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**Children accept information from incongruent speakers when the context explains the
communicative incongruence**

Abstract

Past work has shown that children are less likely to solicit information from speakers who use incongruent communicative cues (i.e., demonstrate an emotion nonverbally that differs from the emotional valence of the words) versus those who use congruent cues. The present study explored whether school-age children show flexibility in their decisions to avoid incongruent speakers based on the situational context and speakers' awareness of the context. Older children (9-10 years old), but not younger children (7-8 years old), demonstrated this flexibility. Within a speaker reliability paradigm, incongruent speakers were more likely to be solicited for information when the situational context rendered their affect more appropriate. Moreover, older children showed appreciation for the speakers' perspective; they were more likely to solicit information from incongruent speakers when the speaker was aware (versus unaware) of the context. Such findings demonstrate the growth in children's ability to integrate various cues to determining speaker credibility across the school-age years.

Keywords: communication; speaker credibility; non-verbal cues; emotion recognition; perspective-taking; selective trust;

Introduction

Within the majority of communicative exchanges, speakers display emotions that are congruent with their words (e.g., looking downcast while discussing a sad event). However, there are times when inconsistency arises, such as when speakers use nuanced communicative behaviour (e.g., irony), mask their true emotions, or lie (DePaulo, Stone, & Lassiter, 1985; Feldman & White, 1980). Imagine the nonverbal affect of an athlete who has recently lost a race as she says to her winning competitor, “I’m so happy for you.” Incongruent cues are ambiguous because each communicative channel is conveying a different meaning (i.e., saying something positive in a sad tone of voice). Given the increased communicative ambiguity (and subsequent risk for miscommunication), it may be advantageous for individuals to be skeptical of the quality of information provided by speakers who use incongruent communicative cues. Moreover, as children acquire knowledge, they may be less likely to learn from speakers who display incongruency in their communicative cues. Indeed, recent work has found that, by 5 years old, children rely less on information from speakers who presented incongruent verbal descriptions (Doebel, Rowell, & Koenig, 2016). Namely, after hearing speakers who presented a series of either logically consistent or inconsistent claims, 4 and 5-year-olds (but not 3-year-olds) detected the inconsistencies and 5-year-olds (but not 4-year-olds) avoided soliciting information from inconsistent informants (Doebel et al., 2016). In terms of children’s ability to track (in)congruency across different communicative channels, 7- to 8-year-olds (but not preschoolers) use (in)congruency between the words spoken and the manner in which such words are uttered when deciding whether to solicit information from a speaker or not (Gillis & Nilsen, 2017). Speakers who show incongruence between their words and nonverbal affect were viewed by children as less believable and as speaking in a confusing fashion. Consistent with this finding,

9-year-old children predict that when speakers utter a lie, they will produce facial expressions that differ from their words, whereas truthful speakers will have facial expressions that match their words (Rotenberg, Simourd, & Moore, 1989).

However, contextual information might excuse, or clarify, why an individual uses affective, non-verbal cues that are incongruent with the verbal meaning of the uttered words. For example, on its own, the statement “I’m going to the park today,” said in a sad tone of voice, is an incongruent message (i.e., most individuals would be happy to go to the park). This affective inconsistency is more understandable if the weather is stormy (i.e., given that most people do not enjoy sitting on a park bench during a rainstorm). In this way, contextual information may influence children’s judgment of speakers who deliver information with incongruent cues. The present study examined this premise. Specifically, we asked, do children take the situational context into account when evaluating the credibility of (in)congruent speakers? We further assessed whether children were able to reflect on the speaker’s access to, and therefore knowledge of, such context. That is, if children take context into account, do they also appreciate that the speaker must be aware of this context in order for it to influence their affect?

Such questions are relevant for the evolving literature on children’s selective learning. That is, extending the finding that preschool-age children show a robust preference for learning from accurate, relative to inaccurate, individuals (e.g., Corriveau, Meints, & Harris, 2009; Koenig, Clement & Harris, 2004; Koenig & Harris, 2005; Li & Yow, 2018; Palmquist & Jaswal, 2015; Scofield & Behrend, 2008), researchers have recently begun asking to what extent, and under what conditions, do children learn from less desirable information sources (e.g., those with histories of inaccuracy). Even credible sources can sometimes be misinformed; therefore, children would benefit from being somewhat flexible when learning from others. The

preferential reliance hypothesis states that while children prefer choosing to rely on accurate sources for information, they still learn from or believe inaccurate sources (Kim, Paulus, & Kalish, 2016). Supporting this notion, Vanderbilt, Heyman and Liu (2014) found that 3 – and 4-year-olds show trust in previously inaccurate informants depending on the availability of alternate informants. Thus, children may be flexible with their credibility judgments as contextual factors change, even if the speaker cues are stable.

Children have been shown to take contextual information into account when evaluating the credibility of informants. They are more likely to rely on inaccurate speakers if there is a context that explains prior inaccuracy. For example, Robinson and Nurmsoo (2009) found that 3- to 5-year-olds take into account the reason for a speaker's inaccuracy (e.g., false beliefs). In addition, Nurmsoo and Robinson (2009a) found that 3 to 5-year-old children relied on information from puppets who had a history of inaccuracy, if the inaccuracy was a result of not having access to pertinent information (i.e., not being able to see an object). (Although see Nurmoo & Robinson, 2009b for contrasting results). Thus, similarly, children may 'excuse' a speaker whose words are seemingly at odds with their non-verbal cues, *if* the context explains the inconsistency.

To appreciate the impact of contextual information on a speaker's affect, children must be able to detect affect cues (typically coming on line by the end of their first year; Barrera & Maurer, 1981; Fernald, 1993; Kuchuk, Vibbert, & Bornstein, 1986). They must also have an awareness of what emotions would be appropriate for a particular context. Within their second year, children show an appreciation for the match between situational context and emotional display. For instance, 14 months-olds are more likely to trust speakers whose non-verbal cues are congruent, as opposed to incongruent with the context (Chow et al., 2008). Infants as young as

14 months react (as measured by pupil dilation) to incongruency between others' emotional expressions and actions (Hepach & Westermann, 2013). Further, 18-month-olds engaged in more checking behaviour (i.e., suggestive of confusion) when speakers' demonstrated emotions were incongruent with the situation; for example, distress when a positive event occurs (Chiarella & Poulin-Dubois, 2013; though infants may not distinguish between sad and neutral expressions; Chiarella & Poulin-Dubois, 2015). Infants (12-15 months-old) have been found to expect congruency between an individual's emotional display and whether or not that individual achieved/did not achieve a goal. This further suggests that young children understand that certain emotional reactions are typical for a particular situational context (Skerry & Spelke, 2014).

