An Investigation of the Epistemic and Social Credibility Cues Guiding Children's Selective Social Learning

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Thesis submitted to the University of Ottawa
in partial fulfillment of the requirements for the
Ph.D. in Clinical Psychology

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Abstract

As inherently social beings, children's acquisition of knowledge often stems from the testimony of others. However, not all sources of information are equally reliable. *Selective learning* refers to an individual's propensity to rely on one source of information over another. The overarching goal of this dissertation is to shed light on the ways in which children interpret credibility cues that guide their selective learning patterns. As such, Study 1 explored how children interpret informant confidence cues. Study 2, which was run concurrently with Study 1, analyzed children's interpretation of informant credibility when cues of accuracy and confidence were conflicting. Finally, Study 3 investigated the cue of explicit informant disagreement and its effect on children's selective learning patterns and informant attributions. Findings from Study 1 (n = 84) suggest that school-aged children, but not preschoolers, expect confident informants to be knowledgeable. Furthermore, Study 2 (n = 87) results show that when accuracy conflicts with confidence, accuracy drives 3- to 8-year-old children's knowledge attributions. Findings from Study 3 (n = 111) suggest that 5- to 8-year-old children do not base their learning decisions on the cue of disagreement despite attributing significantly more confidence and less benevolence to a discordant informant. In all, these studies shed light on the developmental course of children's selective learning, a skill that is indispensable in a world wherein children must carefully evaluate the reliability of others' testimony.

Keywords: selective learning, credibility cues, confidence, accuracy, disagreement

Content of Dissertation and Contributions of Authors

This dissertation was written in a multiple-article format and includes two articles (three studies). The first article, which comprises Study 1 and Study 2, entitled "Children presume confident informants will be accurate (until proven otherwise)" has been submitted for publication in the peer-reviewed journal *Infant and Child Development*[1]. I (Sophie Fobert) am the first author of this manuscript, with co-authors Ms. Rose Varin, Ms. Isabelle Cossette, Ms. Kaitline Fournier, and Dr. Patricia-Brosseau-Liard (thesis supervisor). Elements of this work have been presented at peer-reviewed conferences, including Development (2022, Calgary), Canadian Psychological Association (2022, Calgary), Society for Research in Child Development (2021, virtual), Canadian Psychological Association (2021, virtual), and the Cognitive Development Society (2019, Louisville). Study 3, entitled "Objection! The Effect of Informant Disagreement on Children's Selective Trust" will soon be submitted for publication. When it is submitted, I will be the first author, and Dr. Brosseau-Liard will be listed as a co-author. Elements of this work have also been presented/accepted at peer-reviewed conferences: Jean Piaget Society (Toronto, 2024), Society for Research in Child Development (Salt Lake City, 2023) and Canadian Psychological Association (Calgary, 2022). For all three studies, my contributions included the theoretical formulation of paradigms, formulating ethics proposals (when applicable), literature reviews, collecting data, analyzing data, as well as preparing and revising manuscripts. Throughout this dissertation, "I" refers to the author of this dissertation (Sophie Fobert) and "we" refers to the research team involved in that project, which includes co-authors.

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[1] *Infant and Child Development* has a word limit of 750 for the introduction and discussion sections. Please see *Chapter 1: General Introduction* and *Chapter 4: General Discussion,* for more comprehensive information regarding these topics.

Acknowledgements

This dissertation has been made possible by the invaluable contributions of many. I first want to thank my thesis supervisor, Dr. Patricia Brosseau-Liard, for recognizing my potential as an undergraduate student and for continuing to guide my professional development over the last seven years. I am also grateful to the members of the sixth-floor developmental psychology laboratories, who brought playfulness and friendship to the working environment.

Thank you to Isabelle Cossette, Emma Pellegrini, Kaitline Fournier, Rose Varin, Sara-Emilie McIntee, Madison MacLachlan, Éveline Bruck, Katherine Weir, Olivia Rodgers, Laila Kokenberg-Gallant, Thilini Nadeesha Herath, Liza Ilin, Fiona Ing, and Mackenzie Wong for their assistance in creating materials, collecting and/or analyzing data for this dissertation. I would also like to thank my thesis committee members, Dr. Cristina Atance, Dr. Stuart Hammond, Dr. Jean-François Bureau, and Dr. Angela Evans, for their contributions and improvements to this work. I extend my gratitude to the University of Ottawa, the Social Sciences and Humanities Research Council, the Vanier Scholarship, and the Government of Ontario for their financial support during my graduate studies. I am also grateful to the children and families who participated in these studies—this work would not have been possible without their incredible minds and dedication to research.

To my family, I am grateful to be deeply known and loved by you. Thank you for being there, no matter what. To my dear friends, thank you for filling this long journey with laughs, adventures, and support. I would like to dedicate this dissertation to my partner, Felix Hufnagel.

Table of Contents

Table of Figures & Tables

Chapter 1

General Introduction

Picture this: you are driving through an unfamiliar part of town when your engine light flashes on. You are extremely low on fuel. At a stoplight, you see a couple on the sidewalk and decide to ask for help with directions to the nearest gas station. One of them tells you to head north, and the other guides you south. What do you do? Your decision to drive one way or another depends on a multitude of factors, including your biases and preferences, credibility cues demonstrated by the pedestrians, as well as the physical and social environment at the traffic light.

Learning from others, or social learning, is a relatively new field of study compared to other scientific domains, such as physics and biology, which date back centuries. Remarkably, the socio-cognitive development of children, including their learning patterns, has only been empirically studied for about a century. Despite significant strides in advancing social learning theory, the intricacies of children's social minds remain a captivating frontier, with much left to uncover.

Early Learning Theories

Early traces of social learning theories of development can be found in John Locke's (1632-1704) writings from the 17th century. He proposed a strong environmentalist perspective, stating that a child's environment shapes them completely, without the influence of innate capacities (Locke, 1692). He may best be known for his theory, *tabula rasa*, which equated all infants to blank slates, which implied that infants begin their lives without innate qualities and that their behaviours and traits are shaped by their social surroundings and experiences (Petryszak, 1981). Though opposing nativist theories of development along with evolutionary theories remained popular for most of the 18th and 19th centuries, Locke's emphasis on nurture

over nature had much influence on the rise of behaviourism in the early 1900s (Woody & Viney, 2017).

Another notable figure in the field is John B. Watson (1878-1958), who was the first of his time to adopt Locke's environmentalist view. Watson asserted that observable behaviour could be studied and understood through empirical methods. He coined the theory of *behaviourism*, proposing that human development results primarily from conditioning and learning processes, and de-emphasized the study of internal experiences (Schneider & Morris, 1987). Ivan Pavlov's (1849-1936) famous classical conditioning experiments were at the center of Watson's theory, demonstrating that neutral stimuli can become associated with simple reflexes through repeated pairings, ultimately resulting in conditioned responses (Clark, 2004). B.F. Skinner (1904-1990) accepted Pavlovian conditioning principles, also known as classical conditioning, but did not believe that they accounted for the entirety and complexity of human behaviour. He proposed that the involuntary behavioural responses that are controlled by specific eliciting stimuli, such as Pavlov's dogs' salivation in response to a conditioned bell sound, are simply respondent behaviours. In contrast, Skinner stated that operant behaviours are voluntary, account for a greater number of human behaviours, and, most importantly, are controlled by their consequences (Iversen, 1992). Specifically, he argued that human behaviour is likely to increase when rewarded and decrease when punished. This idea is commonly referred to as operant conditioning. Both classical conditioning and operant conditioning principles are still widely accepted and commonly used in evidence-based parenting practices (e.g., De Graaf et al., 2008), educational settings (e.g., Rafi et al., 2020), and even in non-human animal training (e.g., Schapiro, 2017).

Canadian-born behavioural psychologist Albert Bandura (1925-2021) built on the early classical and operant learning theories by adding the concept of observational learning. Essentially, he argued that humans can learn and change their own behaviour by observing the consequences of others' actions. In Bandura's well-known Bobo doll experiment (Bandura, 1965), children observed a model behave aggressively towards a doll. One group of children witnessed the model then get rewarded for the aggressive behaviour (i.e., vicarious reinforcement), whereas the other group of children witnessed the model receive punishment for their actions (i.e., vicarious punishment). The children in the first group imitated the model's aggressive behaviours when given the opportunity to play with the doll, whereas the second group did not. These pioneering results showed that through the observation of others, children often imitate rewarded behaviour and inhibit punished behaviour.

A key element of Bandura's social learning theory is the *acquisition-performance distinction*. Bandura argued that learning a behaviour (acquisition) and demonstrating that behaviour (performance) are different separate processes. He first demonstrated this in his Bobo doll experiment: A critical result from the study was that children in both groups were capable of reproducing aggressive behaviours when later offered rewards for doing so. Importantly, all children learned the behaviour, even though some children chose not to engage in it based on their vicarious punishment (Bandura, 1965). In other words, just because the children learned the behaviour through observation (acquisition) did not necessarily mean they would reproduce the behaviour (performance). Bandura proposed a model of social learning that followed an interactionist perspective—including an individual's cognitive abilities, physical characteristics, personal motivation, motor responses, language, social interactions, physical surroundings, and other social influences. Bandura described this interaction of the individual, environment, and

behaviour as *reciprocal determinism* (Bandura, 1977). The integration of cognitive, social, and behavioural components into learning has elevated social learning theory to a primary focus in the current field of developmental research.

Selective Social Learning

Bandura was among the first to systematically study this form of learning in young children, and his findings lent empirical support to the idea that children engage in social learning through observation. In other words, as inherently social beings, children's acquisition of knowledge often stems from the testimony of others. This process highlights the importance of understanding the dynamics of social influence on children's learning and decision-making. Unfortunately, not all sources of information are equally reliable. Therefore, children must be cautious when deciding who to trust. Fortunately, recent research on children's socio-cognitive development has shown that children demonstrate *selective social learning*, or the preference to learn from certain informants over others (Harris et al., 2018; Koenig & Sabbagh, 2013; Nurmsoo et al., 2010). Without this discernment of credible sources, children might accept all claims as fact and use this false information to navigate the world. The capacity to selectively learn is, therefore, crucial in the cognitive, social, and emotional development of children (Koenig et al., 2004).

Though selective learning is a mechanism that improves with age, nascent selective learning skills are present in infancy. For instance, Sternberg (2013) found that children as young as 12 months seek information based on informant expertise. In their series of studies, infants played with a new toy more if it was presented by an expert (i.e., an individual who had previously interacted competently with other toys) versus a non-expert. Selective learning also improves with age as children acquire more refined methods of considering testimony. For

example, older preschool-aged children reason about informant intention when considering the reliability of their claims, whereas younger children do not (Shafto et al., 2012).

Credibility Cues

When deciding from whom to learn, many factors come into consideration. These factors, known as credibility cues, guide a child's selective learning by indicating whether (or not) an informant's claim is trustworthy. For the purpose of this dissertation, credibility cues are defined as signals or indicators that individuals use to assess the trustworthiness of an information source. In the context of selective social learning, where individuals filter information from social sources, credibility cues play a crucial role in determining whose information to trust and adopt.

In general, individuals are more likely to adopt information from sources that exhibit these cues, as they signal reliability. However, the importance and interpretation of credibility cues can vary across developmental stages, individuals, and social contexts. Credibility cues are often sorted into two groups: *epistemic* and *non-epistemic* (e.g., Markson & Luo, 2020). Epistemic cues are those that directly relate to the knowledge or expertise of the source and are indicative of the reliability or accuracy of the information being provided. These cues help individuals evaluate the epistemic quality of the information. Non-epistemic cues, on the other hand, are factors that may influence credibility but are not directly related to the accuracy of the information itself. Instead, these cues may relate to social or emotional aspects of the learning situation. There is some debate in the literature pertaining to which credibility cues are considered epistemic, or indicators of an individual's knowledge. As such, a review of the research on epistemic versus non-epistemic cues is provided below.

Epistemic Credibility Cues

Epistemic, or knowledge, cues provide information about how much knowledge or what kind of knowledge an informant possesses. Epistemic cues can be interpreted as indicating either *situational* or *individual* knowledge (Miller, 2000). Indicators of situational knowledge provide information about someone's level of knowledge in a particular situation. An example of this would be a speaker's perceptual access to information (i.e., looking inside a box yields knowledge about its contents). Given the fluctuating nature of situational knowledge, these cues are not used to forecast informant knowledge across contexts. In other words, if someone has looked inside a box, one would grant them knowledge about the contents of that specific box but make no inference about their knowledge of the contents of other boxes or of any other fact. By the age of 3, children have some rudimentary understanding that a person's knowledge is based on their perceptual access to the information, and by the age of five, this understanding seems to be consolidated (Pillow & Weed, 1997). For example, preschoolers tend to view someone who has perceptual access to printed information as trustworthy. However, they stop trusting that person if their access to printed materials is taken away (Eyden et al., 2013).

On the other hand, indicators of *individual* knowledge suggest the stable personal trait of being "knowledgeable," which extends across situations. For example, when all other cues are controlled, 4-year-olds prefer to learn information from an adult versus a child informant (Jaswal & Neely, 2006). Here, children inferred that an adult was knowledgeable about object labels by virtue of being an adult, a trait that extends across learning situations. Another example of individual knowledge cues pertains to children's interpretations of experts—children tend to generalize that an expert in one domain is also knowledgeable in other domains (Lutz & Keil, 2002). Additionally, when 3- and 4-year-olds observe informants who accurately label objects,

they tend to generalize the informants' word knowledge to competency in other areas, such as knowledge of the functions of objects (Koenig & Harris, 2005). These examples demonstrate how children often attribute the general trait of knowledge to an informant across situations and domains. Hermes and colleagues (2015) explained this phenomenon by suggesting that children may use the process of *trait ascription* (i.e., the ability to detect and use an informant's behaviour to attribute a trait to that person) to guide their selective trust. In this way, the trait-centered informant inference becomes useful in making predictions about the informant's future behaviour.

Non-epistemic Credibility Cues

Children and adults also use non-epistemic cues to guide their selective learning. These cues do not directly indicate how much knowledge an informant has; however, they inform on how trustworthy an informant is overall. Certain social and emotional cues that do not inform about the knowledge of an informant still affect how much a child trusts them and endorses their knowledge statements. For example, children generally prefer to learn from familiar, compared to unfamiliar sources of information. For instance, Corriveau and colleagues (2009b) found that 4- and 5-year-old children prefer to learn from their mothers compared to a stranger.

Furthermore, Corriveau and Harris (2009) found that preschool-aged children preferred to ask for information about the names and functions of novel objects from a familiar preschool teacher rather than an unfamiliar one. Additionally, when the two teachers disagreed, children endorsed the statements provided by the familiar over the unfamiliar teacher. Learning preferences based on the credibility cue of informant familiarity also hold when children consider fictional characters: 4-year-olds tend to endorse statements made by familiar characters

(e.g. Dora the Explorer and Bob the Builder), compared to statements made by perceptually similar but unfamiliar characters (Danovitch & Mills, 2014).

Much like children's preference to learn from familiar informants, in-group status is another non-epistemic cue that greatly influences children's selective trust. In general, children prefer to learn selectively from others belonging to their in-group (Qian et al., 2016). For example, Chen et al. (2018) found that by age four, children preferred to learn from and socialize with informants belonging to their same racial group. Furthermore, preschoolers use speaking accents when determining the reliability of an informant's claims. Specifically, Kinzler and colleagues (2011) found that English children preferred to learn object functions from native-accented (English) rather than foreign-accented (Spanish) speakers. Corriveau and colleagues (2013) replicated these findings and demonstrated that 3-, 4-, and 5-year-olds preferred to learn object labels from a native-, versus a foreign-accented speaker.

Children also use informants' physical characteristics as a basis for their selective learning. In fact, children endorse information provided by attractive informants more than less attractive informants—a trait that has nothing to do with the informants' competency. For instance, Bascandziev and Harris (2014) found that when given a choice between two informants, preschoolers chose to ask questions and endorsed object labels provided by the informant with the more attractive face. These findings were later replicated by Bascandziev and Harris (2016), who additionally found that even when children were shown that the two informants were equally accurate, children still preferred to learn from the more attractive of the two. Interestingly, attractiveness remains a cue used for learning into adulthood. Todorov and colleagues (2009) found that adults tend to judge attractive faces as more trustworthy even when the faces are presented rapidly enough to be considered below the threshold of objective

awareness, demonstrating that this bias is automatic. Other physical characteristics also affect children's selective learning: children prefer to learn from a physically stronger puppet (Fusaro et al., 2011) and show less trust in physically disabled or obese informants (Jaffer & Ma, 2015). In all, it is evident that children rely on a host of non-epistemic cues when selectively learning from others.

The overarching goal of the present dissertation is to shed light on the ways in which children interpret credibility cues that guide their selective learning patterns. In Studies 1 and 2, the credibility cues of accuracy and confidence were explored. Specifically, in Study 1, we investigated whether confidence is interpreted as an epistemic cue or not. In Study 2, we conflicted confidence cues with those of accuracy, which is considered by many to be an epistemic cue. In Study 3, children's learning based on explicit disagreement, as well as their interpretations regarding informant confidence, benevolence, and accuracy, were investigated. As such, an overview of the current literature on these credibility cues is provided below.

Accuracy Cues

Koenig and colleagues (2004) proposed a pioneering paradigm to first test preschoolers' selective social learning. They focused on the credibility cue of informant accuracy in the learning domain of object labelling. Their methods included two informants who provided claims independently from one another. Specifically, two informants first named familiar objects. One informant consistently labelled the objects correctly, and the other consistently provided inaccurate labels (e.g., calling a ball a "shoe"). In the test trials that followed, children viewed the same two informants name unfamiliar objects for which no formal object labels exist. Here, the informants provided contradictory non-sense labels (e.g., "That's a mido." and "That's a toma.") and then the child was asked to endorse one of them (e.g., "Can you tell me what this is

called, a mido or a toma?"). They found that 3- and 4-year-old children endorsed the labels provided by the previously accurate informant over the inaccurate one when learning new object labels.

Since Koenig and colleagues' (2004) landmark study, many other studies have found that children prefer to learn from previously accurate over inaccurate informants (e.g., Harris et al., 2018; Henderson et al., 2015; Hermes et al., 2018). These findings have been extended to children as young as 24 months using the classic paradigm (Koenig & Woodward, 2010) and 18-month-olds using a slightly different paradigm (Brooker & Poulin-Dubois, 2013). Others have also built on this classic study by demonstrating similar selective learning trends with slightly different paradigms. For example, Li and Yow (2018) adapted the two-informant method to use a single informant between-subjects research design. Additionally, Fitneva and Dunfield (2010) found that seven-year-olds and adults selectively learned based on accuracy after only one familiarization trial. More recently, Luchkina and colleagues (2020) demonstrated that following the acquisition of a new object label from a speaker, preschoolers persisted in evaluating the speaker's accuracy and adjusted their previously acquired object labels if the source revealed themself as inaccurate. Across many different paradigms and methods, researchers have concluded that children prefer to learn information from competent, over incompetent speakers. Koenig and colleagues' (2004) original paradigm using object labelling has also been adapted to other learning domains. Birch and colleagues (2008) found similar selective learning trends when informants demonstrated knowledge of object functions instead of object labels, demonstrating that children's reliance on prior accuracy remains across knowledge domains.

Confidence Cues

Previous studies have also demonstrated that confidence cues play a significant part in guiding children's selective learning decisions (Birch et al., 2010). In other words, children prefer to learn from previously confident, compared to hesitant, informants. Notably, the terms *confidence* and *certainty* are used interchangeably in the literature. The preference for a confident informant emerges early in childhood, with findings demonstrating that two-year-olds imitate the actions of certain, over uncertain, informants who display non-verbal confidence cues (e.g., Brosseau-Liard & Poulin-Dubois, 2014). Additionally, by the age of three, children rely on confident, compared to hesitant, informants in the context of making an unexpected claim (Jaswal & Malone, 2007). Moreover, young children are sensitive to both verbal and non-verbal indicators of confidence. In fact, preschoolers pay attention to lexical cues (e.g., saying "I think" versus "I know"), paralinguistic cues (e.g., intonation), and gestural cues (e.g., raised index finger versus shoulder shrugging) of certainty (Prieto Vives et al., 2016) and hesitancy (Hübscher et al., 2017). Recent experiments by Juteau and colleagues (2024, submitted) found that older children (7-to-10-year-olds) attributed more knowledge-related traits to confident, over hesitant, informants (Experiment 2) whereas adults attributed both knowledge and prosocial traits to the confident informant (Experiment 1). These findings suggest that school-age children attribute knowledge to a previously confident informant, and with age, this interpretation becomes more generalized and begins to include other positive traits.

Children's preference to rely on a confident over hesitant informant is clear by the preschool years and remains into adulthood (Juteau et al., 2019; Tenney et al., 2011). This reliance on confidence cues across the lifespan makes sense given that confidence is typically a good indicator of informant knowledge (Alba & Hutchinson, 2000). However, this is not always

the case—some individuals are overconfident, and their displayed confidence does not in fact match their competence (Mannes & Moore, 2013). Studies have highlighted the importance of speaker calibration (i.e., correlation between accuracy and confidence) in selective learning (Tenney et al., 2008). Recent findings demonstrate that children display reduced trust in a partially informed confident speaker (Huh et al., 2019), prefer a well-calibrated confident speaker by age 4 (Birch et al., 2020), and that when conflicting, accuracy cues are more salient than those of confidence (Brosseau-Liard et al., 2014).

