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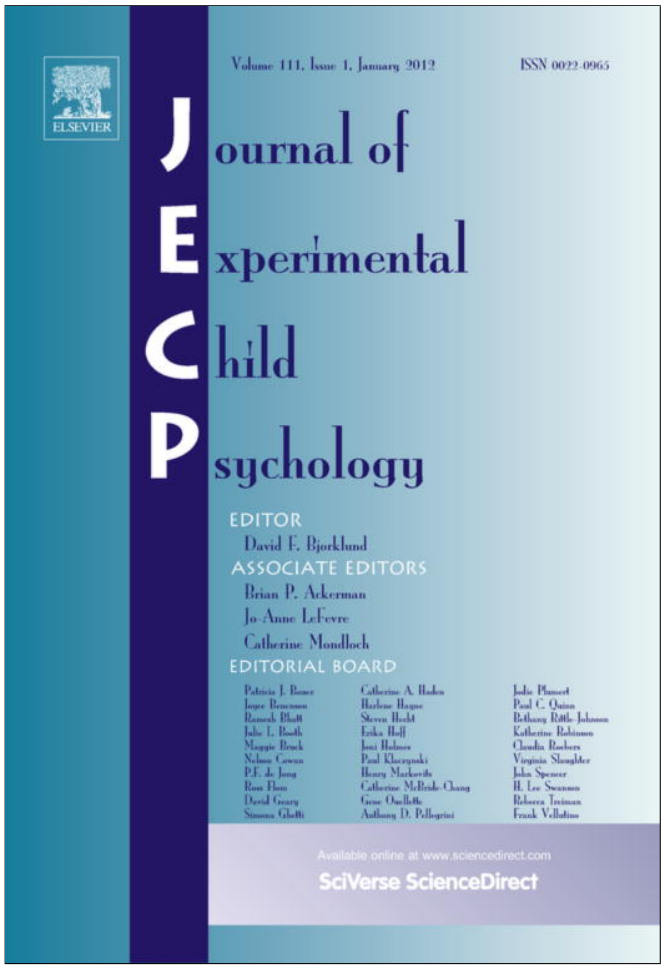

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Journal of Experimental Child Psychology 111 (2012) 128–135

Contents lists available at SciVerse ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Brief Report

The power of well-connected arguments: Early sensitivity to the connective *because*

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ARTICLE INFO

Article history:
Received 9 May 2011
Revised 7 July 2011
Available online 6 September 2011

Keywords:
Connectives
Argument
Development
Testimony
Persuasion
Social learning

ABSTRACT

Connectives, such as *because*, are routinely used by parents when addressing their children, yet we do not know to what extent children are sensitive to their use. Given children's early developing abilities to evaluate testimony and produce arguments containing connectives, it was hypothesized that young children would show an appropriate reaction to the presence of connectives. Three experiments were conducted to test this hypothesis. In each, two informants gave contradicting statements regarding the location of an object and justified their positions by using a similar argument. Only one of the informants used the connective *because* to link his argument to the statement. In each experiment, the 3-year-olds performed at chance in selecting choices containing the connective *because*, but the 4- and 5-year-olds performed above chance. Moreover, in Experiments 2 and 3, the 4-year-olds, 5-year-olds, and adults performed significantly better than the 3-year-olds. These findings show that 4-year-olds, 5-year-olds, and adults are sensitive to the presence of connectives. An interpretation of the difference in performance between the 3-year-olds and the 4- and 5-year-olds in terms of metarepresentational skills is suggested.

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Introduction

Even though children are often thought to be gullible, there is a good reason why they, along with adults, should be wary of communicated information—speakers are not always benevolent or

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doi:10.1016/j.jecp.2011.07.003