Context, however, could only impact a speaker's affect if the speaker is aware of the context. For example, saying "I'm going to the park today," with a sad tone would be understandable if the speaker *knew* that there was a storm, but not if the speaker did *not know* that there was a storm (e.g., the curtains were closed). To appreciate the perspective of the speaker, children require theory of mind, that is, the understanding that others may have differing mental states, thoughts, beliefs, and access to knowledge than they do themselves, a skill that typically develops in late preschool (Flavell, 2004; McHugh, Barnes-Holmes & Barnes-Holmes, 2004). Moreover, to appreciate a speaker's ignorance in this type of scenario, children who are aware of the situational context would need to override a more general social bias, the "curse of knowledge" (referring to individuals' general difficulty with appreciating the knowledge state of a more naïve individual; Birch & Bloom, 2007). That is, to accurately take the perspective of the speaker when evaluating communicative consistency, children would need to separate their own knowledge of the context from the speaker's knowledge of the context.

Adults interpret statements based on the conditions under which the statement is made, integrating factors such as the information available to the speaker, the context, and the speaker's motivation (Fox & Irwin, 1998). In the sarcasm and ambiguity detection literatures, children demonstrate some ability to integrate multiple factors when judging a listener's interpretation of utterances. For example, preschool-age children can accurately interpret referential statements based on the speaker's perspective, even when this perspective differs from their own (Nadig & Sedivy, 2002; Nilsen & Graham, 2009). By 5 years of age, children indicate that an ambiguous clue would be 'tricky' for a listener who did not see where a sticker was hidden – even when the child him/herself was aware of the sticker location (Nilsen & Graham, 2012). Further, Nilsen, Glenwright, and Huyder (2011) found that 8- to 10-year-olds recognized that a listener required access to specific contextual knowledge to accurately interpret sarcasm (though 6- to 7-year-olds did not). While such studies demonstrate children's sophistication in interpreting language based on interlocutors' knowledge of contextual information, it is not clear whether they can apply such skills when evaluating informational sources based on verbal/nonverbal congruency.

In sum, children are discerning learners who are sensitive to the congruency in speakers' communicative cues when acquiring new information. However, it would be adaptive for children to show nuanced and flexible ways to judge speaker credibility since applying a basic heuristic to avoid *all* incongruent speakers could lead them to miss out on obtaining accurate information. That is, some credible speakers may have a logical reason for delivering information with inconsistent communicative cues (e.g., they have access to contextual information that explains their inconsistency). The current study examines children's sensitivity to context when evaluating speakers by exposing 7- to 10-year-old children to speakers who provided a statement where the words uttered either matched (congruent) or did not match

(incongruent) the tone/facial expression with which it was uttered. Children were then asked whether they would like to solicit new information from this individual or an unknown speaker. Prior to hearing the statement, the experimenter told children about the situational context in which the statement was uttered as well as whether the speaker had knowledge of this context or not. With these manipulations, a speaker's affective display could be considered appropriate even if it was incongruent with the words uttered. Referring to the aforementioned example, it would make more sense for someone to sound/look upset about an activity that would usually be considered fun, such as going to the park, if it were raining (versus sunny) and when this speaker was aware (versus not aware), of the inclement weather. Within the current study, if children show a preference for soliciting information from incongruent speakers who are aware of a negative context (versus those speakers who are unaware of the context or are in a positive context), they would be demonstrating an ability to integrate contextual and perspective information when interpreting congruency as a cue to credibility.

In order to explore possible developmental trends, we tested two age groups of children. We examined the performance of 7-8 year-olds as past work has shown that by 8 years of age children rely on verbal-nonverbal congruency when making judgments about speaker credibility (Gillis & Nilsen, 2017). Thus, if children within this age range moderate their use (or lack thereof) of information from incongruent speakers (based on contextual information) it would suggest that as sensitivity to congruency comes on-line children can use this cue in a flexible way. The performance of an older age group, 9- to 10-year-olds, was also examined, so that we could determine whether flexibility in using congruency cues is something that emerges at a later developmental stage.

Method

Participants

Fifty-nine 7- to 8-year-olds (39 females; $M_{\text{age}} = 93.87$ months, $SD = 6.40$) and 38 children aged 9- and 10-years-old (19 males, $M_{\text{age}} = 121.46$ months, $SD = 5.80$) were recruited from the community within a mid-sized North American city¹. Six additional children in the younger group and two in the older group were tested, but their data was not included in the analyses due to 1) a receptive vocabulary score that was $>3SD$ below the mean ($n = 1$), 2) failing to complete the task ($n = 4$), 3) video stimuli not playing ($n = 1$) and 4) child indicating that he/she was purposefully responding in a pattern when asked why he/she chose the speaker ($n = 2$). All children whose data was included for analyses were fluent in English (as per parent report) and possessed language skills sufficient to understand the statements/stories (as assessed by a standardized measure of receptive vocabulary). Thirty-nine percent of the younger children and 40 percent of older children were reported to speak languages in addition to English (e.g., French, Arabic, Urdu, Spanish).

Materials and Procedure

An experimenter individually tested participants in a quiet room within a research laboratory. The experimenter always administered the Contextualized Speaker Task first, followed by a receptive language task.

