Exploring Children's Pragmatic Understanding of How and Why Causality Questions

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Abstract

Children typically provide less productive responses to causality questions – those that require an explanation of motive (Ahern et al., 2015; Andrews et al., 2016). However, the accuracy of children's responses to causality questions is unestablished. The present study examined 180 5-, 7-, and 9-year-old's accuracy in providing causal responses to Why (e.g. Why did you lift the box?), How Come (e.g. How come you lifted the box?), and How Make (e.g., How did she make you lift the box?) causal questions about their own actions. Results revealed that children provided fewer accurate causal responses when responding to "How Make" questions compared to "Why" or "How Come" questions. These findings suggest that the complex structure of How Make causal questions may pose difficulties for children. Further, we found developmental improvements; older children were more accurate in providing causal responses to Why, How Come, and How Make questions compared to younger children, suggesting that accuracy generally improved with age. Taken together, the findings from this study highlight the challenges experienced when answering "How Make" questions and should caution adults from using such questions when questioning children.

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Often children are asked to report on their previous experiences, with the goal of obtaining accurate and complete responses. For multiple reasons, children's ability to answer these questions is critical within a legal context. For one, incidences of abuse typically occur in secret and, as a result, children are often the only witnesses of the incident. In addition, the common lack of medical evidence and delayed disclosure by child victims makes their disclosures vital evidence for such cases (Bussey & Grimbeek, 1995; Goodman-Brown, Edelstein, Goodman, Jones, & Gordon, 2003; Sauzier, 1989). It is important that children are able to accurately respond to questions asked of them, as failure to do so may threaten their credibility (e.g., Ruva & Bryant, 2004). However, the accuracy of children's responses depends not only on the child's ability to produce the appropriate response, but also the adult's ability to clearly communicate the question being asked (Saywitz, Nathanson, & Snyder, 1993). Thus, failure to answer a question appropriately may not reflect an inability to provide the requested information, but rather a lack of understanding of what the question is asking.

Given that adults' question choice may influence children's ability to successfully answer questions, it is critical to investigate potentially challenging questions for young children. Researchers recommend the use of open-ended prompts (e.g., "Tell me more") and directive wh-questions (including who, what, when, where, and why questions; e.g., "Where were you going?") when questioning child witnesses to obtain the most detailed and accurate reports (Lamb, Hershkowitz, Orbach, & Esplin, 2008). Directive wh- questions can be of particular benefit, as they are narrow in requesting specific information but, unlike closed-ended questions, they allow the child to self-generate information. While wh- questions have generally been found to support young children in providing accurate and productive responses, some forms of wh-questions have been found to be more challenging than others (e.g., Andrews, Ahern,

Stolzenberg, & Lyon, 2016). Researchers often differentiate wh- questions as either wh-identity questions (who, what, where) or wh-sentential questions (when, how, why; Malloy, Orbach, Lamb, & Walker, 2016). Young children often experience greater difficulties with wh-sentential questions as they ask about concepts such as manner, causation, purpose, or time (e.g., "How did it happen?"; deVillers & deVillers, 1978). Such questions are more abstract and challenging for young children compared to more concrete identity questions ("Where did it happen?").

Among the wh-sententials, children may have particular difficulty when responding to How and Why questions. Support for this idea comes from a study conducted by Malloy et al. (2016), who found that 22% of prompts in police sexual abuse cases were How/Why questions, but that these prompts elicited only 8.5% of the details from the interview. Further, children provided the information sought by the interviewer's How/Why question only 20% of the time. It is important to note that the cause of children's failures to understand and respond appropriately to these wh- questions remains unclear.

One possible explanation for children's difficulty with How/Why questions is a lack of experience with the questions. Determining an appropriate response depends on learning the social and pragmatic rules for answering the questions. Children are not explicitly taught the rules for responding to wh- questions, but rather learn the rules through experience. This lack of explicit instruction requires children to learn on their own, and may allow for errors to occur while they determine how to properly apply the language. Furthermore, as children learn through experience, difficulties with How and Why questions might arise from their limited exposure to these questions, relative to other wh- questions (Rowland, Pine, Lieven, & Theakson, 2003).

Despite children's difficulties with How and Why questions, interviewers continue to use these prompts in their investigation (Malloy et al., 2016), perhaps because children themselves

produce wh- questions. Developmental research indicates that children will use wh- questions as early as 2 years of age (deVillers & deVillers, 1979). However, the production of language often occurs prior to comprehension in young children (Kenney & Wolfe, 1972; but see Winitz et al, 1981). Therefore, while children may use wh- questions in their daily vocabulary, they may lack a complete understanding of the function of the question (i.e., what information it is requesting).

While children are only beginning to develop the skills necessary to navigate the complexities of wh- questions, they are often required to apply this developing knowledge, for example within a legal context. In cases of sexual abuse, children are faced with wh- questions, more specifically inquiring about the cause of behaviours (known as causality questions) to aid in determining if abuse occurred. Thus, children's ability to answer wh- causality questions is critical when testifying against a suspected perpetrator. Research in applied contexts has only begun to examine children's responses to wh- causality questions. A study by Andrews and colleagues (2016) examined the productivity of wh- prompts in children's testimonies of sexual abuse, including causality prompts, and assessed the average number of details elicited by the wh- prompts. Causality questions made up 11% of the interview questions, framed as either Why or What/How questions, and were among the most productive wh- prompts examined. These findings suggest that children may be able to provide explanations for the cause of an event (Peterson & McCabe, 1992). However, while previous studies have examined the amount of detail elicited by wh- causality questions, none have looked at the accuracy of children's responses. Through examining court transcripts, it is difficult to infer the accuracy of children's reports, as the ground truth is not fully known. However, it is the accuracy, rather than quantity, of details children provide, that reflects an understanding for the question and ability to respond appropriately.

