

THE ROLE OF MOTIVATION IN CHILDREN'S CREDULITY TOWARD FALSE
TESTIMONY

by

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Abstract

The Role of Motivation in Children's Credulity toward False Testimony

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The present research examined the role of motivation in children's credulity toward false testimony that contradicted their first-hand observations. Children observed an experimenter hide an object in one of three containers. Then, the experimenter provided false testimony about the hiding location of the object, and children were asked to retrieve the object on their own. In a Motivation condition, an object that children rated as desirable was hidden and a negatively framed consequence was presented. In a Baseline condition, children did not rate any objects and were not given a consequence. Overall, 3-year-olds were more credulous toward the false testimony than were 4-year-olds. In addition, 3-year-olds, but not 4-year-olds, were more resistant to the false testimony when exposed to motivating factors than when they were not. These findings can have real-world implications in forensic settings where children may serve as a source of eyewitness testimony.

Key words: credulity, motivation, false testimony, first-hand observation

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The Role of Motivation in Children's Credulity Toward False Testimony

Introduction

Children enter this world without knowledge about their surroundings (Dawkins, 1995). In order to learn, children must rely on different sources of information to acquire knowledge, such as their first-hand experiences and the testimony of others. In many situations, children can easily rely on their senses to learn new information as children have direct contact with their environment (Perner, 1991). However, in many cases children cannot learn directly and must rely on the information provided to them by others. For example, a child cannot witness a historical event or learn about geographical landmarks without depending on the testimony of others (Harris & Koenig, 2006). Similarly, adults acquire much of their knowledge through the information provided to them by others. This can be problematic as there is room for human error as information is transferred to other individuals, particularly children (Perner, 1991). Understanding how children weigh and monitor these different sources of information can shed light on how children learn about the world.

In many situations, children may have access to both first-hand observations and the testimony of others. Often, this testimony is consistent with the child's direct observations but is sometimes subject to human error. This error can be due to innocent mistakes, misinterpretations, or the intention to deceive an individual (Dawkins, 1995; Robinson, Champion & Mitchell, 1999). When these two primary sources of information conflict with each other, young children often have the tendency to believe an adult's false testimony that contradicts their direct observations (Dawkins, 1995; Jaswal et al, 2010; Ma & Ganea, 2010; McDonald & Ma, 2016). This can be referred to as credulity—the readiness or willingness to believe or trust something or someone when little evidence is available (Robinson & Whitcombe, 2003). Factors that can influence children's credulity toward false information include a speaker's past reliability (e.g.,

Clément, Koenig & Harris, 2004; Jaswal, 2010; Ma & Ganea, 2010) or group membership (e.g., McDonald & Ma, 2016), the form of communication (e.g., Heyman, Sritanyaratana, & Vanderbilt, 2013; Jaswal, Croft, Seftia, & Cole, 2010), the specific agent the false testimony providing (e.g., Clément et al., 2004; Heyman et al., 2013; Ma & Ganea, 2010) and children's cognitive abilities (e.g., Bruck & Melnyk, 2004; Heyman et al., 2013, Jaswal et al., 2014). The current study examined the role of motivation in children's credulity toward false testimony. Specifically, it investigated whether motivation to avoid a negative consequence influenced the likelihood of young children being credulous toward false testimony that contradicted their first-hand observations.

Children's Understanding About Sources of Knowledge

In order to understand why children are credulous toward false information that is contradictory to their direct observations, it is important to understand whether they are able to link perception to knowledge in the first place. Adults understand that visual perception is one of the most accurate representations of reality and a highly reliable source of information (Perner, 1991). However, it is unclear whether young children understand this.

Gopnik and Graf (1988) examined whether 3- to 5-year-old children would be able to identify the sources of their beliefs. Children were presented with several drawers, each of which contained an object. Then they learned about the contents of the drawers in one of three ways. They either saw the object, were told what the object was, or they were given a clue about the object and had to infer what it was. Following this activity, children were asked to identify the object in the drawer. If they were correct, they received source questions to examine whether they remembered how they learned about the contents in the drawer (i.e., "How do you know there's an [X] inside, did you see it, did I tell you about it, or did you figure it out from a clue?")

(Gopnik & Graf, 1988). In a second condition, the same procedure was followed, however, children were explicitly trained on the task and received feedback based on their responses. Overall, children's performance improved with age. Three-year-olds had difficulty identifying all three sources of information even after receiving training before the task (Gopnik & Graf, 1988). In contrast, most 5-year-olds received close to perfect scores and did not have difficulty with the task. These results suggest that, at 3 years of age, young children have difficulty recognizing how or from whom they learned new information. They may not understand how their knowledge about the world is linked to their perceptions or encounters with other individuals.

Another study specifically explored children's understanding of the role of visual perception and communication as sources of knowledge (Wimmer, Hogrefe, & Perner, 1988). In this study, children were either shown or told about the contents of a box, or they were not given any information at all. They were then asked if they knew what was in the box and why they knew this information. Most 4-year-olds were able to provide correct justifications for their knowledge. However, 3-year-olds could not identify the reason for the presence or absence of their knowledge. They could not explain how they acquired this information about the contents of the box (Wimmer et al., 1988).

Wimmer and colleagues (1988) conducted a few follow-up studies to further explore this phenomenon. A similar methodology was used. However, children were paired up and participated in either a visual access task or a linguistic access task. In the visual access condition, one child observed while another child looked inside a box to find out its contents. In the linguistic access condition, rather than observing what was in the box, one child was told what was in the box while the other child observed them receive verbal information from the experimenter. Following this activity, children were asked about their own knowledge of the

contents of the box as well as the other child's knowledge (Wimmer et al., 1988). Overall, children from each age group did not have difficulty explaining their own knowledge about the contents of the box. However, 3-year-olds and some 4-year-olds were unsuccessful assessing another child's knowledge. Even though children observed the other child being deprived of information, many 3-year-olds believed that they could identify the object in the box (Wimmer et al., 1988). They did not understand that the child needed to have visual or linguistic access to the object to know what was inside.

In contrast to these findings, other studies have shown that children can recognize that perception is a reliable source of information to acquire knowledge (O'Neill, Astington, & Flavell, 1992; Pillow, 1989). A series of studies were conducted to investigate children's understanding of the ability to acquire knowledge through different senses (e.g., sight and touch). Despite the variations in methodology, each study examined children's ability to determine whether seeing and feeling can allow them to acquire knowledge about an object (O'Neill et al., 1992). The children were presented with explicit tasks which emphasized the difference between seeing and touching and that only one of these sources of information was available at a time for the purposes of the study. The results indicated that when seeing was the primary source of information, children as young as 3 years old were able to understand that having visual access to an object could aid them in acquiring knowledge about the properties of the object. However, this was not the case when feeling was the source of information (O'Neill et al., 1992). Thus, children can link perception to knowledge and treat visual experiences as a source of information to learn from. In a similar vein, Pillow (1989) examined young children's ability to understand perception as a source of knowledge. Either a child or a puppet was asked to look inside a container with a hidden object. They were then asked knowledge and perception questions about

the task. Three-year-olds were able to understand that in order to know the colour of the hidden object, they themselves or the puppet must have had direct visual access to the object during the task (Pillow, 1989). Additionally, when the puppet did not look inside the container, most 3-year-olds were able to recognize that the puppet had no knowledge of the colour of the object (Pillow, 1989).

These studies provided mixed findings: In some circumstances young children are able to understand that perceptual experiences are reliable sources of information from which they can acquire knowledge about the world, but in other circumstances they have difficulty recognizing the link between their own observations and knowledge. With that being said, due to the trusting and reliable nature of adults, children may rely on another person's testimony even when it contradicts their first-hand observations (Dawkins, 1995). It appears that young children have difficulty telling different sources of information from one another and may integrate information from different sources. This can be problematic when different sources of information conflict with each other (Harris, 2002). Therefore, it is important to understand how children weigh these different sources of information and understand how different factors can influence children's credulity toward false information that contradicts their visual experiences.