Contextualized Speaker Task. The Contextualized Speaker Task required children to decide whether to solicit information from speakers who provided statements that were either congruent (i.e., positive statement in a positive tone of voice) or incongruent (i.e., positive statement in negative tone of voice) or to choose information from an individual of which they had no prior knowledge. This procedure was chosen to create scenarios where children were

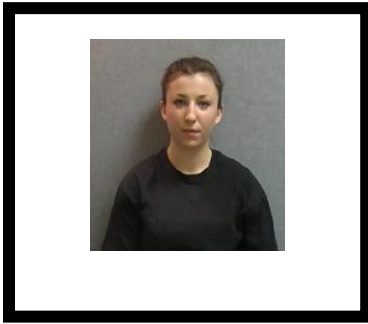
¹ Differences in sample size for two age groups was due to availability of children in laboratory database within each range.

exposed to one information source and could choose to rely on this person or not, as well as to reduce the information the children had to hold in mind (i.e., they did not have to track information from more than one speaker at a time). Prior to hearing the speakers, children were provided with information about the situational context for the speaker (i.e., positive versus negative situation) and they were told that the speaker either had access to this contextual information or not (i.e., knowledgeable versus unknowledgeable). Thus, the design of the study was a 2 (age group) X 2 (speaker type: *congruent, incongruent*) X 2 (speaker knowledge: *knowledgeable, unknowledgeable*) X 2 (situational context valence: *positive, negative*), with all factors within subject except age group. This resulted in 8 different trial types, which were administered twice for a total of 16 stories/trials. It is important to note that the valence of the affect remained the same within each speaker congruency condition (e.g., incongruent speakers used negative affect). The reason for not fully crossing the conditions was to simplify the design and because the main focus was on whether children would accept information from incongruent speakers in certain contexts, rather than whether they are sensitive to congruency per se (as past work has already demonstrated they are; Gillis & Nilsen, 2017).

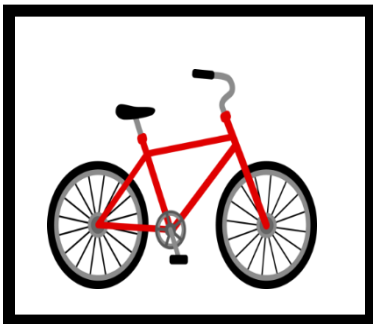
Children completed the task while seated at a table in front of a computer and a book. Each trial began with children being told information about the speaker (with accompanying pictures; Figure 1). The information always followed the same pattern. First, the experimenter named the speaker (e.g., “This is Julia”). Then the experimenter described a situation that would typically be a positive occurrence (e.g., “Julia’s bike just got fixed so she can go biking with her family today”). Next, the experimenter provided a statement that rendered the situational context either positive or negative (e.g., negative: “Her family was planning to go on the really hard route that Julia doesn’t like”). Finally, a statement explained whether the speaker was

Figure 1. Example of Stimuli Images

Knowledgeable / Positive Context



"This is Julia"

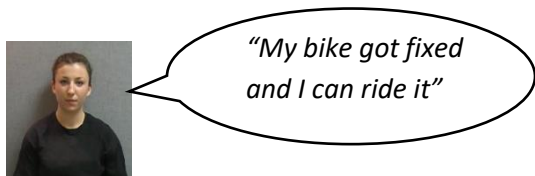


"Julia's bike just got fixed so she can go biking with her family today."

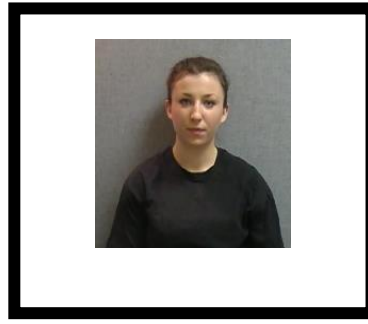


"Her family was planning to go on the fun route that Julia really likes. Julia knew this because she was standing right beside her mom when she said this, so she heard her mom clearly. Then Julia said..."

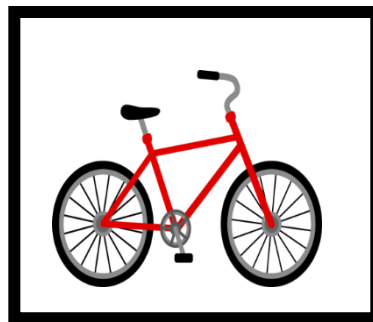
[message said with either positive affect (congruent) or negative affect (incongruent)]



Unknowledgeable / Negative Context



"This is Julia"

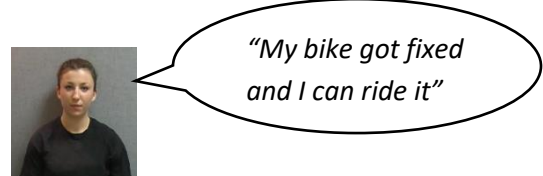


"Julia's bike just got fixed so she can go biking with her family today."



"Her family was planning to go on the really hard route that she doesn't like. Julia did not know this because she was in the garage when her mom said this, so she did not hear her mom. Then Julia said..."

[message said with either positive affect (congruent) or negative affect (incongruent)]



knowledgeable of the contextual information or not (e.g., unknowledgeable: “Julia did not know this because she was in the garage when her mom said this, so she did not hear her mom”). Following this, children watched a video in which the speaker made a statement about the situation (e.g., “Julia said: ‘My bike got fixed and I can ride it.’”). This final statement always involved a statement with words that describe something positive (e.g., I get to eat vanilla cake now, I’m going to play with my new toy, etc.), but was said in a manner that conveyed either happy or sad affect. See Table 1 for an example of each condition. Happy valence involved the speaker smiling, using a higher pitched voice, more pitch variability and more intensity. The sad valence involved the speaker displaying a frown and using speech that was lower pitched with less pitch variability (as assessed on PRAAT [Boersma, 2001], all $ps < .001$).

Each trial involved a different speaker with the type of information each speaker delivered counterbalanced across the participants. That is children heard each of the 16 statements only once, in one of the eight conditions. All speakers were Caucasian women with brown hair pulled back from their face, wearing a different coloured t-shirt.