On top of the previously mentioned body of literature on children's selective learning based on cues of confidence, it can also be helpful to analyze adult social cognitive patterns to better understand the end point of children's selective learning development. In fact, adults are more likely to believe the testimony of a confident informant (Penrod & Cutler, 1995), and tend to infer competence and vote for more confident political contenders (Ballew & Todorov, 2007; Todorov et al., 2005). Around the same time as the first selective learning studies were published, Price and Stone (2004) coined the term *confidence heuristic*, referring to an individual's perception that a more confident advisor will be more knowledgeable and make more categorically correct judgments. Sometimes this heuristic can be helpful, as confidence cues can be true indicators of knowledge. Recently, Pulford and colleagues (2018) demonstrated that individuals with more knowledge tend to be more confident and more persuasive than their partners with less competence across computer-mediated as well as face-to-face communication. Even overconfidence seems to have its benefits: Anderson and colleagues (2012) found that in adults, overconfidence leads to higher social status, suggesting a positive and social interpretation. Furthermore, van Swol and Sniezek (2005) found that judges' utilization of expert advice relied heavily on the advisor's level of displayed confidence. A great deal of research has

also been done supporting the previously mentioned calibration hypothesis, both in child and adult social cognition studies (Tenney et al., 2008). When conflicting, accuracy seems to be a more salient cue than confidence in terms of informant credibility. However, in the absence of informant accuracy, the confidence heuristic tends to prevail (e.g., Sah et al., 2013). Additionally, Bergstra and colleagues (2018) recently demonstrated that 4- to 6-year-olds preferred to learn from certain over uncertain speakers, even when the certain speakers were mean. In all, confidence is a powerful selective learning cue for children, and continues to hold its weight as children develop into adulthood.

Social Dominance Cues

Moreover, researchers have empirically studied how social dominance is used as a heuristic to determine informant competence. Recent findings suggest that prestige and dominance are important factors in elected leader status (Garfield & Hagen, 2020; Maner & Case, 2016), as well as maintaining social rank over time (McClanahan et al., 2022). However, reliance on social dominance cues is not unique to adult populations. Incredibly, preverbal infants recognize social dominance hierarchies and can distinguish leaders from authoritarian bullies (Margoni et al., 2018; Mascaro & Csibra, 2012; Thomsen, 2020). However, what young children do with this information is contested in the literature. Some suggest that preschool and school-aged children prefer to learn from informants displaying social dominance. In fact, Bernard and colleagues (2016) found that Western preschoolers tend to selectively endorse testimony made by informants who had previously demonstrated social dominance over submission. These findings held when agents demonstrated physical dominance (Experiment 1) and when an agent repeatedly imposed their goals (decisional power; Experiment 2). Additionally, Castelain and colleagues (Castelain et al., 2016) extended these findings to 4- to 6-

year-olds from a traditional Maya population, and Charafeddine and colleagues (2019) replicated these results with preschoolers in France. Conversely, these findings were not replicated in a Norwegian sample (Fonn et al., 2022) nor a Japanese sample (Charafeddine et al., 2019), where egalitarian and subordinate cultural values, respectively, prevail. Recently, Margoni and colleagues (2023) tested 1.5 to 10-year-olds' selective learning based on fear-based dominance (demonstrations of physical aggression) compared to respect-based leadership (demonstrations of respect), using an object labelling task. They found that toddlers preferentially learned from a bully character and that by the age of 3, children demonstrate a tendency to learn from a leader character. Additionally, they found that the tendency to rely on respect-based leadership fully develops around the end of the preschool years and continues to strengthen into school age.

Benevolence Cues

Arguably, a first step towards selectively trusting informants with good intentions would be to categorize benevolent and malevolent agents and employ a preference for the former. As such, early in our lives, we begin to develop cognitive mechanisms that help us refine the process of decoding informant intentions. In fact, infants have been shown to prefer prosocial, compared to antisocial agents (Hamlin et al., 2007; Hamlin & Wynn, 2011; Holvoet et al., 2016; Margoni & Surian, 2018; Scola et al., 2015). This propensity for trust in benevolent agents could, therefore, be considered a rudimentary form of selective learning based on social credibility cues.

In the development of vigilance towards deception, preschool-aged children have demonstrated the ability to make epistemic inferences based on an agent's prosocial behaviours (e.g., Landrum et al., 2016). In fact, children rely on an informant's past social credibility cues to determine the reliability of a novel statement. One of the first paradigms to test this was designed by Mascaro and Sperber (2009a). They designed a Testimony Task wherein two informants had

perceptual access to the contents of a box, which were outside of the participants' view. Here, one agent acted in an antisocial manner by hurting the experimenter, whereas the other informant gently stroked the experimenter. Next, the informants both provided contradictory claims about the contents of the box and the children were asked what they thought was inside the box. Findings revealed that 3-year-old children endorsed the statement provided by the prosocial agent significantly more than the antisocial agent.

Lane and colleagues (2013) built on this study by examining how both adults and children selectively learn from informants with contrasting traits. Specifically, they presented participants with three pairs of stories about characters who were 1) honest–dishonest, 2) nice–mean, and 3) smart–not smart. They found that both 3- to 6-year-old children and adults preferred to learn from the characters who were honest, nice, and smart. This selective trust was present for asking tasks (i.e., when the participant chose who to seek information from) and for endorsing tasks (i.e., when the participant endorsed a statement made by one of the informants). Notably, the younger children (3- and 4-year-olds) even demonstrated selective trust in the informants with positive traits even if they lacked the relevant information. Evidently, like confidence cues, the propensity to seek out and learn from prosocial agents is present in young children and continues to endure throughout their lifespan.

Not only have children been shown to endorse and seek information from benevolent speakers (Landrum et al., 2013; Lane et al., 2013; Mascaro & Sperber, 2009), but by the end of the preschool years, children are also attuned to informant intention and avoid selectively learning from deceitful informants (Shafto et al., 2012). In fact, Vanderbilt and colleagues (2011) found that 5-year-olds, but not 3-year-olds, systematically preferred advice from informants who provided correct advice, compared to "trickers" who provided incorrect advice with positive

affect. The role of children's theory of mind, or the capacity to reason about others' mental states (Carlson et al., 2013), in selective learning is not very well understood. Some authors have found positive associations between children's theory of mind and selective learning skills (Brosseau-Liard et al., 2015; Crivello et al., 2018; Palmquist & Fierro, 2018), whereas others have found weak associations better explained by age (Brosseau-Liard et al., 2018) or no association at all (Cossette et al., 2020).

To summarize our current understanding of the influence of credibility cues on preschoolers' selective learning tendencies, Tong and colleagues (2020) conducted three meta-analyses. In their analyses, social characteristics were defined as "a characteristic that reflected the informant's social standing or personality" (Tong et al., 2020), such as informant familiarity or benevolence. Their results revealed that 3- to 6-year-old children were more likely to ask informants and endorse information provided by informants with positive social characteristics. Evidently, children consider an informant's social behaviour when selectively learning.

Explicit Interpersonal Disagreement

In the extensive body of research focused on the selective social learning of young children, there exists a notable gap concerning the impact of informant dialogue and interpersonal disagreement. Surprisingly, no studies have been conducted thus far to explore how children selectively acquire knowledge from informants who openly express conflicting views. This limitation has persisted since the beginning of selective learning studies, notably in the original paradigm introduced by Koenig and colleagues (2004). This poses a significant concern in terms of external validity because, in real-world situations, informants rarely present claims in isolation from each other. As inherently social beings, humans use language to express semantic information to one another. Moreover, our social practices, norms, individual motivations, and

desires impact the delivery of the claim. When making decisions or learning something new, we consider not only the content of an informant's claims but also the way in which the information was delivered.

Let us return to the hypothetical situation of running low on fuel in an unfamiliar part of town. In that example, two informants provided conflicting directions to the nearest gas station. Based on the previous literature, it is possible to determine some of the important cues that an individual would rely on when deciding to head north or south. As discussed, the speaker's characteristics such as their level of confidence (Birch et al., 2010; Brosseau-Liard & Poulin-Dubois, 2014), their attractiveness (Bascandziev & Harris, 2016), or their speaking accent (e.g., Corriveau et al., 2013) might come into play. What is less clear, however, is what would happen if one informant explicitly disagreed with the other while making their claims, and whether the way the disagreement was expressed would influence the credibility of the speaker. Using the previous example, try to imagine these two scenarios:

Scenario 1 . *Speaker 1: "I believe it's just North of here.", Speaker 2, in response: "Actually, I think it's South of here."*

Scenario 2. *Speaker 1: "I believe it's just North of here.", Speaker 2, in response: "Are you serious? Everyone knows it's South of here."*

In both situations, the informants disagree, yet the tone of the disagreement differs.

Disagreements between people are not necessarily good or bad, right or wrong (Laursen & Hafen, 2010). Some studies have investigated children's interpretation of disagreement in social contexts wherein the participant themselves disagrees with another. Children's tolerance of interpersonal disagreement depends largely on the topic of disagreement at hand (Verkuyten & Killen, 2021). In fact, many authors have proposed a domain-specific model for the tolerance of

divergent claims (Verkuyten & Slooter, 2007). For example, in a study conducted by Wainryb and colleagues (2004), children aged 5-, 7-, and 9- years demonstrated tolerance of differing viewpoints in areas of factual information, ambiguous facts, and taste when interviewed about peers with beliefs different from their own. However, this tolerance did not extend to individuals with divergent moral beliefs. In simpler terms, school-aged children were open to disagreement as long as it did not involve moral differences. Recent research by Danniels and Perlman (2021) mirrored this pattern in even younger children. Specifically, 4- and 5-year-olds displayed greater tolerance towards peers with varying preferences and beliefs, compared to those who disagreed with them on moral grounds. Comparable trends have surfaced in children's acceptance of external behaviours that contrast social norms. For instance, Echols and Finkbiner (2013) found that the tolerance of 4- to 6-year-olds towards unconventional social behaviours hinged on whether these actions were deemed moral or not by the participant. Notably, children were significantly more accepting of individuals violating conventional norms, such as exclusively wearing yellow clothing, compared to those transgressing moral norms (e.g., throwing rocks at children). In all, these findings indicate that young children frequently exhibit tolerance towards non-moral disagreements with another.

However, much of the previously cited literature regarding disagreement involves the participant in disagreement with a third party. Even when disagreement between two or more third-party informants is studied, this is often conducted in a way where the two informants do not enter into dialogue when making their claims. For example, a very recent study conducted by Yang and colleagues (2023) demonstrated that children appraise disagreement differently as they age. Specifically, they noted that as children age, they conceptualize that two informants who disagree may both be correct, demonstrating a more complex understanding of disagreement.

However, in their procedure, the way that the informants disagreed with one another was not ecologically valid. An examiner showed the participants photographs of child informants, one at a time, and stated the claims made by the informants: "This boy in [colour of boy's shirt] told me that the ball will sink" (Yang et al., 2023). The existing body of literature lacks exploration of social settings wherein a child witnesses two other informants in dialogue who disagree—a very common occurrence in everyday life and therefore the focal point of Study 3.

That said, we do know that children make epistemic and non-epistemic inferences as well as learning decisions based on an informant's displayed confidence (Birch et al., 2010; Brosseau-Liard & Poulin-Dubois, 2014), benevolence (e.g., Tong et al., 2020), and social dominance (e.g., Margoni et al., 2023). It is plausible that children understand third-party disagreement as a confidence cue, and thus an indicator of knowledge or trustworthiness. On the other hand, children could interpret disagreement as against social or conventional norms, leading to less reliance on a disagreeing informant's claim. In fact, there is some research demonstrating that children believe that they should avoid interpersonal disagreement due to the social repercussions of holding conflicting views. For instance, Enright and Lapsley (1981) proposed that children follow a developmental continuum from a generalized intolerance of disagreement toward a more tolerant stance during adolescence and adulthood. More recently, Komolova and Wainryb (2011) presented 5-, 10-, and 17-year-olds with hypothetical situations involving a protagonist and their friend who demonstrated disagreement in personal preferences. Both the 5- and 10-year-olds indicated that the protagonist should endorse the preference of their friend, over their own personal preference. The authors reason that children in this study prioritized the friendship and thus avoided disagreement, even at the cost of the protagonist's personal preferences. Yoho, Faur, and Laursen (2022) claim that "interpersonal conflict entails overt

disagreement", and it is plausible that children may interpret a speaker's disagreement as antisocial in nature.

Current Research Questions

The specific goals of this dissertation were to empirically test whether young children form measurable expectations of knowledge about individuals demonstrating cues of confidence (Study 1), conflicting confidence and accuracy (Study 2) and disagreement (Study 3), and to further probe which types of confidence, benevolence, and accuracy attributions they make to individuals who demonstrate these cues. Two age groups were targeted in Studies 1 and 2: preschool-age children (ages 3 to 5) who are the subject of the bulk of selective social learning research, as well as young school-age children (ages 6 to 8) to test for developmental differences in the interpretation of these cues. In Study 3, 5- to 8-year-olds were tested based on the findings from Studies 1 and 2, demonstrating that attributions related to knowledge and social cues from informants typically emerge in the school-aged years. Specifically, the following research questions were addressed:

Study 1

a. Do children attribute knowledge to a confident speaker and/or ignorance to a hesitant speaker?
b. Are there developmental differences between preschoolers and school-aged children in their informant attributions based on confidence cues?

Study 2

a. What happens to children's knowledge attributions when there is direct evidence that a hesitant individual is more trustworthy than a confident one?

b. Are there developmental differences between preschoolers and school-aged children in their informant attributions based on conflicting accuracy and confidence cues?

Study 3

a. Do explicit disagreement statements impact children's selective learning patterns? Specifically, do children interpret these as a confidence heuristic or as an antisocial cue?
b. Are children's attributions influenced by the type of informant disagreement presented?
c. Which kinds of informant attributions do children make about individuals who openly express disagreement (and do those differ based on how polite or rude the expression of disagreement is)?

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Chapter 2

Children presume confident informants will be accurate (until proven otherwise)

Abstract

Past research has demonstrated that children prefer to learn from confident rather than hesitant informants. It is frequently assumed that they do so because they believe confidence to predict a person's knowledge and future accuracy; however, this assumption has not previously been tested. The present investigation therefore explored how 3- to 8-year-old children interpret informant confidence. Study 1 (N = 84) aimed to address whether informant confidence is interpreted as an indicator of knowledge. Study 2 (N = 87) explored how children's interpretation changes with conflicting informant credibility cues. Findings demonstrate that school-aged children, but not preschoolers, expect correct statements from confident individuals and incorrect statements from hesitant informants. Additionally, school-aged children attribute word knowledge to a previously confident informant. When accuracy conflicts with confidence, accuracy drives 3- to 8-year-old children's knowledge attributions. This investigation builds on previous research and suggests that, by age 5 or 6, children do make individual epistemic inferences based on informant confidence.

Keywords*:* selective social learning, epistemic cues, confidence, social cognition

Children presume confident informants will be accurate (until proven otherwise)

Literature on *selective social learning*, or the preference to learn from certain informants over others (Harris et al., 2018; Mills, 2013; Nurmsoo et al., 2010), has shown that children can use a variety of cues to decide from whom to learn. One of these cues is informant confidence. Children understand lexical, intonational and gestural indicators of certainty (e.g., someone saying 'I know' with a confident tone and a raised index finger) and uncertainty (e.g., someone saying 'I guess' or 'I think' with a hesitant tone and shrugged shoulders; Hübscher et al., 2017) Children's preference to learn from someone who makes confident claims compared to someone who is hesitant has been confirmed thus far in children as young as 24 months (e.g., Birch et al., 2010; Brosseau-Liard & Poulin-Dubois, 2014). Little is known, however, about how children *interpret* speaker confidence.

A child's selective learning can be influenced by *epistemic cues*, which inform how knowledgeable someone is. For instance, research has shown that children prefer to learn new information from a speaker who was previously accurate, versus inaccurate (Harris et al., 2018). Cues unrelated to knowledge (i.e., *non-epistemic cues*) also play a role in children's selective learning patterns. For example, children prefer to learn from individuals who are more attractive (Bascandziev & Harris, 2016), dressed more formally (McDonald & Ma, 2015) and who are more prosocial (Mascaro & Sperber, 2009).

Some authors either directly posit or implicitly assume that adults and children interpret confidence as an epistemic cue (e.g., Brosseau-Liard et al., 2018; Tenney et al., 2008). Indeed, selective learning literature, especially towards the beginning, frequently assumed that when children preferred to learn from someone, it was necessarily because they considered that person to be the most knowledgeable (e.g. Birch et al., 2010; Brosseau-Liard et al., 2018; Moore et al.,

1989). Yet, some researchers have in fact classified confidence alongside non-epistemic cues (e.g., Sobel & Finiasz, 2020). Confidence could be used in selective learning for reasons other than attributions of speaker knowledge, such as perceived status or dominance, which are cues that children have been shown to use in past selective learning research (e.g., Bernard et al., 2016; Chudek et al., 2012).

Our primary goal in the present research is to test whether children hold knowledge expectations about speakers presenting confidence cues: Do they expect accurate information (e.g., correct labels) to come from a confident person and inaccurate information (e.g., incorrect labels) to come from a hesitant person? When asked outright, do children explicitly attribute more knowledge to a more confident individual? Are their attributions specifically about knowledge or do children make broad positive attributions to a confident speaker and broad negative attributions to a hesitant speaker?

Additionally, what happens when children are presented with evidence that a more confident person may not, in fact, be more knowledgeable than a hesitant one? Confidence is by no means a perfect knowledge cue: In everyday life, it is common to encounter a person who confidently makes an assertion that turns out to be false, or one who hesitantly claims something that turns out accurate. It is also possible for some individuals to be more *calibrated* in projecting confidence only when they are knowledgeable; some people may conversely be consistently over- or under- confident. Do children recognize that an individual's level of confidence may not always correspond to their level of knowledge, and do they revise their attributions accordingly? Previous studies have found that children under the age of 4 struggle to consider the calibration between speaker confidence and accuracy when deciding whom to learn from (e.g., Birch et al., 2020; Tenney et al., 2011). However, children appear to better consider informant calibration

with age. In fact, Brosseau-Liard and colleagues (2014) found a positive relation between children's age (between 4- to 5-years) and their reliance on an accurate informant, when cues of accuracy and confidence conflicted. Again, these findings strictly concern children's learning preferences; what interpretations children make of an individual who is confidently inaccurate or hesitantly accurate has not yet been determined.

The goals of the current investigation therefore were to specifically determine whether children attribute knowledge to a confident speaker and/or ignorance to a hesitant speaker (Study 1) as well as to explore children's attributions when there is direct evidence that a hesitant individual is more accurate than a confident one (Study 2). We targeted two age groups: preschool-age children (ages 3 to 5) who are the subject of the bulk of selective social learning research, and young school-age children (ages 6 to 8) to test for developmental differences.

Study 1

Method

We preregistered both Studies 1 and 2 (which were conducted concurrently and therefore registered as a single study) on the Open Science Framework, which can be accessed at the following link: https://osf.io/q92rw/?view_only=d0785909128e41d9aaf3c0f56e85f875. We note below where we deviate from the preregistration.

Participants

We preregistered a sample of 40 participants per age group, however we recruited a few extra participants to account for eliminations. The final sample therefore consisted of 43 preschoolers (3 to 5 years old; 29 females; *M* age = 52 months, range = 35 to 71 months) and 41 school-age children (6 to 8 years old; 22 females; *M* age = 90 months, range = 73 to 107 months). This sample size was selected in the context of our preregistered analyses to obtain

approximately 80% power to detect an effect size of d=.40 with one-sided one-sample t tests. Participants were recruited from local daycares or from an in-lab participant database and all resided in a large metropolitan area in Canada. Data from 9 additional participants were not included in the analysis due to experimental error (2), failure to answer all questions (4), or because participants or parents expressed that the child knew someone whose name was the same as one of the informants (3). Sixty-eight children participated in English and 16 children in French (the two official languages in the metropolitan area where the study took place). Seventy-three children were tested in person, either in a university laboratory (n = 57) or in their daycare setting (n = 16). Due to the COVID-19 pandemic, 11 children were tested remotely via online video conferencing platforms (primarily GoogleMeet). Further demographic information was collected only for in-lab and virtual (but not daycare) participants (n = 66): most were of medium-to-high socioeconomic status (83.3% of families earning more than $90,000 annual household income), and children were primarily White (80%) or mixed race (16%). This research was approved by the University of Ottawa Research Ethics Board (file #H04-16-10).

Materials and Procedure

In this study, we presented children with a familiarization phase consisting of videos of two informants who differed in their expressed confidence, followed by two experimental tasks. The first task (hereafter the Sorting Task) evaluates whether children expect accurate information from the previously confident individual and inaccurate information (stemming from ignorance) from the previously hesitant one. The second task (hereafter the Attribution Task) additionally assesses whether children make broader explicit attributions of knowledge as well as unrelated skills and attributes based on previously demonstrated confidence cues. As this was part of a larger project with multiple research questions, some children completed additional tasks not

reported in the present article, either before Familiarization or between Familiarization and Sorting (see Results section for more information).

A demographic questionnaire was administered to all parents except those of daycare participants. Parents were asked to answer questions pertaining to household income, parent education, family structure, languages spoken, as well as child's age, ethnicity, and sex at birth. Children interacted briefly with the experimenter as a warm-up before beginning the study.

Familiarization Phase. The children were shown short video clips of two female informants waving to the camera while the experimenter introduced them. Then, children were presented with videos of the informants alternately labelling 5 pictures of familiar objects. The pictures that the informants were labeling were out of the child's view. Thus, the children could not tell whether the labels attributed to pictures were accurate or not. Furthermore, the videos were presented in such a way that it was not clear whether the informants were labelling the same pictures or different ones; therefore, when informants provided different labels, children did not need to assume that only one must be correct. One informant exhibited verbal and non-verbal cues of confidence (e.g., saying, "Oh I know, that's a dress!", with a raised index finger and a satisfied facial expression) while the other informant was hesitant (e.g., saying "Hmm, I guess that's a book", with shrugged shoulders and a puzzled facial expression). The order of the informants was consistent, but the identity of the confident informant was counterbalanced across participants.

