you ate a lot"); consequences (e.g., "to get his hair cut"); non-mechanisms / current state of the world (e.g. "because we have the sun"); other (e.g. "you just don't do it that way"). They found that children's follow-up responses did not differ based on the type of explanation that they received. In other words, even as children followed up differently when they received explanatory versus non-explanatory responses, they did not respond differently to their parents based on the type of explanation that they received. Frazier, Gelman, and Wellman (2016) obtained similar results in an experimental context. They elicited questions from children and then provided them with different types of answers. For example, they presented children with a clam-shell phone that did not open and, when children asked why, they either provided them with a non-explanatory answer (e.g., "it looks like a young girl's cell phone"), an explanation with low levels of detail (e.g., "it's stuck"), an explanation with a medium level of detail (e.g., "it's stuck because someone spilled glue on it"), or an explanation with a high level of detail (e.g., "it's stuck because someone spilled glue on it. The glue ran into the crack and pasted it together"). Consistent with the naturalistic research, they found that children responded differently to explanation and non-explanation – more often providing their own explanations and restating their questions when receiving non-explanations. They also

found that children were more likely to agree with or acknowledge explanations with medium or high level of details (e.g., saying “oh”) than explanations with low levels of detail, but there were no other differences. For example, children did not ask more follow-up questions after receiving explanations with lower-levels of detail than higher levels of detail. In other words, 4- to 5-year-old children did not display dissatisfaction when receiving less detailed explanations. With respect to interpreting these findings, two alternative and testable explanations are possible: First, the apparent lack of differentiation may be the result of a kind of cost-benefit analysis, whereby the topics have been deemed to be of limited scope and personal relevance and so children had little incentive to follow-up after receiving fewer details. Under this analysis, children would be expected to be more sensitive to the different levels of explanations if the stakes were higher, for example, if the explanations were about an object that belonged to them. Second, children may not have distinguished between the different levels of informativeness because even the less informative explanations had enough information for them to infer the mechanism provided in more detailed explanations, that is, “The glue ran into the crack and pasted it together”.

These data should not be taken to imply that children do not care about the quality of the explanation they receive. If an explanation fails to explain the data at children’s disposal, they will ask for more information (Tizard & Hughes, 1984). However, the experimental data just reviewed also suggests that in some contexts preschool children are not too critical about the responses that they receive. They are thus willing to accept explanations that vary in their level of detail if these explanations are somehow relevant to the phenomena at hand and are not inconsistent with what they know.

Summary and questions

Preschoolers can introspect on their knowledge and use this information to decide when they need to request information from other people. In fact, by the end of the preschool years children seek information in response to the same cues as adults –an anomalous event, the presence of a contradiction, a gap in or uncertainty about one’s knowledge (Berlyne & Frommer, 1966; Graesser & McMahan, 1993). They can weigh the information they are given in response to their questions and ask for more information if the response fails to account for the phenomena at hand. This allows them to engage in episodes of sustained question-asking and to clarify and build their understanding through conversation –a remarkable achievement. At the same time, children’s ability to formulate precise questions and to direct those questions to appropriate sources is limited. Preschoolers have the requisite abilities: They can identify reliable sources of information but struggle to use this information to direct their question when juggling other demands such as generating their own question. These developments and continued limitations in children’s question asking abilities suggest that domain general processes such as executive functions skills may constrain children’s ability to ask precise questions and to address them to appropriate sources. Understanding which general cognitive skills impact which part of the question asking process at what age is an important next step for research on this topic. However, what is clear is that coordinating the decision-making that can be embedded within the process of generating questions, such as deciding whether to self-generate an answer or ask someone else, poses a considerable cognitive challenge –one that preschool children struggle to meet.

As with infants and toddlers, we have very little knowledge of how preschoolers’ prior knowledge and intuitions shape the questions they ask, the expectations they have for the kinds of answers they might receive, and therefore how they evaluate the answers they do receive. Research on this topic will benefit from comparing and contrasting preschooler’s performance on explanation and question asking tasks – a comparison that is not feasible with infants and toddlers. Part of asking a targeted question is to identify plausible answers to one’s questions given what one knows. This aspect of asking a question could be particularly difficult for children firstly because explaining an event requires consideration of fewer causes than predicting one (Bartsch & Wellman, 1989; Wellman, 2011; Nancekivell & Friedman, 2017). Moreover, assessing the likelihood of these various causes –a key step for selecting the most informative question– is also likely to be difficult for children younger than 5-years of age because their probabilistic reasoning capabilities are still developing (Sobel, Somerville, Travers, Blumenthal, & Stoddard, 2009). These unique challenges of predicting an event rather than explaining it and the fact that prediction may be embedded within the process of asking a question could also explain why domain-general cognitive skills like EF support question-asking.