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competent (Sperber, 2001; Sperber et al., 2010). Accordingly, there is now a rich literature showing that, from very early on, children are able to use different cues to assess the value of testimony. Starting at 3 or 4 years of age, they evaluate speakers based on their competence and benevolence (Birch, Vauthier, & Bloom, 2008; Clément, 2010; Koenig & Harris, 2005; Mascaro & Sperber, 2009). At 6 years of age, children understand that people are less likely to be truthful when they make self-serving or self-interested claims (Heyman, Fu, & Lee, 2007; Mills & Keil, 2005). Beyond using information about the source of the testimony, children are also able to understand arguments from a young age. For instance, 4-year-olds can react appropriately to conditional arguments (Scholnick & Wing, 1991), and 6-year-olds prefer noncircular arguments to circular ones (Baum, Danovitch, & Keil, 2007; for a review, see Mercier, in press). Adults often use connectives, such as *because* and *so*, in arguments targeted at children (van Veen, Evers-Vermeul, Sanders, & van den Bergh, 2009), and one can expect children to respond to them. From a developmental perspective, one might wonder when children start to be sensitive to such connectives. In the experiments that follow, we focus on one particular connective, *because*, which has been tested through its French equivalent, *parce que*.

Corpus-based studies show that children start to use connectives such as *because* from a very early age, usually at around 2.6 or 3 years (Evers-Vermeul & Sanders, 2009; Zufferey, 2006). Experimental data available from studies of older children confirm that some connectives are well in place at 4 years (Evers-Vermeul, 2005). However, as Zufferey (2006) noted, these productions should not be taken as a proof that younger children are already able to understand connectives. In particular, they might not be able to understand all uses of connectives. Developmental psychologists—as early as Piaget (1928)—and linguists have suggested that the relationship denoted by *because* can have different statuses (Sanders, Spooren, & Noordman, 1992). The relevant contrast here is between *content-based* and *epistemic* relationships (Sweetser, 1990). An example of a content-based relationship is "John had an accident because his car's brakes malfunctioned." An example of an epistemic relationship is "John had an accident because he didn't show up for this very important meeting." In the former case, no argument is being made; an event is simply being described. In the latter case, however, the proposition introduced by *because* can play an argumentative role, and we focus on this latter case here.

What are the effects of this epistemic use of *because*? Whether the connective is used or not, the actual causal relation between the two clauses—for instance, "John had an accident" and "he didn't show up for this very important meeting"—is the same (e.g., Halliday & Hasan, 1976). Even if the connective cannot affect the causal relation itself, it can still ease the understanding of the intended relation; it makes it more likely that the listener forms a representation of the causal relationship (e.g., Britton, 1994). If the goal of the speaker is to convince the listener of a given conclusion ("John had an accident") by displaying a causal relationship between a premise ("he didn't show up for this very important meeting") and this conclusion, the speaker must ensure that the listener pays attention to the relationship. This is presumably why people rely on such connectives (e.g., Kamalski, Lentz, Sanders, & Zwaan, 2008). There are other, more circuitous routes through which the use of connectives could affect persuasion. For instance, the use of a connective could reflect confidence, which could then be taken as a sign that the conclusion can be accepted. In any case, the epistemic uses of *because* are intended to increase acceptance of a conclusion—a goal they usually, but not necessarily, achieve by facilitating comprehension.

Children who understand the epistemic uses of *because* should be more likely to form a representation of the intended causal relationship. To the extent that the causal relation highlighted by the connective is sound, children should be more likely to accept its conclusion than that of an equally strong relation not highlighted by the connective *because*.

Three experiments designed to test children's sensitivity to the epistemic use of the connective *because* are described in this article. In each experiment, 3- to 5-year-olds were given the choice to follow the recommendations of two speakers. The two speakers gave recommendations based on equally strong arguments, but only one of them used the connective *because*. If the children are sensitive to the use of the connective *because*, one could expect them to favor the recommendation of the speaker who uses this connective. In Experiments 2 and 3, adults were also tested as a control group.

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Fig. 1. Vignettes for the ball story: Camille arrives (first vignette); Camille leaves after having put the ball into one of the two boxes (second vignette); and two women point at the different boxes (third vignette).

Experiment 1

Method

Participants

This experiment involved 73 children: 25 3-year-olds (11 girls and 14 boys, mean age = 42.72 months, *SD* = 3.45, range = 36–47), 24 4-year-olds (9 girls and 15 boys, mean age = 54.54 months, *SD* = 3.05, range = 49–59), and 24 5-year-olds (13 girls and 11 boys, mean age = 67.08 months, *SD* = 3.50, range = 61–71) from two schools in Lyon, France.[1] Most children came from middle- and upper-middle-class families. Each child was seen individually in a quiet room by a single experimenter for about 10 min.