To assist children’s comprehension, pictures accompanied each piece of information in the stories (Figure 1). That is, the experimenter placed a picture of the speaker in front of the participant, followed by two images depicting the information read out by the experimenter. The first image depicted the occurrence (e.g., a picture of a fixed bike). The second image depicted the situational context information (e.g., a picture of the speaker’s mother saying “hard route” along with an image of a bike going up a large hill). The speaker’s access to this information was also shown: each scenario involved either the speaker having heard/seen or *not* heard/seen the contextual information. Contextual information was on the left side of the page, while speaker access was on the right side of the page. When a speaker did not have access to the situational

Table 1

Example of Conditions

Comparisons	Congruent (positive lexical / positive non-verbal)	Incongruent (positive lexical / negative non-verbal)
Knowledgeable of:		
Negative situational context: (burnt cake)	I get to eat vanilla cake now / ☺	I get to eat vanilla cake now / ☹
Positive situational context: (delicious-looking cake)	I get to eat vanilla cake now / ☺	I get to eat vanilla cake now / ☹
Unknowledgeable of:		
Negative situational context: (burnt cake)	I get to eat vanilla cake now / ☺	I get to eat vanilla cake now / ☹
Positive situational context: (delicious looking cake)	I get to eat vanilla cake now / ☺	I get to eat vanilla cake now / ☹

Note: ☺ = positive non-verbal cues, ☹ = negative non-verbal cues

context information, there was a squiggly line separating the image of the context information from the image of the speaker; when a speaker did have access to this information, there was no line between the two sides. There was also an image of an eye or an ear in the top right corner of the page that was either bare (if the speaker could see or hear) or was crossed out (if the speaker could not see or hear). The experimenter trained children prior to beginning the task to understand what it meant when they saw these images. Specifically, the experimenter told them what each of the symbols meant and asked them to explain their meaning when presented with examples (i.e., *If I show you a picture like this with a squiggly line down the middle* (experimenter points to line) *and a line through an eye* (point) *or an ear* (point) *it means that this girl* (point to girl) *can't see or hear what's happening over here* (point to other side of image). *But if I show you a picture like this, without a squiggly line down the middle* (point to line) *and without a line through the eye* (point) *or the ear* (point) *it means that this girl* (point to girl) *can see or hear what's happening over here* (point to other side of image. *Let's practice. If I show you a picture like this, (show the squiggle line) what does it mean?*). All participants accurately identified the image meaning, suggesting that they were able to comprehend the stimuli.

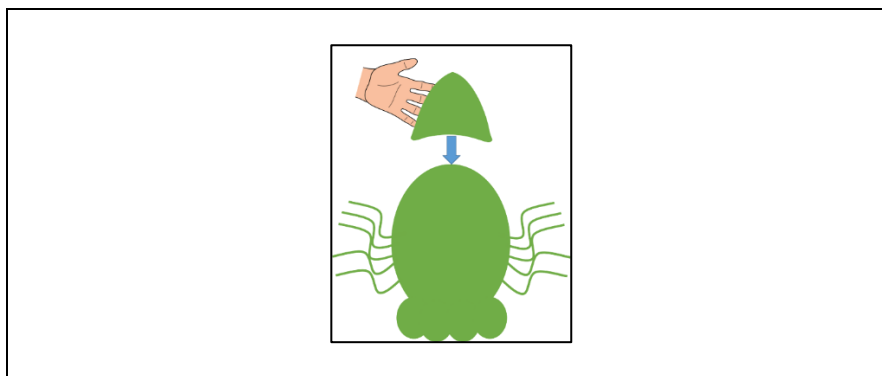
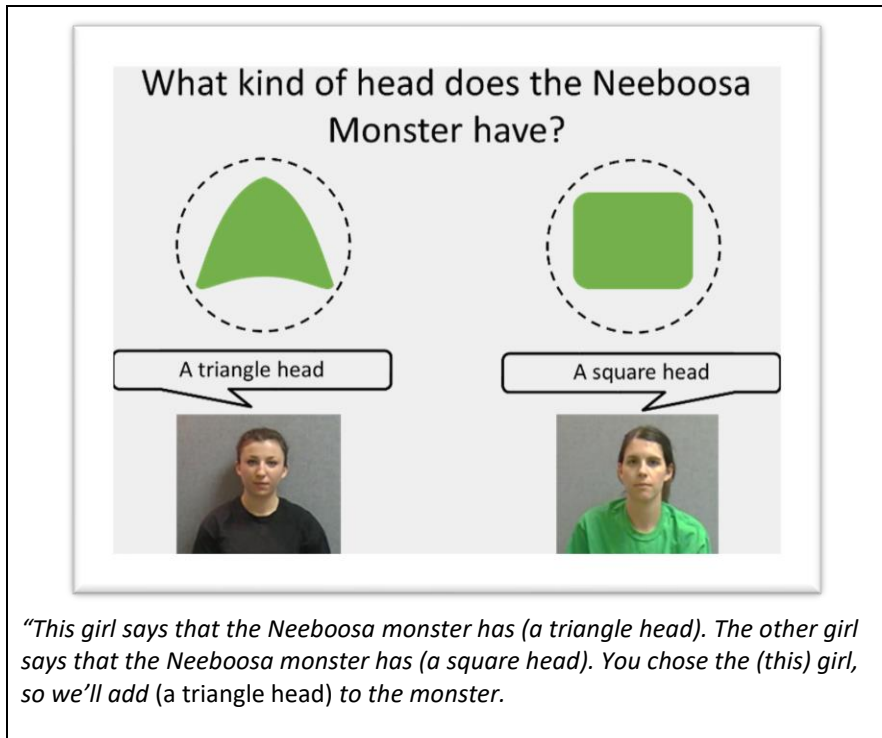
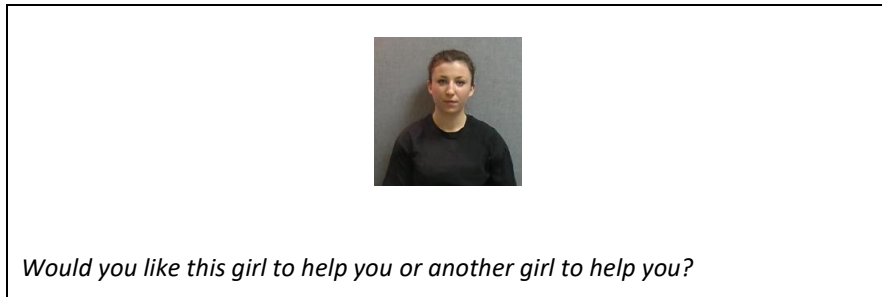
Following the message from the speaker, the experimenter asked children to decide whether they would like to solicit new information from that speaker or from a different individual of whom they have no information. This methodology diverges from the “traditional” speaker reliability paradigm, which pits one type of speaker against the other. However, the present methodology has the advantage of being closer to everyday situations in that it is not often that children hear different information from two sources and have to decide who to rely on. It also reduces the memory demands in that children only have to remember the details from one speaker rather than two. While this is a more conservative test of children’s selective trust

(relative to a forced choice between two speakers), past work has found that young children are capable of making judgments of single speakers (Birch et al, 2010; Koenig & Woodward, 2010; Gillis & Nilsen, 2017; Nurmsoo & Robinson, 2009a/b).