Sorting Task. The Sorting Task required 12 cards with photos and object labels printed on them, as well as two envelopes, each with an informant's photo on the topside. Before beginning the task, the experimenter placed the two envelopes on the table in front of the child (or, for online participants, pictured on each side of the screen). The placement of the envelopes

was consistent across participants: Informant 1 was always on the left and Informant 2 was always on the right of the child. Children were then presented with 12 cards, one at a time in a fixed order, each with a picture of an object and a handwritten label beside the picture. The cards were presented in the same order for all participants. Out of the 12 pictures presented, 4 had correct word-object pairings, 4 had incorrect word-object pairings, and 4 had novel word-novel object pairings. For instance, one correct card had a picture of a plane and a hand-written label beside the photo that was written "plane"; in comparison, an incorrect card had a picture of a flower with the object label reading "pen". Novel cards had photos of unfamiliar objects (e.g., an engine part) and nonsense words (e.g., "virup"). The experimenter explained to the child that the informants had previously written the object labels beside the pictures on each of the cards. Upon the presentation of each card, the experimenter read the object label out loud and asked the child to guess which informant had written the object label on the card. To do so, the children tested in person were instructed to place the card in the envelope to which the speaker belonged, whereas online participants were asked to identify the informant they believed had written the label. A score of 1 was allocated each time the child identified the confident informant as the person who wrote the label for the card. It was expected that, if children saw confidence as indicative of knowledge and hesitancy as indicative of ignorance, they should identify the confident informant as the writer of correct labels and the hesitant informant as the writer of incorrect labels. As for novel labels, our preregistered prediction based on pilot data was that they would be seen as a sign of knowledge and therefore attributed to the confident informant; however, it is also possible that, having no information on the accuracy of novel labels, children would believe that both informants were equally likely to be the writer.

Attribution Task. This task modified a manipulation introduced by Brosseau-Liard and Birch (2010). In this task, children were presented with a card divided into quadrants: The top left corner had a picture of Informant 1, the top right corner had a picture of Informant 2, the bottom left quadrant included pictures of both informants and the bottom right quadrant was left blank. The first part included six warm-up questions about the physical appearance or gender of informants (e.g., 'Who has a white shirt?' 'Who is a boy?') to familiarize the children with the response style of the task. After answering each warm-up question, children were provided with positive feedback or were told the correct answer if they were wrong. They were then presented with 18 statements and were asked to choose whom each statement applied to by pointing to one of the quadrants to answer. The statements represented six categories: knowledge of words (e.g., 'Who knows the names for a lot of insects?'), knowledge of facts (e.g., 'Who knows that cats can see at night?'), prosociality (e.g., 'Who always shares her toys?'), skills (e.g., 'Who can swim?') as well as situation-specific knowledge ('Who knows where I bought my shoes?'), and finally neutral attributions (distractors) about preferences or possessions (e.g., 'Who likes potatoes?'). Each category comprised 3 questions, with one item per category negatively worded (e.g., 'Who doesn't like spaghetti?'). Exceptionally, the prosociality category included one positively worded item, one negatively worded question as well as a negative characteristic item ('Who always yells?'). The statements were administered in a fixed order.

Items attributed to the confident individual were scored as +1 and items attributed to the hesitant individual were scored as -1, except for negative characteristics or negatively worded questions where the items were reverse scored (e.g., score of +1 for each item attributed to the hesitant individual). When the child did not show a bias based on informants' history of confidence (i.e., choosing 'both' or 'none'), the item was scored as 0.

Results and Discussion

Our preregistered analysis plan for both Sorting and Attribution tasks involved summing scores across trials and comparing mean total scores by age group and trial category to chance using one-sample *t* tests. However, since the preregistration took place, there has been a growing consensus that it is superior to analyse data of this sort with cross-classified mixed-effects models (i.e., hierarchical linear modeling or multilevel models) predicting performance at the level of individual trials while accounting for dependence within participants and within identical trials (see for instance Muradoglu et al., 2023). We thus ran our analyses using this method. Analyses using our preregistered approach are available in the Supplementary Materials section below; the conclusions we draw with either approach are very similar. Additional analyses relating to the effect of language, sex, place of experiment, identity of the confident person, experimenter, and additional tasks are also included in the Supplementary Materials section below.

Sorting Task

For the Sorting Task, we ran a model predicting trial-specific performance from age group and trial type. Age was divided into two groups, "younger" (3- to 5-year-olds) and "older" (6- to 8-year-olds). Trial type (correct, incorrect or novel) was dummy-coded with novel label trials as baseline. We fit the model using lme4 (Bates et al., 2014) and lmerTest (Kuznetsova et al., 2017) in R version 4.3.2 (R Core Team, 2023). We first modeled random intercepts for both participant and trial variance; however, due to convergence issues, the random intercept for participant was dropped as its variance was close to zero. We confirmed via model comparison that there was no significant effect of dropping this term ($p = 1.000$).

The coefficients table is included in supplementary materials, but model coefficients were not of primary interest: Our main goal was to examine model-predicted probabilities of siding with the confident informant for each type of trial and each age group. We thus used the emmeans package (Lenth, 2023) to obtain estimated marginal probabilities at all possible levels of age group and trial type. The results demonstrate that older children sided with the confident person 66% of the time on correct trials, which is significantly above chance, $Z = 3.94$, $p < .001$, CI = [58.2% – 72.8%], and sided with the confident informant 40% of the time on incorrect object-label trials (therefore sided with the hesitant informant 60% of the time), which is significantly below chance, $Z = -2.45$, $p = .014$, CI = [32.9% – 48.0%]. They did not differ from chance on novel trials, (45% with confident informant, $Z = -1.38$, $p = .166$, CI = [37.0% – 52.3%]). Younger children, on the other hand, sided with the confident person 58% of the time on correct trials, but this was not quite significantly above chance, $Z = 1.95$, $p = .051$, CI = [50.0% – 64.8%]. They were at chance on incorrect and novel trials, respectively 52%, $Z = 0.60$, $p = .548$, CI = [44.8% – 59.8%] and 51%, $Z = 0.15$, $p = .880$, CI = [43.0% – 58.1%].

In sum, older children (6-8 years old) inferred that the confident informant wrote the correct labels, thus associating confidence with accuracy. The younger children's scores tended in that direction but were just outside of the significance threshold ($p = .051$). Furthermore, only the older children made significant inferences about who wrote the incorrect labels. Neither age group made significant inferences on novel word trials.

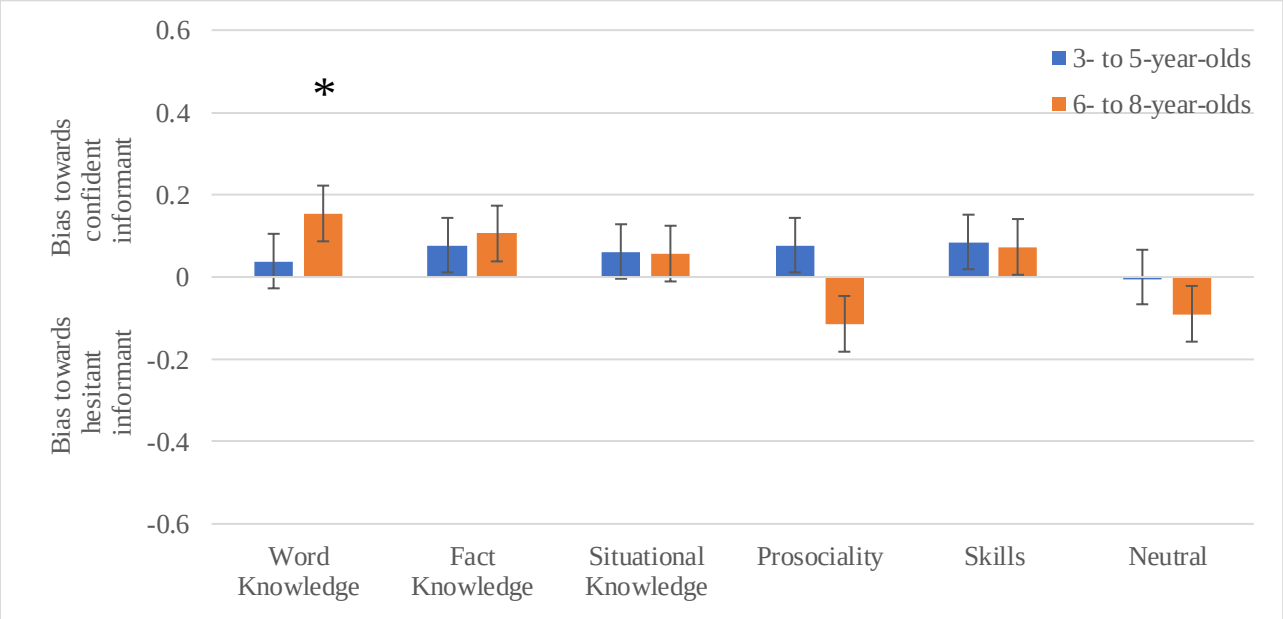
Attribution Task

For the Attribution Task, we ran a model predicting attributions from age group (younger vs. older) and category (dummy-coded with neutral items as baseline). Regression coefficients are included in the supplementary materials. We again obtained estimated marginal means at all

possible levels of predictors, illustrated in Figure 1. Older children only attributed word knowledge to the confident informant, $t = 2.28$, $p = .026$, CI = [0.02 – 0.29]. All other attributions for older and younger children were at chance (all *ps* > .05). It therefore appears that school-age children treat confidence as a domain-specific cue, not generalizing beyond the exact domain (object labeling) for which confidence was demonstrated in the history phase.

Figure 1

Study 1, Attribution Task: Model-Predicted Means by Category and Age Group



Note. Negative means represent bias towards the hesitant informant and positive means represent bias towards the confident informant. The range is between -1 and +1, with 0 being chance. Error bars represent the standard error. * $p < .05$

Additional analyses

One could be concerned, based on the results from the younger age group, that they did not notice the confidence cues presented, or otherwise could not use them, despite past literature

showing that children of that age can notice and use confidence cues. However, we do not believe that is the case. The data presented was collected as part of a broader project where numerous children underwent the same familiarization phase as in our current study. Following this phase, children participated in one or more test phases, which included Sorting and Attribution tasks for some, but not all, children. Twenty-six children ages 4 and 5, of which 6 are included in the present sample, completed a 5-trial selective learning task immediately after the Familiarization phase: In this task, the same informants remained respectively confident and hesitant and children were asked to choose which one to learn novel object labels from (full details of the selective learning task are presented in (Juteau et al., in press), which focuses on performance on this selective learning task across multiple conditions). On average, these 26 children sided with the confident informant above chance (M = 3.65 out of 5 trials, $t(25) = 5.05$, $p < .001$). In other words, younger children could notice the informants' confidence cues and did use them in a different task. Therefore, the lack of attributions made by the younger children in our study is likely not to do with an inability to notice confidence cues (or a poor presentation of these cues on our part) but could be instead explained by an age-related difference in the types of informant attributions children make based on confidence cues.

Given the length of the procedure, one may also be concerned about younger children's capacity to remember who was confident or hesitant until the end. We did not administer memory questions to the children in the present sample. However, another study reported in (Juteau et al., in press, Experiment 3) administered the exact Familiarization phase to a different sample of 4- and 5-year-olds followed by a series of test questions of roughly the same duration as the present study, with two memory questions at the end. In that study, 28 out of 41 children correctly answered both memory questions (binomial p=.014 using a conservative chance rate of

50%). This suggests that most younger children (at least by age 4) should have had the capacity to remember who was confident and hesitant throughout the present experiment.

In the present study, we planned analyses around two age groups. However, much of the selective learning literature reports results by age year, and many studies have found notable differences between 3-year-olds, 4-year-olds and 5-year-olds (i.e., within the range of our "younger" group). Our pre-registered sample size is underpowered to present inferential statistics per age in years, but we present descriptive statistics (see Tables 1 and 2) for those readers interested in year-specific performance.

Table 1

Study 1, Sorting Task: Proportion of Endorsement of the Confident Informant by Trial Type and Age in Years

Trial Type	Age in Years					
	3 (n=16)	4 (n=14)	5 (n=12)	6 (n=16)	7 (n=11)	8 (n=14)
Correct	0.53	0.55	0.69	0.72	0.57	0.66
Incorrect	0.58	0.46	0.48	0.38	0.43	0.41
Novel	0.56	0.46	0.50	0.33	0.52	0.14

Note. Proportions above 50% indicate a positive bias to the confident informant.

Table 2

Study 1, Attribution Task: Mean scores by Category and Age in Years

Category	Age in Years					
	3 (n=16)	4 (n=14)	5 (n=12)	6 (n=16)	7 (n=11)	8 (n=14)

Word	-0.19	0.05	0.42	0.15	0.27	0.07
Fact	0.08	-0.10	0.31	0.13	0.00	0.17
Situational	0.04	-0.07	0.22	0.04	0.12	0.02
Prosocial	0.02	0.10	0.11	0.08	-0.15	-0.31
Skills	0.15	-0.17	0.39	0.10	0.09	0.02
Neutral	0.10	-0.07	-0.08	-0.04	-0.09	-0.14

Note. Means above zero indicate a positive bias (i.e., attributing more positively worded items and fewer negatively worded items) towards the confident informant. Means below zero represent a positive bias towards the hesitant informant. Scores range between -1 and 1.

Study 2

Method

Participants

We preregistered a sample size of 40 participants in each of two age groups for the same reasons as in Study 1 (see pre-registration for more details), but again scheduled and tested additional participants to prepare to replace exclusions. The final sample therefore consisted of 44 preschoolers (27 females; *M* age = 53 months, range = 36 to 71 months) and 43 school-age children (19 females; *M* age = 88 months, range = 72 to 107 months). The sources of participants were the same as for Study 1. Data from 7 participants were not included in the analysis due to experimental error (2), confirmed developmental or language delay (1), poor language comprehension (1), failure to answer all questions (2), or because of parental interference (1). Sixty-five children participated in English and 22 children in French. Most children were tested in person, either in a university laboratory (*n* = 61) or in their daycare setting (*n* = 18). Due to the COVID-19 pandemic, 8 children were tested remotely via online video conferencing platforms

(primarily GoogleMeet). Further demographic information was collected for in-lab and virtual participants (n = 69): most were of medium-to-high socioeconomic status (71.2% of families earning more than $90,000 annual household income), and children were primarily White (82%), Mixed race (11%) or Asian (5%). As in Study 1, some children (n = 33) completed additional tasks.

Materials and Procedure

In Study 2, which was run concurrently with Study 1, we tested how children's attributions would change when cues of confidence directly conflicted with cues of accuracy. If the attributions that children made in Study 1 were based on assuming that a confident person is knowledgeable and thus likely to be accurate (and that a hesitant person is likely to be ignorant and therefore inaccurate), we expected these attributions to reverse if children directly witness inaccuracy coming from a confident informant and accuracy coming from a hesitant informant.

The materials and procedure were identical to those of Study 1, except for one crucial difference in the Familiarization Phase. Exactly as in Study 1, children were presented with videos of the informants alternately labelling 5 pictures of familiar objects. This time, however, the pictures that the informants were labeling were visible before the labeling event. Thus, the children had perceptual access to determine whether the informant was accurately, or not, labeling each familiar object. For all children, the credibility cues of confidence and accuracy were conflicting: one informant was confident but mostly inaccurate, and the other was hesitant but completely accurate. For example, the child could clearly see the informant holding a picture of a tree and then saying either, "Oh I know, that's a shoe!" or "Hmm, I guess that's a tree". The confident informant was correct on the third trial (of five) in order to make it plausible for children to believe that the adult is not being deceitful. Knowing that children reduce their trust

towards an informant after witnessing a single trial of inaccuracy (Ronfard & Lane, 2018), no inaccurate trials were added to the hesitant informant. Past research has demonstrated that even by age 3, children should trust an informant who was always accurate over one who was accurate only once (Pasquini et al., 2007).

For the Sorting Task, a score of 1 was allocated each time the child identified the confident (and inaccurate) informant as the person who wrote the label for that card. Note that, based on our hypotheses, children are expected to score *below* chance on correct label trials and *above* chance on incorrect label trials (i.e., opposite as in Study 1). Scoring for the Attribution Task resulted in scores between -1 and +1 on each item; we expected children to score below chance if they attributed more positive items to the *inaccurate* (and confident) informant.

Results and Discussion

Our analytical strategy was the same as for Study 1. Given convergence issues because of random variances estimated near zero, the random intercept for participant was dropped for the Sorting Task and that for trial was dropped for the Attribution Task. Model comparisons found no significant effects of dropping these terms (*ps* = 1.000). Model coefficients for both the Sorting and Attribution tasks are in Supplementary Materials. Additional analyses pertaining to the effect of language, sex, place of experiment, identity of the confident person, additional tasks, and experimenter are presented in the Supplementary Materials section.

Sorting Task

On the Sorting Task, older children sided with the confident but inaccurate person 23% of the time on correct trials (therefore sided with the hesitant informant 77% of the time), which is significantly below chance, $Z = -6.60$, $p < .001$, CI = [17.5% – 30.2%]. They additionally sided with the confident but inaccurate informant 86% of the time on incorrect trials, which is

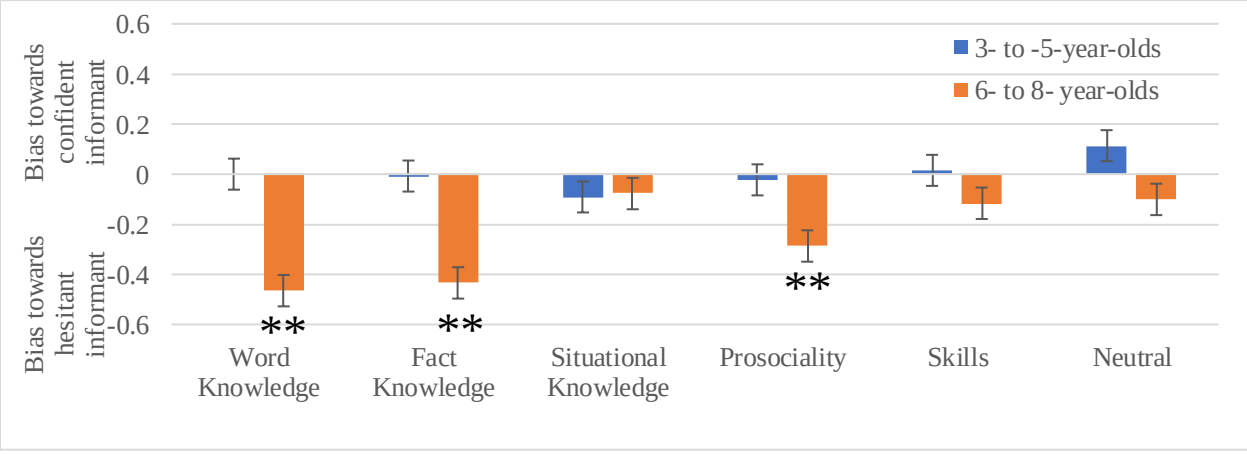
significantly above chance, $Z = 8.25$, $p < .001$, CI = [80.0% – 90.5%]. They did not differ from chance on neutral trials (46%, $Z = -1.06$, $p = .287$, CI = [38.6% – 53.4%]). Younger children, in contrast, sided with the confident but inaccurate person 44% of the time on correct trials, which does not differ from chance, $Z = -1.65$, $p = .099$, CI = [36.6% – 51.2%]. They however guessed that the confident but inaccurate informant provided incorrect labels 61% of the time, which is significantly above chance, $Z = 2.84$, $p = .005$, CI = [53.4% – 67.7%]. On neutral trials, younger children were at chance (47%, $Z = -0.75$, $p = .452$, CI = [39.9% – 54.6%]).

Attributions Task

Means for the Attribution Task are illustrated in Figure 2. Older children significantly attributed word knowledge ($t = -7.42$, $p < .001$, CI = [-0.59 – -0.34]), fact knowledge ($t = -6.92$, $p < .001$, CI = [-0.56 – -0.31]), and prosocial behaviours ($t = -4.57$, $p < .001$, CI = [-0.41 – -0.16]) to the hesitant and accurate informant, and were at chance on neutral items ($p = .109$), situational knowledge ($p = .217$), and skills ($p = .064$). Younger children did not make any significant attributions about either informant (all $ps > .05$).

Figure 2

Study 2, Attribution Task: Model-Predicted Means by Category and Age Group



Note. Negative means represent bias towards the hesitant (and accurate) informant and positive means represent bias towards the confident (and inaccurate) informant. The range is between -1 and +1, with 0 being chance. Error bars represent the standard error. ** $p < .01$

Additional Analyses

As in Study 1, we computed additional exploratory descriptive statistics (see Tables 3 and 4) to display means across all test variables for each age group individually. For the Sorting Task, proportions are displayed, and for the Attribution Task scores range between -1 and +1, with higher scores on both tasks indicating greater bias towards the confident yet inaccurate informant.

Table 3

Proportion of Endorsement of the Confident Informant on the Sorting Task of Study 2 by Trial Type and Age Group

Trial Type	Age in Years					
	3 (n=13)	4 (n=18)	5 (n=13)	6 (n=21)	7 (n=13)	8 (n=9)
Correct	0.56	0.50	0.23	0.27	0.15	0.25
Incorrect	0.50	0.53	0.83	0.81	0.94	0.86
Novel	0.48	0.58	0.31	0.54	0.39	0.39

Note. Proportions below 50% indicate a positive bias to the hesitant but accurate informant.

Table 4

Mean scores on the Attribution Task of Study 2 by Category and Age Group in Years

Category	Age in Years					
	3 (n=13)	4 (n=18)	5 (n=13)	6 (n=21)	7 (n=13)	8 (n=9)

Word	0.15	0.07	-0.26	-0.37	-0.56	-0.56
Fact	0.21	-0.07	-0.13	-0.41	-0.46	-0.44
Situation	-0.23	0.06	-0.15	-0.08	-0.10	-0.04
Prosocial	0.00	-0.04	-0.03	-0.24	-0.21	-0.52
Skills	-0.13	0.11	0.03	-0.16	-0.05	-0.11
Neutral	0.15	0.07	0.13	-0.08	-0.18	-0.04

Note. Means above zero indicate a positive bias (i.e., attributing more positively worded items and fewer negatively worded items) towards the confident (and inaccurate) informant. Means below zero represent a positive bias towards the hesitant (and accurate) informant. Scores range between -1 and 1.