Part III: Elementary school (6- to 10- years-old)

Research on question-asking behaviors with elementary school students reveals important developments in children’s ability to ask precise questions (i.e., Formulation) and to use questions to optimize their receipt of accurate information (i.e., Expression). Unfortunately, however, most of the developmental research on children’s ability to formulate questions has been conducted using “20 questions” type paradigms thus limiting the generalizability of these findings. Moreover, there is very little work on elementary school children’s monitoring of the responses they receive and their follow-up to these responses (i.e., Response Evaluation & Follow-up). In this section, we do not review research on what leads elementary school children to search for information (i.e., Initiation) because the research reviewed in the previous section demonstrates that by the end of the preschool years, children seek information in response to the same cues as adults.

Formulation

In contrast to work with younger children, research on elementary school children’s ability to formulate precise questions has not focused on naturalistic exchanges but has instead primarily been derived from variations of the Twenty Questions game. This work suggests that elementary school children ask more informative questions than their preschool counterparts. For example, a greater

proportion of their questions are constraint seeking questions rather than hypothesis scanning questions (e.g., Legare et al., 2013). Furthermore, they are also able to adapt their question-asking strategy based on task characteristics, such as the information structure of a task (for example, whether or not the hypotheses being considered are equally likely), and the feedback they receive from people about their questions (Ruggeri & Lombrozo, 2015). However, relative to adults, elementary school children ask fewer informative questions – though this difference could be accounted for by differences in knowledge about the topic between children and adults (Ruggeri & Feufel, 2015).

The effectiveness of using constraint-seeking strategies depends on one's knowledge about the probability distribution of plausible answers. When one has prior knowledge about the likelihood of plausible answers, it is better to *exploit* this knowledge and ask hypothesis-scanning questions, but it is better to *explore* by asking constraint-seeking questions when the likelihood distribution of these answers is unknown (Cohen, McClure, & Angela, 2007). Ruggeri and Lombrozo (2015) asked whether 7- to 8-year-old children's question asking behavior is consistent with this strategy. They presented their participants with a problem: "Yesterday, a man was late for work. Why?", then they presented children with a list of 10 reasons explaining why the man was late. In one condition, they told children that each of these 10 reasons was equally likely. In another condition, they told children that some reasons were very likely while other reasons were less likely. They found that children adjusted their search based on the information they received. They asked more constraint-seeking questions when the reasons were equally likely, that is, when hypothesis-scanning questions were least likely to pay off. Importantly, in a follow-up study they showed that children could adjust their question-asking strategy in response to feedback. They told a new group of children that a man was late for work but did not give them a list of reasons. In this situation, children were more likely to ask constraint-seeking rather than hypothesis-scanning questions when they were told "no" in response to their questions (regardless of whether that question had been a constraint-seeking or a hypothesis-scanning question). By implication, when children received feedback indicating that their intuitions about plausible answers were wrong (i.e. that they did not have a good sense of the probability distribution of plausible answers), they appropriately asked questions that *explored* rather than *exploited* the domain of possible solutions.

This conclusion is supported by Van der Meij (1990) who asked a group of fifth graders to select from a list of five definitions and apply these to novel words. Prior to selecting an option, children were given the opportunity to ask questions about the options. These questions were coded as global or specific. Students were also given standardized vocabulary assessments. Students who had more prior knowledge, insofar as they scored higher on the assessments, asked more specific questions – they asked "hypothesis scanning" questions, questions confirming their hypothesis about what the novel word meant (e.g., "Can you say ...?"), while students with lower prior vocabulary knowledge asked more global "constraint seeking" questions, questions that narrowed down multiple meanings of the novel word (e.g., "Does it have something to do with...?"). Thus, children's question asking strategy was related to their knowledge of the topic under consideration (see also, Nelson, Divjak, Gudmundsdottir, Martignon, & Meder, 2014).