Materials and procedure

To test whether children preferentially follow a statement that contains the connective *because*, three stories were presented to children on a computer screen. All stories were built on the same model. In the first vignette, a young Playmobil girl arrived in a place with two colored and closed boxes sitting on a table (the places were counterbalanced). The protagonist was carrying an object, and the experimenter explained that the girl was going to put this object into one of the two boxes. A second vignette showed the same young girl without the object. The experimenter explained that the girl was leaving after having put the object into one of the boxes; the experimenter specified that he did not know which one of the two boxes contained the object. Next, the experimenter showed a third vignette where two Playmobil women were depicted (see Fig. 1).

The experimenter gave the names of the two characters and said that each one would say "hello" to the child. At that point, an animation bubble appeared for one of the women, activating a voice recording uttering "Hello." The experimenter suggested that the child answer "Hello." The same procedure was used for the second woman. For the first woman, another animation bubble and recording voice were activated; for instance, the child heard, "The ball is in the blue box" ("Le ballon est dans la boîte bleue"). The experimenter suggested that the child ask the woman, "Why?" Once the child had done so, another bubble and voice were activated, and the child heard, "Because Camille always puts her ball in the blue box" ("Parce que Camille met toujours son ballon dans la boîte bleue") (with connective). The same procedure was repeated with the second woman, but the last sentence was uttered without the connective *because* (the women's places, the order of bubble activation, and the voice attribution for the women were counterbalanced). Finally, the experimenter asked the child, "According to you, where is the ball?" ("Selon toi, où est le ballon?"). If the child did not respond, the experimenter asked, "Is the ball here [pointing to one of the boxes] or is the ball here [pointing to the other box]?" ("Est-ce que le ballon est là ou est-ce que le ballon est là?").

The two other stories were built on the same model. The objects carried by the young girl, the colors of the boxes, and the names and voices of the two women were varied. The child could obtain a maximum score of 3 points (1 point for each story when the box linked to the connective was chosen).

[1] All of the participants were French, and all of the experiments were conducted in French.

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Results and discussion

The percentage of choices linked to sentences where speakers used the connective *because* was 54.6% for the 3-year-olds, 62.5% for the 4-year-olds, and 65.3% for the 5-year-olds. A 3 (Age Group: 3-year-olds, 4-year-olds, or 5-year-olds $\times$ 2 (Gender: girl or boy) analysis of variance (ANOVA) yielded no significant main effect or interaction effect between these two factors. However, the performance was significantly above chance for the 4-year-olds ($t = 2.30$, $df = 23$, $p = .031$) and the 5-year-olds ($t = 2.25$, $df = 23$, $p = .035$) but not for the 3-year-olds ($t = 0.86$, $df = 24$, $p = .39$). These findings could be explained by the fact that the ANOVA did not take into account the chance level or test hierarchical relations between means (in this case, the ANOVA tested the null hypothesis $M_1 = M_2 = M_3$). Following the difference between the groups in terms of chance and the percentages of choices linked to the connective, another hypothesis can be tested: The 3-year-olds' performance was lower than that of the 4-year-olds, which was similar to that of the 5-year-olds. To test this hypothesis more specifically, a contrast analysis[2] was used (see, e.g., Wendorf, 2004). Two contrasts were tested in a regression analysis: a contrast of interest,[3] corresponding to the previous hypothesis regarding the age difference, and an orthogonal contrast, which tested the residual variance. The hypothesis can be accepted if the contrast of interest predicts the choices linked to the connective *because* and if the orthogonal contrast does not. Neither contrast of interest, $F(1, 70) = 1.65$, $p = .203$, nor orthogonal contrast, $F(1, 70) < 1$, was significant, so the hypothesis involving age difference must be rejected.