The information that children solicited from the speaker (or other individual) was various pieces of information about fictional creatures (e.g., “*Do you want this girl to help you figure out what the dibdat monster looks like, or another girl?*” See Figure 2). The speakers provided information about fictional characters so that none of the content in the stories could relate to information that was conveyed. Once the child made their decision about who they would receive information from, they were shown a page with a question about one of the creatures (e.g., How many eyes does the dibdat monster have?) as well as two stickers that depicted contradicting responses from the two information sources (video-taped speaker, as well as, picture of another woman with whom they had no contact). Then the experimenter and child created the images of the creatures based on the children’s choice of information sources. Importantly, children did not see the page depicting the speakers’ or the “other” women’s responses until they had made their decision regarding from whom to solicit information. In this way, we ensured that participants were not basing their responses on their own personal preferences of the options. To increase motivation for the task, the experimenter told the children that at the end of the task, they would get to see what the monsters really looked like and they would receive a sticker for every correctly identified monster characteristic.

Children completed stimuli check trials to ensure that they could hear what the speaker was saying and accurately judge the emotions. To do this, children watched two speakers provide messages. For the first speaker, the experimenter asked the children to repeat what the speaker

Figure 2. Example of speaker choice procedures



had said and to decide whether the statement was happy or sad. For the second speaker, the experimenter asked the children whether the speaker sounded, happy or sad. All children accurately repeated the content of the statements in the stimuli check trials and correctly labeled the valence of the statements, suggesting that they were able to comprehend the speakers' statements as well as identify the appropriate valence.

Language Task. To ensure all children who participated had the language skills sufficient to complete the task, the experimenter administered the receptive vocabulary subtest of the Wechsler Individual Achievement Test – Third Edition (WIAT-III; Wechsler, 2009). Children pointed to pictures that represented words spoken by the experimenter. As noted above, one participant's data was excluded due to a statistically low score.

Results

Preliminary Analyses

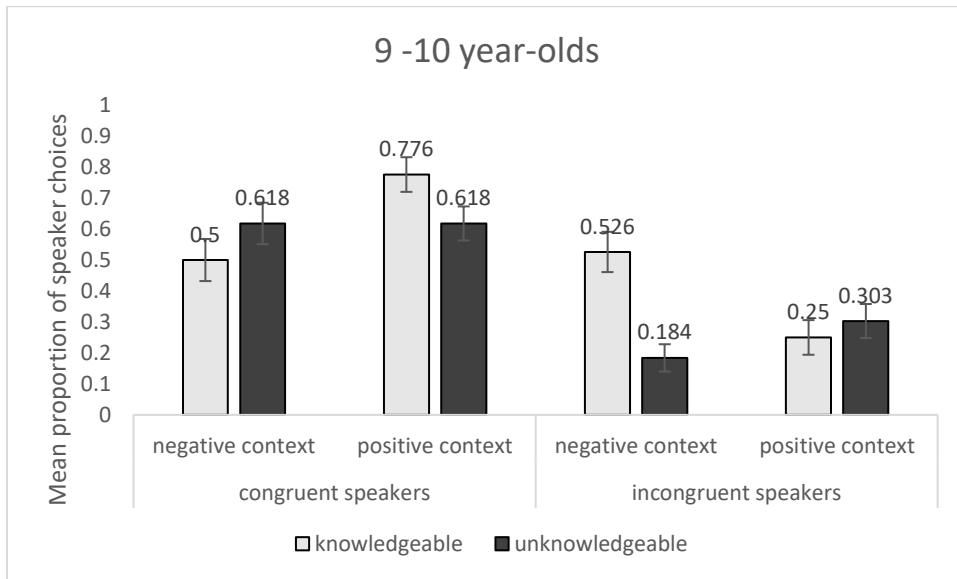
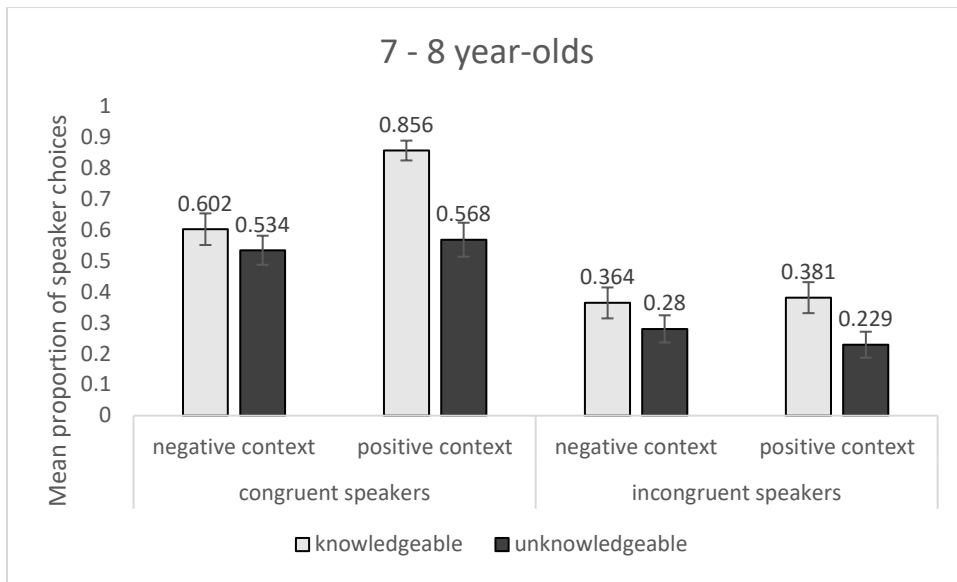
There were no significant gender differences (nor interactions between gender and other factors), $ps > .40$, so this factor was not analysed further.

