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Children’s ability to estimate the frequency of single and repeated events

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ABSTRACT

Although it is extremely important when interviewing children about alleged abuse to determine whether the abuse was a single or a repeated occurrence, we have little information about how children judge the frequency of events. The aim of the current study was to examine children’s accuracy in providing estimates of event frequency that were numerical (that is, 1, 2, 3, . . .) and qualitative (that is, once, a few times, or many times). Younger (4- to 5-year-old) and older (6- to 8-year-old) children took part in a single event or an event that was repeated 6 or 11 times. They were interviewed after a short or long delay; some were interviewed a second time. Overall, children were very accurate at judging the frequency of a single event, but much less so for repeated events. Based on our findings, we make two recommendations for professionals trying to establish the frequency of events when interviewing young children.

INTRODUCTION

When interviewing children about suspected abuse it is important to establish early on whether the abuse was a single or a repeated event. In the latter case, it is also important to establish the frequency of event occurrence. Establishing frequency is a standard component of forensic interview protocols (eg, Lamb, Orbach, Hershkowitz, Esplin, & Horowitz, 2007; Orbach et al., 2000; Wilson & Powell, 2001). It is necessary for several reasons. First, the frequency of occurrence establishes the nature of the criminality, which is important for sentencing. Second, it allows us to understand the impact of the event on memory and the
child’s responses. Qualitatively, the ability to remember the occurrence of an event is remarkably affected by whether it was single or repeated (Powell & Roberts, 2002; Powell, Roberts, Ceci, & Hembrooke, 1999; see Roberts & Powell, 2001, for a review). For example, repeated experience decreases children’s ability to remember specific details that were included in any particular occurrence of the event. Third, the frequency of occurrences informs the nature of the questioning during investigative interviews.

Currently, one of the most common techniques used by police is to ask children how many times the abuse happened and to obtain unique details about each occurrence (Guadagno & Powell, 2009). For police in particular, high importance is placed on establishing specific details that were unique to each occurrence of the event, including information about time. Therefore, they must first establish the number of times that the event occurred. Another option in establishing event frequency — one encouraged by many interview protocols (eg, Wilson & Powell, 2001) — is to ask frequency questions that require qualitative answers. For example, an interviewer could ask a child to respond to a forced-choice question about whether the abuse occurred once, a few times, or many times.

Despite differences in the questions used to establish event frequency, it is difficult to get a sense of how well children can answer these types of questions. The little research to date has examined children’s ability to report the number of times that specific words or pictures were seen within a single session, usually up to a maximum of five occurrences (Connolly, Hockley, & Pratt, 1996; Ghatala & Levin, 1973; Hasher & Chromiak, 1977; Johnson, Raye, Hasher, & Chromiak, 1979; Lund, Hall, Wilson, & Humphreys, 1983). This research has shown that children’s frequency judgments increased as the actual presentation frequency of the words or pictures increased; this suggests that children are sensitive to the frequency of words and pictures presented in a single session. However, it tells us little about children’s ability to judge the frequency of events that occurred over weeks and months and whether the accuracy of their responses is influenced by the type of frequency judgment (numeric or qualitative).

The current study was a descriptive study aimed at providing insight into how children of different ages answer questions about the frequency of events. It assessed the accuracy of children’s judgments and examined the impact of age, the number of events, the delay between the events and the interview, and whether the interview was single or repeated. The outcome of this study has recommendations for practice.

METHOD

Participants

Most of the data for this study were taken from a large dataset that has been previously published (Powell & Thomson, 1996, 1997a, 1997b); a small subset of the data was unpublished. Briefly, 383 children participated: 177 children in the 4– to 5-year-old group (mean age = 4 years 10 months) and 206 children in the 6– to 8-year-old group (mean age = 7 years 3 months). Participants were predominantly white and middle-class. The design was a 2 (age: 4–5 years vs. 6–8 years) × 2 (retention interval: 1 week vs. 6 weeks) × 3 (event frequency: once, 6 times, 11 times) × 2 (interview: one vs. repeated). All factors were between subjects.