Factors Influencing Children's Credulity Toward False Testimony

Several studies have explored different factors that may influence the likelihood of children being credulous toward false testimony that conflicts with their own observations. These factors include a speaker's previous reliability (e.g., Clément et al., 2004; Jaswal, 2010; Ma & Ganea, 2010), the speaker's group membership (e.g., McDonald & Ma, 2016), the form of communication (e.g., Heyman et al., 2013; Jaswal et al., 2010), the identity of the specific agent who provides the false testimony (e.g., Clément et al., 2004; Heyman et al., 2013; Ma & Ganea,

2010) and children's cognitive abilities (e.g., Bruck & Melnyk, 2004; Heyman et al., 2013, Jaswal et al., 2014).

Speaker's previous reliability. Research has shown that, when two speakers are in direct contrast and provide conflicting information, young children are able to decide whom to trust based on the past reliability of the speakers. For example, Clément et al. (2004) examined children's ability to assess an informant's previous reliability in order to solve a problem. In this study, 3- to 4-year-old children were presented with two puppets. The experimenter explained in layman's terms which puppet was reliable and which puppet was unreliable and followed up using a demonstration of each puppet's corresponding behaviours. Following this session, children participated in different tasks. In the Convergent Task, an experimenter hid a pompom inside a box and only allowed the puppets to view the object. The reliable puppet then stated the correct colour of the pompom while the unreliable puppet stated a different colour. When the child was asked to state the colour of the pompom, the majority of the 4-year-olds chose to agree with the reliable puppet rather than the unreliable one, whereas the 3-year-olds showed mixed responses (Clément et al., 2004). Other studies have found similar findings showing that, when two speakers provide contrasting information, preschool-aged children demonstrate selective learning and prefer to learn from the previously reliable speaker rather than the unreliable one (e.g., Jaswal & Neely, 2006; Koenig, Clément, & Harris, 2004; Pasquini, Corriveau, Koenig, & Harris, 2007). This ability is present even in 14-month-old infants: When locating a hidden object, infants were able to follow the eye gaze of a previously reliable informant rather than an unreliable one (Chow, Poulin-Dubois, & Lewis, 2008).

These studies suggest that young children can accurately identify a speaker's previous reliability and make well-informed future decisions based on this knowledge. However, it is

unclear how children will respond to the false testimony of an informant who contradicts their own direct observations. Clément and colleagues (2004) conducted several additional tasks to address this question. In the Contradiction Task, an experimenter placed a pompom on top of a box such that the child participant had visual access to the object. After a few seconds, the experimenter hid the pompom inside the box and both the reliable and the unreliable puppet looked inside. Both puppets stated the wrong colour of the pompom and the child was then asked to state what colour the pompom was. Overall, most children prioritized their first-hand observations and stated the correct colour of the pompom despite the false testimony of the puppets (Clément et al., 2004). This suggests that children ignored the puppets' previous reliability and deferred to their own observations to make an informed decision.

Ma and Ganea (2010) examined children's credulity toward false testimony using a different methodology. In their study, 3- to 5-year-olds watched a human speaker (rather than a puppet) hide a toy under one of three containers. Afterwards, the speaker provided false testimony about the hiding location of the toy. Children were then asked to retrieve the toy on their own. It was found that most 3-year-olds (75%) were credulous toward the false testimony when retrieving the toy, regardless of their own first-hand observations (Study 1). In contrast, most 4- and 5-year-olds relied on their own observations to retrieve the toy. However, with a prior exposure to the speaker's unreliability, 3- and 4-year-olds disregarded her false testimony and relied on their own observations to retrieve the toy (Study 3). Thus, young children were initially credulous toward a speaker's false testimony that conflicted with their direct observations but became skeptical of the false information when they had previous experience of the speaker's unreliability (Ma & Ganea, 2010).

Jaswal (2010) completed a similar study and found that, despite an experimenter's repeated errors, 2.5-year-olds continued to believe a speaker's false testimony regardless of what they had just seen, which contradicts the findings in the studies mentioned above that tested 3- and 4-year-olds. This age difference may suggest that children's ability to reject a speaker's false testimony based on previous reliability starts to emerge between 2.5 and 3 years of age.

Speaker's group membership. A second factor that may play a role in children's credulity toward false testimony is the speaker's social group membership. Throughout development, children start to associate themselves with different groups and start to display ingroup biases. This ingroup bias has been shown to affect how and from whom children learn new information. Specifically, when an ingroup speaker is in direct contrast with an outgroup speaker, children prefer to learn new information from the ingroup speaker (Elashi & Mills, 2014; Corriveau, Kinzler, & Harris, 2013). For example, in one study, 3- to 5-year-olds were assigned to either a red group or a blue group and were introduced to the corresponding ingroup and outgroup informants. Afterwards, children observed while both informants named novel objects with conflicting responses. Then children were asked to label the novel object, most children provided the same response as the ingroup informant (Elashi & Mills, 2014). Rather than using colour to identify group membership, another study investigated whether accent would influence children's selective learning. When a native accented English speaker (ingroup) and a foreign-accent English speaker (outgroup) provided conflicting information, 3- to 5-year-olds preferred to learn from the ingroup informant (Corriveau et al., 2013).

McDonald and Ma (2016) directly explored children's credulity toward false testimony provided by an ingroup versus an outgroup informant. The researchers used a methodology similar to that of Ma and Ganea (2010). However, the group membership of the experimenter

who was providing the false testimony differed across conditions. In the Ingroup condition, the experimenter was Caucasian and a native-English speaker. In the Outgroup condition, the experimenter was Chinese and spoke English with an accent. When Caucasian, native English-speaking children were asked to search for the hidden toy, 3-year-olds were credulous regardless of the group membership of the speaker. In contrast, most 4-year-olds were credulous toward the false testimony of the ingroup speaker despite their own observations but were skeptical when the outgroup speaker provided the false testimony (McDonald & Ma, 2016). These findings indicate that children consider the group membership of a speaker when deciding whom to learn from or which source of information to rely on.

Form of communication. Children's credulity toward false information may be influenced by the form of communication in which the false information is given. Couillard and Woodward (1999) examined the use of pointing and the use of a ball to present children with false information. Three- to 4-year-old children were presented with two opaque bowls and were asked to find the hidden sticker under one of the bowls. The experimenter provided false information about the location of the sticker using either a point or by placing a ball on top of one of the bowls (i.e., the bowl without the sticker). The children participated in 20 trials, half of which were point trials and the other half were ball trials. Across ages, children were able to reject the false information when it was presented with a ball, but when it was conveyed with a point, they continuously searched under the wrong container (Couillard & Woodward, 1999). Although the main goal of this study was to examine children's ability to comprehend the gesture of pointing, the findings suggest the possibility that young children may be credulous toward misleading information indicated by an adult's pointing.

Jaswal and colleagues (2010) conducted a similar study but changed the form of communication in which the false information was conveyed. The false information of the hidden sticker took the form of a cardboard arrow or a verbal statement. Initially, it was found that children in both conditions searched in the wrong location. However, as they moved through the trials, 3-year-olds were able to adapt and locate the hidden sticker when the false information took the form of a cardboard arrow, but not when the information was given by a verbal statement (Jaswal et al., 2010). Researchers have hypothesized that children may have difficulty rejecting conventional forms of communication such as pointing and verbal statements because they may associate these forms of communication with positive outcomes, making it difficult for them to reject and ignore. To reject a deceptive point would require children to ignore a highly-practiced response (Couillard & Woodward, 1999). On the other hand, when faced with an unconventional form of communication (i.e., a ball on a bucket, a cardboard arrow), children may become skeptical as they have not encountered this form of communication in the past. Therefore, they have no associated attitudes towards that specific form of communication, making it easier to reject (Couillard & Woodward, 1999; Jaswal et al., 2010).