Another limitation of previous studies is that How and Why causality questions are grouped together and compared to other wh- prompts (e.g., Ahern, Andrews, Stolzenberg, & Lyon, 2015; Andrews et al., 2016). While Andrews et al. (2016), report findings of no productivity differences between How and Why causality questions, the authors note that these findings are in contrast with previous literature suggesting differences do exist (e.g., Anderson et al., 2010; Simmons, 1985). There are three main reasons to believe that children's responses to How and Why questions might vary: (1) the variety of possible responses, (2) the use of causal vs. mechanism responses, and (3) the linguistic structure.

First, children's pragmatic understanding for How and Why questions may largely be influenced by their range of possible uses and interpretations for these two questions types (Malloy et al., 2016). Why questions, for example, might request subjective information (e.g., Why did you keep the secret?) or require the individual to take on another's perspective and inquire about their intentions (e.g., Why did he ask you to keep the secret?). How questions might instead require an individual to describe actions or a sequence of events (e.g., How do you get dressed in the morning?), provide information regarding kinship (e.g., How are you related to him?), provide spatial details (e.g., How far away is your house?) and temporal concepts (e.g., How long does it take you to go home?), or respond to evaluative requests (e.g., How did it make you feel?). Each form of question varies in the type of information requested. As such, the syntactic and semantic complexity of How and Why questions may place different constraints on children's pragmatic understanding and responsiveness (Bloom, 1991; Bloom, Merkin, & Wooten, 1982).

Second, How and Why questions vary in the responses deemed appropriate. Callanan and Oakes (1992) suggest that Why questions can be appropriately answered with two possible

causal responses, prior cause or consequence. A prior cause precedes and elicits the asked about event (e.g., Q: Why did you lift the box? A: Because she asked me to), and a consequence provides a purpose for the asked about event (e.g. Q: Why did you lift the box? A: To see what was under the box). While differences in causal responses have yet to be examined in children, a study by Callanan and Oakes (1992) found evidence that adults favor prior cause responses as they provided a prior cause response (48%) more frequently than a consequence response (14%). It is interesting to note that all other responses provided by adults (38%) were deemed less appropriate, suggesting that Why questions should only be responded to with causal responses.

How questions may demonstrate greater complexities, as they can be appropriately responded to with causal and non-causal explanations. Most often, the appropriate response for How questions is a mechanism response (Callanan & Oakes, 1992). That is, children often respond with a procedure-like explanation of the event they are being questioned about (e.g. Q: How did you lift the box? A: I bent over and picked it up, or physically acting out their response). However, when a How question is used to inquire about causal information, in the form of How Come (e.g., How come you lifted the box?) or How Make (e.g., How did she make you lift the box?), children should provide a causal response, rather than the typical mechanism response of a How question. This atypical response pattern of requesting a causal response rather than a mechanism response typically requested from How questions may make How causal questions particularly difficult for children.

The third difference is the linguistic structure of the request, specifically when comparing How Make questions to both Why and How Come questions. How Make questions consist of two prompts, that elicit differing responses. For example, when asked the question “How did she make you lift the box?” children are faced with two prompts “How did” and “she make.” While

the first prompt alone (*How did* [you lift the box]?) requests a mechanism response, the inclusion of the second prompt in the question (How did *she make* [you lift the box]?) implies a request for causality. The syntactic and semantic complexity of this question may make it difficult for children to discern which response is being asked of them (mechanism or causality). When responding to How Make questions, children may attend to the first portion of the question (*How did*), and respond accordingly with a mechanism response. Previous studies have shown that children often adhere to a primacy effect, such that they attend to the first portion of the information received (i.e. Siegel, Allik, & Herman, 2016; Bernbach, 1967) which may bias children towards providing the mechanism response. However, How Make questions are most appropriately responded to with a causal response. The lack of clarity in the request for causal information may influence the accuracy of children's responses to How Make questions. In contrast, Why and How Come questions are often clear in their request for causal information. Both questions adhere a similar linguistic structure, consisting of one prompt (*Why did* [you lift the box]?; *How come* [you lifted the box]?), which elicits a causal response. The clarity in the request for causal information, rather than a mechanism response, may improve the accuracy of children's responses to these wh- causality questions. While How Come questions are syntactically similar to Why questions, they share similarities with How Make questions as both questions begin with the word 'How'. Given that How questions most often elicit a mechanism response, children may be misled by this prompt in both How Come and How Make questions. Therefore, it is possible that children will demonstrate greater accuracy for Why questions, compared to both How Come and How Make questions.

Current Study

Taking these three factors together, it is clear that How and Why causality questions may pose challenges for young children. Thus, my thesis explored children's pragmatic understanding of How and Why causality questions for action-based events. Children 5, 7 and 9 years of age were taken through a series of action-based activities. Children were randomly assigned to one of three question conditions where children were asked either Why, How Come, or How Make questions regarding the cause of their previous actions. How Come questions were included as a control condition, to examine whether it is the use of the word 'how' (as seen in How Come and How Make questions) that may lead to mechanism responses, or whether it is the complexity of How Make questions in particular. Additionally, children were asked to perform actions using a direct prompt (explicit request for action; e.g., "lift the box") or indirect prompt (request for an end goal that indirectly requires the child to perform the desired action; e.g., "show me what's under the box", which results in lifting the box). These differing prompts were used to increase the variability of possible responses by the child (i.e., avoiding the correct response always being "she told me to"). Finally, children completed the Woodcock-Johnson IV Test of Oral Language.