Nevertheless, relative to adults, elementary school children show some limitations in their ability to deploy questions. Ruggeri and Feufel (2015) investigated the performance of 7- and 10-year-old children as well as adults on a version of the Twenty Questions game. In a first study, they presented children with 40 items and asked them to identify the target item by asking yes or no questions. Half of the participants were presented with 40 animals and half of the participants were presented with 40 professions. This manipulation allowed Ruggeri and Feufel (2015) to assess the impact of prior knowledge on question asking. Study 1 findings revealed a steady age-related increase in the proportion of constraint-seeking questions asked and in the informativeness of these questions (i.e., how many items a question ruled out), and thus an age-related decrease in the total number of questions asked. Importantly, there was a main effect of domain. All participants asked fewer constraint seeking questions, asked less informative questions, and asked more questions in the domain of professions than animals. By implication, across the lifespan, prior knowledge facilitates question asking by making it easier to identify the dimensions along which items can be classified and searched. Indeed, this interpretation was confirmed in a follow-up study 2 which found that 7- to 10-year-olds could generate more distinctive features within the animal than the professional domain. In Study 3, same aged participants were presented with the same task as Study 1 – identifying a target item – but were given a set of questions to choose from. Adults selected more informative questions than 10-year-olds who in turn selected more informative questions than 7-year-olds.

In sum, these three studies confirm that asking effective questions requires the ability to identify dimensions along which items can be categorized. This ability is influenced by prior knowledge. Having identified relevant dimensions, an individual must then select the most informative dimension and ask questions about those dimensions, consistently tracking and updating information to further constrain the search space. The differences found between elementary school children and adults suggests that both the prior knowledge and the ability to express queries that exploit and track this knowledge continue to develop into adolescence.

Expression

Elementary school children are better than preschoolers at using their knowledge of who knows what to identify who to question. However, this ability is still developing, notably in contexts where children have competing cues to reliability.

Identifying whether someone is available to provide reliable information

The challenges of preschool children to coordinate multiple aspects of the question-asking process and the resulting failure to request information in an optimal fashion, are less apparent in the elementary school years. Recall that Aguiar et al. (2012) found that while 4-year-old children struggled to assign questions to relevant experts (i.e., doctor, firefighter, or farmer) when they also had to decide whether to answer the question on their own or to ask for help, performance did not drop off among 6-year-olds (see also Fitneva et al., 2013). However, improved performance by elementary school children on these experimental tasks does not imply that

elementary school children do not struggle with using their knowledge of whom to ask for information to target those informants when asking questions. For example, even though 5- to 8-year-old children are able to distinguish between knowable and unknowable pieces of information (e.g. the number of leaves on all the trees in the world), they struggle to use this knowledge when faced with an informant who is confident about their knowledge of unknowable facts. That is, children between 5- and 8-years-old rely on a speakers' confidence even when such confidence is misplaced (Kominsky, Langthorne, & Keil, 2016).

Assessing the social context

Beyond considerations of competence, elementary school children's decision to express their questions is influenced by their perceptions of settings' norms and conventions and by their beliefs that others might judge them for asking "stupid" question. Van der Meij (1988) found that 3rd and 5th graders were hesitant to ask questions to teachers and peers during instruction and seatwork as a result of classroom rules (e.g., "You are sometimes not allowed to ask question"), the emotional and physical availability of the teacher or peer (e.g., "May be she is in a bad mood", "I don't want to disturb her when she is busy"), and the possibility that others may judge them for asking questions (e.g., "Then the others laugh at you", "Then, during lunch time they say you are stupid"). Thus, the context of questioning as well the presence of other people at the time of questioning influence whether a question is asked. Indeed, Graesser and Person (1994) found that 7th graders asked questions in a tutoring setting 240 times more often than they asked questions in classroom setting even though there was little difference in the number of questions tutors and teachers asked.