A more recent series of studies further examined children's ability to reject false information and whether their performance would be influenced by way the false information was presented (Heyman et al., 2013). The methodology across studies was similar to that of Couillard and Woodward (1999) and Jaswal et al. (2010). However, the form in which the false information was presented differed across studies. Children were presented with a sticker-finding game and were told that they would be playing the game with a puppet (i.e., The Big Bad Wolf). The children had to find a sticker hidden under one of two boxes after receiving false information about the location of the sticker. The experimenter explicitly explained and

demonstrated to the children that the Big Bad Wolf was very mean and tricky (Heyman et al., 2013).

In the first study, the Big Bad Wolf presented misleading advice using verbal statements and pointing. Similar to previous findings, 3-year-olds were credulous toward the Wolf's advice 50% of the time. Four-year-olds showed a better performance but still showed some difficulty rejecting the Wolf's deceptive points (Heyman et al., 2013). A follow-up study used the same procedure, but the misleading advice was presented with only verbal statements and not pointing (Study 2). It was found that children's credulous behaviour did not decrease (Heyman et al., 2013). Heyman and colleagues (2013) hypothesized that, by presenting the false information using verbal statements, children in both studies might have associated this with a conventional form of communication, thereby affecting their performance. Similar evidence was found from Jaswal et al. (2010) when children found it difficult to reject false information when it was conveyed verbally.

Following up on this finding, Heyman and colleagues (2013) conducted a fourth study in which the Big Bad Wolf presented misleading advice to the child by using a picture that depicted the wrong box. Children's performance did not show significant improvements compared to that of the children in the previous studies. The results suggest that presenting misleading advice verbally or visually does not make a difference in children's credulity toward false information (Heyman et al., 2013).

The mixed findings in these studies indicate that children's credulity toward false information depends on the specific form in which the false information is given. This may be due to the conventionality and familiarity of certain forms of communication. However, in each of these studies, children did not have visual access to the informant hiding the object. To date,

little is known about how children would weigh false information that contradicts their first-hand observations when the information is communicated in different ways (e.g., verbally or through pointing).

The agent providing the false testimony. The fourth factor that may influence children's likelihood of being credulous toward false testimony despite their first-hand observations, is the specific agent providing the testimony. Several studies have provided indirect support for this, using either a puppet or a human experimenter to present false testimony. However, no study has directly compared the influence of these two different agents.

Referring back to the literature, Heyman et al. (2013) used a puppet (i.e., The Big Bad Wolf) to determine if the form in which false information was conveyed would influence children's likelihood of being credulous toward false information. Overall, 3-year-olds had difficulty rejecting the false information regardless of the form of communication used (Heyman et al., 2013). It should be noted that this series of studies did not examine whether young children would be credulous when the false testimony of a puppet contradicted their own observations.

Clément et al. (2004) found that 3- to 4-year-old children were able to ignore the false testimony provided by both an unreliable and a reliable puppet and relied on their first-hand observations to identify the colour of a hidden pompom (Clément et al., 2004). Inconsistent results were found when human experimenters were used to present the false testimony (Jaswal, 2010; Ma & Ganea, 2010; McDonald & Ma, 2016). For example, Ma and Ganea (2010) found that, when there was no evidence about previous reliability, 3-year-olds deferred to a human speaker's false testimony to find a hidden toy, despite their first-hand observations (Study 1). These findings suggest that children may be more credulous toward the false testimony of a human speaker rather than a puppet. For example, 3- and 4-year-olds were able to reject the false

testimony of a puppet, even when the puppet was previously reliable (Clément et al., 2004), but they were credulous toward the false testimony of a human speaker even when they did not know whether the speaker was previously reliable (Ma & Ganea, 2010). It is conceivable that, when the human speaker is shown to be previously reliable, children would be even more credulous toward his or her false testimony despite their direct observations.

Cognitive abilities. The last additional factor that can influence children's credulity toward false information is their overall cognitive ability. Between the ages of three and five, children's executive functioning undergoes large developmental shifts. Executive functioning refers to a broad range of mental processes and skills that underlie individuals' behaviours, thoughts, and actions (Bruck & Melnyk, 2004). Empirical research examining children's suggestibility to misleading information suggests that children's inability to reject false information may be due to limitations in their executive functioning. However, many inconsistencies are found within the literature.

A main measure of executive functioning is inhibitory control. Inhibitory control is the ability to inhibit an automatic or natural response and behave in an appropriate manner that will allow an individual to achieve their goal (Gerstadt, Hong, & Diamond, 1994). Therefore, when talking about selective trust and credulity, researchers infer that children with a higher inhibitory control will be able to inhibit their natural tendency to listen to an adult and act based on their direct observations. In the studies previously mentioned by Heyman and colleagues (2013), they also investigated whether there was a link between children's inhibitory control and their trust in false testimony. Across four studies, no significant correlation between these two measures was found. However, this study examined children's selective trust in an overtly misleading informant and children did not have visual access to the hiding event (i.e., Big Bad Wolf). In

contrast, Jaswal and colleagues (2014) examined if children's inhibitory control was related to children's credulity toward false testimony that contradicted an event they had just witnessed. Overall, they found that 2.5-to 3.5-year-olds who consistently deferred to an adult's misleading testimony had more difficulty on an inhibitory control task than children who were more skeptical toward the testimony (Jaswal et al., 2014).

Another important component of executive functioning is working memory. However, few studies have examined whether this cognitive ability is related to children's suggestibility to misinformation (for a review, see Bruck & Melynck, 2004). Due to the inconsistencies in the literature and the lack of inclusion of cognitive measures, the present study measured both children's inhibitory control as well as their working memory in order to examine whether children's general cognitive abilities are related to their credulity.

Effects of Motivation on Decision Making

The present study aims to add to the literature by exploring the role of motivation. Specifically, would the motivation to avoid a negative consequence influence children's credulity toward false information that contradicts their direct observations? Motivation promotes goal-directed behaviour and increase the amount of effort individuals expend on a given task in order to achieve their goals (Chiew & Braver, 2011). In addition, motivation can influence what information individuals pay attention to and how they process that information. When making decisions, individuals are commonly motivated to arrive at a desired and advantageous outcome but also try to avoid making decisions that may lead to a personal loss (Larrick, 1993). Therefore, motivation can cause individuals to attend to relevant information more carefully and use cognitive strategies to reach a decision and pursue a goal (Kunda, 1990).

In order to understand the role motivation plays in children's decision making, it is imperative to first understand individuals' ability to make decisions based on incentives and rewards. Goldsmith and Dhar (2013) investigated whether positively or negatively framing an incentive would influence an individual's motivation to complete a task. Sixty-two undergraduate students were randomly assigned to receive either a positively or negatively framed incentive and were then asked to perform a task. The task required the participants to unscramble a list of anagrams. In the positive frame condition, participants were told that they would receive \$0.25 for every word they correctly unscrambled. In the negative frame condition, participants were told they would start with \$1.50 but for every word they incorrectly unscrambled they would lose \$0.25. All participants were told that there was no time limit and that they could stop working on the task at any point. However, participants were unaware that the experimenter was actually timing how long they took to stop working on the task. Within this set of anagrams, two of them were intended to be extremely difficult and essentially unsolvable. The time spent persisting to solve these difficult anagrams was the main measure of motivation. Goldsmith and Dhar (2013) found that participants in the positive-frame condition spent less time working on the task than participants in the negative-frame condition. These results suggest that undergraduate students were more motivated to complete a task when presented with a negatively framed incentive that would lead to a personal loss (i.e., monetary loss).

The researchers conducted a follow-up study with a larger participant pool that varied in age (18-76 years) to determine if the same results would be seen in older populations. Overall, the results showed that younger participants were significantly less motivated to persist with the task in the positive-frame condition than in the negative-frame condition. However, after approximately age 36, this pattern did not persist. Older adults seemed to be more motivated

when presented with positively framed incentives (Goldsmith & Dhar, 2013). From these results, it can be inferred that presenting young adults with a negatively framed incentive may enhance their task performance as a means to avoid loss.