Hypotheses

In the current study, we were interested in the types of responses children provide when answering causal questions. There are four response options that we were interested in examining, including accurate causal responses (e.g., when children appropriately provide the cause of their behavior), inaccurate mechanism responses (e.g., when children misinterpret the question to be asking how they performed the behavior, rather than the cause of their behavior), inaccurate error responses (e.g., when children lack an understanding for the question, leading children to provide irrelevant information), and I don't know (IDK) responses (e.g., when

children convey a lack of knowledge, and therefore an inability to answer the question; Koriat & Goldsmith, 1996; Roebergs & Fernandez, 2002). Given that How Make questions comprise a more complex linguistic structure that may pull for either a causal or mechanism response, children were expected to produce more inaccurate (mechanism and error) and IDK responses, and fewer accurate (causal) responses to How Make questions, compared to Why and How Come questions. Further, children's abilities to provide appropriate responses to How and Why causality questions may be influenced by children's exposure to these questions (Rowland et al., 2003). As older children are thought to have greater experience with How and Why questions, it was expected that older children would provide more accurate causal responses, and fewer mechanism, error, or IDK responses to these wh- questions, compared to younger children.

Finally, when requesting children to perform an action, experimenters used either direct (e.g., "please put the missing piece into the puzzle") or indirect prompts (e.g., "please solve the puzzle") to elicit the behaviour. We were interested in whether the type of prompt used influences children's causal responses. Given that both direct and indirect prompts provide information that precedes the asked about action (e.g. the request itself), it is expected that children's prior cause responses (e.g., because she asked me to lift the box) will not significantly differ in response to direct and indirect prompts. In contrast, only indirect prompts provide information that follows the asked about event (e.g., the outcome of the requested behaviour). Therefore, it is expected that children will provide more consequence responses (e.g., to see what was under the box) following an indirect prompt, compared to direct prompt.

Method

Participants

One-hundred and eighty children participated in this study (M_{age} = 89.37 months, *SD* = 19.85; 51% Male): 60 5 year olds (M_{age} = 65.5 months, *SD* = 3.65), 60 7 year olds (M_{age} = 89.28 months, *SD* = 3.38), and 60 9 year olds (M_{age} = 113.28 months, *SD* = 3.44). Participants were recruited from the Niagara Region through a shared participant database called Growing with Brock, as well as from the Ontario Science Centre. Total household income was collected as an indicator of economic status, where the majority of households (61%) reported an income over $75,000 (11% did not report total household income). Child ethnicity was also collected, with approximately 69% of participants identifying as Caucasian, 7% as Asian, 3% as South-Asian, 2% African-Canadian, 3% as Hispanic, 8% as other, and 8% did not report child ethnicity. Prior to beginning testing, written consent was obtained by all parents and verbal assent from all children. The protocol used was approved by Brock University's Research Ethics Board (See Appendix A).

Procedure

All children were tested individually in the laboratory or in a dedicated area of the Ontario Science Centre. The session began with children completing the How-Why task, where they were lead through five different activity stations with the Experimenter. Each of the stations included three to four different activities (e.g., solving a puzzle, or smiling for a photo). See Appendix B for a complete list of activities at each station. The order of the stations as well as the order of the activities within each station were randomized between participants. For each activity, participants were given a prop (e.g., a puzzle), and asked to perform an action-based behavior. The request for the desired action was either an indirect prompt (e.g., "please solve the

puzzle") or a direct prompt (e.g., "please put the missing piece into the puzzle"), randomized within participants, with approximately half of the prompts being direct and half being indirect.

To reduce memory demands, children were interviewed about the activities they completed after each activity station (rather than at the end of all activities). Following each activity station, the Experimenter excused herself from the room, and the Interviewer entered the room to ask the child questions about the previously completed activities. The Experimenter left all the objects used in the previous activities on the table to reduce memory demands and allow the Interviewer to point to the exact activity they were referring to during questioning. This also allowed the child to physically demonstrate the action they performed with the objects during the activity if they chose to do so. Participants were randomly assigned to one of three question-type conditions: Why (i.e., Why did you put the missing piece in the puzzle?), How Come (i.e., How come you put the missing piece in the puzzle), or How Make (i.e., How did [the experimenter's name] make you put the missing piece in the puzzle?). See Appendix C for a complete list of the questions asked at each station. The question-type condition remained constant across all activity stations. One question was asked per activity and questions were asked in the same order as the participant experienced the activities. The Interviewer then exited the room and the Experimenter returned. This procedure was repeated until all five activity stations were complete.

Children's responses to the Interviewer's questions were coded for accuracy. An accurate response included a *causal* response, given that all questions asked inquired about the cause of children's behaviour. We then further differentiated each *causal* response as either a *prior causal* response or a *consequence* response, given that both response types provide causal information in response to the question. An inaccurate response included a *mechanism* response if the children responded with a physical action or description of their behavior, and an *error* response

if the child provided irrelevant information. These response types are inaccurate, as they do not appropriately address the cause of the child's behaviour. Finally, we coded for *I don't know* (IDK) responses as an indication of children's lack of understanding the question. Inter-rater reliability was assessed for 10% of the sample (Kappa > 0.90).

Woodcock-Johnson IV Test of Oral Language. (WJ IV, Schrank, McGrew, & Mather, 2014). The picture vocabulary task (Test 1) was administered to children. This task assesses children's oral language development and lexical knowledge. Children were presented with a series of pages with several pictures on each page. Each child was asked to identify the pictures. The task was terminated if six consecutive pictures were incorrectly identified. Children received one point for each correctly identified picture. Scores can range from 0 to 54.

Results

We assessed the accuracy of children's responses, and the influence of prompt type on children's responses. Preliminary analyses indicated that children's verbal ability (WJ IV scores) was significantly related to their performance on the How-Why task. Therefore, all analyses controlled for WJ IV scores.