In sum, we expected that if children's performance in Study 1 was due to an expectation that accuracy was associated with confidence, then their performance should reverse upon encountering an individual who was inaccurate despite her confidence, and vice versa. Our predictions were mostly confirmed: For the Sorting Task, both younger and older children believed that the confident, yet inaccurate, informant had provided *incorrect* object labels. Furthermore, older children guessed that the hesitant, yet accurate, informant had provided the correct labels. Descriptive statistics show that the trend towards these systematic beliefs may in fact start at age 5 (within our "younger" group), whereas 3- and 4-year-olds appear to guess randomly. In the Attribution Task, younger children did not make any significant attributions; school-age children, however, attributed word knowledge, fact knowledge, and prosociality to the hesitant yet accurate informant. Descriptive statistics do not show a clear demarcation but suggest that children begin making these attributions around age 5 or 6. Therefore, when

conflicting, children rely more heavily on accuracy cues than confidence cues when making knowledge attributions.

Discussion

The present studies explored the kinds of attributions preschool- and school-age children make about confident and hesitant speakers, as well as how children interpret conflicting cues of confidence and inaccuracy. The data supports an epistemic interpretation of confidence in school-aged children (and perhaps by age 5). In other words, older children attributed knowledge to the previously confident informant (Study 1) but reversed these attributions when a hesitant informant was shown to be most accurate (Study 2). It is interesting, and somewhat reassuring, that children's attributions based on confidence were narrow and easily reversed by conflicting accuracy information, in light of research showing that children can be over-reliant on confidence cues even when these are unjustified (e.g., Birch et al., 2020; Kominsky et al., 2016; Tenney et al., 2011). If one has to choose between prior accuracy and confidence, accuracy is arguably the better cue to knowledge.

Younger children did not make any knowledge attributions based on the demonstrated confidence cues. This lack of attributions in our sample is consistent with past studies that have shown that younger children are generally less likely to make attributions of stable personal traits and are more likely to predict change instead of consistency in people's behavior (e.g., Kalish, 2002; Kalish & Shiverick, 2004), as well as with new research showing that 4- and 5-year-olds treat confidence as a situation-specific cue for selective learning purposes (Juteau et al., in press). Alternatively (or in addition), younger children's chance performance on the Attribution Task specifically could have been due to the task being too demanding for the youngest children in our

samples. Future research using a variety of tasks would be necessary before drawing firm conclusions about young children's interpretation.

School-age children appeared to make domain-specific attributions (i.e., exclusively about word knowledge) following confidence cues, but made broader knowledge attributions after accuracy (i.e., fact knowledge) as well as attributions of prosociality, similar to those demonstrated by 5-year-olds in past research (Brosseau-Liard & Birch, 2010). The breadth of children's attributions could of course be in part determined by the exact information about which the informants were confident or hesitant. For instance, past research has shown that children draw broader inferences from accuracy demonstrated with semantic information (e.g., object labels) than episodic information (e.g., object locations; Stephens & Koenig, 2015). Future research could test if, for example, children draw narrower inferences from confidence about situational information than from confidence about words and enduring facts.

The present research has both strengths and weaknesses. Contrary to many selective social learning studies, this sample included not only preschoolers, but also children between 6 and 8 years old. Developmental differences in children's understanding of credibility cues may have been overlooked due to the infrequent inclusion of school-age children in such investigations. The flipside of this relatively wide age range is that it is difficult to design a procedure that is ideal across the entire range. For instance, as mentioned previously, the performance of the youngest children on the Attribution Task may be an artifact of the demands of the task, which, although modelled on a previous study with preschoolers (Brosseau-Liard & Birch, 2010), appeared in that past study to be challenging for those below age 5. The length of the procedure and the fact that the Attribution Task always followed the Sorting Task may have dampened the youngest children's performance on the former. We had low statistical power to

detect fine-grained age differences; larger samples within the preschool period, specifically, could help determine when children begin reliably making knowledge attributions from confidence and hesitancy cues.

Samples in both studies represented very limited cultural diversity, representing primarily White children from educated and high-earning families, residing in Canada (however there likely was greater diversity in the children tested in daycares, for whom no demographic data were collected). We took advantage of the *linguistic* diversity of the area where we conducted this research by testing children in two languages. Future research should nevertheless explore the cross-cultural generalizability of our findings with more diverse and representative samples.

The findings of this study contribute to our current understanding of preschoolers' and school-age children's interpretation of informants' level of confidence, suggesting an epistemic interpretation for school-aged children. Furthermore, our results suggest that informant accuracy cues trump confidence cues for both preschool- and school-age children when drawing knowledge inferences. Additionally, even when children expect accuracy (or lack thereof) based on informants' level of confidence, they reconsider these attributions when they have direct evidence about informants' accuracy.

Supplementary Materials

The data that support the findings of this study are available at the following link:

https://osf.io/p97ea/?view_only=05d188c86a7b4cc5bde6cf1e6ff05136

Model Coefficient Tables for Mixed-Effects Models

Table 5

Regression Coefficients for Mixed Models of Study 1 Sorting Task

	Estimate	Std. Error	*z*-value	*p*-value

(Intercept)	0.023	0.155	0.150	0.880
Age_YO	-0.243	0.219	-1.113	0.266
DummyCorrect	0.282	0.220	1.279	0.201
DummyIncorrect	0.070	0.219	0.319	0.750
Age_YO:DummyCorrect	0.596	0.315	1.895	0.058
Age_YO:DummyIncorrect	-0.245	0.311	-0.788	0.431

Table 6

Regression Coefficients for Mixed Models of Study 1 Attribution Task

	Estimate	Std. Error	*t*-value	*p*-value
(Intercept)	-0.000	0.066	0.000	1.000
Age_YO	-0.894	0.091	-0.981	0.327
Dummy_Situational	0.062	0.086	0.722	0.475
Dummy_WordKnowledge	0.039	0.086	0.451	0.654
Dummy_Prosocial	0.078	0.086	0.902	0.373
Dummy_FactKnowledge	0.078	0.086	0.902	0.373
Dummy_Skills	0.085	0.086	0.992	0.327
Age_YO:Dummy_Situational	0.084	0.117	0.718	0.473
Age_YO:DummyWordKnowledge	0.205	0.117	1.747	0.080
Age_YO:Dummy_Prosocial	-0.102	0.117	-0.868	0.386
Age_YO:Dummy_FactKnowledge	0.118	0.117	1.002	0.317
Age_YO:Dummy_Skills	0.077	0.117	0.659	0.510

Table 7

Regression Coefficients for Mixed Models of Study 2 Sorting Task

	Estimate	Std. Error	*z*-value	*p*-value
(Intercept)	-0.114	0.151	-0.752	0.452
Age_YO	-0.049	0.215	-0.230	0.818
DummyCorrect	-0.138	0.215	-0.641	0.522
DummyIncorrect	0.553	0.216	2.554	0.011*
Age_YO:DummyCorrect	-0.893	0.319	-2.798	0.005**
Age_YO:DummyIncorrect	1.430	0.344	4.154	0.000***

Note. *$p < .05$, **$p < .01$, ***$p < .001$

Table 8

Regression Coefficients for Mixed Models of Study 2 Attribution Task

	Estimate	Std. Error	t-value	p-value
(Intercept)	0.114	0.062	1.833	0.067
Age_YO	-0.214	0.088	-2.432	0.015*
Dummy_Situational	-0.205	0.076	-2.699	0.007**
Dummy_WordKnowledge	-0.114	0.076	-1.499	0.134
Dummy_Prosocial	-0.136	0.076	-1.799	0.072
Dummy_FactKnowledge	-0.121	0.076	-1.599	0.110
Dummy_Skills	-0.098	0.076	-1.299	0.194
Age_YO:Dummy_Situational	0.228	0.108	2.113	0.035*
Age_YO:DummyWordKnowledge	-0.251	0.108	-2.326	0.020*

Age_YO:Dummy_Prosocial	-0.050	0.108	-0.461	0.645
Age_YO:Dummy_FactKnowledge	-0.212	0.108	-1.968	0.049*
Age_YO:Dummy_Skills	0.083	0.108	0.770	0.442

Note. *$p < .05$, **$p < .01$

Results based on Preregistered Analytical Strategy: Study 1

Sorting Task

Children were attributed a score of +1 on every trial where they attributed the item to the confident informant and -1 when they attributed an item to the hesitant informant. These were summed across trials for each item type (correct, incorrect, novel), resulting in mean scores between -4 and +4.

Analyses were conducted separately for younger (3 to 5 years old) and older children (6 to 8 years old). Means are illustrated in Figure 1. As preregistered, one-tailed one-sample t-tests were conducted to compare each age group's mean scores (attribution of correct labels, wrong labels, and novel labels) to chance level (score of 0). In our preregistration, we expected a mean score significantly higher than zero for correct answers, indicating that children expect the confident individual to be accurate, and a mean score significantly lower than zero for wrong answers, indicating that children expect the hesitant individual to be inaccurate. We originally included novel word trials as distractors but based on pilot testing, we predicted a mean score above zero for these trials, under the assumption that providing novel words would be seen as demonstrating knowledge.

Our predictions were confirmed for correct labels: Children of both age groups attributed more correct labels to the confident informant (Young: $M = .60$, $SD = 1.61$, $t(42) = 2.47$, $p = .009$, $d = .38$; Old: $M = 1.27$, $SD = 2.23$, $t(40) = 3.65$, $p <. 001$, $d = .57$). However, only school-

age children attributed (slightly) more wrong answers to the hesitant individual (M = -.78, SD = 2.56, $t(40)$ = -1.95, p = .029, d = .30); the younger age group performed at chance (M = .19, SD = 2.22, $t(42)$ = 0.55, p = .293, *ns*, d = .08). Both age groups were at chance for novel labels (Young: M = .05, SD = 2.02, $t(42)$ = 0.15, p = .440, *ns*, d = .02; Old: M = -.44, SD = 2.30, $t(40)$ = -1.22, p = .115, *ns*, d = .19).

Attribution Task

Scores for all items within a category were summed per child. Children thus received a score between -3 and +3 on each category. As preregistered, one-tailed one-sample t-tests were conducted to compare both younger and older children's mean scores on each attribution category to chance level (score of 0). Means are illustrated in Figure 2. if children obtained a mean score significantly higher than 0, this indicated that children would tend to attribute this type of characteristic to the confident informant and if they obtained a mean score significantly lower than 0, this indicated that they would tend to attribute the characteristic to the hesitant informant. We predicted in our preregistration that younger children would attribute all three knowledge categories to the confident informant but made no prediction for the other three categories; for older children, we expected above-chance performance in all six categories as confidence may not only influence knowledge attribution but be overgeneralized to the attribution of several positively-valanced traits. Findings did not follow our predictions: Older children only attributed more word knowledge to the confident informant (M = .46, SD = 1.31, $t(40)$ = 2.27, p = .014, d = .36). All other means for older children and all means for younger children were at chance (all $ps > 0.05$).

Results based on Preregistered Analytical Strategy: Study 2

Sorting Task

As in Study 1, one-tailed one-sample t-tests were conducted to compare each age group's mean scores (attribution of correct labels, wrong labels and novel labels) to chance level (score of 0). Results demonstrated that the younger children attributed incorrect labels to the confident but inaccurate informant at a level higher than chance (M = .86, SD = 2.17, $t(43) = 2.64$, p = .006, d = .40). However, they did not make any systematic inferences about the correct labels and the novel labels (all $ps > .175$). Older children attributed more correct labels to the hesitant but accurate informant (M = -2.14, SD = 2.02, $t(42) = -6.95$, $p < .001$, d = -1.06) and more incorrect labels to the confident but inaccurate informant (M = 2.88, SD = 1.82, $t(42) = 10.42$, $p < .001$, d = 1.58). They did not make any inferences about novel labels (p = .368).

Attribution Task

One-tailed one-sample t-tests were conducted to compare, separately, both younger and older children's mean scores by category to chance level (score of 0). A mean score significantly higher than 0 indicates a systematic attribution to the *inaccurate* (confident) informant, and a mean score significantly lower than 0 to the *accurate* (hesitant) informant. Per our preregistration, we expected that younger children would attribute all three knowledge categories to the hesitant but accurate individual and older children to make this attribution in all six categories.

Contrary to our preregistration, younger children did not significantly make any knowledge attributions about the two informants. Older children, however, were more likely to attribute word knowledge (M = -1.40, SD = 1.45, $t(42) = -6.31$, $p < .001$, d = .97), fact knowledge (M = -1.30, SD = 1.35, $t(42) = -6.30$, $p < .001$, d = .96), prosocial behaviors (M = -.86, SD = 1.23, $t(42) = -4.60$, $p < .001$, d = .70), skills (M = -.35, SD = 0.97, $t(42) = -2.35$, p =

.012, d = .36), and neutral items (M = -.30, SD = 1.04, $t(42)$ = -4.60, p = .031, d = .29) to the hesitant and accurate informant, but not situational knowledge (p = .137).

Additional Analyses

To further explore the factors affecting children's attributions, we conducted a series of multivariate ANOVAs. Results are below. No significant effects were anticipated, and, given the large number of both independent and dependent variables, it is likely that many of the significant effects obtained below are Type-I errors. They are nevertheless reported for completeness.

Study 1

No significant effects were found for language, sex, place of experiment, or the identity of the confident person on children's performance in the Sorting Task, and no additional tasks or experimenter effects were found on either task.

Children participating in French attributed more skills to the confident informant (M = 0.81, SD = 1.87) compared to the children who participated in English (M = 0.10, SD = 1.11; p = .050). Male participants attributed more prosocial behaviors to the hesitant informant (M = -0.45, SD = 1.46), compared to female participants (M = 0.22, SD = 1.30; p = .031). Children who participated in-lab attributed more word knowledge to the confident informant (M= .74, SD= 1.32) compared to those who participated in daycares (M = -.63, SD = 1.67) and via videoconferencing (M = -.73, SD = 1.49; p < .001). Note however that the average age of participants differed by place of experiment, as only older participants remained to be tested online when the COVID-19 pandemic began, and only preschool-age children were tested in daycares. Therefore, any effect of place of experiment may be an artifact of this unplanned age difference. Children who were presented the confident informant first and the hesitant informant

second attributed more fact knowledge (*M* = .56, *SD* = 1.25 vs. *M* = .00, *SD* = 1.07; *p* = .029), situational knowledge (*M* = .44, *SD* = .98 vs. *M* = -.07, *SD* = .94; *p* = .017) and prosocial behaviors (*M* = .27, *SD* = 1.36 vs. *M* = -.35, *SD* = 1.36; *p* = .042) to the confident informant, compared to children who were presented the confident informant second. This may indicate an overall slight preference for the individual who was presented first.

Study 2

No effect of additional tasks were found in the Sorting Task. No effect of experimenter was found on either task. No effect of place of experiment or identity of confident informant were found on the Attribution Task.

Most participants only partook in the above-mentioned tasks (N = 54). However, some participants completed additional tasks related to the informants (N = 26) and some participants completed additional tasks unrelated to the informants (N = 7). Participants who partook in additional tasks related to the informant attributed more word knowledge to the confident (and inaccurate) informant (*M* = .57, *SD* = 1.62) compared to participants who partook in additional tasks unrelated to the informants (*M* = -1.12, *SD* = 1.70). However, there were no differences between the scores of those who did not participate in additional tasks (*M* = -.65, *SD* = 1.51). It is important to note that the sample size is unequal (N=7 vs. 26 vs. 54) and that those who completed the additional tasks related to the informant were aged 4-5 years old, so this may reflect the age effect which was found in the main analyses.

Children who participated in English attributed more incorrect labels to the confident (and inaccurate) informant (*M* = 2.18, *SD* = 2.08) compared to children who participated in French (*M* = .91. *SD* = 2.45; *p* = .020). Female participants attributed more novel labels to the confident (and inaccurate) informant (*M* = 2.09, *SD* = 1.93) compared to male participants (*M* = 1.61, *SD* =

2.54; p = .032). Children who partook in the study online attributed more incorrect labels to the confident (and inaccurate) informant (M = 3.00, SD = 1.07) than those in the physical laboratory (M = 2.10, SD = 2.29) and in daycare settings (M = .56, SD = 1.92; p = .010). This may again be an artifact of the average age difference between places of experiment. Children who observed the confident (and inaccurate) informant label objects second attributed more incorrect labels to that individual (M = 2.51, SD = 1.91) in comparison to the children who were presented the confident (and inaccurate) informant first (M = 1.23, SD = 2.37; p = .007). This may be a demonstration of the same slight overall preference for the first speaker found in the Attribution Task of Study 1. Children who participated in English attributed more prosocial behaviors to the hesitant (and accurate) informant (M = -.64, SD = 1.26) in comparison to children who participated in French (M = .09, SD = .97; p = .014). Male participants attributed more neutral behaviors to the hesitant (and accurate) informant (M = -.29, SD = 1.19) compared to female participants (M = .30, SD = 1.01; p = .013).

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Chapter 3: Objection! The Effect of Informant Disagreement on Children's Selective Trust

Abstract

Children use a socio-cognitive skill known as *selective learning* to consider reliable sources of information and filter out untrustworthy claims. Past research has demonstrated that children prefer to learn from previously accurate, confident, and benevolent informants. However, little is known about how children consider the cue of explicit interpersonal disagreement in their selective learning. Considering how common conflict and disagreement is in children's social environments, this represents a major gap in our knowledge. Therefore, the goal of this study was to gain a deeper understanding of children's learning preferences based on different types of interpersonal disagreement, as well as which kinds of attributions children make about informants who disagree. One hundred and eleven 5- to 8-year-old Canadian children completed a novel selective learning paradigm along with two attribution tasks after viewing videos of informants in either neutral disagreement (Polite Disagreement Condition), negative disagreement (Rude Disagreement Condition), or no explicit disagreement (Control Condition). Results reveal that children attribute more confidence and less benevolence to disagreeing informants in the Rude Disagreement Condition; however, their learning preferences remain unaltered. These findings shed light on the previously unexplored credibility cue of interpersonal disagreement and have important implications for future social learning and education research.

Key Words: *Selective Learning, Disagreement, Credibility Cues, Interpersonal Conflict*

Objection! The Effect of Informant Disagreement on Children's Selective Trust

Selective learning, also known as epistemic trust, refers to an individual's propensity to rely on one source of information over another. In the modern digital world, there is an overwhelming amount of (mis)information available at our fingertips. The socio-cognitive process of selective learning allows us to systematically filter reliable information during knowledge acquisition. Selective learning decisions are based on a variety of factors, including credibility cues, which are the epistemic and social heuristics used to infer speaker reliability (Koenig et al., 2022; Tong et al., 2020).

The field of study on children's selective learning is relatively new. In Koenig and colleagues' (2004) pioneering study, two informants labelled familiar objects, with one providing accurate labels and the other providing inaccurate ones. In subsequent test trials, the same informants gave contradictory novel labels for unfamiliar objects. The researchers found that 3- and 4-year-old children tended to endorse the labels provided by the informant who had previously been accurate when learning these new object labels. Since then, Koenig and colleagues' (2004) findings have been largely replicated (see Markson & Luo, 2020 for a recent review) and extended to children as young as 24 months (Koenig & Woodward, 2010). Their methods have been adapted using a single informant between-subjects research design (e.g., Li & Yow, 2018), across learning domains (Birch et al., 2008), as well as with older children and adults (Fitneva & Dunfield, 2010). Informant accuracy remains one of the most salient credibility cues studied to date (e.g., Cossette et al., 2020; Harris et al., 2018; Hermes et al., 2018; Luchkina et al., 2020). However, social and interpersonal cues have also been demonstrated to influence children's selective learning decisions. For example, children have demonstrated a preference to learn from members belonging to their same in-group (e.g., Elashi

& Mills, 2014; Hetherington et al., 2014; Li & Koenig, 2022; Ma & Woolley, 2013), preference for learning from attractive informants (Bascandziev & Harris, 2016), and selective trust in informants who dressed more formally (McDonald & Ma, 2015).

In the breadth of research that has been conducted on young children's selective social learning, there is an important gap in the literature: the effect of informant dialogue and interpersonal disagreement on children's selective learning. In conventional social interactions, when two individuals voice divergent opinions, it is customary for the involved parties to engage in dialogue around the disagreement. However, within the context of past selective learning research studies, such responses and/or interactions are notably absent. In fact, there is no research to date on how children selectively learn from informants who explicitly disagree with one another. This limitation has been present since the birth of selective learning studies, namely, in Koenig and colleagues' original paradigm (2004). In previous two-informant selective learning experiments, informants provide contradictory information completely independently of one another—an example of "the science of the behavior of children in strange situations with strange adults" (Bronfenbrenner, 1974). Furthermore, the lack of dialogue between informants in previous studies limits our understanding of interpersonal disagreement as a potential credibility cue directing children's selective learning decisions.

Although explicit interpersonal disagreement has not yet been studied, conceptually related credibility cues have been investigated, including cues of informant confidence, benevolence, and social dominance. When speakers disagree, communicating the disagreement in a decisive and assertive manner could potentially lead children to perceive the speaker as more confident. Specifically, disagreeing while utilizing clear and unambiguous language, gesturing, and maintaining a composed and assured tone could contribute to the perception of confidence,

given that preschoolers can distinguish lexical cues (e.g., saying "I think" versus "I know"), paralinguistic cues (e.g., intonation), and gestural cues (e.g., raised index finger versus shoulder shrugging) of certainty (Prieto et al., 2016) and hesitancy (Hübscher et al., 2017). Additionally, children's preference to rely on a confident over hesitant informant is clear by the preschool years and remains into adulthood (Juteau et al., 2019; Tenney et al., 2011). These preferences begin to emerge early in childhood, with findings demonstrating that two-year-olds imitate the actions of certain, over uncertain, informants who display non-verbal confidence cues (e.g., Brosseau-Liard & Poulin-Dubois, 2014). Additionally, by the age of three, children rely on confident, compared to hesitant, informants in the context of making an unexpected claim (Jaswal & Malone, 2007).

