A Meta-Analysis of Differences in Children's Reports of Single and Repeated Events

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Abstract

When children report abuse, they often report that it occurred repeatedly. In most jurisdictions, children will be asked to report each instance of abuse with as many details as possible. In the current meta-analysis, we analyzed data from 31 experiments and 3099 children. When accuracy was defined as the number of correct details from the target instance (i.e., narrow definition), repeated-event children were less accurate than single-event children. However, we argue that defining accuracy as the number of reported details that were experienced across instances (i.e., broad definition) is more appropriate for repeated events. When a broad definition was applied, single- and repeated-event children were similarly accurate. Importantly, repeated-event children were less likely than single-event children to report details that had never been experienced and they were no more likely to say "I don't know." Overall, repeated-event children were more suggestible than single-event children, but this was moderated by length of delay to recall. In analyses of recognition data, single-event children's sensitivity score was higher than repeated-event children's, with no significant difference in response bias as a function of event frequency. We discuss these results in the context of how children's memory for repeated events is organized. We also consider the advantage of applying a broad definition of accuracy for victims of repeated abuse and charging repeated abuse as a continuous offense rather than discrete acts.

Keywords: children; repeated events; script memory; meta-analysis

Public Significance. This meta-analysis suggests a legal requirement to remember details of a particular occurrence is more challenging for children who experienced several similar instances of an event than for those who experienced a single instance of an event. However, when particularization of instances

is not required, accuracy is comparable among children who have experienced a repeated and single event.

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Abuse is a leading reason for children's involvement in the legal system (World Health Organization, 2002). Recent research on judicial decisions (Connolly, Chong, Coburn, & Lutgens, 2015) and from child welfare organizations (Trocmé et al., 2010) in Canada demonstrated that approximately 50% of child sexual abuse cases involved repeated abuse. Often, there is little to no corroborating evidence in cases of child sexual abuse (CSA); thus, the likelihood that a case will proceed to prosecution will frequently depend on the specificity of the child's report of discrete instances of the alleged abuse (Guadagno, Powell, & Wright, 2006). Legal requirements for discrete charges in most common-law jurisdictions require complainants to specify instances of abuse with reasonable particularity (for review, see Woiwod & Connolly, 2017). To fulfill particularization requirements, investigators often try to secure specific details of at least one individual instance of abuse, such as details related to time and place (Guadagno et al., 2006). Accordingly, drawing on the findings from basic laboratory research, forensic interviewing protocols such as the National Institute of Child Health and Human Development [NICHD] Investigative Interview Protocol (Lamb, Orbach, Hershkowitz, Esplin, & Horowitz, 2007) advise forensic interviewers to direct children to describe an instance of alleged abuse, followed by descriptions of other instances if the child reports repeated abuse (see Brubacher, Powell, & Roberts, 2014).

What is a reasonable amount of detail to expect a child who has experienced repeated abuse to provide about one particular instance of abuse? How might this differ from a child who has experienced a single episode? Despite the growing body of literature on children's memory for repeated events, there is no published meta-analysis on how accurate children are when asked to recall an instance after a single or repeated experience and how factors such as age, delay, and the introduction of suggested details may moderate this effect.

In this meta-analysis, we synthesize the findings in the repeated-event literature to provide a profile of the types of details children report when asked to recount a specific instance of a repeated event and we describe ways in which the reports differ from children who have experienced a single event. We further examine how reports differ for children who have experienced a repeated event as a function of age, delay, and suggested details presented during a biasing interview. This is important because what a child can report about an instance after repeated experiences may be differentially affected by these factors that are frequently a consideration in forensic investigations. We also explore the recent suggestion that redefining accuracy for repeated event children to include *all experienced details* (rather than details from one or more specific instances) will show that repeated-event children are equally or more accurate than single-event children (Price, Connolly, & Gordon, 2016).