Materials and procedure

During their regular classes, children participated in a single or repeated event (hereafter called the ‘Deakin Activities’), which
was led by their teacher. Each event was approximately 25 minutes long. For children who experienced the repeated event, it occurred twice a week for three weeks (6 events in total) or five and a half weeks (11 events in total). Children were individually interviewed about the event(s) either 5–6 days or 5–6 weeks after the last occurrence. During the interview, children were first asked how many times they had done the Deakin Activities. If they did not provide a numerical estimate for this question (for example, if they replied ‘many times’ or did not reply) then children were asked the follow-up question, ‘Was it a lot, a few times, or one time?’

RESULTS
The results are presented in three sections, distinguishing the children who experienced the event once from those who experienced it 6 or 11 times.

Single event
60 children experienced a single event. When asked how many times they had done the Deakin Activities, 54 children gave a numerical response: 52 (96 per cent) said that they had done the event once; two children said twice. When the six children who did not give a numerical response were asked the follow-up question, four said once and one child said ten times. One child did not reply to either question. Overall, the children were very accurate in judging the frequency of a single event: after one or two questions, 56 (93 per cent) of children gave the correct response.

To determine whether the children’s age or the interview delay affected their frequency estimates, a 2 (age) × 2 (delay) univariate ANOVA was conducted on their responses (for all univariate analyses, outliers were removed when they had standardised residuals greater than 3.29 (Tabachnick & Fidell, 2001)). There were no significant main effects or interaction, all \( F(1, 54) < 2.03, \ p > 0.15. \) These findings suggest that both younger and older children were accurately able to judge the frequency of a single event after a short or long delay.

Events repeated six times
297 children experienced the event six times. They were interviewed about the activities after a short or long delay; 179 were interviewed a second time.

First interview
In response to the question ‘How many times did you do the Deakin Activities?’, fewer than half (49 per cent) of the 297 children gave numerical estimates. When children gave more than one number in their response, the average of those values was used. For example, one child’s response, ‘five times or ten or something’ was averaged to 7.5 events; this value was rounded up to eight events. Although their estimates ranged from 1–60 times, most children judged that they had done the activities five times (15 per cent), followed by six times (9.4 per cent), and four times (8.4 per cent). Put another way, of the children who provided numerical estimates, 67 per cent gave correct estimates or were only one event away from the correct number. Many of the responses (all from older children) were remarkably accurate, such as ‘we did it for three weeks Mondays and Wednesdays’, ‘twice a week [interviewer: “for a total of how many times?”], six times’.

Of the 51 per cent of children who did not give numerical responses, 28 per cent said that they did not know or remember, 13 per cent gave a frequency response, such as ‘once or twice every few weeks’, and 10 per cent did not reply to the question. Those who did not provide numerical estimates were asked whether the activities happened once, a few times, or many times. Most children (64 per cent) responded that
the events occurred a few times, 25 per cent said that they occurred ‘a lot’, 2 per cent said once, and the rest of the children said that they did not know, gave a frequency response (eg, ‘one time and then some more times but not all of the day’), and 5 per cent gave numerical responses ranging from 3–18 times.

Figure 1 shows the number of events reported by the 158 children who provided a numerical response to the first or second question. Only 18 per cent correctly reported six times; the majority (78 per cent) underestimated the number of events that they had experienced. A one-sample t-test revealed that the mean number of reported times ($M = 5.46$, $SD = 2.50$) was significantly lower than the correct number of times, $t(155) = 2.69$, $p = 0.008$, Cohen’s ($1988$) $d = 0.22$.

To determine whether children’s age or the interview delay affected their estimates of event frequency, their error rate was calculated. The number of events that children reported was subtracted from the correct value of six; the absolute value of this difference was the error rate. For example, children who gave estimates of five or seven times both had an error rate of one event; children who gave estimates of four or eight times both had an error rate of two events. A 2 (age) × 2 (delay) univariate ANOVA was conducted on children’s error rates. There was a significant main effect for age: younger children made more errors (error rate $M = 2.41$ events, $SD = 2.14$) than older children (error rate $M = 1.39$ events, $SD = 1.39$), $F(1, 152) = 12.58$, $p = 0.001$, $\eta^2 = 0.076$. There was no significant main effect for delay, $F(1, 152) = 0.03$, $p = 0.872$, and no significant interaction, $F(1, 152) = 0.03$, $p = 0.867$. These results show that younger children make more errors than older children regardless of the delay between the events and the interview.