In a similar vein, explicit interpersonal disagreement could be interpreted by children as a cue of social dominance, as assertiveness in expressing disagreement can convey a sense of control and influence over the conversation. Remarkably, infants demonstrate an ability to discern social dominance hierarchies, distinguishing between individuals in leadership roles and those exhibiting authoritarian bullying behaviour (Margoni et al., 2018; Mascaro & Csibra, 2012; Thomsen, 2020). However, whether children selectively learn based on social dominance cues is up for debate. Findings drawn from North American (Bernard et al., 2016), traditional Mayan (Castelain et al., 2016), and French (Charafeddine et al., 2019) populations suggest that children prefer to learn from informants who display both physical and decisional dominance. Notably, these findings were not replicated in a Norwegian sample (Fonn et al., 2022) nor in a Japanese sample (Charafeddine et al., 2019), where egalitarian and subordinate cultural values prevail. Margoni and colleagues (2023) recently demonstrated developmental differences between the ages of 1.5 and 10 years in children's learning based on social dominance: toddlers preferred to

learn from characters demonstrating fear-based dominance, compared to preschoolers and school-aged children who preferred to learn from characters showing respect-based leadership (marked by being respected by others and receiving resources). Despite these mixed findings, some sort of dominance-based interpretation of explicit disagreement markers could influence children's selective trust.

On the other hand, informants who frequently disagree in an explicit manner may be perceived as deviating from social norms, leading children to categorize such behaviour as antisocial. Furthermore, the emotional tone presented during disagreements can shape children's perceptions of the informants' social orientation: if disagreements are accompanied by negative emotional expressions, such as hostility, children may associate these informants with antisocial tendencies. In fact, children can distinguish prosocial from antisocial agents in early development and base their preferences on benevolence cues (see Holvoet et al., 2016 for a review). Children's selective learning is also impacted by informant benevolence: children have been shown to endorse and seek information from benevolent speakers (Landrum et al., 2016; Lane et al., 2013; Mascaro & Sperber, 2009), and by the end of the preschool years, children are also attuned to informant intention and avoid selectively learning from deceitful informants (e.g., Shafto et al., 2012). Most recently, Tong and colleagues (2020) conducted three meta-analyses revealing that 3- to 6-year-old children were more likely to ask informants ($k = 32$, $N = 666$) and endorse the information provided by informants ($k = 56$, $N = 1,264$) with positive social characteristics.

What can be said about explicit interpersonal disagreement? Is it interpreted by children as a confidence and/or social dominance cue and/or antisocial cue? Does the type of displayed disagreement affect these inferences? It is possible that children understand third-party

disagreement as a confidence cue and, thus, an indicator of knowledge or trustworthiness. On the other hand, children could interpret disagreement as against social or conventional norms, leading to less reliance on a disagreeing informant's claim. Moreover, clear developmental differences have been demonstrated across children's selective learning based on social dominance (e.g., Margoni et al., 2023), confidence interpretations (Fobert et al., submitted), as well as explaining children's tolerance of disagreement (e.g., Komolova & Wainryb, 2011). It would, therefore, be plausible that children's selective trust based on disagreement cues could shift across their development.

Therefore, the main objective of this investigation was to curate a deeper understanding of how children selectively learn when there is active dialogue and explicit disagreement between two informants. Specifically, we examined whether the presence or absence of explicit disagreement, along with the type of disagreement presented (polite versus rude), influenced both children's learning preferences and informant attributions. Furthermore, we examined the effect of children's age to examine developmental differences across these measures. To reach this goal, the following questions were addressed: (1) Does the presence or absence of explicit informant disagreement impact children's selective learning? (2) Does the presence or absence of explicit informant disagreement impact children's attributions of accuracy, confidence, benevolence, or physical strength? (3) Does the type of presented explicit disagreement cues (Polite Condition versus Rude Condition) influence children's selective learning patterns? (4) Does the type of presented explicit disagreement cues (Polite Condition versus Rude Condition) influence children's informant attributions (accuracy, confidence, benevolence, strength)? (5) Are there developmental differences in how children interpret explicit informant disagreement?

In this study, children first viewed videos of two informants providing contradictory novel object labels to unfamiliar objects. In the Control Condition, each informant made their claim independently of one another. In the Polite Disagreement Condition, the second speaker replied to the first voicing explicit and neutral disagreement before making their claim. In the Rude Disagreement Condition, the second speaker voiced doubt about the first speaker's competence and then made their own claim. After hearing both speakers make their claims, the children were asked to endorse one of the provided labels. In subsequent tasks, children answered questions about the informants regarding their knowledge, confidence, benevolence, and strength. Finally, children completed a memory check to ensure they remembered the identity of the disagreeing informant.

Method

Participants

One hundred and twenty 5- to 8-year-old typically developing children participated in this study. Nine children were not included in the final sample, due to failed memory check (5), outside of age criterion (1), reported developmental disorder (1), or incomplete administration (2). Therefore, the final sample consisted of 111 children (5 to 8 years old; 67 females; mean age = 85 months, range = 61-107 months). This sample size was selected after power calculations showing that N=96 gives approximately 85% power to detect an effect size of d=.31 (effect size of confidence cues reported in Brosseau-Liard & Poulin-Dubois, 2014); additional participants were recruited to account for common attrition in child development studies, resulting in the obtained sample size. We selected to study 5- to 8-year-olds to investigate developmental differences in young school-aged children, as previous studies demonstrate that though children selectively learn based on a variety of cues by their preschool years, epistemic and social

attributions made based on informant cues seem to appear initially in 5- and 6-year-olds (e.g., Fobert et al., submitted). Furthermore, pilot work suggested that the tasks were too complex for children under the age of 5, particularly with the online testing requirement.

Participants were recruited from internet-based advertisements and from an internal participant database. All children were tested virtually in English, using a videoconferencing platform (i.e., *Zoom*). Most children resided in Canada (98%), with two participants living in the United States. A demographic questionnaire was optional for parents to complete, and therefore, additional demographic information was collected from most, but not all, of the participants who made up the final sample (n = 107). Our sample consisted mostly of White children with European ethnic/cultural origins (74%). Other children in the sample had Latin Central and South American origins (7%), Indigenous origins (6%), Middle Eastern/West Central Asian origins (6%), African origins (2%), Caribbean origins (1%), Oceana/Pacific Island origins (1%), and 'other non-specified' (3%). Most children in the sample (72%) came from families earning over $105,000CAD annual household income, with less than 3% earning below $69,999. This research was approved by the University of Ottawa Research Ethics Board (file #H04-16-10). Regardless of experiment completion, all children were compensated for their participation with a gift certificate to a bookstore.

Materials and Procedure

This study was administered over a videoconferencing platform. Therefore, all participants had access to a laptop, tablet, or smartphone as well as an internet connection to join the testing session. The experiment consisted of a Familiarization Phase, a Selective Learning Task adapted from Koenig and colleagues (2004), followed by a series of attribution questions (Independent Attribution Task and Paired Attribution Task) adapted from Study 1 and 2. At the

beginning of the virtual testing session, the experimenter confirmed with the child's guardian that the consent had been completed. Next, they reviewed the testing procedure as well as confidentiality with the parent and obtained verbal consent from the parent. The parent was asked to stay close to the child in case of technical difficulties or disconnection. They were also asked not to provide answers to the child as the goal was to test the child's spontaneous responses. Participants were encouraged to complete the testing session in a quiet space, away from other children and distractions, and all experimenters conducted the sessions in a private space with no other individuals in the same room. With the parent's permission, the experimenter recorded the sessions using a screen recording feature on the videoconferencing platform. All children completed the tasks in the same order.

Familiarization Phase. Before beginning the first experimental task, all children participated in a practice round to warm to the virtual testing session. Here, participants were asked to name the following familiar objects: an apple, a ball, a fork, and a cat. All objects were age-appropriate and have been successfully named by young children in previous studies (e.g., Cossette et al., 2020). In the current investigation, all children provided correct labels across all practice questions.

Selective Learning Task. After the children completed the Familiarization Task, they were shown short video clips of two informants alternately labelling pictures of unfamiliar objects (e.g., a frame for an eraser, a small pump) using novel object labels. The informants provided contradictory labels, and thus, the second speaker was always considered to be the disagreeing informant. Within each condition, items were administered in a fixed order.

Children were randomly assigned into one of three conditions: the Polite Disagreement Condition, the Rude Disagreement Condition, and the Control Condition. In the Polite

Disagreement Condition, the second speaker voiced disagreement about the object label in a neutral, polite manner (e.g., Informant 1: "I think it's a *Mido*", Informant 2: "I disagree, I think it's a *Toma*"). In the Rude Disagreement Condition, the disagreeing informant undermined the other informant's claim before making their own, using a negative tone of voice (e.g., Informant 1: "I think it's a *Mido*", Informant 2: "She doesn't know what she's talking about, I think it's a *Toma*"). Furthermore, a Control Condition in which no overt statement of informant disagreement was present was used to assess whether children demonstrated a bias towards one informant or another, based on non-targeted cues such as speaker order. As in the other experimental conditions, the second speaker provided a contradictory object label. However, no explicit disagreement was present (e.g., Informant 1: "That's a Misk!", Informant 2: "That's a Jole!"). This was necessary given that pragmatically, disagreement statements always come second in dialogue. A control condition was also important given previous findings demonstrating children tend to divide others into social groups based on both in-group and arbitrary characteristics, such as age (Jaswal & Neely, 2006), gender (Maccoby & Jacklin, 1987), and t-shirt colour (Bigler et al., 1997). Additionally, group preferences have been shown to affect children's selective learning decisions (Elashi & Mills, 2014).

Random assignment was done by assigning random numbers to participants using Microsoft Excel random number generator, stratifying by age and sex. Each condition group had roughly the same number of children (Control Condition, n = 37; Polite Disagreement Condition, n = 35; Rude Disagreement Condition, n = 39). Discrepancies in the frequency of condition are due to random assignment as well as participants eliminated from final sample. However, condition groups were comparable in terms of mean age, $F(2, 108) = 0.873$, $p = 0.420$, and sex at birth, X^2 (2, N = 111) = 2.54, $p = .281$. The identity of the disagreeing informant was

counterbalanced across participants in all conditions. We took care to reduce the potential impacts of informant characteristics other than our manipulated variable (i.e., informant disagreement) on children's selective learning. As such, both informants were members of the same gender (women), racial group (White, European descent), and age group (young adults). The chosen characteristics were based on the availability of research assistants to record the informant videos. The informants did not wear any jewelry or pronounced make-up and they wore their hair in the same style. Informant 1 wore a yellow shirt and Informant 2 wore a green shirt in order to distinguish them in a neutral manner.

Here is an example of how a test trial would go: first the participant would view a video. In the video, a picture of an unfamiliar object (e.g., an adapted image of a kitchen gadget) was placed on a stand in front of two informants sitting on either side. In the video, Informant 1 would look at the picture of the unfamiliar object and say: "I think that's a *Misk*!", next Informant 2 would provide a contradictory novel object label. In the Control Condition, the second speaker would reply "I think that's a *Jole*!". In the Polite Disagreement Condition the second informant would say: "I don't think so, that's a *Jole*!", in the Rude Disagreement Condition they would say: "She doesn't know what she's talking about. That's a *Jole*!". Then, the child was asked to endorse one of the provided labels: "So *child's name*, what do you think: is this a *Misk* or a *Jole*?". See Figure 3 for an illustration. Forced-choice questions across conditions for the Selective Learning Task were employed as they have been commonly and successfully used across past selective learning paradigms (e.g., Mills, 2013) and because preschoolers as well as adults have been shown to endorse that that two people disagreeing over facts cannot both be right (Heiphetz et al., 2013).

Figure 3

Experimental Set-Up for Informant Videos

Attribution Tasks.

After completing the Familiarization Phase and Selective Learning Task, children were asked questions about the informant's attributes. The questions were aimed at exploring children's inferences about informant accuracy, confidence, benevolence, as well as physical strength. Questions about accuracy, confidence and benevolence were included given the hypotheses considering the possibility that children might perceive informant disagreement in these terms. Additionally, questions pertaining to the informant's physical strength were posed across both tasks to explore if children were attributing positive qualities to informants that are not related to the cues of accuracy, confidence, or benevolence (i.e., 'halo effect' inferences about the informants). Across both tasks, items were administered in a randomized order. In the Independent Attribution Task, children were asked to use a Likert scale to identify how smart,

confident, nice, and strong each informant was. For example, for one of the accuracy items, children were asked "How smart is *Informant 1*? Not smart at all (0), a little bit smart (1), mostly smart (2), or totally smart (3)?". Visual as well as verbal (written labels) aids were provided to children when completing this task, as pictured in Figure 4. In the Paired Attribution Task, children were asked eight forced-choice questions comparing the informants they saw in the videos directly. Two questions pertained to attributions of informant accuracy (e.g., "Who is better at naming objects, *Informant 1* or *Informant 2*?"), two to confidence (e.g., "Who is most sure of their answers?"), two to benevolence ("Who is better at sharing?") and two to physical strength ("Who can lift the heaviest box?"). See Tables 9 and 10 to review all items across Attribution Tasks.

Table 9

Items Used in Independent Attribution Task

Attribute Domain	Item	Response Options
Accuracy	How smart is *Informant 1*? Not smart at all, a little bit smart, mostly smart, or totally smart?	0 – 1 – 2 – 3
Confidence	How confident is *Informant 1*? Not confident at all, a little bit confident, mostly confident, or totally confident?	0 – 1 – 2 – 3
Benevolence	How nice is *Informant 1*? Not nice at all, a little bit nice, mostly nice, or totally nice?	0 – 1 – 2 – 3
Physical Strength	How strong is *Informant 1*? Not strong at all, a little bit strong, mostly strong, or totally strong?	0 – 1 – 2 – 3
Accuracy	How smart is *Informant 2*? Not smart at all, a little bit smart, mostly smart, or totally smart?	0 – 1 – 2 – 3

Confidence	How confident is *Informant 2*? Not confident at all, a little bit confident, mostly confident, or totally confident?	0 – 1 – 2 – 3
Benevolence	How nice is *Informant 2*? Not nice at all, a little bit nice, mostly nice, or totally nice?	0 – 1 – 2 – 3
Physical Strength	How strong is *Informant 2*? Not strong at all, a little bit strong, mostly strong, or totally strong?	0 – 1 – 2 – 3

Note: Response options were read out loud and provided with a visual aid.

Table 10

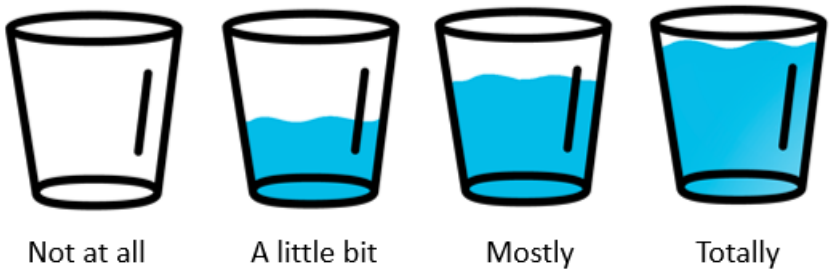
Items Used in Paired Attribution Task

Attribute Domain	Item	Response Options
Accuracy	Who is best at naming objects?	Informant 1 OR Informant 2
Confidence	Who is most sure of their answers?	Informant 1 OR Informant 2
Benevolence	Who is nicest?	Informant 1 OR Informant 2
Physical Strength	Who is strongest?	Informant 1 OR Informant 2
Accuracy	Who says the right answers?	Informant 1 OR Informant 2
Confidence	Who thinks they know best?	Informant 1 OR Informant 2
Benevolence	Who is the best helper?	Informant 1 OR Informant 2
Physical Strength	Who can lift the heaviest box?	Informant 1 OR Informant 2

Note: Response options were read out loud and provided with a visual aid.

Figure 4

Visual and Verbal Aids Provided in the Independent Attribution Task



Note: An accompanying image of the informant under consideration was also presented.

Memory Check. After completing the Paired Attribution Task, children in either experimental condition (Polite Disagreement Condition or Rude Disagreement Condition) completed a memory check to ensure they could identify the disagreeing informant. No memory check was conducted in the Control condition wherein no informant disagreement was present. Children who did not pass the Memory Check were excluded from data analysis (n = 5).

Scoring and Hypotheses

In the absence of accuracy cues, children may employ a confidence and/or dominance heuristic to interpersonal disagreement. Therefore, Hypothesis 1 posited that in the Polite Disagreement Condition, children would endorse labels provided by a disagreeing informant (Hypothesis 1) and make significantly more confidence and epistemic trait attributions (e.g., accuracy) to the disagreeing informant (Hypothesis 2). This prediction was based on studies demonstrating children's tolerance of differing beliefs (Verkuyten & Killen, 2021; Wainryb et al., 2004), their preference for confident informants (Birch et al., 2010), and their trust in informants with decision-making authority (Bernard et al., 2016, Experiment 2).

On the other hand, previous findings suggest that infants can differentiate and prefer prosocial agents (Holvoet et al., 2016), and preschoolers selectively learn from past social cues (Landrum et al., 2016; Lane et al., 2013; Mascaro & Sperber, 2009). Additionally, children typically prioritize social harmony and avoid conflict (Komolova & Wainryb, 2011). Therefore, it was hypothesized that children would endorse the labels provided by the neutral informant in the Rude Disagreement Condition in order to avoid endorsing the discordant informant in the Selective Learning Task (Hypothesis 3) and would be less likely to attribute accuracy, confidence, and benevolence to the discordant informant in Tasks B and C (Hypothesis 4).

Furthermore, some researchers have proposed that mental state understanding is related to an individual's interpretation of interpersonal disagreement (e.g., Barzilai & Eshet-Alkalai, 2015) and that higher theory of mind understanding is linked to greater tolerance of diverse beliefs and preferences (Danniels & Perlman, 2021). Additionally, students' epistemic metacognitive skills are positively related to their ability to integrate multiple information sources (Barzilai & Ka'adan, 2017). Based on these findings, it was predicted that children's age would be positively and significantly correlated with their endorsement of the disagreeing informant in the Polite Disagreement Condition (Hypothesis 5) and negatively associated in the Rude Disagreement Condition (Hypothesis 6). Finally, we did not expect any significant findings across any tasks in the Control Condition (Hypothesis 7), seeing as there was no presence of credibility cues, and both informants were matched according to age, gender, race, and speaking accent.

Results

Selective Learning Task

Across all three conditions, one-sample t-tests were conducted to compare children's scores on the Selective Learning Task (range 0-6) to a chance score (3), with higher scores indicating reliance on the overtly disagreeing informant in the test conditions (Neutral Disagreement Condition and Rude Disagreement Condition). Notably, a higher score indicates reliance on the second speaker in the Control Condition. Reported *p* values are two-tailed. Hypothesis 1 posited that in the Polite Disagreement Condition, children would endorse object labels provided by the disagreeing informant significantly above chance as children would interpret disagreement as a confidence or social dominance cue. The results do not support our initial prediction; in the Polite Disagreement Condition, children's mean score was not significantly different than chance ($M = 3.09$, $SD = 1.15$, $t(34) = .442$, $p = .661$, $d = .075$). These findings suggest that children do not rely on Polite Disagreement as a credibility cue when learning new object labels from disagreeing informants. Moreover, we expected that children would interpret interpersonal disagreement presented in the Rude Disagreement Condition as an antisocial cue and would endorse the labels provided by the neutral informant more often than chance (Hypothesis 3). This prediction was also not supported by our results: children's learning patterns were at chance in this condition ($M = 3.18$, $SD = 1.30$, $t(38) = .865$, $p = .392$, $d = .139$). Our hypothesis regarding chance performance in our Control Condition (Hypothesis 7) was confirmed ($M = 3.00$, $SD = 1.13$, $t(36) = .000$, $p = 1.00$, $d = .000$), demonstrating that there were no underlying systematic preferences for one informant over the other.

Furthermore, Pearson bivariate correlations were calculated to test for developmental differences in children's selective learning. It was predicted that children's age would be

positively and significantly correlated with their endorsement of the disagreeing informant in the Polite Disagreement Condition (Hypothesis 5) and negatively correlated in the Rude Disagreement Condition (Hypothesis 6). Neither of these predictions was supported by the results (Polite Disagreement Condition: r = -.147, p = .399; Rude Disagreement Condition: r = .039, p = .815).

To further explore the factors affecting children's total selective learning scores (dependent variable), we conducted a univariate ANOVA. No significant main effects were found for sex (F(1, 95) = .104, p = .748), experimenter (F(3, 95) = .707, p = .550), or informant (F(1, 95) = 2.38, p = .126; preference for one informant over the other, regardless of speaking order).