Children's Choice of Speaker

To examine whether speaker type, speaker knowledge and situation valence influenced children's speaker preferences, a 2 (age group) X 2 (speaker congruency: congruent, incongruent) X 2 (speaker knowledge: knowledgeable, unknowledgeable) X 2 (situation valence: positive, negative) mixed measures ANOVA was conducted². The dependent variable was the means of children's *speaker choices* (see Figure 3). That is, whether the child indicated they

² As the choices made were binary (albeit summed across trials) data were also examined using Generalized Linear Mixed Model, Logit (Jaeger, 2008) using R (R Development Core Team, 2011). Results were consistent with the ANOVA data. That is, a significant 4-way interaction emerged ($p=.01$). When data were examined separately there was a significant 3-way interaction for the older group ($p<.001$), but not for the younger group ($p=.27$).

Figure 3. Children’s choices of speaker (over an unknown speaker)



would like to gain information from the speaker they just saw/heard or from another woman (of whom they had no information). Recall that an effect of situation valence (or an interaction between knowledge and valence) mainly for *incongruent* speakers would reflect children's flexibility in using congruency as a cue to reliability.

The ANOVA revealed an effect of speaker congruency ($p < .001$), speaker knowledge ($p = .001$), and situation valence ($p = .050$), as well as a number of significant two and three-way interactions. However, all effects were qualified by a significant four-way interaction, $F(1, 95) = 5.55, p = .020, \eta_p^2 = .055$. Given this interaction, data was examined separately across the between-group factor, namely across the young versus older age groups.

Younger age group (7- and 8- year-olds). Results revealed a main effect of speaker consistency, $F(1, 58) = 57.70, p < .001, \eta_p^2 = .50$, replicating previous findings that children of this age solicit information from congruent speakers more frequently than incongruent speakers (Gillis & Nilsen, 2017). However, this finding was qualified by an interaction with situation valence, which also showed a main effect (with speakers in positive situational contexts being solicited for information more frequently, $F(1, 58) = 5.18, p = .027, \eta_p^2 = .08$). The significant interaction between congruency and situation valence, $F(1, 58) = 9.75, p = .003, \eta_p^2 = .14$, was followed up by paired t-tests (with Bonferroni correction, $.05/4$). Results revealed that, when speakers were congruent, children more often chose those in the positive context versus the negative context ($t(58) = 3.96, p < .001, d = .61$) but that such a difference did not exist for incongruent speakers ($p = .670$). In both situational contexts, children were more likely to solicit information from congruent speakers (positive affect, positive words) than incongruent speakers (negative affect, positive words); $t(58) = 8.11, 4.91$ respectively for the positive and negative contexts, $ps < .001, ds = 1.63, .94$.

There was a main effect of knowledge, $F(1, 58) = 12.45, p = .001, \eta_p^2 = .18$, in that speakers who knew about the situational context were chosen more frequently than speakers who did not know about the context. This factor interacted with situation valence ($p = .010$), but the interaction was not analyzed further as it did not make sense conceptually to be looking at the results collapsed across the congruency of the speaker. There were no other significant effects ($ps > .251$).

In sum, while the younger children show some sensitivity to situational context (e.g., when evaluating congruent speakers), they are not factoring in this information when evaluating incongruent speakers. That is, relevant to the main question, these children do not seem to ‘excuse’ incongruent speakers even if the situational context would make such inconsistency understandable.

Older age group (9- and 10-year-olds). Results revealed a main effect of speaker consistency, $F(1, 37) = 39.32, p < .001, \eta_p^2 = .52$. However, this main effect was qualified by a 2-way interaction between speaker consistency and situation valence, $F(1, 37) = 9.44, p = .004, \eta_p^2 = .20$, as well as a significant 3-way interaction between consistency, speaker knowledge and situation valence, $F(1, 37) = 13.43, p = .001, \eta_p^2 = .27$. No other main effects or interactions were significant, $ps > .126$. As the main objective of this study was to examine how knowledge and situational context may impact children’s interpretation messages, particularly from incongruent speakers, the 3-way interaction was explored with two 2-way interactions (speaker knowledge X situation valence within each speaker type).

Incongruent speakers. For the incongruent speakers (i.e., those saying a positive statement in a negative tone of voice), there was a main effect of knowledge, $F(1, 37) = 6.61, p = .014, \eta_p^2 = .15$. The main effect of situation valence was not significant $p = .148$, but there was a

significant 2-way interaction between situation valence and knowledge, $F(1, 37) = 18.14, p < .001, \eta_p^2 = .33$. Exploring the interaction, comparisons with Bonferroni correction (.05/4) showed that children were more likely to solicit information from the incongruent speakers when these speakers were knowledgeable of a negative context compared to when they were knowledgeable of a positive context: $t(37) = 3.70, p = .001, d = .66$. Thus, reflecting a key point of interest, these children preferred to solicit information from a speaker when the situational context helped to explain the inconsistency (e.g., sounding sad in a negative context as opposed to a positive context). They also preferred to solicit information from incongruent speakers (over an unknown speaker) to a greater extent when these speakers were knowledgeable of the negative context compared to when they were unknowledgeable of the negative context, $t(37) = 4.52, p < .001, d = .92$. Therefore, importantly, these children were tracking the speakers' knowledge of the situational context (which explained the inconsistency) when forming judgments of the speakers' credibility. There were no other differences between speakers, $ps > .083$.

Taken together, the findings reveal sophistication in how incongruent speakers were treated. Namely, unlike the younger group, this older group modified their avoidance of incongruent speakers such that they were more willing to accept information from an incongruent speaker if there was 1) a context to explain the affect and 2) the speaker was aware of the context.