Accurate Responses

Causal responses. To assess children's accuracy, we examined the effects of question type and age on the proportion of children's causal responses, using a 3 (Condition: Why, How Come, How Make) by 3 (Age: 5, 7, 9) between-subjects factorial ANOVA, with the proportion of causal responses as the dependent variable. There was a significant main effect of condition, $F(2,170) = 21.33$, $p < .001$, $\eta_p^2 = .20$ (see Figure 1). Planned contrasts (*Bonferroni*) revealed that, as predicted, children in the How Make condition ($M = .50$, $SE = .04$) provided significantly fewer causal responses, compared to children in the Why ($M = .84$, $SE = .04$) and How Come (*M*

= .79, *SE* = .04) conditions, *p*s < .001. Why and How Come conditions were not significantly different, *p* = 1.00. There was also a significant main effect of age, $F(2,170) = 4.10$, $p = .018$, $\eta_p^2 = .05$ (See Figure 2). Planned contrasts (*Bonferroni*) revealed that, as predicted, 5 years olds (*M* = .59, *SE* = .05) provided significantly fewer causal responses, compared to 7 years olds (*M* = .78, *SE* = .04), *p* = .02. Nine-year-olds (*M* = .75, *SE* = .05) were not significantly different from 5-year-olds (*p* = .12), or 7-year-olds (*p* = 1.00). The interaction of age and condition was not significant, *p* = .13.

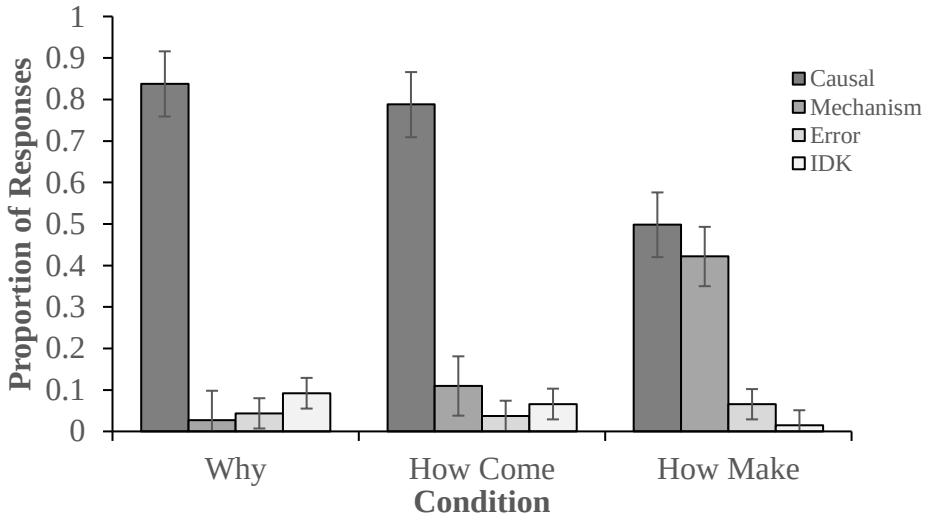

Figure 1. Proportion of children's responses (causal, mechanism, error, IDK) by condition (Why, How Come, How Make).

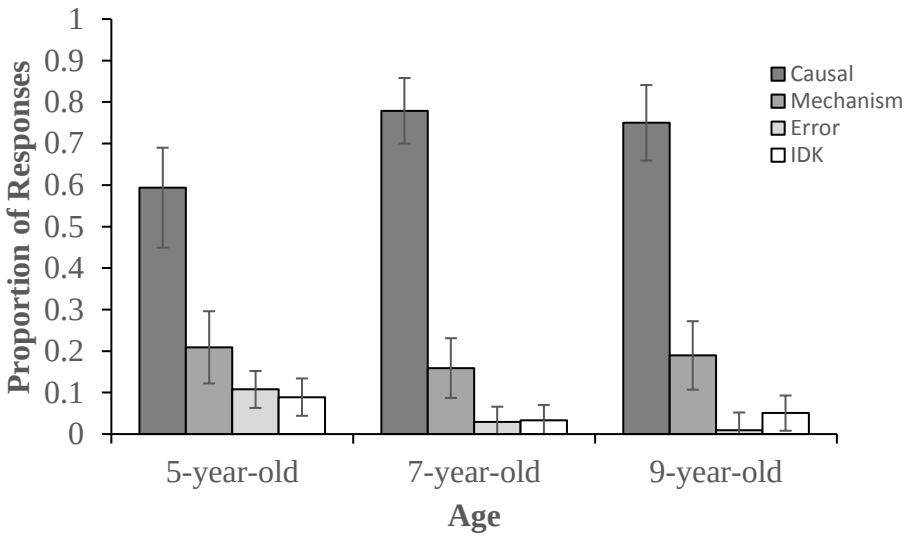

Figure 2. Proportion of children's responses (causal, mechanism, error, IDK) by age (5, 7, 9 years old).

Inaccurate Responses

Mechanism responses. To assess children's inaccuracies, we first examined the effects of question type and age on the proportion of children's mechanism responses using a 3 (Condition: Why, How Come, How Make) by 3 (Age: 5, 7, 9) between-subjects factorial ANOVA, with the proportion of mechanism responses as the dependent variable. There was a significant main effect of condition**,** $F(2,170) = 33.15$, $p < .001$, $\eta_p^2 = .28$ (see Figure 1). Planned contrasts (*Bonferroni*) revealed that, as predicted, children in the How Make ($M = .42$, $SE = .04$) condition provided significantly more mechanism responses, compared to children in the Why ($M = .03$, $SE = .04$) and How Come ($M = .11$, $SE = .04$) conditions, ps $< .001$. Why and How Come conditions were not significantly different, $p = .32$. The main effect of age ($p = .66$) and interaction between age and condition ($p = .12$) were not significant.

Error responses. Next, we examined the effects of question type and age on the proportion of children's error responses, using a 3 (Condition: Why, How Come, How Make) by 3 (Age: 5, 7, 9) between-subjects factorial ANOVA, with the proportion of error responses as the

dependent variable. There was a significant main effect of age, $F(2,170) = 4.38$, $p = .014$, $\eta_p^2 = .05$ (see Figure 2). Planned contrasts (*Bonferroni*) revealed that, as predicted, 5-years-olds ($M = .11$, $SE = .02$) provided significantly more error responses compared to 7-year-olds ($M = .03$, $SE = .02$, $p = .03$) and 9-year-olds ($M = .01$, $SE = .02$, $p = .02$). Further, 7- and 9-year-olds were not significantly different, $p = 1.00$. The main effect of condition ($p = .52$), as well as the interaction of age and condition ($p = .68$) were not significant.