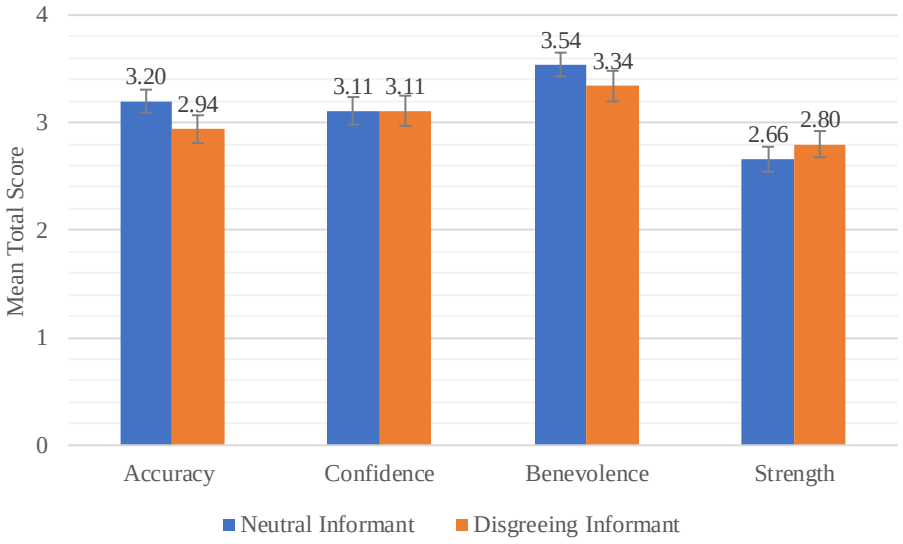
Independent Attribution Task

Paired sample t-tests were computed to determine whether there was a statistically significant difference between the participant's attribution of accuracy, confidence, benevolence, and physical strength to the neutral informant compared to the disagreeing informant within each condition. Therefore, 12 total paired sample t-tests were computed (4 attributions x 3 conditions). All reported p-values are two-tailed. Means are presented in Figures 5, 6 and 7. Because of the large number of comparisons, it is possible that some of the significant effects obtained below are Type-I errors.

Results from the Polite Disagreement Condition do not support our initial predictions (Hypothesis 2), as children did not attribute more accuracy (t(34) = 1.55, p = .130, d = .262) nor confidence (t(34) = 0.00, p = 1.00, d = 0.00) to the disagreeing informant. They also did not differ from chance on benevolence attributions (t(34) = 1.19, p = .242, d = .201) or physical strength attributions (t(34) = -1.15, p = .257, d = -.195).

Figure 5

Mean Independent Attribution Scores in the Polite Disagreement Condition



Note. Error bars reflect the standard error of the mean.

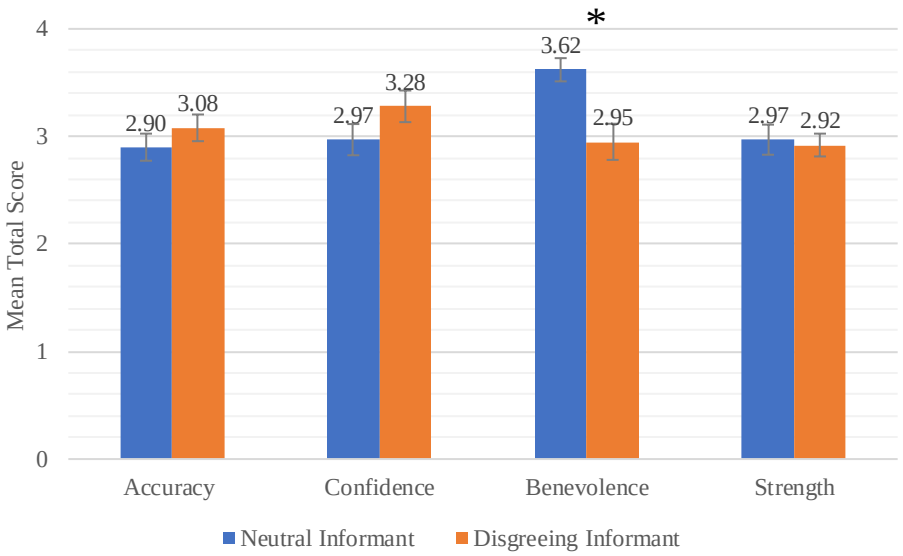
Our initial hypotheses for the Rude Disagreement Condition were partially supported; on average, children attributed significantly more benevolence to the neutral informant ($M = 3.62$, $SD = .673$) compared to the disagreeing informant ($M = 2.95$, $SD = 1.05$; $t(38) = 3.30$, $p = .002$, $d = .528$). However, all other attributions were non-significant (Accuracy: $t(38) = -1.02$, $p = .313$, $d = -.164$; Confidence: $t(38) = -1.39$, $p = .172$, $d = -.223$; Strength: $t(38) = .285$, $p = .777$, $d = -.046$).

To further explore the independent variables affecting children's total independent accuracy, confidence, benevolence, and strength scores (dependent variables), we conducted two multivariable ANOVAs. No significant main effects were found for sex, experimenter, or informant across the Disagreeing Informant Attributions (Sex: $F(4, 92) = 1.10$, $p = .362$; Experimenter: $F(12, 243) = 1.18$, $p = .302$; Informant: $F(4, 92) = 1.37$, $p = .251$) and the Neutral

Informant Attributions (Sex: $F(4, 92) = 1.50$, $p = .210$; Experimenter: $F(12, 243) = 1.07$, $p = .388$; Informant: $F(4, 92) = 1.33$, $p = .266$).

Figure 6

Mean Independent Attribution Scores in the Rude Disagreement Condition

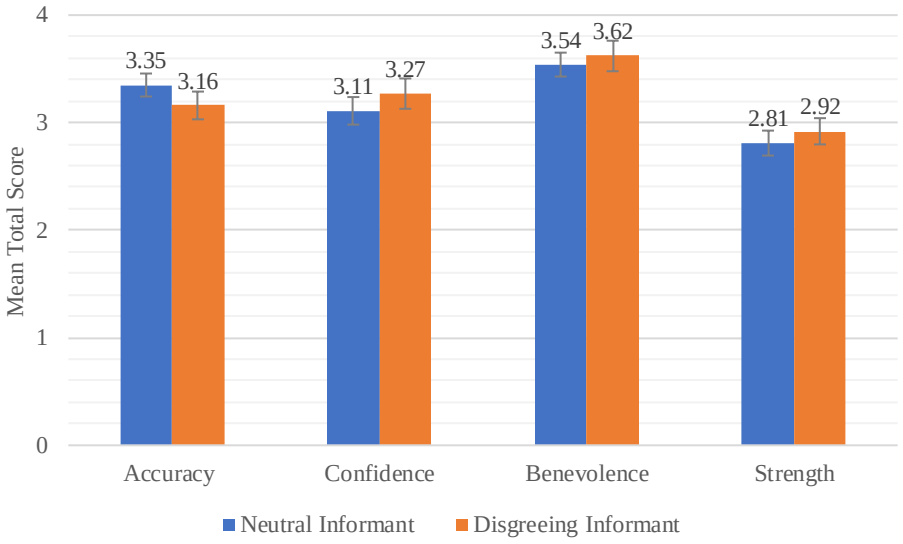


Note. Error bars reflect the standard error of the mean. * $p < 0.05$.

Finally, as predicted, there were no significant differences on any type of attributions in the Control Condition (Hypothesis 7), when there was no disagreement present (all ps>.20).

Figure 7

Mean Independent Attribution Scores in the Control Condition



Note. Error bars reflect the standard error of the mean.

Paired Attribution Task

Across all three conditions, one-sample t-tests were conducted to compare children's scores on the forced-choice attributions task (range 0-2) to a chance score (1), with higher scores indicating a positive bias towards the disagreeing informant in the test conditions (Polite Disagreement Condition and Rude Disagreement Condition). Again, a higher score indicates a positive bias towards the second speaker in the Control Condition. Reported *p* values are two-tailed. Not all items were completed by all participants. Therefore, an item sample size for each result is provided. In total, 19 participants did not answer a minimum of 1 item for this task. When faced with the forced choice between informants, these children refused to pick one informant and spontaneously answered "both" or did not answer at all. We will return to the implications of this in the discussion section below.

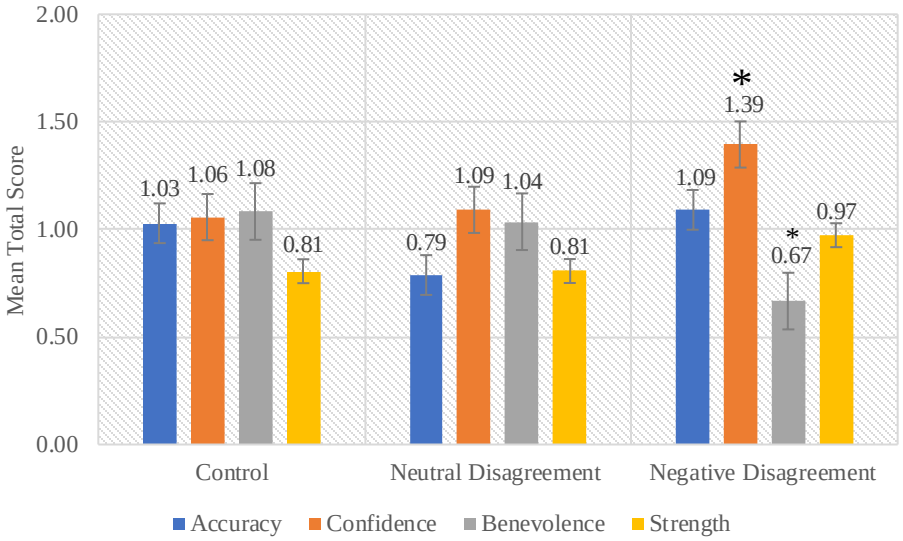
We initially predicted that children in the Polite Disagreement Condition would interpret disagreement as an assertive confidence or social dominance cue (Hypothesis 2), and therefore make more confidence attributions about the disagreeing informant. This initial prediction was not supported: when exposed to neutral disagreement in the Polite Disagreement Condition, children did not make any significant attributions about the informants (all *ps* > 0.05; Accuracy: $t(32) = -1.37$, $p = 0.182$, $d = -.238$; Confidence: $t(32) = 0.683$, $p = 0.500$, $d = .119$; Benevolence: $t(27) = 0.225$, $p = 0.823$, $d = .043$; Strength: $t(30) = -1.29$, $p = 0.206$, $d = -.232$). However, in support of Hypothesis 4, children in the Rude Disagreement Condition attributed more confidence ($M = 1.39$, $SD = 0.790$, $t(37) = 3.08$, $p = .004$, $d = .500$) and less benevolence ($M = 0.667$, $SD = 0.828$, $t(35) = -2.41$, $p = .021$, $d = -.403$) to the disagreeing informant. Children in this condition did not make any significant inferences about informant accuracy nor physical strength (all *ps* > 0.05; Accuracy: $t(32) = .594$, $p = 0.557$, $d = .103$; Strength: $t(36) = -.172$, $p = 0.865$, $d = -.028$). Furthermore, in support of our initial Hypothesis 7, children in the Control Condition did not make any significant informant attributions regarding accuracy, confidence, benevolence, or physical strength (all *ps* > 0.05; Accuracy: $t(34) = .206$, $p = .838$, $d = .035$; Confidence: $t(34) = .442$, $p = .661$, $d = .075$; Benevolence: $t(35) = .595$, $p = .556$, $d = .099$; Strength: $t(35) = -1.48$, $p = .147$, $d = -.247$). See Figure 8 for a summary of mean total scores across attribution categories and study conditions.

To further explore the independent variables affecting children's total forced-choice accuracy, confidence, benevolence, and strength scores (dependent variables), we conducted a multivariable ANOVA. No significant main effects were found for sex ($F(4, 73) = 1.35$, $p = .260$), or experimenter ($F(12, 193) = 1.08$, $p = .378$). However, there was a significant informant effect ($F(4, 73) = 4.68$, $p = .002$), demonstrating that the children had a preference for one

informant over the other, regardless of speaking order. A discussion of the implications of this finding will follow.

Figure 8

Mean Paired Attribution Scores sorted by Attribution Type and Condition



Note. Error bars reflect the standard error of the mean * $p < 0.05$

Exploratory Analyses

Pearson bivariate correlations were calculated to test for developmental differences in children's attributions. Results demonstrate that age was not significantly associated to children's attribution of accuracy, confidence, benevolence, nor physical strength of the informants across the Control Condition (Accuracy: $n = 35$, $r = -.056$, $p = .749$; Confidence: $n = 35$, $r = -.182$, $p = .296$; Benevolence: $n = 36$, $r = .107$, $p = .533$; Strength: $n = 36$, $r = .015$, $p = .929$) and in the Polite Disagreement Condition (Accuracy: $n = 33$, $r = -.119$, $p = .510$; Confidence: $n = 33$, $r = .066$, $p = .716$; Benevolence: $n = 28$, $r = .041$, $p = .834$; Strength: $n = 31$, $r = .113$, $p = .546$). However, in the Rude Disagreement Condition, children's age was significantly and negatively correlated with children's benevolent attributions towards the disagreeing informant ($n = 36$, $r =$

-.390, p = .019). This finding indicates that as children age, they attribute less benevolence to informants who disagree rudely. All other informant attributions did not correlate with age for the Rude Disagreement Condition (Accuracy: n = 33, r = -.039, p = .829; Confidence: n = 38, r = .245, p = .139; Strength: n = 37, r = -.127, p = .454).

Furthermore, correlations between children's scores on the Selective Learning Task and their paired attribution questions regarding confidence and benevolence were conducted to examine the possibility of individual differences in learning patterns based on disagreement. Results revealed non-significant correlations across the Polite Disagreement Condition (Confidence: n = 33, r = .067, p = .713; Benevolence: n = 28, r = -.044, p = .842) and the Rude Disagreement Condition (Confidence: n = 38, r = .105, p = .267; Benevolence: n = 36, r = -.034, p = .842).

Discussion

This study was the first of its kind, to our knowledge, to investigate selective learning and children's informant attributions in the context of active dialogue between speakers. This novel paradigm represents a springboard for future research. This is of utmost importance given the social environments children are exposed to outside of laboratory studies. There is a large body of research demonstrating that dialogue between a child and an informant (typically a teacher) improves the child's learning (see Littleton & Mercer, 2010 for a review). However, we know extraordinarily little about how children learn from third-party informants in dialogue with one another.

Results from the Selective Learning Task revealed that, on average, 5- to 8-year-old children did not selectively learn based on disagreement cues; this result held whether the type of disagreement presented was neutral (Polite Disagreement Condition) or negative (Rude

Disagreement Condition). That said, results from both Attribution Tasks suggest that children did notice and consider disagreement when making informant attributions about confidence and benevolence. In support of our initial hypotheses, children in the Rude Disagreement Condition made systematic inferences about the disagreeing informant. Specifically, children attributed significantly more benevolence to the neutral informant in comparison to the disagreeing informant (Independent Attribution Task). Furthermore, in the Paired Attribution Task, children tended to infer that the disagreeing informant displayed higher confidence levels and lower benevolence than would be expected by chance. In combination, these findings suggest that although children make confident and antisocial trait assumptions about disagreeing informants who undermine others' competency, these attributions do not guide their learning preferences in an object labelling task.

Results from this study are in-line with recent findings demonstrating that children's selective learning decisions are not always associated to the kinds of attributions they make about informants (Fobert et al., submitted). It is crucial to recognize that making distinct attributions to different speakers does not necessarily result in selectively learning from one speaker over the other. Understanding both situations—when attributions do and when they do not influence selective learning—is important for a more complete understanding of the subject.

While certain studies indicate that children generally favour learning from benevolent rather than antisocial sources (e.g., Holvoet et al., 2016) as well as confident over hesitant speakers (e.g. Birch et al., 2010), it is essential to recognize that this preference may not be consistent across all social situations. Our findings suggest a lack of systematic learning patterns based on disagreement, when presented in polite as well as impolite social exchanges. This underscores the complexity of children's decision-making processes and caution against

overgeneralizing the influence of benevolence and confidence cues in every instance of learning. For instance, it is plausible that when benevolence or confidence cues are presented within the context of two individuals disagreeing over a specific fact, children may interpret the cues as situational rather than inherent traits of the speakers.

It is somewhat reassuring, however, that children do not use the mere fact of expressing disagreement as a cue that one person is competent or knows more. This would perhaps allow children to prioritize evaluating the content of testimony, which is arguably a more effective strategy for discerning the reliability of a claim. However, children's learning preferences might have remained unchanged based on the presence of explicit disagreement given that the paradigm used in this study only evaluated children's learning decisions in a specific learning context: namely, learning a label for a novel object. Future studies could investigate whether children's learning preferences are affected when the learning task is moral rather than factual, such as when faced with ethical decision-making or reasoning.

Another main conclusion that can be drawn from these results is that the type of disagreement presented to children influences the type of informant attributions they make. Specifically, results from both Attribution Tasks reveal that when presented with informants who disagree in a neutral/polite manner, children did not make any significant attributions about their accuracy, confidence, benevolence, or physical strength. These results, and specifically in terms of children's confidence attributions, were unexpected. We hypothesized that children in the Polite Disagreement Condition might interpret the presented disagreement statements as indicators of certainty. This prediction was based on previous research demonstrating that children consider assertive gestures, tone of voice, as well as lexical cues to discern confidence (Prieto et al., 2016; Hübscher et al., 2017). This is in contrast with the significant results in the

Rude Disagreement Condition, wherein the disagreeing informant made their claims in a negative manner by undermining the first speaker's claims. Here, children made antisocial and confident attributions based on disagreement but did not make any attributions regarding the speaker's accuracy or physical strength. Based on the substantive body of literature demonstrating that from a very young age children can distinguish prosocial from antisocial behaviours, and prefer the former (e.g., Hamlin et al., 2007; Hamlin & Wynn, 2011; Holvoet et al., 2016; Margoni & Surian, 2018) it was not completely surprising that children interpreted the demonstrated rude disagreement behaviour as antisocial, both when compared to a neutral informant and when measured independently. Future research could make attempts to delineate whether children made these attributions based on the general negative valence of the disagreeing informant's claim or based on the actual manipulation of disagreement. In other words, questions pertaining to which element of the explicit rude disagreement led to these attributions remain.

Furthermore, this study investigated the developmental course of children's disagreement evaluations. Given the non-significant findings demonstrating that children did not selectively learn based on the cue of explicit disagreement, it was not surprising children's age was not correlated with selective learning scores across conditions. However, exploratory analyses results from the Paired Attribution Task revealed that as children age, they attributed less benevolence to informants who disagreed in a negative manner (Rude Disagreement Condition). This significant and negative correlation suggests that perhaps as children age, they attribute less benevolence to informants who disagree in a negative manner due to their increasing ability to discern nuances in social interactions and understand that disagreement can sometimes be associated with negative intentions or attitudes. This developmental trend is in line with research demonstrating

that children's *pragmatic understanding*, or their ability to use language in social contexts effectively, improves with age (Bosco et al., 2018). Furthermore, pragmatic understanding has been found to develop greatly within the developmental period studied in the current investigation. For instance, Glenwright and Pexman (2010) have found that although children show a nascent understanding of sarcasm and irony by the age of 6, they do not fully recognize the underlying intentions behind these speech acts until around the age of 9 or 10.

Forced-choice style methods were employed in the Selective Learning Task (selective learning) and the Paired Attribution Task, drawing on the success of similar approaches in previous studies on selective learning, such as Cossette and colleagues (2020), and given that both preschoolers and adults have been found to believe that when two individuals disagree on factual matters, both cannot be correct (Heiphetz et al., 2013). However, when faced with the dichotomous forced choice across both tasks, children in this study often spontaneously endorsed both informants and/or refused to endorse any informant altogether. Because of this, in the Paired Attribution Task, nineteen of the 111 participants did not complete all items. This represents a limitation of the current investigation, as the excluded data points may differ systematically from the included ones. Additionally, the restrictive answer options might not have accurately represented the possible nuance in children's learning patterns and informant inferences. Notably, findings across both attribution tasks were similar, even with Likert-scale items (the Independent Attribution Task). Furthermore, despite our efforts to control the appearance of the informants, on the Paired Attribution Task, children demonstrated a systematic preference for one informant over the other. Importantly, this effect was likely mitigated by the inclusion of counterbalanced informant identity. In other words, the "preferred" informant was the disagreeing informant for half of participants, and the neutral informant for the other half of

participants. It is also possible that this significant effect is the result of a type 1 error, given the large number of tests conducted and variables included. However, an area of future research could be to explore children's selective learning patterns and attributions based on informant disagreement using more nuanced measures, such as those used by Fobert and colleagues (submitted) where options to endorse 'Informant 1', 'Informant 2', 'Both', or 'None' were available for each attribution item.

In conclusion, this study contributes to filling two current gaps in the literature: 1) the effect of disagreement on children's learning and attributions, and 2) the development of a novel paradigm to investigate selective learning in the context of informant dialogue and explicit disagreement. The findings from this investigation reveal that children's learning decisions may not be influenced by the presence of informant disagreement, children's informant inferences do not always map on to their learning preferences, and that the type of disagreement present in third-party dialogue influences children's informant attributions. These contributions represent an essential springboard for future research and contribute to furthering our understanding of children's social learning. These results are especially relevant in a time of polarization, digitalization, and given children's easy access to extraordinary amounts of (mis)information.

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Chapter 4: General Discussion

Summary and Interpretation of Results

The primary objective of this dissertation was to provide insight into how children interpret and use credibility cues that guide their selective learning decisions. To achieve this, Study 1 investigated the kinds of inferences children make regarding confidence credibility cues. Study 2 examined how children interpret credibility cues when indicators of accuracy and confidence are contradictory. Lastly, Study 3 explored cues of informant disagreement and addressed a limitation in existing selective learning experiments by introducing explicit disagreements between informants.

Findings from Study 1 build on prior research showing that children prefer to learn from someone who is confident rather than hesitant (e.g., Brosseau-Liard et al., 2014; Jaswal & Malone, 2007). It is often assumed in the selective learning literature that if children show a preference to learn from an individual who displays a specific cue (e.g., confidence), it is because they attribute more knowledge to that individual (e.g., Birch et al., 2010; Brosseau-Liard et al., 2018; Moore et al., 1989). However, to our knowledge, this assumption had never been directly tested. In Study 1, we provided this test in two ways. First, we asked children to make guesses about the author of correct and incorrect answers, reasoning that if children attributed knowledge to a confident individual and lack of knowledge to a hesitant individual, they should expect accurate answers from the confident person and inaccurate answers from the hesitant one. Second, we asked children to make explicit knowledge as well as broader attributions to each individual. Both tasks revealed that children, particularly by age 6, attributed knowledge to confident informants and inaccuracy to hesitant informants. Furthermore, older children made explicit knowledge attributions based on confidence but only on some types of trials (word knowledge).