Second interview

In response to the question ‘How many times did you do the Deakin Activities?’, the majority (62 per cent) of the 179 children gave numerical estimates. Similar to the first interview, children’s estimates ranged from 1–51 times, but most judged that they had done the events five times (14 per cent). In contrast to the first interview, the next highest estimate was seven times (8 per cent of children), then six and eight times (6 per cent each). Put another way, of the children who provided numerical estimates, only 44 per cent gave correct estimates or were only one activity away from the correct number.

Of the 38 per cent of children who did not give numerical responses, 22 per cent said that they did not know or remember, 12 per cent gave a frequency response, such as ‘once or twice every few weeks’, and 4 per cent did not reply to the question. Those who did not provide numerical estimates were asked whether the activities happened once, a few times, or many times. Most children (57 per cent) responded that the activities occurred a few times, 37 per cent said that they occurred ‘a lot’, 2 per cent said once, and the rest of the children gave numerical responses ranging from 9–25 times.

Figure 1B shows the number of estimated events from the 115 children who provided a numerical response to the first or second question. Only 9 per cent correctly reported six events; in contrast to the first interview, the majority (48 per cent) overestimated the number of times that they had experienced the activities. A one-sample $t$-test revealed that the mean number of reported times ($M = 6.73$, $SD = 3.78$) was significantly higher than the correct number of times, $t(112) = 2.06$, $p = 0.041$, $d = 0.19$.

To determine whether children’s age or the interview delay affected their estimates
of event frequency, their error rate was calculated. Overall, children’s estimated number of activities were out by almost three events; they over- and underestimated by an average of 2.65 times ($SD = 2.76$). A 2 (age) × 2 (delay) univariate ANOVA was

**Figure 1**
Percentage of children reporting how often a repeated event occurred (A) in the first interview and (B) in a second interview.
conducted on children’s error rates. There were no significant main effects for delay or age, and no significant interaction, \( F(1, 106) < 0.13, p > 0.729 \). These results show that younger and older children made a similar number of errors when asked about event frequency during the repeated interview, regardless of the delay between the activities and the interview.

Change in frequency estimates from the first to second interview

To examine whether children’s event frequency estimates changed from the first to the second interview, we focused on the 179 children who were interviewed twice. Most children (41 per cent) gave numerical estimates at both interviews, 23 per cent gave other responses at both interviews, 22 per cent gave other responses in the first interview and numerical estimates in the second interview, and 13 per cent gave numerical estimates in the first interview and other responses in the second interview.

To examine how children’s numerical responses changed from the first to the second interview, we examined the responses of the 73 children who reported numbers at both interviews. 15 children (21 per cent) reported the same number both times; however, only three of those children correctly reported six events at both interviews. In the first interview, the children reported that they had done the activities on average of 5.57 times (\( SD = 2.15 \)); in the second interview, they reported an average of 6.31 times (\( SD = 2.15 \)). This increase was significant, \( t(69) = 2.14, p = 0.036, d = 0.45 \). A 2 (age) \( \times \) 2 (delay) univariate ANOVA was conducted on the difference in the number of activities that children reported during the first and second interviews. There were no significant main effects or interaction, \( F(1, 66) < 1.47, p > 0.230 \). These results are consistent with the significant underestimation shown by all children in the first interview and the significant overestimation shown by all children in the second interview.

Events repeated 11 times

26 children experienced the activities 11 times; they were all interviewed once after a short delay. In response to the question ‘How many times did you do the Deakin Activities?’, only 31 per cent of children provided numerical estimates; the number of times that they reported ranged from one to eight. One child reported each of one, two, three, five, six, and eight times; two children reported seven times. Interestingly, younger children gave more numerical responses (one child each responded with one, two, three, five, six, and seven times) than older children (one child responded seven times, another eight times). Although there were too few children to conduct statistical analyses, these results suggest that the younger children were more willing to provide (incorrect) numerical frequency estimates than the older children.