The methodology of this experiment raises a potential concern: *Because* is often used in answering "why" questions; children themselves often start using *because* in answer to "why" questions (Evers-Vermeul & Sanders, 2009). Perhaps children prefer to follow the speaker who uses *because* only because the utterance is more pragmatically felicitous and fits better with conventional conversational practices. To control for this possible confound, a second experiment was conducted where the connective was embedded within two clauses in the sentence.

Experiment 2

Method

Participants

This experiment involved 74 children: 25 3-year-olds (16 girls and 9 boys, mean age = 43.04 months, *SD* = 3.08, range = 38–47), 25 4-year-olds (11 girls and 14 boys, mean age = 54.76 months, *SD* = 3.08, range = 49–59), and 24 5-year-olds (14 girls and 10 boys, mean age = 63.62 months, *SD* = 2.9, range = 60–69). The demographics were similar to those of Experiment 1. Each child was interviewed individually in a quiet room by a single experimenter for approximately 10 min. In addition, 40 adults were tested (39 women and 1 man, mean age = 21.26 years, *SD* = 2.83, range = 18–35).

Materials and procedure

Four scenarios were proposed to the participants in this experiment. All were built on the same model, as described above (Experiment 1). Modifications were introduced only on the last vignette, when the two women were introduced. There were no voice recordings for these women. For the first woman, an animation bubble popped up, and the experimenter read the following sentence in a neutral voice: "The ball is in the blue box because Camille always puts her ball in the blue box" ("Le ballon est dans la boîte bleue parce que Camille met toujours son ballon dans la boîte bleue") (with connective). For the second woman, the following sentence was read: "The ball is in the green box, Camille always puts her ball in the green box" ("Le ballon est dans la boîte verte, Camille met toujours son ballon dans la boîte verte") (without connective). Finally, the experimenter asked the participants

[2] This kind of analysis is more powerful for testing specific hierarchical hypotheses than classical analyses and can be used even if the classical test is not significant (Brauer & McClelland, 2005).

[3] The contrast of interest was −2 1 1. The 3-year-olds' performance (coded −2) was lower than that of the 4-year-olds (coded 1), which was similar to that of the 5-year-olds (coded 1). The orthogonal contrast was 0 −1 1.

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where the object was. The order of bubble activation and the presence or absence of the connective in the statements were counterbalanced.

Three other stories were built on the same model. The boxes' colors, the characters and their names, and the objects carried by the young girl were varied. The participant could obtain a maximum score of 4 points (1 point for each story when the box linked to the connective was chosen). Adults were presented with the same tasks as children but with appropriate explanations.

Results and discussion

The percentage of choices linked to the connective *because* was 50% for the 3-year-olds, 62% for the 4-year-olds, 60% for the 5-year-olds, and 63.1% for the adults. As in Experiment 1, performance was significantly above chance for the 4-year-olds ($t = 3.12$, $df = 24$, $p = .005$) and the 5-year-olds ($t = 2.30$, $df = 23$, $p = .031$) but not for the 3-year-olds ($t = 0.00$, $df = 24$, $p = 1.00$). Performance was also significantly above chance for the adults ($t = 2.59$, $df = 39$, $p = .013$). An ANOVA failed to reveal any significant main effects or interaction effects between age group and gender factors. However, the contrast analysis with the same hypothesis tested in Experiment 1 but including the adult group[4] confirmed the hypothesis of an age difference between the 3-year-olds and the older participants, $F(1, 110) = 4.37$, $p = .039$, for the contrast of interest, $F(1, 110) < 1$, for the two orthogonal contrasts.

These findings confirmed the results of Experiment 1 regarding children's performance compared with chance. Moreover, the contrast analysis showed that the 3-year-olds' performance was lower than that of the 4-year-olds, which was similar to that of both the 5-year-olds and the adults. Using connectives embedded in the sentence, this experiment indicated that the effect of the connective for the 4- and 5-year-olds was not due to the pragmatic factors highlighted previously. Moreover, this manipulation could also account for the failure to observe a difference between age groups in Experiment 1. Some of the 3-year-olds in Experiment 1 might have relied on the pragmatic cue to give the expected answer. This would have rendered the contrast between the 3-year-olds and the older children less strong.