Study 2, in contrast, tested children's knowledge inferences when conflicting credibility cues were at play, specifically when one informant was accurate and hesitant and the other was inaccurate and confident. We reasoned that if the attributions made in Study 1 were due to an assumption of knowledge (or lack thereof), then conflicting information about accuracy should reverse these attributions, as accuracy is arguably a more reliable cue to knowledge than confidence. Indeed, results revealed that when making knowledge attributions, children relied on informant accuracy over displayed confidence cues and that the breadth and size of these effects appear greater for accuracy (Study 2) than for confidence (Study 1).

In previous chapters, I mentioned several possible ways that children could interpret confidence: as an epistemic cue (person-specific or situational) or as a non-epistemic cue. The data supports a person-specific epistemic interpretation of confidence in school-aged children. In other words, older children attributed knowledge to the previously confident informant (Study 1) but reversed these attributions when a hesitant informant was shown to be most accurate (Study 2). Younger children (3- to 5-year-olds) did not seem to make systematic informant attributions based on confidence. The developmental trend obtained here aligns with other selective learning research, showing that with age, children become more likely to generalize knowledge attributions based on other credibility cues (e.g. Brosseau-Liard & Birch, 2010).

Addressing a significant gap in previous research, Study 3 explored the impact of interpersonal informant disagreement on children's selective learning patterns and informant attributions. This study aimed to enhance the ecological validity of selective learning paradigms by incorporating explicit informant disagreement as a cue for children's learning decisions. Findings revealed that 5- to 8-year-old children do not base their learning decisions on the cue of disagreement despite attributing significantly more confidence and less benevolence to

discordant speakers who undermine another's claim. Specifically, we initially predicted that children would selectively endorse object labels and make positive attributions about informants who disagreed neutrally and that children would selectively avoid endorsing object labels and make negative attributions about informants who disagreed negatively. Findings deviated somewhat from expectations: children did not make systematic learning decisions nor attributions in the Polite Disagreement Condition. In the Rude Disagreement Condition, children attributed more confidence and less benevolence to the disagreeing informant, but their learning patterns remained unaffected. These findings suggest that although children make confident and anti-social trait assumptions about discordant informants who undermine others' competency, these attributions do not guide their learning preferences in an object labelling task.

Theoretical Contributions

The present results also relate to ongoing investigations into the cognitive mechanisms underlying children's learning decisions. One line of reasoning suggests that children's selective learning is an active, rational process in which they rely on their knowledge as a baseline for making further inferences (e.g. Sobel & Kushnir, 2013). Multiple avenues of evidence support this theory; for instance, when presented with two competent models who differ in their field of expertise, children attribute domain-specific competence to each informant (Hermes et al., 2015; Kominsky et al., 2018; Kushnir et al., 2013; Lutz & Keil, 2002; Sobel & Corriveau, 2010). In these cases, children attributed specific knowledge to relative experts and did not simply generalize the trait of "being knowledgeable" to all informants across all domains. In addition, work on children's selective learning in the presence of conflicting cues suggests that, at least by age four, children make seemingly reasoned learning decisions, preferring, for instance, an unfamiliar accurate informant compared to a familiar inaccurate counterpart (Corriveau &

Harris, 2009), or weighing speaker accuracy over speaker accent in object labelling tasks (Corriveau et al., 2013). In contrast, less complex mechanisms could explain children's selective trust in other situations: Some authors posit, for instance, that selective learning can be based on an associative process, in which children make sweeping positive or negative generalizations about an informant and then base their future trust on these generalized inferences. For instance, children assume attractive speakers are more knowledgeable (Bascandziev & Harris, 2016) and trust that an informant's prosocial behaviours reflect their expertise (Landrum et al., 2013).

Hermes, Behne and Rakoczy (2018) proposed a dual-process account of selective learning to reconcile these two seemingly opposite arguments. They suggested that children use two co-existing cognitive processes: type I is automatic and provides heuristic default judgments, whereas type II is slow and provides flexible trait reasoning. Recently, Blakey and colleagues (2022) found that younger children completed a selective learning task using associative problem-solving (Type I), whereas older children demonstrated explicit and flexible selective learning (Type II). These results suggest that children can better access and employ Type II selective learning mechanisms as they age.

The results from Studies 1 and 2 do not conclusively determine the type of mechanism underlying children's trust in confident speakers, as this was not a primary research objective. Nevertheless, both Study 1 and Study 2 lend evidence that children employ flexible trait reasoning based on demonstrated confidence cues. Specifically, findings from Study 1 revealed that older children used confidence to attribute knowledge explicitly, but only for the specific trait of word knowledge, demonstrating that children made domain-specific epistemic inferences. In other words, children inferred that the speaker who demonstrated confidence while labelling objects was also knowledgeable at object labelling but not necessarily knowledgeable in other

domains such as fact knowledge. Furthermore, results from Study 2 show that even preschoolers overrode confidence cues when conflicting accuracy cues were present. Both of these results are consistent with a rational inference such as described by Sobel and Kushnir (2013) or a type II learning mechanism as delineated by Hermes et al. (2018). Our results suggest that children move beyond simple shortcuts or general rules when deciding whom to trust for information. Instead of relying on mere associative or heuristic reasoning, children seemed to use a more nuanced cognitive approach in decision-making.

Because no systematic learning patterns were found in Study 3, it is unclear whether children employed associative problem-solving (Type I) and/or flexible selective learning (Type II; Hermes et al., 2018). That being said, the disconnect between children's systematic informant attributions and unsystematic learning patterns is worthy of note and future investigation. Choosing *not* to be selective *can* be a learning strategy; one can rationally consider a cue and then disregard it. Additionally, the fact that children recognized certain informant attributes (confidence, benevolence) but did not change their selective learning accordingly is somewhat in line with the findings from Study 1, wherein younger children did not attribute knowledge to the confident informant even though we know that children of this age, exposed to the same protocol, are capable of noticing the confidence cues displayed. In both cases, children took stock of the presented cues but did not update their informant attributions (Study 1) or learning patterns (Study 3) based on them. However, experimentally, it is challenging to distinguish active rejection of a cue from lack of noticing said cue. It is also possible that children's lack of systematic informant inferences (Study 1) and learning preferences (Study 3) was a product of the employed methodology or instability of individual differences in children's performance.

Future research is required to better understand the cognitive mechanisms underlying children's evaluations of informant disagreement.

Generally, these studies provide a deeper understanding of how children evaluate credibility cues, ultimately increasing our understanding of their selective social learning and socio-cognitive learning theory in general. All three studies increase our comprehension of both epistemic and non-epistemic cues. Confidence and accuracy emerge as epistemic cues, suggesting that they influence children's judgments about knowledge and credibility. Disagreement, however, does not appear to function as a standalone credibility cue in all contexts. However, in a Rude Disagreement Condition, children perceive discordant speakers as more confident in their knowledge (epistemic reasoning) and less benevolent, indicating a need for further investigation.

Methodological Considerations

The present investigation contributes novel insights and perspectives to the existing research on selective learning. For instance, the attribution-related tasks employed across all three studies represent novel paradigms (Study 1 and 2: Sorting Task, Attribution Task; Study 3: Independent Attribution Task, Paired Attribution Task). While drawing from some aspects of methods from prior studies (Brosseau-Liard & Birch, 2010), these tasks introduced new ways of measuring the underlying attributions children make when deciding to learn from different sources of information. These tasks were designed to be simple and adaptable across various testing settings, such as daycares, laboratories, or videoconferencing. Consequently, the attribution tasks offer a practical and accessible framework for researchers to adopt and adapt in their investigations. Future endeavours can apply these methods to explore other credibility cues,

where learning patterns but not informant attributions based on the cues have been extensively studied.

Along the same lines, Study 3 contributes a new paradigm to measure children's selective learning patterns by targeting a critical concern regarding ecological validity. Prior to this study, the research landscape lacked investigations into how children acquire knowledge in social contexts characterized by interactive dialogue among speakers. This is crucial because much of the previous research has drawn substantial conclusions regarding children's learning from informants providing conflicting claims (see Markson & Luo, 2020). However, such conclusions were often founded upon methodologies that lacked realism, such as presenting videos wherein informants label objects individually and independently (Yang et al., 2023). Consequently, the extent to which these findings reflect the selective learning processes in children's natural social environments, encompassing settings like home, school, and peer interactions where information is rarely presented in isolation, remains unclear. Study 3 provided a simple paradigm that fills this gap. Future research could employ the methods used in Study 3 and adapt them to explore other credibility cues to ensure that the conclusions drawn from previous studies are held in social environments wherein speakers are in active dialogue.

The current investigation has several strengths and weaknesses. As previously noted, Studies 1 and 2 expanded beyond preschoolers to include children aged 6 to 8, which is less common in studies focusing on selective social learning. This broader age range allowed for a more comprehensive examination of developmental differences in children's comprehension of confidence and accuracy cues. For instance, Studies 1 and 2 found clear developmental progressions in the interpretation of confidence: starting around the age of 5 or 6 (but not sooner) children begin making broad-based epistemic informant inferences based on confidence.

However, accommodating such a wide age range presented challenges in designing a procedure suitable for all age groups. Generally, tasks that are developmentally appropriate for 3-year-olds carry the risk of being boring or leading to ceiling effects for school-aged children, particularly by age 7 or 8. The opposite is also true—tasks that are developmentally appropriate for older school-aged children may be too difficult for the younger children in the sample. For instance, the Attribution Task, based on a previous study involving preschoolers (Brosseau-Liard & Birch, 2010), might have posed difficulties for the youngest children due to its length and the order in which it was administered (following the Sorting Task).

Regarding the stimuli presented to the children, the informants selected for all three studies were primarily determined by the availability of research assistants. While efforts were made to match informants across various demographic traits such as gender, age, race, and speaking accent, it's important to note that all six informants were consistently young, white women. This homogeneity in informant characteristics raises questions about the representativeness of the informants and the potential impact on children's learning experiences. Previous research has shown that children may learn differently from individuals who vary in demographic traits such as age (Jaswal & Neely, 2006) and race (Chen et al., 2018). Future directions could include attempts at replicating these findings with a diverse range of informants while ensuring that the two speakers are matched on their relative demographic features. For example, how would having two male speakers, compared to two females (as seen in our studies), impact children's inferences about speaker confidence, accuracy, and disagreement? In all, the reliance on a narrow demographic profile for informants in these studies limited the generalizability of findings and may have overlooked essential nuances in children's learning processes. That being said, results from the Control Condition in Study 3 demonstrate that

children's learning decisions were not systematically influenced one way or another by the demographic qualities of these specific informants. Moreover, the fact that both informants were adults also impacts the validity of some items in this task, which children may have assumed would be easy for any adult (e.g., in Studies 1 and 2: 'Who can bake cookies?') or, on the contrary, inapplicable to adults (e.g., in Studies 1 and 2 'Who always shares her toys?'). Future studies could explore the kinds of informant attributions children make as well as the selective learning patterns children demonstrate in response to peer informants.

In all three studies, children viewed informants making contradictory claims about object labels. This offered a focused lens through which to examine attributions (Studies 1, 2, 3) and selective learning (Study 3) within a specific learning domain (i.e., object labelling). Additionally, this learning domain was chosen because of clear findings indicating that children mistrust informants who mislabel objects (e.g., Koenig & Woodward, 2010; Pasquini et al., 2007; Sobel & Corriveau, 2010). In fact, previous research has found that children are more vigilant in their treatment of semantic testimonials (including object labelling) compared to their treatment of episodic claims (e.g., object location) when selectively learning (Stephens & Koenig, 2015). Furthermore, examining object labelling across all three studies provided a consistent framework for analysis and interpretation. This was particularly important for Studies 1 and 2, which were conducted simultaneously and had similar research questions. However, it is essential to acknowledge that our exclusive use of object labelling as the learning domain presented introduces a degree of specificity to our findings. While this methodology offers insights into children's word learning, it may only partially capture the breadth of children's cognitive processes across different learning contexts. Harris and colleagues (2018) note the need for selective trust paradigms to go beyond straightforward word-labelling tasks and include

scenarios that reflect challenging and nuanced testimony that children are exposed to in their everyday lives. Future research could examine the effects of different presented learning domains (e.g., knowledge of object functions, moral claims) on children's attributions and selective learning decisions.

The cross-sectional research design employed in our studies also presents strengths and limitations. Examining children's attributions and selective learning patterns across different age groups allowed for the investigation of developmental differences. However, this study design could have introduced a possible cohort effect (i.e., when a social, historical, or cultural event systematically influences a measured outcome; Trzesniewski & Donnellan, 2010), ultimately influencing the results. Essentially, the impact of the COVID-19 pandemic could have affected individuals within the same age group differently from individuals in other age groups. The impact of the COVID-19 pandemic and accompanying factors on young children's social and behavioural outcomes is still largely unknown (Kästner et al., 2023). However, acute stress has been shown to affect children's working memory, cognitive flexibility, and interference control (see Shields et al., 2016 for a review), and the COVID-19 pandemic has been found to have increased children's risk for experiencing chronic and acute stress (Smith & Pollak, 2022). Furthermore, there is early evidence of age-related effects of the COVID-19 pandemic on children's mental health (Schmidt et al., 2021) and executive functioning skills (Perry et al., 2023). It is therefore plausible that the participants in our studies had systematically different experiences with COVID-19, depending on their age group. This effect could complicate interpretations of study findings, as differences observed between age groups may be attributed to cohort-specific factors rather than true developmental differences. This is particularly pertinent for Study 3, given that all participating children experienced the COVID-19 pandemic

before participating, enduring various forms of government-issued containment measures, such as physical distancing, stay-at-home orders, and school closures (Canet-Juric et al., 2020), which may have influenced the development of children's social learning strategies. Notably, in Study 3, many children spent a significant portion of the preceding two to three years amidst the pandemic's impact. This prolonged exposure to pandemic-related circumstances could have affected children across different age cohorts disparately or potentially influenced the outcomes of Studies 1 and 2 compared to Study 3. For instance, our studies included children who would have transitioned to kindergarten after the Spring of 2020 lockdowns, which is the cohort that has been found to be the most affected by the pandemic in terms of their executive functioning performance (Perry et al., 2023). Thus, careful consideration of the potential cohort effect is essential in interpreting the findings and understanding the nuanced impact of the pandemic on children's social learning behaviours. To mitigate this, future research could examine our research questions using longitudinal studies to assess the stability of individual differences in informant attributions over time or reproduce this study with children who were not directly affected by the pandemic (children born after 2022).

Finally, a major limitation of this investigation includes the generalizability of our findings. The three samples used in the current investigations do not accurately reflect the cultural diversity of the population for which they describe. This was due to convenience sampling and recruitment from a pre-existing participant database. Most of our samples consisted of White Canadian children from educated families with middle to high socio-economic status. Unfortunately, these samples reflect the current norm in developmental science. In fact, Nielsen and colleagues (2017) note a massive sampling bias in the field of child development. These findings built on work done by Henrich and colleagues (2010), showing an

overrepresentation of Western, Educated, Industrialized, Rich, and Democratic (i.e., WEIRD) samples published in high-impact-factor child development journals. In an attempt to diversify our samples, we offered Study 1 and Study 2 in two languages (English and French). We also conducted testing in daycare centres (Study 1 and 2), for which no demographic information was collected. Previous research has noted several barriers to testing in the laboratory, such as transportation and flexible work schedules that allow for participation during business hours, disproportionately affecting low-income families (Gross et al., 2001). Evidently, our daycare participants did not experience these barriers, which suggests that our daycare sample could have been more diverse than our laboratory participants. In Study 3, we offered even fewer geographical barriers through online testing. However, it remains essential for future research to explore the cross-cultural applicability of our findings using more diverse and representative samples.

Practical Applications and Implications

The current findings have many practical implications for the field of selective learning and the broader field of developmental science. Before 2021, many cognitive development studies examining children's selective trust were conducted in person and often involved physical participation, such as children searching different rooms, pointing to informants, or manipulating stimuli (e.g., Cossette et al., 2020; Jaswal et al., 2010). In a similar fashion, the majority of Study 1 and 2 participants were tested in person and were asked to manually place cards in envelopes as part of the Sorting Tasks. However, due to physical distancing practices and policies following the COVID-19 pandemic, our methods had to be adapted to a videoconferencing platform, as was the case for many other researchers. Results revealed some differences in performance across settings. In Study 1, children who participated in the lab attributed more word knowledge

to the confident informant than those who participated in daycares and via videoconferencing. Similarly, in Study 2, children who participated in the study online attributed more incorrect labels to the confident (and inaccurate) informant than those in the physical laboratory and daycare settings. However, the average age of participants differed by place of experiment, as only older participants remained to be tested online when the COVID-19 pandemic began, and only preschool-age children were tested in daycares. Therefore, any effect of the place of the experiment may have been an artifact of this unplanned age difference. More research is needed to support the feasibility, reliability, and validity of these online testing methods. Nevertheless, the virtual administration of previously in-person-only paradigms, including Studies 1 and 2 as well as other published works in the field (e.g., Dragon & Poulin-Dubois, 2023; Li & Koenig, 2022), offered a promising first step which paved the way for Study 3 to be exclusively conducted online, marking a significant departure from traditional approaches in developmental science. Furthermore, a recent meta-analysis (N= 2440) found that online developmental studies are comparable to those administered in a laboratory setting (Chuey et al., 2022).

The development of virtual testing methods, which was largely prompted by the social environment of the pandemic, resulted in many practical implications for developmental science in general (Rodd, 2024), and for our findings specifically. Firstly, remote testing allowed for broader and more diverse participant recruitment. For instance, in Study 3, we tested children residing in Ontario, Quebec, British Columbia, Nova Scotia, and the United States. In general, broader geographical recruitment enhances the generalizability of findings and promotes a more comprehensive understanding of cognitive processes across populations. Moreover, the virtual testing methods employed offered increased accessibility and convenience for both researchers and participants. In our investigations, many participants voiced that they benefitted from the

flexibility of completing assessments remotely, especially given their busy lives with young children. Further anecdotal evidence was collected, suggesting that a large portion of scheduled in-person appointments during winter months tend to be cancelled due to adverse weather conditions such as snowfall, freezing rain, or extreme cold temperatures. By eliminating the need for physical laboratory spaces and travel and/or parking arrangements, the conducted research was also more efficient and cost-effective compared to in-person studies. Furthermore, we tailored the virtual testing platform in Study 3 to incorporate interactive elements and multimedia stimuli, providing richer and more ecologically valid experimental environments. This facilitated the investigation of cognitive processes in contexts that more closely resemble real-life scenarios, thereby enhancing the ecological validity of research findings. Overall, the development and implementation of virtual testing methods represent a significant advancement in cognitive development research, offering researchers new opportunities to explore social learning and other socio-cognitive mechanisms with enhanced efficiency, accessibility, and ecological validity.

The current investigations also hold significant promise for applications in education, particularly in informing pedagogical practices. Educators can use the findings to enhance their teaching by incorporating developmentally appropriate credibility cues when delivering new content. This tailored approach to information delivery could enhance students' trust in the presented content, which could ultimately increase learning in the classroom. On the flip side, future research could explore intervention and skill-building opportunities to increase selective learning skills in the classroom based on the current body of knowledge. By equipping children with the tools to evaluate content critically, educators can help foster a generation of discerning learners capable of navigating the vast information available in the digital age. Increasing

selective learning skills is crucial for several reasons, particularly as children develop into adults who constantly need to select reliable sources of information. This is imperative for fostering a society capable of making informed decisions, participating in democratic processes, and responding effectively to novel crises such as the COVID-19 pandemic.

To our knowledge, there is no existing program to increase selective learning skills in children or adults. There is, however, research pertaining to the improvement of critical thinking, which has been defined as a "purposeful, self-regulatory judgment that results in interpretation, analysis, evaluation, and inference, as well as explanations of the considerations on which that judgment is based" (Abrami et al., 2015). The construct of selective social learning is arguably similar to that of critical thinking in that they both are cognitive decision-making processes which require individuals to assess the credibility, relevance, and reliability of the information they encounter. However, more research is needed to conclude that increases in critical thinking skills relate to improved selective learning.

While there is some research on fostering critical thinking skills in educational contexts, these tend to be concentrated on adolescents and adults (see Behar-Horenstein & Niu, 2011 for a review). Additionally, although critical thinking instruction is increasingly integrated into higher education, many of the delivered programs are not empirically based and lack effectiveness (Tiruneh et al., 2014). Furthermore, effect sizes for critical-thinking interventions targeting elementary to middle-school-age children are greater than for either high-schoolers or university students (Abrami et al., 2008; Kettler, 2014), suggesting early intervention is key. It may thus be worthwhile to start teaching critical thinking even earlier than the school years. Yet, little research focuses on critical thinking abilities in children below age 6. This may be partly explained by historical tendencies in cognitive development research, particularly based on the

influence of classical Piagetian theory, which considers preschoolers too young to engage in any sort of critical thinking (Raven & Polanski, 1974). As such, further investigation into methods for cultivating and strengthening selective learning skills in young children represents a vital area of research with far-reaching implications for education, public health, and societal well-being.

Conclusions

Children have a lot to learn from others. Rooted in social learning theory is the idea that a tremendous amount of learning is done through observation, imitation, and trust that others can be reliable sources of information (Rendell et al., 2011). However, without a selective filter when acquiring new information, children would likely have difficulty prioritizing the most important and accurate incoming information. Hence, developing a critical stance is crucial to children's ability to learn efficiently.