Response evaluation and Follow-up

Few studies have examined elementary school children's responses to the answers they receive to their questions. The study by Ruggeri and Lombrozo (2015) found that when playing the "20 questions" game, children responded to feedback and were more likely to ask constraint seeking questions that "explored" possible answers rather than hypothesis scanning questions that "exploited" what they knew, when they receive a "no" answer to a question. Thus, elementary school children's follow-up to the answers they receive to their questions is guided by a sense of whether they have a grasp on the likeliest hypotheses for a problem. Similarly, elementary school children's search for information following responses to other people's questions suggests that they can evaluate the strength of an explanation and use this information to determine whether they need to acquire more information. For example, Sands, Mills, Rowles, and Campbell (2017) found that 7- to 10-year-old children were more likely to seek out additional information after hearing a question posed by someone else (e.g., "How do racket-tailed drongos use their voices to steal food?") if they heard a weak explanation (e.g., "They use their voice to help them take food that they can eat"), rather than a strong explanation, (e.g., "They copy alarm sounds of animals to scare them and steal their food") (see also Mills, Danovitch, Rowles, & Campbell, 2017).

However, there is also some, albeit limited, evidence that children's ability to use information in this way is affected by whether they are receiving answers to their own questions rather than someone else's question (Ross & Killey, 1977). Ross and Killey (1977) presented pairs of 9- and 10-year-old children with a series of slides depicting a scene. Children were told they were going to play a detective game— they would be shown five pictures and then given the chance to ask any question they wanted about these pictures. Children received standardized answers to their questions, took turns asking questions and could ask multiple questions about the same picture. Findings revealed that when children asked follow-up questions, they more frequently built on their initial question (and therefore on the initial response they received) rather than on their partner's questions (and the response received in response to that question). Moreover, they found that, after a three-day delay, children had greater memory for information provided in response to their own questions rather their peer's questions—a finding that replicated when each child was only allowed to ask one rather than multiple questions about each picture. This set of findings suggest that elementary school children (in some circumstances) may be better able to learn from responses to their own questions—a finding consistent with the memory advantage demonstrated in infancy (Lucca & Wilbourn, 2016). However, more research is needed to confirm this result and to understand its limitations.

Importantly, relative to adults, elementary school children are still learning how to adjust their search for information using questions. They are more likely to continue searching for information beyond the point at which a single hypothesis remains even when they have been told to find the solution in as few questions as possible. In other words, they continue to ask questions even after their previous queries have provided them with the information they need (Ruggeri, Lombrozo, Griffiths, & Xu, 2016). An interesting possibility raised by Ruggeri et al. (2016) is that younger children continue to ask questions even after they have obtained enough information because they perceive more risk in deciding on an answer than adults and thus feel the need to obtain more confirmatory information (e.g., "I think I know, but let me ask just one more question, to be sure"). Indeed, given their lower prior knowledge, children are likely to be more often wrong and thus more uncertain. If this is the case, then children should seek less confirmatory information (i.e., continue to ask for information after they have obtained enough to make a decision) in domains where they have more prior knowledge than in domain where they have less prior knowledge.

Summary and questions

In sum, the elementary years are an important developmental period for children's question asking. In contrast to preschool children, elementary school children ask more informative questions and can coordinate multiple aspects of the question asking process. They are also able to adapt their search in real time as they gain information about the likelihood of hypotheses. However, as most of the data on formulation and evaluation comes from studies utilizing the "20 questions" paradigm. This makes it difficult to know how elementary school children use their prior theoretical knowledge to formulate questions and evaluate responses in more naturalistic settings. It is likely that, relative to preschoolers, elementary school children are better at formulating questions to obtain

the information they need: As children transition from the preschool to the elementary school years, they demonstrate increased proficiency in reasoning about evidence and specifically about the kind of evidence that is needed to evaluate a claim (Chen & Klahr, 1999; Piekny, Grube, & Maehler, 2014; Ronfard, Chen, & Harris, 2017). Such domain-general knowledge is likely to help children formulate more targeted questions. Moreover, as children transition to the elementary school years, they also begin to have much stronger intuitions, even in the absence of detailed mechanistic knowledge, about unseen causal systems (Ahl & Keil, 2017; Keil et al., 2008; Newman & Keil, 2008). Such developments, in addition to increases in general knowledge, should also lead to more targeted question although these predictions await experimental confirmation. In addition to lab-based experimental work, assessing elementary school children's question formulation and response evaluation skills in naturalistic contexts is also an important next step for research.