While these results help to explain how young adults may be motivated by incentives and rewards, it is important to examine how young children may respond to similar stimuli. Previous studies have focused on the effects of motivation on children's memory and recall and how motivation may enhance children's memory performance on a variety of tasks. Kunzinger and Witryol (1984) found that young children were able to use more effortful mnemonic and rehearsal strategies to recall a list of words when there was an incentive to receive more money (i.e., 10 cents vs. 5 cents). Building on these results, Nida (2015) investigated the effects of extrinsic motivation on 4-year-olds' object recall and mnemonic strategy use. Children were placed in one of three conditions, incidental, intentional, or motivational. In each condition, children were introduced to 10 objects and given 90 seconds to interact with them. However, the conditions differed in their instructions. In the incidental condition, children were simply told they could spend some time looking and playing with the objects. In the intentional condition, children were given similar instructions, but were explicitly told to remember the objects as they would be asked to recall them later. Lastly, children in the motivational condition were given the same instructions as those in the intentional condition, but they were also told they would be able to keep all the toys they remembered. Overall, children's object recall did not significantly improve across conditions. However, a trend emerged indicating improved recall performance for children in the motivational condition (Nida, 2015). In addition, when observing children's mnemonic strategies, children in the motivational condition were more likely to use more strategic and resourceful strategies to remember the objects (i.e., naming, grouping, etc.),

suggesting that by providing children with incentives, children were more focused and engaged on the task at hand.

This study demonstrates the possible effects of motivation on young children's memory and recall. Researchers have also focused on how these results may transfer to a forensic setting. In Nida (2015), in both the intentional and the motivational conditions, children were warned that they would have to recall the objects later, which allowed children to focus on and study the objects. However, in real-life forensic settings, eyewitnesses do not have this opportunity, which may in part contribute to their difficulty recalling accurate details about events. This has led researchers to investigate how motivational factors may influence children's accurate recall during investigative interviews.

Roebbers, Moga, and Schneider (2001) examined the role of motivation in 6- to 8-year-olds' event recall. Participants watched a short video depicting a conflict between two groups of children and unlike Nida (2015), children were not informed that they would have to remember details about the video. Three weeks later, they were interviewed using open-ended questioning about the observed video. The instructions given to the children prior to the interview varied across condition. In the Forced Report condition, children were forced to answer each question, even if they had to guess. In the Free Report condition, children were told to answer any questions they could but to say "I don't know" when they were uncertain. Lastly, in the Free Report Plus Incentive condition, children either received a token for every correct answer they recalled, lost a token to an experimenter when they answered incorrectly, or did not lose or gain any tokens if they answered with "I don't know." They were then told they would be able to purchase a big toy if they earned many tokens and a small toy if they earned only a few tokens. Overall, it was found that across ages, children's recall in the Free Report Plus Incentive

condition was more accurate than in the Free Report condition. Furthermore, children who were given incentives were better able to withhold uncertain information and provide significantly more “I don’t know” responses than those in the Free Report condition. These results suggest that using motivation (e.g., incentives) can help children strategically and effectively retrieve and report information in their memory and thus, increase their credibility as eyewitnesses. Roebbers and Fernandez (2002) used a similar paradigm to examine whether motivation would also help decrease children’s suggestibility to misleading questions. Providing children with incentives for every correct response improved their recall accuracy and reduced their suggestibility.

When exploring the role of motivation in children, it is also important to examine children’s judgments of expected value. It has been shown that children are able to understand the link between the probability and value of a certain goal (Schlottmann, 2001; Schlottmann & Anderson, 1994). For example, Schlottmann and Anderson (1994) examined whether children were able to assess the desirability of a goal and the likelihood of obtaining it. To measure this concept, 5- to 10-year-old children helped a puppet play a roulette-type game to win crayons. The probability of winning (i.e., spinning the colour red on a circular disk) and the size of the prize varied across trials. After each spin, children were asked to indicate how happy they thought the puppet would be based on the results of the game. In the practice trials, children were told that the puppet would be happier in games involving more red sections and the largest prize. Overall it was found that children as young as 5 years were able to weigh the value and attainability of a goal and make an appropriate judgment of happiness. For example, as the probability of spinning red increased, and the value of the prize increased (i.e., higher number of crayons), children were able to attribute higher ratings of happiness to the puppet (Schlottmann & Anderson, 1994). These findings suggest that children are able to critically assess the

desirability of a goal and how obtainable that goal is, which may indirectly have an influence on their credulity toward false testimony. For example, if children are presented with a highly desirable object and are able to recognize that they only need to rely on their own observations to obtain that object, they may be less credulous toward false testimony.

To date, only one known study has directly explored the role of motivation in children's credulity. Jaswal (2010) examined whether 2.5-year-olds would be credulous toward false testimony if they were given an incentive. Children observed as an experimenter dropped a goldfish cracker through a clear tube into an opaque cup. The experimenter then provided false testimony about the location of the cracker. Afterwards, children were asked to retrieve the cracker from the correct cup and if they were successful, they were allowed to eat it. It was found that the children in this condition deferred to the experimenter's false testimony even though this meant they could not eat the goldfish cracker. It was suggested that if a more desirable object was used, perhaps children would have been more skeptical of the false testimony and relied on their own observations (Jaswal, 2010).

To summarize thus far, research demonstrates that motivation can enhance both adults' and children's task performance in several domains. Motivation can promote goal-directed behaviour and encourage children to use certain cognitive strategies to achieve a goal. Specifically, it has been shown that using incentives can help children use more effective mnemonic strategies to accurately recall object names and increase their recall accuracy 3 weeks after observing a video (Nida, 2015; Roebbers & Fernandez, 2002; Roebbers et al., 2001). Based on these findings, it is conceivable that when presented with false testimony that may lead to a negative consequence (e.g., losing a highly desirable object), children might be motivated to avoid the loss, which would prompt them to pay attention to which source has provided accurate

information and strategically decide whether to rely on the testimony in order to obtain the desirable object. If that is the case, children would be less credulous toward false testimony that contradicts their direct observations when they are motivated to avoid a potential loss than when they are not. The present study aimed to address this possibility.

The Present Study

Previous research has revealed that young children's credulity toward false testimony can be influenced by various factors, such as the speaker's previous reliability (e.g., Clément et al., 2004; Ma & Ganea, 2010), the speaker's group membership (e.g., McDonald & Ma, 2016), the form in which false testimony is conveyed (e.g., Jaswal et al., 2010), the specific agent that provides the false testimony (e.g., Clément et al., Heyman et al., 2013; Ma & Ganea, 2010) and children's cognitive abilities. The present study aimed to add to the literature by examining whether motivation would play a role in 3- to 4-year olds' credulity toward false testimony that contradicted their direct observations. During the study, children decided whether to rely on their first-hand observations or an adult's false testimony to locate a hidden object. Across two conditions, children's exposure to motivating components varied. In the Motivation condition, children were presented with a negative consequence and were asked to retrieve an object they previously rated as desirable. The Baseline condition was a replication of Ma and Ganea (2010, Study 1), in which no object-rating or consequence was presented children were asked to retrieve a toy.

Based on previous findings (e.g., Ma & Ganea, 2010; McDonald & Ma, 2016), it was hypothesized that regardless of condition, developmental differences would emerge when examining children's credulity toward false testimony. Therefore, it was predicted that in general, 3-year-olds would be more credulous than 4-year-olds. Furthermore, research suggests

that children may be motivated to avoid a loss when presented with a negatively framed incentive (e.g., Roebbers et al., 2001), use more strategic and effective cognitive strategies to focus on a task and attend to relevant information when there is a risk of losing a desirable object (e.g., Roebbers et al., 2001), and disregard an adult's misleading suggestions when motivated by incentives (e.g., Roebbers & Fernandez, 2002). Thus, it was predicted that in the Motivation condition, children would be less credulous toward the experimenter's false testimony due to the high desirability of the object and the stated consequence of not finding the object, as compared to the children in the Baseline condition.