Congruent speakers. For the congruent speakers, there was a main effect of situation valence, $F(1, 37) = 6.99, p = .012, \eta_p^2 = .16$, which was qualified by an interaction with knowledge, $F(1, 37) = 5.55, p = .024, \eta_p^2 = .13$. The main effect of knowledge was not significant, $p = .792$. Paired t-tests, with Bonferroni correction (.05/4), revealed that children were more likely to solicit information from the congruent speakers when the speakers were

knowledgeable of the positive context compared to when they were knowledgeable of the negative context: $t(37) = 3.30, p = .002, d = .67$. Specifically, children were more likely to choose a congruent speaker when she was aware of situational contextual information that rendered her positive affect appropriate (i.e., sounding happy about a positive context), as opposed to when the situational context was incongruent with the speaker's positive affect (i.e., sounding happy about a negative context). There were no other differences between speakers depending on knowledge or situational context, $ps \geq .05$.

Congruent versus incongruent speakers. To further follow-up the 3-way interaction, the older children's choices were compared across the different speaker congruencies. Recall that congruent speakers used a positive affect to say positive words and incongruent speakers used negative affect to say positive words (i.e., the words were consistent but the affect varied). In a positive context, regardless of speakers' knowledge, older children chose congruent speakers, more than incongruent speakers (knowledgeable: $t(37) = 5.96, p < .001, d = 1.44$; unknowledgeable: $t(37) = 4.13, p < .001, d = .92$). Similarly, in a negative context, older children chose congruent speakers (over unknown speakers) more often than incongruent speakers when speakers were *unknowledgeable* ($t(37) = 5.13, p < .001, d = 1.18$). However, there was no difference in these children's preferences when the speaker was knowledgeable of a negative context ($p = .782$). Thus, older children's preference for congruency between affect and statements remained when the situational context was positive (i.e., congruent with the statement) as well as when the speaker was unaware of a negative context. However, when speakers were aware of a situational context that helped to explain the speaker's incongruent affect, older children showed equivalent rates of soliciting information from the speaker and an unknown source.

Discussion

Children tend to avoid soliciting information from speakers who are incongruent both within (Doebel et al., 2016) and across (Gillis & Nilsen, 2017) their communicative cues. The present study sought to examine if children are flexible in their judgments; that is, whether they take into account situational context information, as well as the speaker's access to this information, when determining whether to rely on information from speakers who produce (in)congruent messages (i.e., between the valence of the words and the speakers' nonverbal cues).

Results demonstrated developmental differences in children's speaker choices. Consistent with previous work, 7- and 8-year-olds showed a preference for soliciting information from congruent speakers. This preference for congruency remained stable even when the situation of the speaker helped to explain the incongruence between cues. As the incongruent speakers in the current study always used negative affect, the younger age group may simply be demonstrating a bias towards choosing speakers who demonstrated positive affect. If this were the case, the findings would still reflect this age group's inability to consider all factors, including context, when evaluating speakers. However, past work finds that affect valence is not the only factor to which children in this age range attend. That is, Gillis and Nilsen (2017) found that 7- to 8-year-old children solicited information from speakers who used negative affect when uttering negative sentences more often than speakers who used positive affect when saying negative sentences. This previous study, therefore, suggests that 7- to 8-year-olds value congruency between affect and words more than just positive affect when evaluating speaker credibility. Thus, we interpret the present results as indicating that 7- to 8-year-olds' general avoid soliciting information from incongruent speakers, regardless of the situational context or

the speaker's knowledge of this context. Though speculative, these children may have interpreted the mismatch between the affective valence of the words and the non-verbal cues to be indicative of deception (Rotenberg et al., 1989) or may have appreciated that such inconsistencies create communicative ambiguity and, thus, a less reliable source of information (Gillis & Nilsen, 2013).

In contrast, the 9- and 10-year-olds showed more sensitivity to the situational context when evaluating incongruent speakers. These children also generally demonstrated a preference for consistency by choosing the congruent speaker (over an unknown speaker) at a greater frequency than the incongruent speaker in most conditions (similar to the younger group). However, there was one condition where this was not the case. When speakers were aware of a negative context, children chose the incongruent and congruent speakers at comparable rates; that is, when it made sense for the speaker to be incongruent. In this scenario, the speaker knew about something negative in the context (rainy weather, a cake burning, a broken toy etc.). Thus, it would make sense for her to display sad affect when describing an otherwise positive event (e.g., "I get to eat vanilla cake now").

Further evidence supporting the notion that children show flexibility with their judgments (based on the situational context) comes from the pattern of data when looking at the rates of choosing the incongruent and congruent speakers (in varied contexts) separately. Specifically, children chose to solicit information from incongruent speakers (i.e., a positive statement in a negative tone of voice) more often when the situational context was negative, compared to when it was positive, that is, when the context rendered the negative tone of voice more appropriate. For example, children were more likely to solicit information from a speaker who said, "I'm going to play my favourite game," delivered in a negative tone of voice, when it was raining outside (negative context), compared to when it was sunny outside (positive context). Past work

has found that 18-month-olds expect that a speaker's tone will be congruent with the situational context (Chiarella & Poulin-Dubois, 2013). The findings here extend this notion, demonstrating that older children are able to use the match between affective tone and situation to qualify their understanding of affect/word congruency when making credibility judgments. Thus, older school-age children consider the inconsistency of a statement against the contextual backdrop. Moreover, participants chose the congruent speakers more often when the situational context was positive as opposed to negative. For example, children were more likely to solicit information from a speaker who said, "I'm going to play my favourite game," in a positive tone of voice, when it was sunny outside (positive context) as opposed to when it was raining outside (negative context). Thus, even within the preferred speaker type, namely those who are congruent, children consider the match between affect and context.