An important result from Ruggeri and Feufel (2015) is their demonstration of the role of prior knowledge on abilities to ask questions throughout the lifespan. One implication of this finding is that part of the improved effectiveness of question asking in the elementary years may be a result of the greater knowledge that older children possess relative to younger children. Having greater prior knowledge matters because it helps children organize the search space and facilitates their ability to ask questions that narrow the field of potential answers in an efficient manner. This is an important result that supports our model of the steps involved in question asking, particularly in relation to the third step of question formulation whereby knowledge constrains search and the ability to formulate questions. This suggests that age-related differences are not likely to be fully explained by age-related developments in domain general cognitive resources but rather by interactions between domain specific knowledge and domain general skills.

Research relevant to children's evaluation of responses suggests that children are particularly attentive to the answers they receive to their own questions. Consistent with the infant research, elementary school children seem to have better recall for information provided to self-generated queries than to other people's questions (Ross & Killey, 1977). Moreover, children find it easier to follow-up on their own questions. One intriguing possibility consistent with the model presented in this paper is that following up on a self-generated question is easier because the act of formulating the first question helps to identify the form the answer to the question should take and in some cases what possible answers to that question may be. Following up then simply requires an update of the field of potential answers. In contrast, following up on another's question requires reconstructing the search space that led to other person's initial inquiry.

Part IV: Summary of development from infancy to elementary school

Looking across age, children's ability to seek information through questions develops rapidly between infancy and the elementary school years. These developments occur across the four components of question-asking we have identified: initiation, formulation, expression, response evaluation and follow-up. We briefly review these age-related trends before turning to implications for future research. Before doing so, however, we note that one of the important findings of this review is that the distribution of research across the four components of questions-asking is uneven. Initiation has been well-studied across all age groups. In contrast, formulation has been mostly studied in preschoolers and elementary school children. However, research on the process of formulating questions in these two-age groups has relied on different methods. Studies with preschoolers have mostly relied on analyses of naturalistic data. In contrast, studies with elementary school children have relied on "20 questions" paradigms. Expression as well as Response Evaluation and Follow-up have been almost exclusively studied with preschoolers. Thus, in order to provide greater clarity on age-related trends an important next step for research is to "fill in the gaps" to ensure that research on the four components of question asking is more evenly distributed across age and that similar approaches to the study of these components are used across age. Moreover, once a better understanding of development at the level of these components has been gained, it will be important for further theoretical and empirical research to be conducted on the potential sub-steps of these components. Below, we provide a quick summary of the current state of age-related trends for each facet of the question asking process.

Initiation

Requests for information begin with a realization that information is needed. In infancy, children seek information when they lack knowledge or are uncertain (Begus & Southgate, 2012; Goupil et al., 2016). By the end of the preschool years, children also request information when they have identified inconsistencies and contradictions in their understanding of concepts and when they know they need instruction to complete a task (Tizard & Hughes, 1984; Was & Warneken, 2017). Thus, by the end of the preschool period, and by implication through elementary school, children seek information in response to the same cues as adults (Graesser & McMahan, 1993).

Formulation

Having realized that information is needed, children have to decide what information to seek. There is indirect and limited evidence that background knowledge (i.e., prior task relevant knowledge and conceptual knowledge) facilitates this task in infancy (Chouinard, 2007). In contrast, there is direct evidence that background knowledge shapes 3- and 5-years-old's questions and their expectations about the content of possible answers (Greif et al., 2006; Kemler Nelson et al., 2004). However, at that age, children struggle to effectively communicate the kind of information that they are seeking to obtain and often ask ambiguous questions (Kelemen et al., 2005). Thus, more work is needed to fully understand how background knowledge shapes question formulation at that age. During the elementary school years, research using paradigms based on "20 questions" demonstrates that background

knowledge shapes children's ability to identify the dimensions along which items can be categorized and thus facilitates efficient information search (Ruggeri & Feufel, 2015). However, support from naturalistic observations is lacking in this age group.

Expression

To obtain an informative reply, children must address their questions to knowledgeable agents. This ability is present in infancy. Infants ask questions more frequently about novel objects when faced with a knowledgeable speaker than when faced with a speaker that is less knowledgeable (Begus & Southgate, 2012). With development, children are better able to consider additional features of the task and context (Fitneva et al., 2013). However, preschoolers still struggle with appropriately targeting their question to knowledgeable sources when they are asked to consider multiple aspects of the question-asking process (i.e., formulating a question and deciding whom to address it to, e.g., Mills et al., 2011). By elementary school, children show fewer such limitations.