Method

Participants

An a priori power analysis indicated that a sample size of 82 participants would be sufficient to detect a medium-large effect size of the condition effect (.40) with a power of .95 and an alpha of .05. In total, 88 typically-developing children were recruited for this study. However, only 53 were included in the final sample: 23 three-year-olds ($M = 40.8$ months, range = 37.2-46.9; 10 girls) and 30 four-year-olds ($M = 54.4$ months, range = 48.8-59.8; 19 girls). The other 35 children were excluded due to possible memory difficulties (18)¹, experimenter error (6), parental interference (4), lack of attention or difficulty with instructions (4), or for other reasons (3). Twenty-seven children participated in the Motivation condition (11 three-year-olds and 16 four-year-olds) and 26 children participated in the Baseline condition (12 three-year-olds

¹ One child looked for the prize in the neutral location first and then in the misleading location before searching in the correct location. Additionally, in the testing phase, when asked where the object was placed, the child responded incorrectly. Seventeen children (15 three-year-olds, 2 four-year-olds) searched for the object in the correct location but responded incorrectly when asked to recall E2's false testimony, suggesting that these children might have forgotten the false testimony during the search.

and 14 four-year-olds). The sample was ethnically diverse such that 40% of participants were Caucasian (21), 21% were Asian or Pacific Islander (11), 5% were Black (3), 4% were Latin American (2), 2% were Arab (1), and 28% identified as other (15). All children were recruited through the Ryerson and Infant Child Database (RICD) and were asked to come to the lab to participate.

Materials and Setting

Three different containers with covers (blue bucket, pink bowl, and yellow box) were each placed on one of three stools. Each container had a different role. One of the containers was used as the correct hiding location (C), one as the neutral location (N), and one as the misleading location indicated by the false testimony (F). The arrangement of the containers was the same for all participants, however, the role of each container was counterbalanced. Depending on the condition, a toy or a toothpaste was used as the target object. The toy that was used was different for girls and boys to ensure the desirability of the object was equal across genders. The target object for girls was a beanie boo and the target object for boys was a superhero toy.

The experiment took place in two adjacent rooms—the testing room and the observation room, which are connected by a one-way window. In the observation room, children observed through the one-way window an experimenter hide the target object in C in the testing room. After the hiding event, the experimenter entered the observation room and provided false testimony about the hiding location of the object. A video camera was used to record the child's responses throughout the study.

After the experiment, children's cognitive abilities were measured, specifically their working memory and inhibitory control. Working memory was measured using the non-verbal picture memory subtest in the WPPSI-IV and inhibitory control was measured using the

Day/Night task (Gerstadt, Hong & Diamond, 1994). With parental consent, children's responses were video recorded for both tasks.

Research Design

The present study employed a 2 (condition) x 2 (age group) between-subjects design. At each age, children were randomly assigned to one of two conditions, ensuring that there were an equal number of girls and boys in each condition.

Procedure

Upon arrival, the parent and the child were directed into a waiting room and were introduced to two female Caucasian experimenters (E1 and E2). The parent was asked to fill out a consent form and a demographics questionnaire while the child interacted and played with E1. E2 was also present in the room but made limited contact with the child (e.g., waved hello and continued working on a computer). In total, two experimenters acted as E1 and six experimenters fulfilled the role of E2. After consent and demographic information were provided, E1 obtained verbal assent from the child and then directed the parent and the child into the testing room. In the Motivation condition, before going into the testing room, children were shown two objects (e.g., a toy and a toothpaste) and were asked to rate them (i.e., "This is toothpaste, and this is a beanie boo/superhero toy. Which one do you think is more fun?"). In the Baseline condition, children did not rate the objects.

The general procedure was similar across conditions. During the *orientation* phase, E1 asked the child to look inside each container and describe what they saw. After the child confirmed the containers were empty, E1 covered each container. Following this activity, E1 directed the child into the observation room and ensured that the child could clearly see all three containers through the one-way window. E1 then informed the child that they were going to

observe E2 hide a prize in one of the containers. In the Motivation condition, E1 explained that the object being hidden was going to be the object they rated as desirable. For example, “[E2 ‘s name] has a prize for you! It’s the beanie boo/superhero toy/toothpaste. She’s going to hide the prize in one of the containers. Watch carefully!”² Since the child did not rate the objects in the Baseline condition, the toy (e.g., beanie boo or superhero toy) was always hidden in this condition.

In the *testing* phase, E2 entered the testing room with a prize and hid it in C. During this time, in the observation room, E1 asked the child in which container E2 placed the prize. E2 exited the testing room and entered the observation room and excitedly stated that she hid the prize in F (the false container was described by its colour and identity). The child was then asked to retrieve the prize on their own in the testing room while the parent and the experimenters observed from the observation room. The experimenter noted if children hesitated before searching for the prize. Additionally, if children did not find the prize on their first search, they were encouraged to continue searching until they retrieved the object. In the Motivation condition, the child was given a consequence by E1 before retrieving the prize (i.e., “If you don’t find the prize, you won’t be able to take it home”). In the Baseline condition, no consequence was presented to the child.

After the child retrieved the prize, the *interview* phase began. Children were asked two memory check questions, one question at a time: “Where did [E2’s name] put the [prize]?” and “Where did [E2’s name] say she had put the [prize]?” If the child did not correctly respond to one of these questions, children were given a reminder. The child was then asked why E2

² Two children chose the toothpaste as being more desirable. Therefore, the toothpaste was hidden during the procedure.

provided the false testimony. For example, “[E2’s name] said the [prize] was in the [F], but you found it in the [C]. Why did he/she say it’s in the [F]?” If the child did not respond spontaneously, they were provided with two choices, “You can take a guess. Do you think she was trying to trick us, or do you think she made a mistake?” The order of these two choices was counterbalanced. With parental consent, the procedure was videotaped for reliability purposes.

Following the *interview phase*, children were asked to go back into the observation room where they completed two cognitive tasks. First, children completed the non-verbal picture memory task taken from the WPPSI-IV. In this task, E1 presented the child with a stimulus page of one or more pictures for either 3 seconds (i.e., 1 picture) or 5 seconds (i.e., 2 or 3 pictures). E1 then flipped to a response page and asked the child to point to the picture they just saw on the previous page. The difficulty of the task gradually increased and E1 stopped the task when children incorrectly recalled three consecutive stimuli pages in a row. Children received a raw score out of 35 and an associated standardized score (adjusted for age) out of 19.

The second cognitive task measured children’s inhibitory control using the Day/Night task. In this task, children were presented with 20 cards, 10 of which depicted a daytime sky (sun) and 10 of which depicted a nighttime sky (moon). Children completed three different types of trials: same trials, opposite trials, and control trials. For each type of trial, children were given four practice cards in which E1 ensured the child understood the task by providing feedback and repeating the instructions when necessary. Following the practice cards, children were presented with 16 test cards and E1 did not provide any feedback to the child. The number of correct responses was recorded, and children received a total score out of 16 for each trial.

The purpose of same trials was to familiarize children with the cards. When children were presented with a daytime card, E1 instructed them to say “day” and when children were

presented with a nighttime card, they were instructed to say “night.” The opposite trials were the main measure of inhibitory control. In these trials, when children saw a daytime card, E1 instructed them to say “night” and when children saw a nighttime card, they were instructed to say “day.” The control trials consisted of two versions that were counterbalanced across participants. One card depicted a squiggle and the other card depicted a checkerboard. In one version, children were asked to say “night” when presented with the squiggle card and say “day” when presented with the checkerboard card. In the second version, the same two cards were shown but the word associated with each card was reversed.

Coding and Reliability

Children’s searching patterns and explanations were coded immediately after the procedure by E1 and E2. Later, two additional research assistants coded the complete sample from the video-recordings. There were no disagreements among coders.