I Don't Know Responses

To assess the effects of question type and age on children's IDK responses, a 3 (Condition: Why, How Come, How Make) by 3 (Age: 5, 7, 9) between-subjects factorial ANOVA was performed, with the proportion of IDK responses as the dependent variable. There was a significant main effect of condition, $F(2,170) = 4.47$, $p = .013$, $\eta_p^2 = .05$ (see Figure 1). Planned contrasts (*Bonferroni*) revealed that, contrary to what we had predicted, children in the How Make ($M = .02$, $SE = .02$) condition provided significantly fewer IDK responses, compared to children in the Why ($M = .09$, $SE = .02$) condition, $p = .01$. The How Come ($M = .07$, $SE = .02$) condition was not significantly different from Why ($p = .95$) or How Make ($p = .16$) condition. The main effect of age ($p = .18$) as well as the interaction of age and condition ($p = .33$) were not significant.

Direct-Indirect

To further assess whether participants were providing different types of accurate causal responses for direct and indirect prompts, a 2 (Causal response: Prior Cause, Consequence) by 2 (Prompt type: Direct, Indirect) within subjects repeated measures ANOVA, with the proportion of accurate causal responses as the dependent variable. There was a significant main effect of causal response, $F(1,179) = 58.24$, $p < .001$, $\eta_p^2 = .25$, where participants reported significantly

more Prior Cause responses (M = .26, SE = .02), compared to Consequence responses (M = .09, SE = .01), that was qualified by a significant causal response by prompt type interaction, $F(1,179) = 12.68$, $p < .001$, $\eta_p^2 = .07$. Follow-up post hoc comparisons (*Bonferroni*) were used to examine the influence of prompt type on children's responses, separately for prior cause and consequence responses. Results revealed that participants provided significantly more prior cause responses when given a direct prompt (M = .28, SE = .02), compared to an indirect prompt (M = .25, SE = .02), $p < .001$. It was also found that participants provided significantly more consequence responses when given an indirect prompt (M = .10, SE = .01), compared to a direct prompt (M = .08, SE = .01), $p < .001$. There were no other significant effects.

Discussion

The current study investigated the accuracy of children's responses to How and Why causal questions. Overall, children experienced the greatest difficulty with How Make questions compared to Why and How Come questions, as children often interpreted the How Make questions as asking about *how* they performed the action, rather than how someone *caused* them to perform the action. Further, it was found that children's accuracy improved with age.

The Influence of Question Type on Children's Causal and Mechanism Responses

Consistent with our predictions, we found that children were significantly more likely to provide causal responses and significantly less likely to provide mechanism responses to Why and How Come questions compared to How Make questions. Past research has often grouped Why and How Come questions together in their analyses (e.g., Callanan & Oakes, 1992). Our findings provide support for this methodology, as no significant differences were found between children's responses to Why and How Come questions. Given that these questions directly request causal information, children were able to accurately provide causal responses to Why and How Come questions (79-84% of the time).

In contrast, children experienced difficulties when generating accurate responses to How Make questions. Children in the How Make condition were about equal in providing a causal (50% of the time) or mechanism (42% of the time) response. One possible explanation for these difficulties is the complex linguistic structure of How Make questions. How Make questions consist of two prompts, that elicit differing responses. While the first prompt alone (*How did* [you lift the box]?) requests a mechanism response, the inclusion of the second prompt in the question (How did *she make* [you lift the box]?) implies a request for causality. Depending on which prompt children were attending to, this likely influenced the type of response children provided. For example, children who provided a mechanism response were likely adhering to a primacy effect and providing a response to the first prompt in the question. This supports past research, which suggests that children often adhere to a primacy effect, such that they attend to the first portion of the information received (i.e. Siegel, Allik, & Herman, 2016; Bernbach, 1967). Research suggests that complex questions place constraints on children's pragmatic understanding and responsiveness to the question (Bloom, 1991; Bloom, Merkin, & Wooten, 1982). Therefore, when questions are not clearly articulated due to the pragmatic complexity of the question, as in "How Make" questions, children experience difficulty in providing accurate responses.

It is important to note the possibility that How Make questions were less relevant than Why and How Come questions in the current context, as children were asked to perform an action rather than coerced or physically made to complete the action. While adults may use How Make questions when coercion or physical intervention is not used (e.g., How did she make you laugh?), a more explicit force of making may be required for children to understand these questions. Asking the child how the experimenter *made* them perform an action may appear

inappropriate in this context, posing difficulties for children answering How Make questions. Future studies would benefit from using a more explicit form of coercion or physical interaction. However, if children felt the question to be irrelevant or odd, it would be expected that children would provide more error responses. Given that there were no significant differences in error responses between question types, the appropriateness of the question does not appear to account for the inaccuracies in children's responses to How Make questions. Therefore, it is likely the complexity of the question that influences children's accuracy when responding to How Make questions.

To gain further insight into the development of children's abilities to accurately answer How and Why causal questions, the influence of children's age was also examined. Consistent with previous research (Rowland et al., 2003), our findings revealed that in response to How and Why causal questions older children (7 year olds) were significantly more likely to provide causal responses, compared to younger children (5 year olds). Interestingly, while the 9-year-olds provided more causal responses compared to 5-year olds, the two age groups were not significantly different. However, it is informative to note that the relationship was in the expected direction. Taken together, these findings suggest that in general older children provided more causal responses compared to younger children. Previous research suggests that younger children often experience greater difficulties with How and Why questions, as they require an understanding of concepts (e.g., causation) for which children are less familiar (Malloy et al., 2016). It is also possible that older children have greater experience answering causal questions. Rowland and colleagues (2003) suggest that increased exposure to a specific type of question increases children's understanding and ability to respond to that question type. Therefore, young children's lack of experience may undermine their ability to accurately provide causal responses

to How and Why causal questions. It is important to note that the ages examined in the current study were not continuous, and therefore caution should be taken when interpreting developmental trends. Future research should examine consecutive age groups to gain a greater understanding of the intricacies of children's improvements in accuracy with age.