The pattern of data also highlights older children's sensitivity to a speaker's perspective when evaluating them as an information source. That is, children chose to solicit information from speakers who delivered incongruent communicative cues to a greater extent when the speaker was aware, as opposed to unaware, of the negative context (i.e., the situational context that rendered the negative tone of voice more appropriate). Thus, it appears that children appreciate that it would not be appropriate for a speaker to use a negative tone of voice to describe a positive event, if the speaker was unaware of the negative context (e.g., a speaker saying, "I'm going to the park" in a negative tone when she was unaware that it was pouring rain outside due to the blinds being closed). This latter finding is quite impressive because children had to set aside their own knowledge of the situational context to determine the appropriateness of the affect displayed based on the speaker's knowledge, a skill that even adults have difficulty with (Birch & Bloom, 2007). While previous work has demonstrated children's ability to

override privileged contextual information in other communicative contexts (e.g., Nilsen & Graham, 2012; Nilsen et al., 2011), this is the first to show that they do so when judging the credibility of speakers of varying communicative consistency.

Together, the findings extend a growing literature highlighting children's flexibility in using cues to judge speakers. For instance, despite preferring to solicit information from knowledgeable speakers, preschool-age children solicit information from ignorant speakers when there is a reason for such ignorance (i.e., the speaker lacks access to pertinent information; Nurmsoo & Robinson, 2009a). Moreover, 4- to 7-year-old children show a flexibility wherein their level of trust in an informant is continually adjusted based on an informant's ongoing accuracy (Ronfard & Lane, 2017) and, for 5- to 9-year olds, the same self-interest cues from their partner lead to different impressions of trustworthiness depending on context (Reyes-Jaquez & Echols, 2015). In addition, preschoolers treat information from inaccurate speakers' differently depending on how the inaccuracy arises (i.e., through limited perceptual access or not; Kim et al., 2016). In the present study, with an older age group, children were able to integrate contextual and affective information in order to demonstrate such flexibility. That is, whereas the aforementioned work isolated various features to examine flexibility, we show that within the late school years children are integrating multiple and complex pieces of information when determining from whom to solicit information.

Together with past work, a developmental trajectory in children's sensitivity to communicative style when judging information sources emerges. Nonverbal cues (albeit ones indicative of confidence as opposed to affective states) are used by children as young as two years old to interpret a speaker's credibility (Birch, Akmal, & Frampton, 2010). In addition, preschool-age children tend to rely more on prosodic cues when judging speaker credibility (e.g.,

choosing ‘happy’ sounding speakers more frequently than ‘sad’ sounding speakers) as opposed to the consistency between tone of voice with the verbal content (Gillis & Nilsen, 2017). This being said, late preschoolers are wary of information from speakers whose verbal messages show inconsistency (Doebel et al., 2016). At around 7 to 8 years of age, when children are starting to be able to explicitly detect incongruity between verbal/nonverbal cues (Morton & Trehub, 2001), they generally appreciate that incongruent affective/communicative cues indicate that a speaker is a poor source of information (Gillis & Nilsen, 2017; present study). However, as demonstrated in the present work, it is not until about 9 to 10 years of age that children demonstrate flexibility in their judgments of (in)congruent speakers and can integrate multiple cues when making decisions about informational sources. In particular, they show less avoidance of soliciting information from incongruent speakers when the situational context, and the speaker’s knowledge of the context, renders their statements to be more appropriate.

While the current study highlights developmental differences, the present data does not speak to *how* children perceived the various speakers (in terms of beliefs/motivations/attributes, etc.) or *why* the older children are better able to integrate the communicative (in)congruency, situational context, and speakers’ access to context. It is possible that various attributions were being formed of the incongruent speakers. For instance, past work has found that 7- 8-year-old children find individuals with incongruent communicative cues to speak in a “weird” fashion. However, these same children did not rate incongruent speakers differently than congruent speakers on attributes that were unrelated to communication (e.g., friendliness or likeability; Gillis & Nilsen, 2017). It is also possible that inconsistencies between affect and context created disruption or ambiguity within messages that older children detected. It would be useful for future work to probe children’s perceived characteristics of speakers (within different situations)

to understand more about how and why children choose to solicit information from one speaker over another. With respect to the developmental differences found, it could be that the older children have learned, through exposure to many conversations, that communicative intent can differ from the literal words uttered (and thus, that being incongruent does not necessarily mean someone is not trustworthy). For instance, it may be the case that the older children, with better appreciation of non-literal language such as sarcasm (Harris & Pexman, 2003; Whalen & Pexman, 2010), are better able to integrate incongruent communicative information with contextual information. It may also be the case that older children's ability to track the perspective or intentions of the speaker happens in a more efficient manner relative to the younger children (as perspective-taking shows improvement into the adolescent years; Dumontheil, Apperly, & Blakemore, 2010), thereby allowing them to integrate this information more efficiently. The younger age group also likely does not have the same level of executive functioning to support the integration of the contextual and perspective information, given that these cognitive skills show improvements throughout childhood and into the adolescent years (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; Luna, Garver, Urban, Lazar, & Sweeney, 2004). Certainly, working memory capacity relates to children's ability to detect inconsistency within verbal messages (Doebel et al., 2016). In the present task, children would have needed to hold in mind the various pieces of information (working memory) as well as suppress their own perspective in order to appreciate the perspective of the speaker (inhibitory control). The fact that there were effects of knowledge and situational context within the 7- to 8-year-old group suggests that they were tracking this information to some degree. However, it is likely that the complexity of integrating the various pieces of information required cognitive skills beyond their ability. Further research could examine the skills that may facilitate children's

ability to integrate information from various cues when forming credibility judgments. Reflecting another limitation, the extent to which findings generalize to other forms of (in)congruency cannot be determined from our data. Indeed, past work has found that different types of incongruent messages impact speaker's perceptions differently (e.g., reducing confidence in confident voices and amplifying confidence of doubtful voices; Jiang & Pell, 2016). Thus, further work could explore whether similar developmental patterns are yielded with various types of incongruent communicative cues (including congruency between verbal/nonverbal confidence cues, as well as speakers who utter negative words with positive prosody).

Conclusions

The present study highlights the impressive ways with which children draw on various pieces of information when deciding who constitutes a reliable source for information. In particular, whereas congruency between the affective valence of the words uttered and the speaker's non-verbal cues are preferred (Gillis & Nilsen, 2017), older school-age children show sensitivity to the informants' situation (situational context, knowledge of the context) when evaluating (in)congruency.

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