Results

Preliminary analyses were conducted to explore whether children’s searching behaviours, across age and condition, were influenced by: 1) the role of the containers, $\chi^2(5) = 3.08, p = .704$, 2) the use of multiple speakers (e.g., E2), $\chi^2(5) = 1.50, p = .963$, 3) child’s gender, $\chi^2(1) = .245, p = .772$, and 4) child’s ethnicity, $\chi^2(5) = 2.91, p = .796$. No significant results were found. Therefore, these variables were not included in the main analyses.

Credulity Toward the False Testimony

The location of children’s first search for the hidden object was coded: “0” if the child searched in C first (i.e., not credulous, being skeptical) and “1” if the child searched in F first (i.e., being credulous). No children included in the final sample searched in N first. First, separate Chi-square tests of independence were conducted to examine the main effects of age (3-

years-old vs. 4-years-old) and condition (Baseline vs. Motivation) on children’s credulity toward E2’s false testimony.

Collapsing across condition, a significant main effect of age emerged, $\chi^2(1) = 4.98, p = .040$, Cramer’s $V = .31$. Overall, there were significantly more 3-year-olds (19/23, 83%) than 4-year-olds (16/30, 53%) who were credulous toward E2’s false testimony. However, collapsing across age, the main effect of condition was not significant, $\chi^2(1) = .232, p = .773$ (Baseline: 18/26 credulous, 69%; Motivation: 17/27 credulous, 63%), suggesting that overall children were equally credulous toward E2’s false testimony across the two conditions.

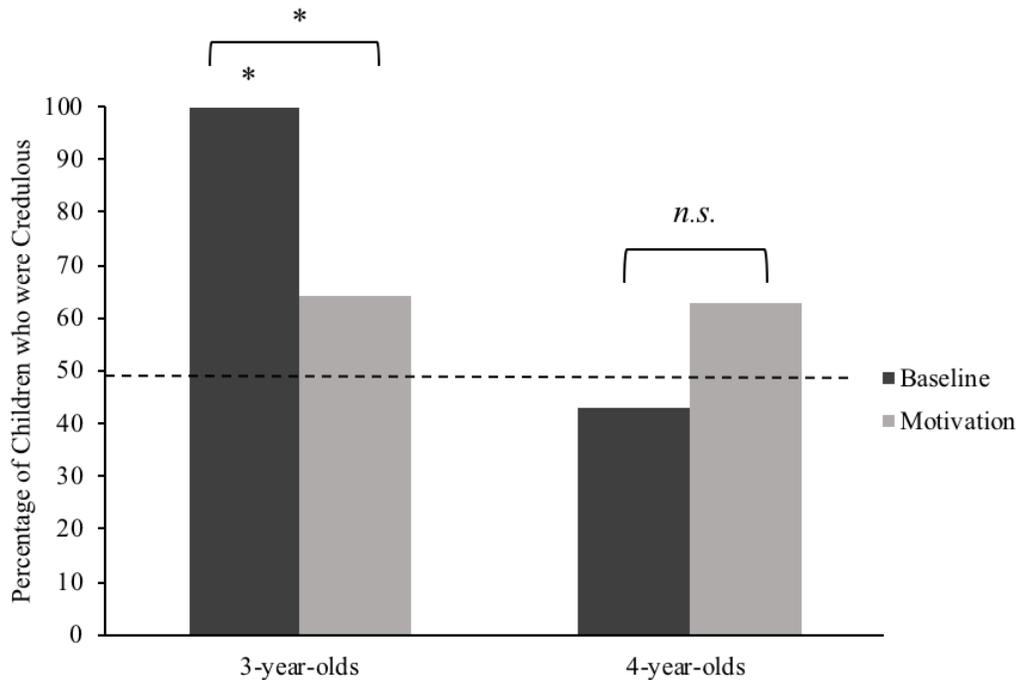


Figure 1. Percentage of children who were credulous (by age group and condition), $*p < .05$

Further analyses were conducted to explore the effect of condition in each age group. The results indicated a significant effect of condition in the 3-year-olds, $\chi^2(1) = 5.28, p = .037$, Cramer’s $V = .479$. Significantly more 3-year-olds were credulous toward E2’s false testimony in the Baseline condition (12/12, 100%) than in the Motivation condition (7/11, 64%). However,

there was no significant effect of condition in the 4-year-olds, $\chi^2(1) = 1.16, p = .464$ (Baseline: 6/14 credulous, 43%; Motivation: 10/16 credulous, 63%) (see Figure 1).

Second, the percentage of children who were credulous was compared with chance expectation (50%) by age group and condition using one-sample binomial tests. Although the procedure involved children choosing between three containers, all children either searched for the object in the correct container or misleading container first. Therefore, chance expectation was set at 50% instead of 33.3% (see Ma & Ganea, 2010). Results indicated that in the Baseline condition, the 3-year-olds were significantly more likely to search in the misleading container first (i.e., being credulous) than would be expected by chance, $p < .001$, whereas in the Motivation condition this was not found, $p = .549$. The percentage of the 4-year-olds who were credulous toward the false testimony did not differ significantly from chance expectation in both conditions (Baseline: $p = .791$; Motivation: $p = .454$) (see Figure 1).

Memory Check

Children’s responses to each memory check question were explored. Table 1 shows the percentage of children who correctly answered each memory check question by age group and condition.

Table 1
Percentage of children who passed each memory check question (by age group and condition)

| Age Group | 3-year-olds | | 4-year-olds | |
|---------------------|--------------|--------------|--------------|--------------|
| | Baseline | Motivation | Baseline | Motivation |
| Q1: Hiding location | 100% (12/12) | 100% (11/11) | 100% (16/16) | 100% (16/16) |
| Q2: False testimony | 75% (6/8) | 67% (6/9) | 100% (14/14) | 86% (12/14) |

Overall, when asked where E2 had put the object, one child did not respond. Of the remaining children, all correctly recalled where E2 had placed the object. When asked where E2

had said she put the object, eight children either did not respond or said, “I don’t know.” Of the remaining children, the percentage of children who recalled the false testimony correctly was examined using a one-sample binomial test. It was found that 84% (38/45) of the children recalled the false testimony correctly, $p < .001$ as compared to chance expectation. Although 16% (7/45) of the children responded to this question incorrectly, these children deferred to E2’s false testimony and searched in the misleading container first, suggesting that they understood E2’s false testimony even though they could not recall what she had said.

Explanations of the False Testimony

Across age groups, when children were asked to explain why E2 had provided the false testimony, nine 3-year-olds either did not respond or said, “I don’t know”; three 4-year-olds did not choose an option from the forced-choice question but had other responses. Of the remaining 41 children, 33 (80%) stated that E2 was trying to trick them (8 spontaneous answers) and 8 (20%) said E2 made a mistake (see Figure 2).

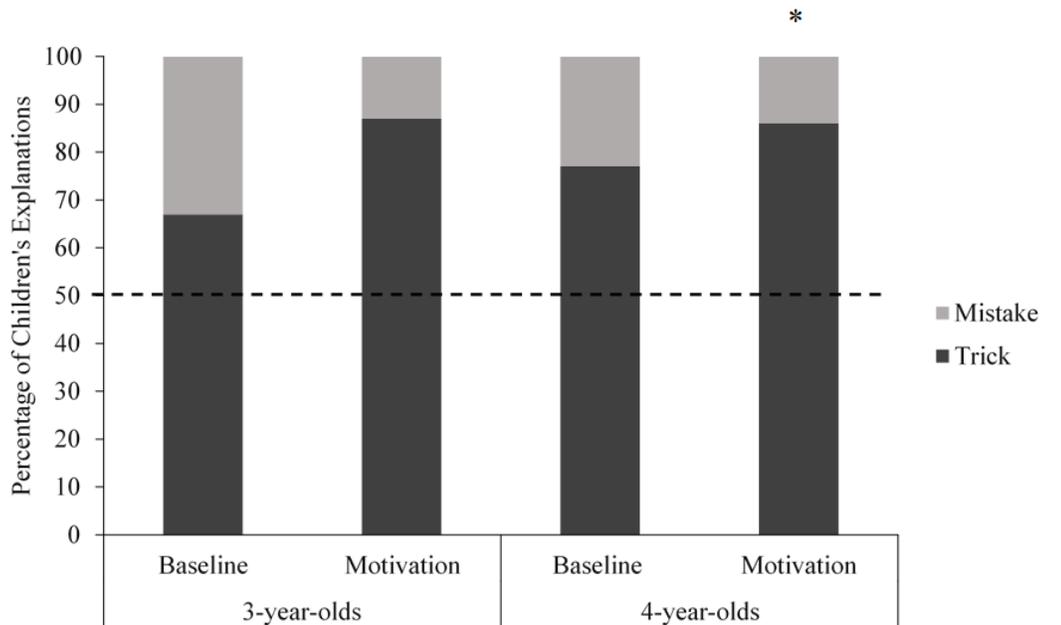


Figure 2. Percentage of children who explained E2’s false testimony as a trick or a mistake (by age group and condition), $*p < .05$ as compared to chance (50%).