However, another interpretation of the data is possible. In both experiments, the sentences with the connective *because* were longer than the sentences without it. Perhaps the children and adults were sensitive to this difference. To control for this possible effect, a third experiment was conducted where the phatic term *well* was introduced in the sentence without the connective *because*.

Experiment 3

Method

Participants

This experiment involved 77 children: 26 3-year-olds (13 girls and 13 boys, mean age = 40.42 months, *SD* = 3.21, range = 36–46), 26 4-year-olds (12 girls and 14 boys, mean age = 53.85 months, *SD* = 3.76, range = 48–59), and 25 5-year-olds (14 girls and 11 boys, mean age = 64.92 months, *SD* = 2.95, range = 60–69). The demographics were similar to those of Experiments 1 and 2. Each child was seen individually in an adapted quiet place in the school for approximately 10 min. In addition, 38 adults were tested (30 women and 8 men, mean age = 22.42 years, *SD* = 2.10, range = 19–29).

Materials and procedure

The materials and procedure used in this experiment were the same as those used in Experiment 2, but a modification was introduced in the sentences without the connective *because*. To control for the possible effect of sentence length, the phatic term *well* (*et ben* in French) was included in the sentences without the connective *because* (e.g., "The ball is in the green box, well Camille always puts her ball in

[4] The contrast of interest was −3 1 1 1. The 3-year-olds' performance (coded −3) was lower than that of the 4-year-olds (coded 1), which was similar to that of both the 5-year-olds (coded 1) and the adults (coded 1). Two orthogonal contrasts (0 −2 1 1 and 0 0 −0.5 0.5) were tested because the age group variable now had four modalities.

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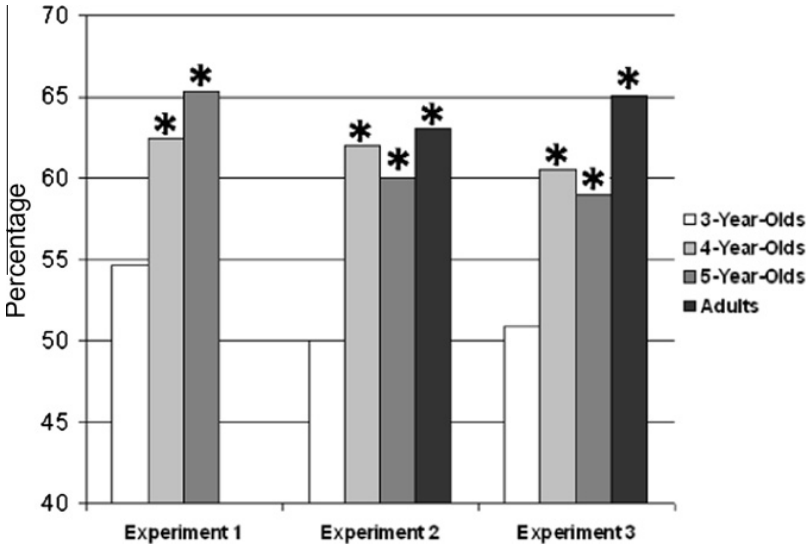

Fig. 2. Percentages of children and adults who chose to follow the speaker using *because* in each experiment. The asterisks indicate above-chance performance.

the green box" ["Le ballon est dans la boîte verte, et ben Camille met toujours son ballon dans la boîte verte"]). The boxes' colors, the characters and their names, and the objects carried by the young girl were varied. The participant could obtain a maximum score of 4 points (1 point for each story when the box linked to the connective was chosen). Adults were presented with the same tasks as children but with appropriate explanations.

Results and discussion

The percentage of choices linked to the connective *because* was 50.9% for the 3-year-olds, 60.6% for the 4-year-olds, 59% for the 5-year-olds, and 65.1% for the adults. As in Experiment 2, performance was significantly above chance for the 4-year-olds ($t = 2.85$, $df = 25$, $p = .009$), the 5-year-olds ($t = 2.57$, $df = 24$, $p = .017$), and the adults ($t = 3.05$, $df = 37$, $p = .004$) but not for the 3-year-olds ($t = 0.25$, $df = 25$, $p = .802$). Analyses similar to those of Experiment 2 revealed no significant main effects or interaction effects between age group and gender factors (ANOVA) but confirmed the hypothesis of Experiment 2 in the contrast analysis, $F(1, 111) = 4.15$, $p = .044$, for the contrast of interest, $F(1, 111) < 1$ and $F(1, 111) = 1.04$, $p = .308$, for the two orthogonal contrasts.