The majority of children (69 per cent) did not give numerical estimates: 27 per cent said that they did not know, 27 per cent did not reply, and 15 per cent gave frequency responses, typically responses such as ‘many times’ and ‘lots of times’. When asked whether the activities occurred once, a few times, or a lot, most of these children said ‘a lot’ (58 per cent); the rest said ‘a few’ (42 per cent). These results suggest that children had difficulty estimating how often an event occurred when it happened 11 times; they largely underestimated event frequency.

DISCUSSION

Taken together, the results of the current study demonstrated a number of important findings about how children answer questions about event frequency. Overall, children aged 4–8 years were very good at
distinguishing a single from a repeated event. When they experienced a single event, they were very accurate in reporting that it only happened once (see also Brubacher, Powell, & Roberts, 2011). When they experienced a repeated event, they were also very accurate in reporting that it happened more than once.

If children experienced a repeated event, they were not likely to answer the numerical question accurately. Although they could identify that more than one event occurred, their estimates of the number of events varied considerably. For those who experienced the event six times, some children were remarkably accurate (eg, stating that the event was held twice a week for three weeks for a total of six occurrences); others were extremely inaccurate (eg, one child reported that the event occurred 60 times). Children’s ability to provide numerical estimates appeared to improve with age and was better at the first interview than the repeated interview. However, some of the more inaccurate estimates were provided by older children at the first interview. Although there were overall age effects, we unfortunately have no way of knowing which children will provide accurate frequency judgments and which ones will not.

As a group, however, children tended to underestimate event frequency, especially in the first interview and with a greater number of event occurrences. This underestimation is consistent with findings from other studies (eg, Ellis, Palmer, & Reeves, 1988). Given children’s underestimation of event frequency, it is best to consider their responses with caution if accuracy is an issue. It is likely that their tendency to underestimate events will contribute to an underestimation of the extent of criminality in repeated occurrences of abuse.

One possible limitation to the current study is that only children who did not give an initial numerical frequency estimate were asked to provide a qualitative frequency estimate. Thus, it is possible that these qualitative estimates were provided by children who were not as confident about their memories or their estimation abilities as the children who provided numerical estimates. As a result, the accuracy of children’s qualitative estimates might not have been as accurate as they might have been if all children—including those who gave numerical estimates — provided qualitative responses. Future research might determine whether this occurred by assigning half the children to make numerical estimates and half to make qualitative estimates. Even if it did occur, our results probably reflect children’s real-life estimations: those who are less confident may not want to provide numerical estimates and may rely on qualitative estimates instead.

We can make at least two recommendations from the current study. First, when accuracy is important, it is better to ask qualitative questions that require children to identify whether the event happened once or more than once. In best practice interview protocols, it is recommended that children who have difficulty with time-related concepts be asked forced-choice questions about an event (such as ‘did it happen in the morning, the afternoon, or at night?’); they should provide clarification for their chosen option (Powell & McMeeken, 1998; Wilson & Powell, 2001). These qualitative questions could also be used to determine the frequency of events. Indeed, the National Institute of Child Health and Development (NICHD) investigative protocol advises that interviewers prompt children to indicate whether the event happened ‘one time or more than one time’ (Lamb et al., 2007, p. 1204, see also Home Office, 2007; Orbach et al., 2000).

The second recommendation is that — as with any questions — interviewers should be cautious not to repeat questions
about event frequency. We found that children changed their frequency estimates when asked a second time. There could be many reasons why these changes occurred. Research suggests that repeatedly asking children the same question encourages them to change their responses (see Ceci & Bruck, 1995; Fivush & Schwarzmueller, 1995, for reviews). It is possible that our children changed their responses in the second interview simply because they were asked the same question a second time. It is also possible that the children merely forgot their answers from the first interview and provided new answers in the repeated interview.

The findings from the current study are consistent with previous interview protocols in that they highlight the importance of avoiding questions that are beyond the level of children’s development. The study’s unique contribution is that it emphasises this point within children’s memory for the frequency of event occurrences.

References