Further analyses revealed that children’s explanations were not influenced by condition, $\chi^2(1) = 1.04, p = .436$, age, $\chi^2(1) = .050, p = 1.00$, or whether children were credulous toward E2’s false testimony, $\chi^2(1) = .010, p = 1.00$. The percentage of the 3-year-olds choosing the “trick” explanation did not exceed chance expectation in the Baseline condition (4/6, 67%), $p = .234$ or in the Motivation condition (7/8, 88%), $p = .070$. Similar results were found for the 4-year-olds in the Baseline condition (10/13, 77%), $p = .092$. However, in the Motivation condition, the percentage of the 4-year-olds choosing the “trick” explanation was significantly greater than chance expectation (12/14, 86%), $p = .013$.

Cognitive Tasks

Table 2 shows the means and standard deviations of children’s inhibitory control and standardized working memory scores by age group.

Table 2

Children’s mean scores of inhibitory control and working memory by age group (*SDs* in parentheses)

| Task | 3-year-olds | 4-year-olds |
|----------------------------|-------------|-------------|
| Day/Night (out of 16) | 9.6 (5.24) | 11.1 (4.93) |
| Picture Memory (out of 19) | 11.1 (1.96) | 10.1 (2.84) |

Note. Seven 3-year-olds and one 4-year-old did not complete the day/night task. Four 3-year-olds did not complete the picture memory task due to unwillingness or difficulty with instructions.

A 2 (age: 3-and 4-year-olds) x 2 (condition: Baseline, Motivation) between-subjects ANOVA revealed no significant differences between age groups ($p = .321$) or conditions ($p = .446$) in children’s inhibitory control. Similarly, when examining children’s working memory, there was no significant age ($p = .204$) or condition ($p = .446$) differences. Additionally, separate logistic regressions were employed to examine whether inhibitory control or working memory was associated with children’s credulity. Across age groups and conditions, no significant results

were found for inhibitory control ($B = -.005$, $SE = .063$, $p = .930$) or working memory ($B = -.121$, $SE = .124$, $p = .326$). Therefore, no further analyses were conducted.

Discussion

The present study extends previous research regarding preschoolers' credulity toward false testimony that contradicts their direct observations. Overall, more 3-year-olds than 4-year-olds were credulous toward the false testimony of an adult, despite their firsthand observations. Interestingly, in the presence of motivating factors (i.e., rating and hiding of a desirable object, a negatively framed consequence), fewer 3-year-olds were credulous compared to when these factors were absent. In contrast, the 4-year-olds appeared equally credulous toward the false testimony regardless of whether the motivating factors were present. No significant associations were found between children's likelihood of being credulous and their inhibitory control or working memory abilities. These main findings will be discussed in turn.

The first main finding concerns the age difference in children's credulity toward false testimony. While previous literature has found that young children view their visual perceptions as reliable sources of information (e.g., O'Neill et al., 1992), there is also evidence to suggest that children have the tendency to trust an adult's testimony even when it contradicts their firsthand experiences. This is especially true in children 3 years and younger (e.g., Jaswal, 2010; Ma & Ganea, 2010; McDonald & Ma, 2016). Consistent with these findings, the present research found that overall, the 3-year-olds were more credulous than the 4-year-olds. Children largely depend on the information provided to them by adults and have an automatic assumption that "adults know best". Dawkins (1995) explains that early in childhood, children have not had enough experiences to know or question what adults tell them. Therefore, they have the tendency to believe much of what adults tell them is true, including false information. As children get

older, their experiences and knowledge start to expand, and this leads children to become more skeptical and doubtful of certain information (Dawkins, 1995; Gilbert, 1991). Additionally, having more experiences and knowledge can help children to become more confident in their own judgements and perceptions, essentially reducing their robust trust in adult's testimony. For example, simply having a successful searching experience to obtain a hidden object helped 3- and 4-year-olds rely on their own observations instead of an adult's false testimony, as they were able to recognize that their direct observations were credible sources of information (Ma & Ganea, 2010, Study 2). It is possible that due to potential lack of relevant experiences, the 3-year-olds in the present study (relative to the 4-year-olds) were less able to rely on their visual perceptions and more likely to defer to an adult's false testimony.

When no motivating factors were present (i.e., in the Baseline condition), the present research was able to replicate some findings in both Ma and Ganea (2010, Study 1) and McDonald and Ma (2016), in that the majority of the 3-year-olds were credulous. However, when looking at the 4-year-olds' searching patterns, there is some inconsistency in the results. First, in the present study, 43% of the 4-year-olds were credulous whereas in Ma and Ganea (2010), only 25% of the 4-year-olds were credulous. This inconsistency may have something to do with the minor differences in the paradigms. In the present study, the procedure took place in two separate rooms connected by a one-way window. Children observed the hiding event and received the false testimony in one room and went to retrieve the object in the other room. When moving from one room to the other, children might have engaged in the idea that somehow the object had been transferred to the "new" location as indicated by the false testimony. In Ma & Ganea (2010), however, the procedure took place in a single room divided by a curtain that had a window. Children observed the hiding event through the window in the curtain and were asked

to retrieve the object in the same room. This setting rendered it less likely that the object had been transferred to a new location, which might have led the 4-year-olds to perceive the false testimony as deceiving and choose to rely on their own first-hand observations. It must be noted that this explanation is only speculative given the small sample size of the present study.

Second, McDonald and Ma (2016, Study 1) used the same paradigm as the present study and found that, 4-year-old Caucasian children were credulous toward the false testimony of a native-English speaking Caucasian speaker (75% credulous), were not particularly credulous or skeptical when the speaker was a racial-outgroup (56%) or an accent-outgroup (63%), but were skeptical and resisted the false testimony when the speaker was a racial-and-accent outgroup (25%). In the present study, 43% of the 4-year-olds (6/14) were credulous toward the native-English speaking Caucasian speaker. Further examination showed that among the 4-year-olds, 33% of the Caucasian children (2/6) were credulous as compared to 50% of the non-Caucasian children (4/8). Given the small sample size of the present study, it is difficult to make reasonable speculations about what factors (e.g., sample diversity) might have contributed to the different rates of credulity in the 4-year-olds across the two studies.

The second main finding concerns the effect of motivation on children's credulity. Consistent with our hypothesis, the present study revealed that the 3-year-olds' searching patterns differed across conditions, in that they were less credulous toward an adult's false testimony that conflicted with their observations when they were presented with motivating factors. Similar to Goldsmith and Dhar (2013), the present study found that using a negatively framed incentive motivated participants to solve a problem and enhanced their task performance. While only speculative, it is likely that some of the 3-year-olds were able to disregard E2's false

testimony and rely on their direct observations when they knew there was a risk of losing a highly desirable object.