Importantly, children's age did not influence their use of mechanism responses. Given that children rarely provided mechanism responses in the Why (2.7% of the time) and How Come (11% of the time) conditions, these responses were most often given in response to How Make (42.2% of the time) questions. As children across all age groups are providing similar rates of mechanism responses, these findings suggest that even the older children are failing to recognize the causal intentions of How Make questions. Instead, these children are interpreting How Make questions as a request for *how* they performed the task. These results emphasize that How Make questions are possibly not developmentally appropriate for children ages 5 through 9 years old. This is problematic given that children in this age range are often faced with questions inquiring about the cause of their behavior, particularly within a legal context (e.g., Malloy et al., 2016). Given that previous studies have indicated that a child's ability to successfully answer questions can influence a trial outcome (Bala, Ramakrishnan, Lindsay, & Lee, 2005) it is important to further investigate children's ability to answer causal questions. While it is clear that caution should be taken when asking young children How Make questions, it remains unclear at what age children are able to successfully provide causal rather than mechanism responses to these questions. Future research is needed to assess older children's ability to accurately answer How Make questions.

The Influence of Question Type on Children's Error and IDK Responses

Another area of interest was children who provided inaccurate error responses to How and Why causal question. Consistent with our predictions, younger children (5 year olds) were significantly more likely to provide error responses, compared to older children (7 and 9 year olds). When children provide completely irrelevant information in response to a question, it often suggests a lack of understanding for what is being asked of them. In line with this, the younger children in the present study may have lacked an understanding for the task. However, 5-year-olds only provided error responses 11% of the time, suggesting that children understood the intentions of the task in the current study the majority of the time. Importantly, in contrast to our predictions, there was no significant differences in children's error responses across condition suggesting that question type did not influence children's overall understanding of the task.

The present study also investigated the likelihood of children providing IDK responses. An IDK response can be informative about the level of knowledge children possess and can be used to accurately convey a lack of knowledge (Roebergs & Fernandez, 2002) or to avoid providing inaccurate information (Koriat & Goldsmith, 1996). Contrary to our predictions, findings from the current study revealed that children provided fewer IDK responses to How Make questions, compared to Why questions. Given that How Make questions are often responded to with causal and mechanism responses, it is possible that having two response options decreased the likelihood that children needed to resort to IDK responses. Conversely, Why questions solely elicit causal responses. It is possible that if children fail to produce a causal response, their only other option is to say that they do not know, increasing their rate of providing IDK responses. Another possibility is that children's confidence in their response may prevent them from recognizing their lack of understanding of the question. For example, children

who provided mechanism responses to How Make questions, while inaccurate, may have felt over-confident in their response. Notably, the age related findings for IDK responses were also in contrast to our predictions, as children ages 5 to 9 years old were not significantly different in their IDK responses to causal questions. Given that younger children were less accurate in their responses to causal questions, it was expected that they would more often provide IDK responses. However, these age related findings may also suggest that young children are over-confident in their responses, preventing them from recognizing their lack of understanding for the question. Future studies should examine children's confidence in their responses to causal questions to determine whether this plays a role in children's ability to convey a lack of knowledge.

The Influence of Prompt Type on Children's Causal Responses

Another interesting finding was that the type of prompt used by the experimenter to elicit the requested behaviour influenced children's causal responses. According to Callanan and Oakes (1992), causal responses include both prior cause and consequence responses. Consistent with the adult literature (Callanan & Oakes, 1992), our findings revealed that children more often provided prior causal responses (information that precedes the event), compared to consequence responses (information that follows the event and justifies the behaviour). However, we were further interested in whether these causal response types were more likely to occur in response to direct or indirect prompts. First, when examining children's prior causal responses, results revealed that children were more likely to provide a prior cause response when given a direct prompt, compared to an indirect prompt. These findings did not fully support our predictions, as we expected that children would similarly provide prior cause responses to both prompt types, given that both direct and indirect prompts provide information that precedes the asked about

action (e.g. the request itself). However, indirect prompts encourage children to think about information that precedes the action (e.g. the request to lift the box), and information that follows the action (e.g. seeing what is under the box). Therefore, it is possible that the explicit nature of direct prompts in providing only information that precedes the action more clearly directs children to answer with a prior cause response. Next, when examining children's consequence responses, in line with our predictions, children were more likely to provide a consequence response when given an indirect prompt, compared to a direct prompt. As previously noted, indirect prompts provide children with the outcome of their behaviour (e.g., seeing what is under the box), while direct prompts do not. In line with this, children given indirect prompts possess information that follows their action and justifies the behaviour, allowing them to more readily provide consequence responses to indirect prompts, compared to direct prompts.

Taken together, the present study builds on the growing body of literature examining questions that challenge children and provides insight into children's abilities to accurately answer How and Why causal questions. Past research examining How and Why causal questions has evaluated court transcripts that code for the productivity of children's responses (e.g., Andrews et al., 2016). The current study extends this research to examine children's accuracy in responding to causal questions, which better indicates their level of understanding for the question. Additionally, past studies have grouped How and Why questions together, comparing these questions to other forms of WH- questions. Given that How and Why questions differ on their uses, the responses they elicit, as well as the clarity of their request, the current study compared these questions to better understand which causal questions are more challenging for young children.