These findings confirmed the results of Experiment 2. The 4- and 5-year-olds, like the adults, chose the speakers who used the connective significantly more often than the 3-year-olds. By introducing the phatic term *well* into the sentences without the connective *because*, this third experiment indicated that the effect of the connective was not due to the length of the sentence. Fig. 2 summarizes the results from all three experiments.

General discussion

The aim of this study was to test the sensitivity of young children to the presence of the connective *because* in arguments. In each of the three experiments, the 4- and 5-year-olds performed above chance in choosing to follow the speaker who used the connective *because*, whereas the 3-year-olds performed at chance. In Experiments 2 and 3, contrast analyses confirmed the hypothesis that the 3-year-olds' performance was lower than that of the 4-year-olds, which was similar to that of the 5-year-olds and the adults.

A possible interpretation of these results is in terms of the metarepresentational skills required to understand the epistemic relationship denoted by *because*. Linguists and psychologists have argued that understanding epistemic relationships requires specific metarepresentational skills (Zufferey,

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2006). In particular, Mercier and Sperber (2009) suggested that reasoning is necessary to understand such relationships. Reasoning is understood here as a metarepresentational ability—the ability to gauge the degree of support that a premise provides a given conclusion. These specific metarepresentational skills are different from those needed to understand human ostensive communication in general (Grice, 1975; Sperber & Wilson, 1995), which are now well attested in children from 1 to 2 years of age (Liszkowski, Carpenter, & Tomasello, 2008; Onishi & Baillargeon, 2005; Surian, Caldi, & Sperber, 2007). One possibility, then, is that the metarepresentational skills necessary for the understanding of epistemic relationships (such as the one denoted by *because*) develop alongside the skills required to pass standard false belief tasks (see, e.g., Frye, Zelazo, & Palfai, 1995), which also develop between 3 and 4 years of age (Wellman, Cross, & Watson, 2001). For instance, it is plausible that limited working memory resources may constrain the use of complex metarepresentational skills in younger children (see, in the case of reasoning, Barrouillet & Lecas, 1999).

In any case, it might not be wise to dwell on the failure of the 3-years-olds in our experiment. First, this failure may be due to a misunderstanding of the task unrelated to the connectives. Second, we know that 3-year-olds sometimes use epistemic connectives. This apparent gap between production and evaluation (in our task) is likely due to the fact that our task was less engaging than naturally occurring situations in which children have a stake in being able to defend their point of view (e.g., Resnick, Salmon, Zeitz, Wathen, & Holowchak, 1993). Finally, as the example of the false belief task demonstrates, new experiments may be able to unveil sophisticated cognitive skills in children much younger than was previously thought possible.

More interesting is the suggestion that 4-year-olds already possess a genuine understanding of the connective *because*. Further experiments could test this hypothesis. A first step would be to replicate the current results while also testing the children with standard false belief tasks to establish the existence of a correlation between the ability to pass both. A second step might test children's reactions to content-based uses of the connective *because*. Being sensitive to content-based uses of *because* should not require any extra metarepresentational skills; accordingly, we should expect sensitivity in younger children. A third possibility would be to extend the range of arguments offered to children. If the increased influence of the speaker who uses *because* stems from a genuine understanding of the connective, we might expect a reverse pattern—with increased following of the speaker who does not use a connective—if the arguments that are offered are weak, as is observed in adults (see Kamalski et al., 2008). Finally, the influence of connectives in more naturalistic settings should also be investigated, for instance, by trying to persuade children to perform a given task while relying or not relying on connectives. The methodology developed here, as well as the results presented, offers a promising avenue for future research on the role played by subtle features of arguments—such as the presence or absence of a connective—in children's reactions to testimony.

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