Evaluation

By at least 2-years of age, children actively monitor and respond to the answers they are given (Chouinard, 2007): Toddlers expect informative replies to their questions and follow-up when they do not receive an appropriate reply. Preschoolers show the same ability: they follow-up when they get an uninformative reply. However, if children at this age receive an informative reply, they are not overly critical. They accept different type and different levels of explanation as long as those explanations do not conflict with what they know (Frazier et al., 2009, 2016). There is no naturalistic data on elementary school children's evaluation and follow-up on responses to their questions. However, data from "20 questions" paradigms reveal that elementary school children use answers that they receive to their questions to adjust their subsequent search for information (Ruggeri & Lombrozo, 2015) and experiments with elementary school children show that they will seek additional information following weak rather than strong explanations to someone else's questions (Sands et al., 2017).

Development

It is clear from our review that many factors influence the emergence of question-asking. However, given the uneven distribution of research on each component across age (and the use of different paradigms), it is difficult to piece together a detailed or coherent developmental story. Language development, prior task relevant knowledge, conceptual knowledge, and more domain general cognitive skills (e.g. executive functions skills) certainly play a role. For example, developments in children's mastery of the syntax of wh-questions facilitates their ability to ask for explanations (Bloom et al., 1982). Across the lifespan, conceptual knowledge facilitates question asking on "20 questions" paradigms (e.g., knowledge about animals) by making it easier to identify the dimensions along which items can be classified and searched (Ruggeri & Feufel, 2015). Cognitive flexibility –the ability to sort information along multiple dimensions– is significantly correlated with the proportion of constraint seeking questions preschoolers ask on "20 questions" paradigms (Legare et al., 2013). Children's working memory develops rapidly between preschool and elementary school (Kail, 1991, 2007) and age-related developments in this capacity parallels age-related developments in children's ability to manage multiple steps of the questioning process simultaneously (e.g., Fitneva et al., 2013). However, more research is needed to identify the unique contributions of these different factors.

Another reason for the difficulty in telling a coherent developmental story is that we lack detailed information about how question asking is shaped by interactions between these domain-general cognitive skills and domain-specific knowledge. Thus, a critical area for future research is how background knowledge and cognitive skills shape the questions children ask and how children evaluate and follow-up on the answers that they receive. For example, the way that background knowledge and cognitive skills interact to facilitate performance on a search task like the "20 questions" paradigm may be different than how background knowledge and cognitive skills interact to support question-asking about relatively mundane information (e.g., "What movie are you watching?") and more conceptually focused questions (e.g., "What happens after we die?"). Within the "20 questions" paradigm, background knowledge facilitates search by helping one categorize items along various dimensions (Ruggeri & Feufel, 2015). In the case of general everyday questions, background knowledge may only shape general expectations about the form and content of possible answers. For example, asking someone "what movie you are watching?" leads one to expect movie information and not radio information, fact not opinion, movie genre or name and not plot or actor details. In the case of more conceptual questions, children's intuitive theories may provide guidance to children about what information to seek by providing a basis for understanding what information is causally relevant or important to know. Indeed, we know that children's intuitive theories shape their explanations (Hickling & Wellman, 2001). However, we do not have data on the relation between children's intuitive theories and the questions they ask. For example, we know that young children increasingly ask about Theory of Mind (ToM) topics during the years when their ToM is developing (Chouinard, 2007). However, we do not know whether children's questions about ToM related topics change as different psychological concepts become more central to their ToM. Moreover, while we know that children restate their questions or self-generate an answer when they receive non-explanations (e.g., Frazier et al., 2009), we do not know how they respond to explanations that are consistent rather than inconsistent with their intuitive theories. It is likely that children's responses will vary according to the robustness of their theory and based on the perceived social arbitrariness of the domain but this area is as yet unexplored. Thus, an important goal for future research is directly testing the impact of children's conceptual knowledge and task specific prior knowledge on their questions and to do so across different information seeking contexts.

Part V: Individual differences and conclusions

Our review of the research on children's question-asking has focused on age-related developments in children's performance because it represents the majority of the work conducted to date. However, there are also large individual differences in performance across children of a similar age. These individual differences provide important insights into the nature of question-asking, the influence of context, as well as insights in possible developmental mechanisms. We briefly review research on individual differences and then discuss implications for our understanding of question-asking development.