The Typical Repeated-Event Paradigm

Laboratory studies that have examined children's memory for an instance of a repeated event have employed variations on a common experimental paradigm. In this research, children participate in three to six instances of a novel activity (e.g., a magic show). Across instances, children are typically presented with details that are *fixed*, *variable*, and/or *deviations*. Fixed details are experienced in the same way each time (e.g., children are given the same hat to wear in each instance of the magic show; e.g., Connolly & Lindsay, 2001). Variable details have associated *options* that change predictably across instances (e.g., children are given a magic prop to use during each instance, but the type of prop is different in some or all shows, for instance, a wand, a ring, a kerchief; e.g., Connolly et al., 2016). Deviations occur when something unexpected occurs during one or more instances (e.g., a fox participates in one instance of the activities: Brubacher, Glisic, Roberts, & Powell, 2011 or a confederate interrupts one instance of the magic shows: Connolly et al., 2016).

After a delay, children are interviewed about discrete instance(s) of the event. Many researchers use a distinct cue and label to identify the target instance that children will be asked to describe during the memory interview (e.g., during the target instance only, children wear a badge and that instance is referred to as "badge day"). The interview may consist of free recall questions (e.g., tell me about all the things that happened during badge day?), cued recall questions (e.g., what did you sit on during badge day?), and/or recognition questions (e.g., on badge day, did you sit on a mat?). Researchers typically code responses into the following categories: correct responses (an option that occurred in the target instance), external intrusion errors (a detail that did not occur in any of the instances and was not suggested), suggested responses (a detail that did not occur in any of the instances and had been suggested), and don't know responses. Some also code internal intrusions (an option that occurred in a non-target instance).

The Effects of Age and Delay on Children's Memory for Repeated Events

To understand the predicted effects of age and delay on children's memory for repeated events, we briefly describe the two main theories that apply to memory for repeated events: script theory and fuzzy-trace theory (FTT). According to script theory, a script is a canonically ordered knowledge structure that contains the typical actors, actions, and objects in an event (Hudson & Mayhew, 2009). Details experienced in instances are decontextualized and linked to the script rather than being retained as separate memory traces for specific instances. Therefore, recall of instances is reconstructive rather than reproductive unless the to-be-recalled instance is recalled immediately after the experience (Slackman & Nelson, 1984). According to FTT, gist memory contains the general meaning for the event and memory for specific instances is retained in separate memory traces called verbatim memory (Brainerd & Reyna, 2002). Each time a similar event is experienced, the gist trace is activated and strengthened and a new verbatim trace is laid (Price & Connolly, 2007). FTT asserts that it is possible

to retrieve memory for an entire instance if the verbatim trace has not decayed and the retrieval cues activate the verbatim trace (Brainerd & Reyna, 1990).

Both theories purport that recall of instances becomes impoverished over time and more quickly among younger than older children. Generally speaking, the script strengthens faster for older than younger children and this makes it easier for older children to identify and remember differences in particular instances of a repeated event (Hudson, 1986; Nelson & Gruendel, 1981). Therefore, younger children will show a higher rate of confusion across instances (i.e., internal intrusions) than older children across delays-to-test. FTT notes that younger children's verbatim traces decay faster than older children's (Brainerd & Reyna, 1998; Brainerd, Reyna, & Forrest, 2002; Brainerd, Reyna, Howe, & Kingma, 1990). Thus, older children should be better than younger children at recalling variable options that occurred in a target instance of a repeated event when there is a delay-to-test.

In sum, FTT claims that retrieval of the entire instance is possible if the verbatim trace is identified at retrieval and has not decayed. Script theory describes recall of instances as a reconstructive process, which is similar to the decision-making process described by the source-monitoring framework (discussed below). Both theories predict that older children will outperform younger children in recall of details experienced during an instance because they are more sensitive to event changes (script theory) or because verbatim traces decay more slowly (FTT).

Are Repeated-Event Children More Suggestible Than Single-Event Children About Variable Options?

There has been debate in the literature as to whether children who experienced a repeated event are more, less, or equally suggestible to children who experienced a single event. Early researchers found that children who experienced a repeated event were more suggestible than children who experienced an event one time in response to recognition (yes/no) questions (Connolly & Lindsay,

2001) but not in response to cued recall questions (Powell, Roberts, Ceci, & Hembrooke, 1999). Powell and Roberts (2002) directly compared children's responses to cued recall and recognition questions and found that children who experienced a repeated event were more suggestible than single-event children in response to recognition questions and equally suggestible to single-event children in response to cued recall questions.