Importantly, the findings from the current may inform individuals working with children (e.g., parents, teachers, social workers) on how to communicate and inquire about children's experiences to obtain accurate information. For example, questions that comprise a complex linguistic structure, as in How Make questions, may impede children's understanding and ability to provide accurate information. It might also be the case that children's understanding of causality improves with age, as older children provided more accurate responses to all forms of causal questions. Ultimately, this information can be used to promote the use of developmentally appropriate questions when inquiring about children's past experiences.

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Appendix A

Brock University
Research Ethics Office
Tel: 905-688-5550 ext. 3035
Email: reb@brocku.ca

Social Science Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE: 1/24/2017

PRINCIPAL INVESTIGATOR: EVANS, Angela - Psychology

FILE: 16-157 - EVANS

TYPE: Faculty Research STUDENT: Breanne Wylie
SUPERVISOR: Angela Evans

TITLE: Children's Understanding of How and Why Questions

ETHICS CLEARANCE GRANTED

Type of Clearance: NEW Expiry Date: 1/31/2018

The Brock University Social Science Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from 1/24/2017 to 1/31/2018.

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before 1/31/2018. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Research Ethics web page at http://www.brocku.ca/research/policies-and-forms/research-forms.

In addition, throughout your research, you must report promptly to the REB:

a) Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
c) New information that may adversely affect the safety of the participants or the conduct of the study;
d) Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

Approved:

Ann-Marie DiBiase, Chair
Social Science Research Ethics Board

Note: Brock University is accountable for the research carried out in its own jurisdiction or under its auspices and may refuse certain research even though the REB has found it ethically acceptable.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of research at that site.

Appendix B

→ Explain the game:
"Okay, so we are going to start by playing some games at different stations. I am going to be asking you to do different things for me."

Table Play Station
"*First / Now, we will be playing at the Table Play station*"

___: Give the child the **book**
- Indirect prompt: "*Okay [child's name], please name the colours on the different pages*"
- Direct prompt: "*Okay [child's name], please turn the pages of the book*"

___: Give the child the **present and the picture of animals**
- Indirect prompt: "*Okay [child's name], please give the red bird the present*"
- Direct prompt: "*Okay [child's name], please put the present on the red bird*"

___: Give the child the **puzzle** with one missing piece
- Indirect prompt: "*Okay [child's name], please solve the puzzle*"
- Direct prompt: "*Okay [child's name], please put the missing piece into the puzzle*"

"*Great job! Okay I'm going to leave the room for a minute, and [interviewer's name] is going to come in for a little bit*"

Sensory Station
"First / *Now, we will be playing at the Sensory station"*

___: Give the child the **squishy ball**
- Indirect prompt: "*Okay [child's name], please see how hard the ball is"*
- Direct prompt: "*Okay [child's name], please squish the ball"*

___: Give the child the box of **playdoh**
- Indirect prompt: "*Okay [child's name], please make a hand print"*
- Direct prompt: "*Okay [child's name], please push your hand into the playdoh"*

___: Give the child the **glitter bottle**
- Indirect prompt: "*Okay [child's name], please make the glitter move"*
- Direct prompt: "*Okay [child's name], please shake the bottle"*

___: Give the child the **pig flashlight**
- Indirect prompt: "*Okay [child's name], 'this' is how you make the pig oink. Please make the pig oink"*
- Direct prompt: "*Okay [child's name], please squeeze the handle on the pig"*

"*Great job! Okay I'm going to leave the room for a minute, and [interviewer's name] is going to come in again for a little bit*"

Toys Station
"First / *Now, we will be playing at the Toys station"*

___: Give the child three square **blocks** and one triangle block
- Indirect prompt: "*Okay [child's name], please build a tower"*
- Direct prompt: "*Okay [child's name], please stack the blocks"*

___: Give the child a **pipe cleaner and four beads**
- Indirect prompt: "*Okay [child's name], please make a bracelet"*
- Direct prompt: "*Okay [child's name], please put the beads on the pipe cleaner"*

___: Give the child the **marble game**
- Indirect prompt: "*Okay [child's name], if I put the marble 'here' it will go down the track into the red container. Please get the marble into the red container"*
- Direct prompt: "*Okay [child's name], please drop the marble down the track"*

"*Great job! Okay I'm going to leave the room for a minute, and [interviewer's name] is going to come in again for a little bit*"

Motor Station
"*Now, we will be playing at the Motor station"*

___: Give the child the **picture card**
- Indirect prompt: "*Okay [child's name], this card is telling me to do 'this'. Please follow the instructions on the card."*
- Direct prompt: "*Okay [child's name], please clap"*

___: Give the child the **ball** and the **bucke**t
- Indirect prompt: "*Okay [child's name], please get the ball into the bucket"*
- Direct prompt: "*Okay [child's name], please throw the ball"*

___: Give the child the **toy car** and set a **bottle** on the other side of the table
- Indirect prompt: "*Okay [child's name], please get the car to touch the bottle*
- Direct prompt: "*Okay [child's name], please push the car*

___: Show the child the **camera**
- Indirect prompt: "*Okay [child's name], please say cheese"*
- Direct prompt: "*Okay [child's name], please smile"*

"*Great job! Okay I'm going to leave the room for a minute, and [interviewer's name] is going to come in again for a little bit*"

Drawing Station
"*Now, we will be playing at the Drawing station"*

___: Give the child the **box with a colouring** page hiding underneath
- Indirect prompt: "*Okay [child's name], please show me what's under the box"*
- Direct prompt: "*Okay [child's name], please lift the box"*

___: Give the child the **crayon container**
- Indirect prompt: "*Okay [child's name], please take the crayon out of the container"*
- Direct prompt: "*Okay [child's name], please take the lid off the container"*

___: Give the child the **ruler**
- Indirect prompt: "*Okay [child's name], please try to break the ruler"*
- Direct prompt: "*Okay [child's name], please fold the ruler"*

"*Great job! Okay I'm going to leave the room for a minute, and [interviewer's name] is going to come in again for a little bit*"

Appendix C

Table Play Station

Lay materials of the previously completed activities on table in arms reach of the child

"Okay, [child's name], I'm going to ask you some questions about the activities you just did with [experimenter's name]."