Research on the frequency of question asking in childhood consistently finds that preschool children in families from higher socio-economic strata ask significantly more questions than children from lower socio-economic strata (Endsley, Hutcherson, Garner, & Martin, 1979; Gauvain, Munroe, & Beebe, 2013; Kurkul & Corriveau, 2017; McCarthy, 1930; Tizard & Hughes, 1984). One possibility is that these individual differences arise because of differences in parental beliefs that are associated with differences in the conversational and thus question-asking environments that children grow up in (Ronfard et al., 2017). Specifically, analyses of parental beliefs suggest the existence of two different parental orientations – one aimed at nurturing the child's autonomy or independence and the other aimed at nurturing the child's deference or obedience (Feldman, 2003; Park & Lau, 2016). These value choices are correlated with how parents engage in conversation with their children. On average, parents who have obtained more education and are thus more likely to prioritize independence and curiosity are more accepting of disagreement, debate, and exploration than parents who prioritize respect and good manners (Hart & Risley, 1992; Huttenlocher, Vasilyeva, Waterfall, Vevea, & Hedges, 2007; Rowe, 2008). Differences in the frequency of children's question asking associated with socio-economic status may reflect these socialization priorities. Moreover, there is some evidence that parents' beliefs about children's readiness to learn about certain topics like death and sex may lead parents to shy away from these topics (Ballard & Gross, 2009; Davies & Robinson, 2010; Geasler, Dannison, & Edlund, 1995; Rosengren et al., 2014). By implication, cultural and parental beliefs and practices may shape not only the frequency with which children ask questions but also the domains in which they do so.

These differences between families aside, even within a family, different activities afford different conversational environments and thus question-asking opportunities (Callanan & Oakes, 1992; Jipson, Labotka, Callahan, & Gelman, 2018). Settings such as breakfast, playtime, car rides, bath time, dinner time involve different routines, different levels of stress, and thus provide different openings for children and their caregivers to talk to one another. Indeed, Thompson, Foster, and Kapiros (2016) found that parents' scores on the Parent Stress Index (PSI-Short Form; Abidin, 1995) were negatively correlated with the number of questions parents asked their children during a problem-solving activity.

The conversational environments children encounter at school also have a marked impact on the number of questions that children ask. As noted earlier, research indicates that, relative to home, questioning drops off in school and classroom environments (Cazden, 2001; Chin & Osborne, 2008; Engel, 2011; Good, Slavings, Harel, & Emerson, 1987). However, somewhat echoing findings on home environments, children ask more questions when their teachers take an authoritative rather than an authoritarian stance (e.g., Chin & Osborne, 2008), and also when they create a supportive classroom climate (e.g., Nayfeld, 2014), for example, by helping children to generate and revise their questions by scaffolding conversation and inquiry (Stokhof et al., 2017). In sum, conversational environments at home and at school that encourage dialogue and debate lead children to ask more questions while children ask fewer questions when their questions "may be regarded as impolite challenges" (Rogoff, 1990, p. 129) or add to existing stress (Thompson et al., 2016).

Variability in the number of questions children ask across conversational environments is consistent with our claim that the process of determining whether it is worthwhile to voice a question can be thought of as a kind of cost-benefit analysis – children ask more questions in settings that lower the cost of asking them. It also points to the malleable nature of question asking. Relative to less conducive environments, time spent in a conversational environment that encourages question-asking leads children to ask more questions at home and at school (Tizard & Hughes, 1984). Furthermore, research with older elementary school students and college-aged students has shown that students can quickly be taught how to ask higher level questions (e.g., "what is the difference between ... and ...?") rather than factual questions during small group discussion and independent study and that this leads to improvements in learning and reading comprehension (King, 1990, 1992; Rosenshine, Meister, & Chapman, 1996). These sets of data point to the malleability of question-asking and raise four important questions about potential developmental mechanisms.

First, how do temperamental variables interact with conversational environments to shape the development of question asking in childhood? To our knowledge, there has been no research on the role of temperament in question-asking. The only research related to this topic is the work of Jirout and Klahr (2012) who have developed a measure of young children's curiosity, that is, their propensity to seek out information in response to uncertainty. This measure of curiosity was positively correlated with preschool and first-grade students' tendencies to ask more questions on a question-generation task (Jirout, 2011). This measure could be used to assess whether more curious children increase their question-asking more than children who are less curious in supportive conversational environments. It would help answer an important question: are certain children more sensitive to the costs and benefits of asking questions and thus differentially sensitive to conversational contexts? Differential sensitivity to conversational contexts may lead to differences in opportunities to ask questions and to obtain feedback on one's questions - input that may support the development of question asking in childhood.