Our understanding of children's selective social learning has advanced remarkably since the early works of Locke, Pavlov, Watson, and Bandura. That said, there is still much left to discover about how children learn from others. This is especially relevant given the technological advancements of modern-day, wherein children have access to an enormous amount of information available at their fingertips. Learning more about how children navigate these endless sources of information will ultimately allow us to help children discern reliable sources. In all, the answers to the research questions explored in the three presented studies have clear implications for the selective learning literature and a better understanding of children's learning in general.

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Appendix A: Study 1 & 2 Protocol and Script

English Version

I would like to present you two of my friends on video.
This is Brianna (*show video 01*) and this is Shannon (*show video 02*).
Before we keep playing, I want to show you some videos of Brianna and Shannon playing a picture game. In the videos we're going to see them naming some objects, OK?

(*Show videos from 03 to 14. After, put away computer)*

I have a few questions for you about Brianna and Shannon. They played another game where they got to name some pictures. I have some of their answers here, and I wanted to ask you if you can help me put their answers in these two envelopes here. See, there's Brianna's picture on this envelope and Shannon's picture on this envelope. I'll read you their answers and you decide who you think said the answer. If you think Brianna said the answer, you can put the card in this envelope, and if you think Shannon said the answer, you can put the card in this envelope. OK?

Let's start with this one.

1. Sorting Task

#1- Its written "Plane" (*Pic: Plane*) … who do you think wrote down this answer?
Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Plane for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#2- Its written "Bear" (*Pic: Rabbit*) … who do you think wrote down this answer?
Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Bear for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#3- Its written "Hibbon" (*Pic: Random*) … who do you think wrote down this answer?
Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Hibbon for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#4- Its written "Pen" (*Pic: Lamp*) … who do you think wrote down this answer?
Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Pen for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#5- Its written "Coveg" (*Pic: Random*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Coveg for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#6- Its written "Window" (*Pic: Window*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Window for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#7- Its written "Pillow" (*Pic: Ruler*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Pillow for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#8- Its written "Bosly" (*Pic: Random*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Bosly for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#9- Its written "Fish" (*Pic: Fish*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Fish for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#10- Its written "Banana" (*Pic: Banana*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Banana for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#11- Its written "Door" (*Pic: Flower*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Door for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

#12- Its written "Virup" (*Pic: Random*) … who do you think wrote down this answer? Brianna or Shannon?
(*Prompt: Do you think its Brianna or Shannon that wrote Virup for this picture?*)

ANSWER: Brianna Shannon Prompts needed: Y N

*** Why do you think it's _____ that wrote "Virup" for this picture?

ANSWER: _____

Alright! Thanks for helping me with this!

2. Attribution Task

Now I have some more questions for you about Brianna and Shannon. This is how we play this game: I'll ask you questions, and you have to point to one of the pictures here to answer. You can point to Brianna, or Shannon, or both of them, or nobody *(demonstrating while saying this)*.

Practice round

If I ask you…

#1. Who has a black shirt, who should you point to? (*R: Brianna*)
R: That's right
W: Actually, you should point to Brianna because she is the only one with a black shirt.

Brianna Shannon Both None Prompts needed: Y N

#2. Who has hair? (*R: Brianna and Shannon*)
R: That's right
W: Actually, you should point to Brianna and Shannon because they both have hair.

Brianna Shannon Both None Prompts needed: Y N

#3. Who is a boy? (*R: None*)
R: That's right
W: Actually, you should point to nobody because they are both not a boy.

Brianna Shannon Both None Prompts needed: Y N

#4. Who has a white shirt? (*R: Shannon*)
R: That's right
W: Actually, you should point to Shannon because she is the only one with a white shirt.

Brianna Shannon Both None Prompts needed: Y N

#5. Who is a girl? (*R: Brianna and Shannon*)
R: That's right
W: Actually, you should point to Brianna and Shannon because they are both a girl.

Brianna Shannon Both None Prompts needed: Y N

#6. Who has a pink shirt? (*R: None*)
R: That's right
W: Actually, you should point to nobody because they both do not have a pink shirt.

Brianna Shannon Both None Prompts needed: Y N

Good job! Now I'm going to ask you to guess some more things, and some of them are really hard, others are really silly, but it's okay to guess if you don't know.

Experimental round:

1. Who knows what my favourite animal is?

Brianna Shannon Both None Prompts needed: Y N

2. Who has a cat?

Brianna Shannon Both None Prompts needed: Y N

3. Who doesn't know that this is called an alligator?

Brianna Shannon Both None Prompts needed: Y N

4. Who never says thank you?

Brianna Shannon Both None Prompts needed: Y N

5. Who knows a lot about stars and planets?

Brianna Shannon Both None Prompts needed: Y N

6. Who can swim?

Brianna Shannon Both None Prompts needed: Y N

7. Who doesn't know that birds eat seeds?

Brianna Shannon Both None Prompts needed: Y N

8. Who doesn't know my brother's name?

Brianna Shannon Both None Prompts needed: Y N

9. Who can bake cookies?

Brianna Shannon Both None Prompts needed: Y N

10. Who likes potatoes?

Brianna Shannon Both None Prompts needed: Y N

11. Who knows the names for a lot of insects?

Brianna Shannon Both None Prompts needed: Y N

12. Who always yells?

Brianna Shannon Both None Prompts needed: Y N

13. Who knows that this is called a stethoscope?

Brianna Shannon Both None Prompts needed: Y N

14. Who doesn't like spaghetti?

Brianna Shannon Both None Prompts needed: Y N

15. Who always shares her toys?

Brianna Shannon Both None Prompts needed: Y N

16. Who knows where I bought my shoes?

Brianna Shannon Both None Prompts needed: Y N

17. Who cannot draw pretty pictures?

Brianna Shannon Both None Prompts needed: Y N

18. Who knows that cats can see at night?

Brianna Shannon Both None Prompts needed: Y N

French Version

J'aimerais te présenter à deux de mes amies sur des vidéos.
Voici Maéva (*montrer la vidéo 01*). Et voici Adéline (*montrer la vidéo 02*)
Avant de continuer à jouer à notre jeu, je veux te montrer des vidéos de Maéva et de Adéline en train de jouer à un jeu d'images. Dans leur jeu, Maéva et Adéline vont nommer des objets, OK?

(Montrer les vidéos 03 à 14. Après, ranger l'ordinateur)

J'ai quelques questions pour toi à-propos de Maéva et de Adéline. Elles ont joué à un autre jeu où elles devaient nommer des images. J'ai quelques-unes de leurs réponses ici (*sortir les images*) et je me demande si tu peux m'aider à mettre leurs réponses dans ces deux enveloppes (*sortir les enveloppes*). Regarde, il y a la photo de Maéva sur cette enveloppe et il y a la photo de Adéline sur cette enveloppe. Je vais te lire leurs réponses et tu décideras qui tu crois a dit chaque réponse. Si tu penses que c'est Maéva qui a écrit la réponse, tu peux mettre la carte dans cette enveloppe et si tu penses que c'est Adéline qui a écrit la réponse, tu peux mettre la carte dans cette enveloppe. OK ?

On va commencer avec celle-là.

#1. *Photo avion*. C'est écrit « avion ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline? (*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « avion » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#2. *Photo lapin*. C'est écrit « ours ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « ours » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#3. *Photo inconnue*. C'est écrit « sitan ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « fasot » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#4. *Photo lampe*. C'est écrit « crayon ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « crayon » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#5. *Photo inconnue*. C'est écrit « covet ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « sitan » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#6. *Photo fenêtre*. C'est écrit « fenêtre ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « fenêtre » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#7. *Photo règle*. C'est écrit « oreiller ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « oreiller » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#8. *Photo inconnue*. C'est écrit « volem ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « nolet » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#9. *Photo poisson*. C'est écrit « poisson ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « poisson » pour cette image?*)
RÉPONSE: Maéva Adéline Prompts? O N

#10. *Photo banane*. C'est écrit « banane ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline?
(*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « banane » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#11. *Photo fleur*. C'est écrit « porte ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline? (*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « porte » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

#12. *Photo inconnue*. C'est écrit « satif ». Qui penses-tu a écrit cette réponse? Maéva ou Adéline? (*Prompt : Est-ce que tu penses que c'est Adéline ou Maéva qui a écrit « loris » pour cette image?*)

RÉPONSE: Maéva Adéline Prompts? O N

***Pourquoi penses-tu que c'est _____ qui a écrit loris pour cette image ?

RÉPONSE: _____

OK ! Merci de m'avoir aidé !

Maintenant j'ai quelques questions pour toi à propos de Maéva et Adéline. Voici comment jouer à ce jeu : je vais te demander des questions, et tu dois pointer l'une des cases ici pour répondre à ma question. Tu peux pointer vers Maéva, ou Adéline, ou les deux ou bien aucune personne (*démontrer en disant cela*).

<u>Pratique</u>
Si je te demande...
Qui porte un chandail noir ? Vers quelle case devrais-tu pointer ? (*Réponse : Maéva*)

Si bonne réponse C'est bien!
Si mauvaise réponse En fait, tu devrais pointer vers Maéva parce que c'est la seule qui porte un chandail noir

Maéva Adéline Les deux Personne Prompts?: O N

Qui a des cheveux ? (*Réponse : Maéva & Adéline*)

Si bonne réponse C'est bien!
Si mauvaise réponse En fait, tu devrais pointer vers Maéva et Adéline parce que les deux ont des cheveux

Maéva Adéline Les deux Personne Prompts?: O N

Qui est un garçon ? (*Réponse : personne*)

Si bonne réponse C'est bien!
Si mauvaise réponse En fait, tu devrais pointer vers personne parce que les deux ne sont pas un garçon

Maéva Adéline Les deux Personne Prompts?: O N

Qui porte un chandail gris ? (*Réponse : Adéline*)

Si bonne réponse C'est bien!
Si mauvaise réponse En fait, tu devrais pointer vers Adéline parce que c'est la seule qui porte un chandail gris

Maéva Adéline Les deux Personne Prompts?: O N

Qui est une fille ? (*Réponse : Maéva & Adéline*)
Si bonne réponse C'est bien!
Si mauvaise réponse En fait, tu devrais pointer vers Maéva et Adéline parce que les deux sont des filles

Maéva Adéline Les deux Personne Prompts?: O N

Qui porte un chandail rose ? (Réponse : personne)
Si bonne réponse C'est bien!
Si mauvaise réponse En fait, tu devrais pointer vers personne parce que les deux ne portent pas de chandail rose

Maéva Adéline Les deux Personne Prompts?: O N

Super! Maintenant, je vais te demander si tu peux deviner d'autres choses. Il y en a qui sont vraiment difficiles et d'autres qui sont vraiment bizarres, mais c'est correct de deviner si tu ne sais pas quoi répondre.

#1. Qui sait quel est mon animal préféré ?

Maéva Adéline Les deux Personne Prompts?: O N

#2. Qui a un chat ?

Maéva Adéline Les deux Personne Prompts?: O N

#3. Qui ne sait pas que ceci s'appelle un alligator ?

Maéva Adéline Les deux Personne Prompts?: O N

#4. Qui ne dit jamais merci ?

Maéva Adéline Les deux Personne Prompts?: O N

#5. Qui sait beaucoup de choses sur les étoiles et les planètes ?

Maéva Adéline Les deux Personne Prompts?: O N

#6. Qui sait nager ?

Maéva Adéline Les deux Personne Prompts?: O N

#7. Qui ne sait pas que les oiseaux mangent des graines?

Maéva Adéline Les deux Personne Prompts?: O N

#8. Qui ne connait pas le nom de mon frère ?

Maéva Adéline Les deux Personne Prompts?: O N

#9. Qui est capable de cuisiner des biscuits ?

Maéva Adéline Les deux Personne Prompts?: O N

#10. Qui aime les patates ?

Maéva Adéline Les deux Personne Prompts?: O N

#11. Qui connait le nom de beaucoup d'insectes ?

Maéva Adéline Les deux Personne Prompts?: O N

#12. Qui crie tout le temps ?

Maéva Adéline Les deux Personne Prompts?: O N

#13. Qui sait que ceci s'appelle un stéthoscope ?

Maéva Adéline Les deux Personne Prompts?: O N

#14. Qui n'aime pas le spaghetti ?

Maéva Adéline Les deux Personne Prompts?: O N

#15. Qui partage toujours ses jouets ?

Maéva Adéline Les deux Personne Prompts?: O N

#16. Qui sait où j'ai acheté mes souliers ?

Maéva Adéline Les deux Personne Prompts?: O N

#17. Qui n'est pas capable de faire des beaux dessins ?

Maéva Adéline Les deux Personne Prompts?: O N

#18. Qui sait que les chats voient bien quand il fait noir ?

Maéva Adéline Les deux Personne Prompts?: O N

Appendix B: Study 3 Protocol and Script

Before Testing:

The purpose of this research is to learn more about the links between young children's learning strategies and their various cognitive skills. Your child's participation will consist of one visit lasting approximately 45 minutes (the study itself lasts approximately 15 to 30 minutes). During this session, your child will play a series of short games with an experimenter that involves short video clips and a variety of pictures.

We video record your child's behavior during the study in order to later code this behavior. Only the study team will have access to the video recordings of your child. The information shared in this research will remain strictly confidential. Your participation in this study is voluntary. Children typically have fun engaging in these types of "games" with the researcher. The researcher will stop the session if your child does not wish to continue playing or becomes tired or frustrated. You and your child are also free to withdraw from the study before or during the session, refuse to participate, and/or refuse to answer questions, without any negative consequences for yourself or your child. Also, you will receive a bookstore gift certificate after the session, regardless of whether your child completes the full session.

During the meeting, we kindly ask that you stay with your child to help with any technology issues. However, if you could limit your interactions with your child to a minimum, that would be much appreciated as we really want to know how they answer the questions on their own, without any help. There are no right or wrong answers, we are simply looking at young children's overall learning preferences.

Do you have any questions before we start?

Disagreeing Informants: All Orders

Today we will be playing a game together, okay? In this game you will help me by naming the objects that I show you. Do you think you can help me with that? Let's do a few practice ones so that you feel comfortable with the game! Let's get started.

<u>Practice Round</u>

- *Here is our first object* (apple). *Can you tell me what this object is?*
  Prompt 1- if child doesn't answer or says don't know: It's okay to guess, what do you think?
  Prompt 2: Show picture of the object, what do you think this is?

ANSWER: _____ Prompts needed: Y N

- *Okay let's try another object. See this picture* (ball)? *What do you think it is?*

(Same prompts)

ANSWER: _____ Prompts needed: Y N

- *Here is our third object. Let's take a look at the photo* (fork). *What is that?*

(Same prompts)

ANSWER: _____ Prompts needed: Y N

- *Now look at this one. Can you tell me what is it* (cat)*?*

(Same prompts)

ANSWER: _____ Prompts needed: Y N

Well done! Now we're all done the practice round.

Experiment Round

For the rest of the game, the questions are going to be really hard. So, I will get you some extra help to make sure that you get the answers right, okay? I am going to show you two people on video who will help you get the right answer. Let's meet them. (show introduction video)

1. *See this picture? Let's see what they say about it.* (show video) _____ *says it's called a* _____ *and* _____ *says it's called a* _____ *(order dependent).*

Now it's your turn to tell me what you think it is? Is it a JOLE or a MISK?

Prompt 1: It's okay to guess, what do you think?

Prompt 2: Show picture of the object, what do you think this is?

ANSWER: JOLE MISK Prompts needed: Y N

2. *OK, let's try another one. See this picture? Let's see what they say about it.* (show video) _____ *says it's called a* _____ *and* _____ *says it's called a* _____ *(order dependent).*

Okay, it is your turn to tell me what you think it is? Is it a PREEK or a RABB?

(Same prompts)

ANSWER: PREEK RABB Prompts needed: Y N

3. *See this picture? Let's see what they say about it.* (Show video). _____ *says it's called a* ____*and* _____ *says it's called a* _____*(order dependent).*

Okay, it is your turn to tell me what you think it is? Is it a ZARE or a JID?
(Same prompts)

ANSWER: ZARE JID Prompts needed: Y N

4. *See this picture? Let's see what they say about it.* (Show video) _____ *says it's called a* _____ *and* _____ *says it's called a* _____ *(order dependent).*

Okay, it is your turn to tell me what you think it is? Is it a MIDO or a TOMA?
(Same prompts)

ANSWER: MIDO TOMA Prompts needed: Y N

5. *See this picture? Let's see what they say about it*. (Show video) _____ *says it's called a* _____ *and* _____ *says it's called a* _____ *(order dependent).*

Okay, it is your turn to tell me what you think it is? Is it a DAX or a WUG?
(Same prompts)

ANSWER: DAX WUG Prompts needed: Y N

6. *See this picture? Let's see what they say about it.* (Show video) _____ *says it's called a* _____ *and* _____ *says it's called a* _____ *(order dependent).*

Okay, it is your turn to tell me what you think it is? Is it a VERU or a BORA?
(Same prompts)

ANSWER: VERU BORA Prompts needed: Y N

And why do you think this is a VERU/BORA?

_____

<u>Attribution Questions</u>

Now I have some questions about MALINA and DORIS. (Stay on slide with picture of the informants).

Let's start with MALINA, who wears a yellow shirt. (MALINA Slide)

How smart is MALINA? Not smart at all, a little bit smart, pretty smart, or super smart
0 – 1 – 2 – 3

How confident is MALINA? Not confident at all, a little bit confident, pretty confident, or super confident
0 – 1 – 2 – 3

How nice is MALINA? Not nice at all, a little bit nice, pretty nice, or super nice
0 – 1 – 2 – 3

How strong is MALINA? Not strong at all, a little bit strong, pretty strong, or super strong
0 – 1 – 2 – 3

Now let's talk about DORIS, who wears a green shirt.

How smart is DORIS? Not smart at all, a little bit smart, pretty smart, or super smart
0 – 1 – 2 – 3

How confident is DORIS? Not confident at all, a little bit confident, pretty confident, or super confident
0 – 1 – 2 – 3

How nice is DORIS? Not nice at all, a little bit nice, pretty nice, or super nice
0 – 1 – 2 – 3

How strong is DORIS? Not strong at all, a little bit strong, pretty strong, or super strong
0 – 1 – 2 – 3

Now let's look at both of them.

Question 1: Accuracy

Who is best at naming objects?
Prompt 1: It's okay to guess. Who is best at naming objects?
Prompt 2: Is it MALINA(point) or DORIS (point)

MALINA DORIS

Question 2: Confidence

Who is most sure of their answers?
(Same prompts)

MALINA DORIS

Question 3: Benevolence

Who is nicest?
(Same prompts)

MALINA DORIS

Question 4: Strength

Who is strongest?
(Same prompts)

MALINA DORIS

Question 5: Accuracy

Who says the right answers?
(Same prompts)

MALINA DORIS

Question 6: Confidence

Who thinks they know best?

(Same prompts)

MALINA DORIS

Question 7: Benevolence

Who is the best helper?
(Same prompts)

MALINA DORIS

Question 8: Strength

Who can lift the heaviest box?
(Same prompts)

MALINA DORIS

Question 9: Preference

Who do you like best?
(Same prompts)

MALINA DORIS

<u>Memory Check</u>

One of the people in the video said things like, "I disagree" and "Nah, I don't think so". Which person said things like that? MALINA or DORIS? (Go to slide with picture of the informants).

MALINA DORIS

Appendix C: Ethics Approval Certificates

File Number: H04-16-10 **Date (mm/dd/yyyy):** 05/10/2018

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

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Office of Research Ethics and Integrity

Ethics Approval Notice

Health Sciences and Science REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

First Name	Last Name	Affiliation	Role
Patricia	Brosseau-Liard	Social Sciences / Psychology	Principal Investigator

File Number: H04-16-10

Type of Project: Professor

Title: Preschoolers' attention to the credibility of others

Renewal Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
05/26/2018	05/25/2019	Renewal

Special Conditions / Comments:
N/A

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Patricia	Brosseau-Liard	Social Sciences / Psychology	Principal Investigator
Sophie	Fobert	Social Sciences / Psychology	Co-Investigator
Aimie-Lee	Jueteau	Social Sciences / Psychology	Co-Investigator
Florence	Aquilina	Social Sciences / Psychology	Student Researcher
Thilini	Herath	Social Sciences / Psychology	Student Researcher
Isabelle	Cossette	Social Sciences / Psychology	Research Assistant

File Number: H04-16-10

Type of Project: Professor

Title: Preschoolers' attention to the credibility of others

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
05/26/2019	05/25/2020	Renewal

Special Conditions / Comments:
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Thilini	Herath	Social Sciences / Psychology	Student Researcher
Isabelle	Cossette	Social Sciences / Psychology	Research Assistant

File Number: H04-16-10

Type of Project: Professor

Title: Preschoolers' attention to the credibility of others

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
05/26/2020	05/25/2021	Renewal

Special Conditions / Comments:
N/A

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File Number: H04-16-10 Date (mm/dd/yyyy): 06/11/2021

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File Number: H04-16-10

Type of Project: Professor

Title: Preschoolers' attention to the credibility of others

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
05/26/2021	10/31/2021	Renewal

Special Conditions / Comments:
Renewal exceptionally granted due to the fact that the Principal Investigator is on maternity leave. A new application should be submitted through eReviews before the expiry date of the certificate.

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04/10/2022

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CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	H-10-21-7107
Titre du projet / Project Title	(English) Preschoolers' and school-age children's attention to the credibility of others (French) L'attention portée à la crédibilité des autres chez les enfants d'âge préscolaire et scolaire
Type de projet / Project Type	Recherche de professeur / Professor's research project
Statut du projet / Project Status	Renouvelé / Renewed
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	18/10/2021
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	17/10/2023

Équipe de recherche / Research Team

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Aimie-Lee JUTEAU	École de psychologie / School of Psychology	Co-chercheur / Co-investigator
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Conditions spéciales ou commentaires / Special conditions or comments

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