Adult literature has shown that introducing motivational incentives can enhance individuals' cognitive processes such as attention, learning, and memory (see Yee & Braver, 2018 for a review). Therefore, perhaps presenting children with motivational factors enhanced the 3-year-olds' cognitive strategies and allowed them to successfully disregard an adult's false testimony. Similar to Roebbers and Fernandez (2002), it is possible that the 3-year-olds used more strategic retrieval processes to access their memory of the location of the object and were able to selectively attend to the relevant, correct information rather than the misinformation presented to them. Additionally, in Roebbers and Fernandez (2002), 6 -to 8-year-olds were more likely to admit they did not know the correct answer when they were given incentives. These results suggest that children may have felt more comfortable rejecting an interviewer's misleading suggestions when they were presented with motivational factors. Thus, in the present study, perhaps the 3-year-olds also felt more comfortable to disregard the experimenter's false testimony and to rely on their own observations in order to retrieve their prize. While these explanations are only speculative, it can be argued that perhaps the cognitive (i.e., retrieving and monitoring information from memory), social (i.e., disregarding false information from a stranger) and motivational (i.e., consequence) demands of the present task interacted with one another to allow the 3-year-olds to be less credulous in the Motivation condition than in the Baseline condition.

In addition to presenting children with a consequence, the current study also had children rate a desirable object versus an undesirable one prior to the experimental procedure. Previous literature has found that younger children are able to understand that when people express a

desire, they act in a way to fulfill that desire (e.g., Wellman & Woolley, 1990). Additionally, they can infer the emotions an individual will experience when their desire has been fulfilled. For example, Wellman and Woolley (1990) presented 2-year-olds with various stories and asked children to predict how different characters would act and feel in response to when their desires have been fulfilled (or not fulfilled). Similar findings have also been found with children 3 years and older (e.g., Yuill, 1984). Therefore, it can be speculated that the 3-year-olds in the present study may have been able to understand that 1) in order to fulfill their desire (i.e., the toy) they must successfully retrieve the object and 2) if they fulfill their desire they will feel happy because they get to take the toy home.

Although the 4-year-olds may have had the same understanding, it seems that their search behaviours did not differ across the two conditions. Perhaps the toy used in the present study was not desirable enough for the 4-year-olds to motivate them. However, although not significant, an interesting trend emerged showing the reverse pattern than predicted. It seems more 4-year-olds were credulous in the presence of motivating factors (63%) than in the absence of them (43%). This finding may be attributed to a negativity bias. Baumeister and colleagues (2001) provide an extensive review demonstrating the strong influence that negative information has on individuals' behaviours and cognitions compared to positive or neutral information. The authors explain that negative information often outweighs positive information when adults make judgements and decisions. This bias can also be seen in infants and children as well. For example, it has been shown that 5-year-olds can recognize negative faces (i.e., angry, fearful, sad) faster than positive faces (i.e., neutral or happy faces) (LoBue, 2009). In the present study, it is possible that the 4-year-olds placed greater value on an adult's testimony than their direct observations in the presence of negative information, in order to avoid the risk of losing a

desirable object. While a negativity bias may be at play, it must be noted that this explanation is only speculative as this trend was not significant. Future research should extend these results by examining how children would perform in a similar task when given a positively framed incentive (compared to a negatively framed incentive) to determine if a negativity bias is truly playing a role in children's credulity.

The third main finding concerns the lack of association between children's credulity and their inhibitory control or working memory. As stated previously, the literature on the role of executive functions in children's suggestibility and credulity toward false information is inconclusive (e.g., Bruck & Melnyk, 2004; Heyman et al., 2013; Jaswal et al., 2014). These mixed findings could largely be due to the specific cognitive tasks being used. For example, Jaswal and colleagues (2014) used a spatial conflict task to measure children's inhibitory control, whereas Heyman and colleagues (2013) used the day/night task similar to the present study. Additionally, each of these studies, including the present research, employed different methodologies and measured children's ability to resist false information in various ways. Therefore, children's cognitive scores in each study were correlated with a different measure of resistance to misinformation. Perhaps using one task to measure specific executive functioning skills is not strong enough to detect differences between paradigms, thus creating large discrepancies within the literature. For example, having several measures of inhibitory control would increase the reliability of measuring a child's overall inhibitory control. Further research should be conducted to continue to explore how these individual differences amongst children may influence how they respond and react to false testimony. Also, while the present study only measured two cognitive measures, there may be other cognitive skills influencing children's behaviour. For example, children with a more developed theory of mind may have the mental

capacity to understand that adults can inaccurately represent reality and thus, can successfully assess the credibility of an adult's testimony (e.g., Vanderbilt & Heyman, 2011). Therefore, future research should examine how other cognitive abilities may be related to children's credulity toward false information that conflicts with their visual observations.

Lastly, when looking at children's explanations for the false testimony, the 3-year-olds were equally likely to explain E2's false testimony as a trick or a mistake. This finding is consistent with both Ma and Ganea (2010) and McDonald and Ma (2016), which may be due to children's inability to understand that another person is capable of making false claims and hold false beliefs (Wellman, Cross, & Watson, 2001). Therefore, children responded at random. Interestingly, the 4-year-olds showed similar patterns, except that most children in the Motivation condition thought E2 was tricking them. This finding is inconsistent with the literature whereby 4-year-olds have been shown to consistently describe E2's false testimony as a trick in the absence of motivating factors (e.g., Ma & Ganea, 2010; McDonald & Ma, 2016). It is by this age where children develop the ability to distinguish lies from mistakes and are able to recognize when someone is being deceitful (e.g., Siegal & Peterson, 1988). Additionally, in the Motivation condition, the 4-year-olds might have explained E2's behaviour as having purposeful deceit due to the fact that the object hidden about which false testimony was given, was the object they previously rated as desirable. Therefore, they might have viewed E2's behaviour as "teasing" or "joking" instead of simply making a mistake.

It is important to note some limitations in the present study. First, children were not given a memory check to ensure that they heard and/or understood the consequence. Although the results revealed a significant effect of condition on the 3-year-olds' credulity toward false testimony, it can only be inferred that children were motivated by the negatively-framed

consequence so as to avoid the potential loss of the desirable toy. It would have been informative to know if children truly understood what the experimenter told them about the consequence. Second, it is difficult to make generalizable comparisons between groups due to the small and unequal sample size of each age group and condition.

That being said, this study is one of the first to examine the role of motivation in children's credulity toward false testimony. It is important for future research to further explore how different motivating factors may influence children's trust in an adult's false testimony. For example, as mentioned earlier, examining how children would behave when presented with a positively framed incentive in comparison to a negatively framed incentive, would help to explicate the effect of motivation on children's credulity. It is hypothesized that 3-year-olds would not be sensitive to differences in incentive-framing but would continue to be motivated by the desirability of the object. Thus, their searching behaviour would not differ from the current study. However, with a positively-framed incentive, 4-year-olds may be less credulous compared to the current study due to the absence of a potential negativity bias. It would also be interesting to explore whether children's search behaviour would vary based on where the consequence is placed during the procedure. For example, in Roebbers, Moga, and Schneider (2001) children were told about receiving incentives three weeks after watching a video, which may have influenced their recalling strategies during the interview whereas, in Nida (2015) children were given explicit instructions to remember the objects prior to the task in order to receive incentives later, which may have affected children's memorizing strategies. Thus, in the present study it would be interesting to examine whether children's credulity toward false information would change if the consequence was given before the hiding event (e.g., "E2 is going to hide a prize in one of the containers and you will have to go find it later. Watch carefully because if you don't

find it, you won't be able to take it home!"). In addition, the present study included two motivating components, the rating/hiding of a desirable object and a negatively framed consequence. It is unclear whether children would continue to disregard an adult's false testimony when only one of these components was present. Future research is needed to parse apart these components.

In conclusion, the current study investigated the role of motivation in children's credulity toward false testimony that contradicted their direct observations. The findings can add to our understanding of what factors can reduce children's credulity toward false information and may have important real-world implications for educational purposes and in forensic contexts where children serve as eyewitnesses.

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