___ : "*In the _____ activity…"* (pointing to the **book**)
- Why: *"why did you turn the pages of the book?"*
- How Come: *"how come you turned the pages of the book?"*
- How Make: *"how did [experimenter's name] make you turn the pages of the book?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (pointing to the **animal picture**)
- Why: *"why did you put the present on the red bird?"*
- How Come: *"how come you put the present on the red bird?"*
- How Make: *"how did [experimenter's name] make you put the present on the red bird?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (pointing to the **puzzle**)
- Why: *"why did you put the missing piece in the puzzle?"*
- How Come: *"how come you put the missing piece in the puzzle?"*
- How Make: *"how did [experimenter's name] make you put the missing piece in the puzzle?"*

Response: ACTION - VERBAL - IDK

"Great job! Okay I'm going to go get [experimenter's name] so you can continue on with your activities."

Sensory Station

Lay materials of the previously completed activities on table in arms reach of the child

"Okay, [child's name], I'm going to ask you some questions about the activities you just did with [experimenter's name]."

___ : *"In the _____ activity…"* (point to the **squishy ball**)
- Why: *"why did you squish the ball?"*
- How Come: *"how come you squished the ball?"*
- How Make: *"how did [experimenter's name] make you squish the ball?"*

Response: ACTION - VERBAL - IDK

___ : "*In the _____ activity…"* (point to the box of **playdoh**)
- Why: *"why did you push your hand into the playdoh?"*
- How Come: *"how come you pushed your hand into the playdoh?"*
- How Make: *"how did [experimenter's name] make you push your hand into the playdoh?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (point to the **glitter bottle**)
- Why: *"why did you shake the bottle?"*
- How Come: *"how come you shook the bottle?"*
- How Make: *"how did [experimenter's name] make you shake the bottle?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (point to the **pig flashlight**)
- Why: *"why did you squeeze the handle on the pig?"*
- How Come: *"how come you squeezed the handle on the pig?"*
- How Make: *"how did [experimenter's name] make you squeeze the handle on the pig?"*

Response: ACTION - VERBAL - IDK

"Great job! Okay I'm going to go get [E1's name] so you can continue on with your activities."

Toys Station
Lay materials of the previously completed activities on table in arms reach of the child

"Okay, [child's name], I'm going to ask you some questions about the activities you just did with [experimenter's name]."

___ : *"In the _____ activity…"* (point to the **blocks**)
- Why: *"why did you stack the blocks?"*
- How Come: *"how come you stacked the blocks?"*
- How Make: *"how did [experimenter's name] make you stack the blocks?"*

Response: ACTION - VERBAL - IDK

___ : "*In the _____ activity…"* (point to demo **pipe cleaner & beads**)
- Why: *"why did you put the beads on the pipe cleaner?"*
- How Come: *"how come you put the beads on the pipe cleaner?"*
- How Make: *"how did [experimenter's name] make you put the beads on the pipe cleaner?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (point to the **marble game**)
- Why: *"why did you drop the marble down the track?"*
- How Come: *"how come you dropped the marble down the track?"*
- How Make: *"how did [experimenter's name] make you drop the marble down the track?"*

Response: ACTION - VERBAL - IDK

"Great job! Okay I'm going to go get [experimenter's name] so you can continue on with your activities."

Motor Station
Lay materials of the previously completed activities on table in arms reach of the child

"Okay, [child's name], I'm going to ask you some questions about the activities you just did with [experimenter's name]."

___ : *"In the _____ activity…"* (point to the **picture card**)
- Why: *"why did you clap?"*
- How Come: *"how come you clapped?"*
- How Make: *"how did [experimenter's name] make you clap?"*

Response: ACTION - VERBAL - IDK

___ : "*In the ___ ____ activity…"* (point to the **ball**)
- Why: *"why did you throw the ball?"*
- How Come: *"how come you threw the ball?"*
- How Make: *"how did [experimenter's name] make you throw the ball?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (point to the **car**)
- Why: *"why did you push the car?"*
- How Come: *"how come you pushed the car?"*
- How Make: *"how did [experimenter's name] make you push the car?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (point to the **camera**)
- Why: *"why did you smile?"*
- How Come: *"how come you smiled?"*
- How Make: *"how did [experimenter's name] make you smile?"*

Response: ACTION - VERBAL - IDK

"Great job! Okay I'm going to go get [experimenter's name] so you can continue on with your activities."

Drawing Station
Lay materials of the previously completed activities on table in arms reach of the child

"Okay, [child's name], I'm going to ask you some questions about the activities you just did with [experimenter's name]."

___ : *"In the _____ activity…"* (point to the **box**)
- Why: *"why did you lift the box?"*
- How Come: *"how come you lifted the box?"*
- How Make: *"how did [experimenter's name] make you lift the box?"*
    - *Okay, I'm going to put your colouring page to the side, and you can take it home at the end of the day"*

Response: ACTION - VERBAL - IDK

___ : "*In the _____ activity…"* (point to the **container**)
- Why: *"why did you take the lid off the container?"*
- How Come: *"how come you took the lid off the container?"*
- How Make: *"how did [experimenter's name] make you take the lid off the container?"*

Response: ACTION - VERBAL - IDK

___ : *"In the _____ activity…"* (point to the **bendy ruler**)
- Why: *"why did you fold the ruler?"*
- How Come: *"how come you folded the ruler?"*
- How Make: *"how did [experimenter's name] make you fold the ruler?"*

Response: ACTION - VERBAL - IDK

"Great job! Okay I'm going to go get [experimenter's name] so you can continue on with your activities."