Second, do individual differences in conversational environments influence the *number* of questions children ask, the *quality* of these questions, or both? Thus far, conversational environments at home and at school have been shown to predict the *frequency* with which children seek out information through questions. There is no evidence linking conversational environments with the *quality* of children's questions, for example, their abilities to generate precise questions and efficient non-redundant searches in "20 questions" paradigm or their ability to ask unambiguous questions in naturalistic settings (e.g., Kelemen et al., 2005). There are two ways in

which conversational environments may play an important role in helping children develop the ability to deploy information seeking questions more effectively. First, rich conversational environments may over time improve the quality of children's questions by increasing their knowledge about a range of topics concerning properties of a good question. Indeed, parents vary in the extent to which they talk to their children about what constitutes appropriate evidence for a claim (Luce, Callanan, & Smilovic, 2013). Such conversations may play an important role in the development of children's question-asking abilities by teaching them to think critically about the information they should seek and by providing them with domain-specific knowledge. Second, reviews of educational interventions aimed at increasing children's question asking during reading find that such interventions lead to robust gains in children's reading comprehension (King, 1990, 1992; Rosenshine et al., 1996). Thus, children who are trained to ask more questions or who are raised in environments that lead them to ask more questions may internalize question-asking as a comprehension monitoring strategy. By improving their skills to reflect on their own knowledge, this, in turn, may improve their ability to efficiently use questions to seek information. Of course, these two hypotheses are not mutually exclusive.

A third important question raised by individual differences in question asking focuses on the emergence of question asking in relation to other exploratory behaviors in different cultural contexts. Questions are only one of many strategies that children can use to seek information. Indeed, the fact that children's socio-cultural environments shape children's use of explicit questions as an information seeking strategy is a reminder that culture is a "repertoire of practice" and that the primacy of a strategy in that repertoire is culturally dependent and culturally adaptive (Gutiérrez & Rogoff, 2003). Children have multiple strategies available to them to gain information including observation, overhearing, exploration, and reading. Thus, an important step for future research is to examine how children's search for information through questions is related to other information seeking strategies – mainly, first-hand exploration. Do these two forms of exploration develop independently of one another or do developments in first-hand exploration shape the development of question asking? Does children's curiosity about a domain similarly influence question asking and exploration? How do children decide which strategy to use and when do they decide to try another strategy if the one they have selected does not work? Answering these questions requires designing new experimental paradigms where children can use multiple information seeking strategies to obtain the information they need to complete a task. By providing multiple ways for children to obtain information, future research can better investigate the effect of culture on question-asking by charting the proportion of children across culture and age that rely on different information seeking strategies across different contexts.

Finally, while there is quite a bit of research on isolated question-asking by individuals, there is more need to focus on social interactions and how particular kinds of extended conversational question-and-answer exchanges might foster children's knowledge acquisition (e.g., "passages of intellectual search", Tizard & Hughes, 1984). Indeed, work by King (1990) suggests that scaffolding question-answer exchanges between students by providing them with question-stems that generate richer explanations catalyzes child learning.

In closing, humans rely heavily on the accumulated knowledge of their community. The ability to learn from other people makes it possible to learn information quickly and to learn about ideas and entities we would have difficulty discovering on our own. Children possess multiple strategies for acquiring such information from other people. However, the ability to question others stands out as particularly effective. Extended bouts of discourse with a cooperative partner following a query allow children to address two challenges of question-asking that they struggle to meet: identifying what information to ask for and phrasing their request for information in such a way that their interlocutor understands the kind of information they want. Moreover, extended bouts of discourse play to children's strength. They harness children's ability to spot non-explanations and to follow-up appropriately. Thus, questions are a particularly effective strategy for seeking information because they jumpstart a back and forth that is likely to significantly stimulate the social construction of knowledge. We hope that the questions that we have raised in this review will perform a similar function for researchers interested in the nature and development of knowledge acquisition processes.

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