Connolly and Price (2006) argued that a high degree of similarity between the suggested and experienced variable options could increase suggestibility for a repeated event. Answers to cued recall questions showed partial support: older children (6-and 7-year-olds) who had experienced an event four times were more suggestible than older children who had experienced an event one time when details were highly associated; however, this effect did not hold for younger children (4- and 5-year-olds). Roberts and Powell (2006) also found that children (6- and 7-year-olds) who experienced a repeated event were more suggestible than those who had experienced a single event if suggested details were consistent with the theme of the variable detail and less suggestible if suggested details were inconsistent with the theme. Taken together, these findings indicate that when suggested variable details are highly similar to experienced options, suggestibility is increased among both single- and repeated-event children, but the effect is particularly pronounced among repeated-event children.

Memory for Experienced Details: Narrow Versus Broad Definitions of Accuracy

In the repeated-event literature, accuracy has traditionally been narrowly defined as the number of options of variable details that were correctly attributed to the target instance. When accuracy is defined this way, repeated-event children are less accurate than single-event children (e.g., Powell & Roberts, 2002; Price & Connolly, 2007). Despite having impoverished instance memory, repeated-event children have strong memory for what occurred in the event (see Hudson & Mayhew, 2009 for review). To fully understand the relative accuracy of single- and repeated-event children, researchers

must 1) examine the types of errors repeated-event children tend to make in comparison to single-event children (i.e., internal versus external intrusion error rates), and 2) consider how accuracy is defined.

A broad definition of accuracy, to include all experienced details, may present a very different picture of comparative accuracy rates between single- and repeated-event children. It could even result in a reversal such that repeated-event children are more accurate than single-event children. Evidence for this possibility comes from Price et al. (2016) who used a broad definition of accuracy and found that repeated-event children were at least as consistently correct across interviews as single-event children. Therefore, employing a narrow definition may underestimate the extent to which repeated-event children remember experienced details.

We consider both narrow and broad definitions of accuracy for repeated-event children in this meta-analysis. A narrow definition is commonly employed because individual acts of repeated CSA are often charged as discrete offenses. Child complainants must describe one or more instance(s) in reasonable detail in order to fulfill particularization requirements for discrete charges (Guadagno et al., 2006; Woiwod & Connolly, 2017). A charge is considered to be reasonably particularized if each separate act is delineated by time, place, and/or other specific details that specify the offense charged rather than what generally occurred in the course of the abuse (*Podirsky v. The Queen*, 1990; *S v. The Queen*, 1989). Some jurisdictions have recognized that memory for repeated events differs from memory for single events and have adopted continuous CSA legislation that reduces particularization requirements (Woiwod & Connolly, 2017). Although requirements differ for continuous CSA charges across jurisdictions, it is typically sufficient for a complainant to provide a description of what usually occurs along with some details that differentiate between more than one discrete act. In other words, under continuous abuse statutes, children are not required to describe each act with particularity. Given this shift in law, it is especially important that a comprehensive examination of memory for repeated

events include definitions reflective of requirements for charging repeated CSA as discrete offenses (i.e., accurate recall of each instance charged) and a continuous offense (i.e., accurate details in the context of the entire event).

Present Research

This meta-analysis fills a gap in the literature on memory for repeated events by providing a comprehensive examination of the ways in which children's repeated-event reports differs from children's single-event reports. Further, this compilation of existing research addresses how broadening the definition of accuracy for repeated-event children highlights the strengths of their memory for what was experienced. Our main research questions are:

1. What are the response profiles of repeated- and single-event children when asked to describe an instance?
2. When accuracy is defined broadly, are repeated-event children more, less or comparably accurate to single-event children?
3. Are repeated-event children more suggestible to details presented in an interview than single-event children?
4. How do the repeated-event and single-event response profiles differ as a function of age and delay?

Our goal in this meta-analysis is to provide direction for forensic interviewers, investigators, and policy makers in order to appropriately accommodate complainants of repeated abuse.

Method

This meta-analysis followed the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses: Moher, Liberati, Tetzlaff, Altman, The PRISMA group, 2009), which provide a checklist for researchers to use when conducting a systematic review and/or meta-analysis

and recommend authors use a flow diagram to demonstrate the four-phases of the process (identification, screening, eligibility, and included sources).

Literature Search and Inclusion/Exclusion Criteria

Figure 1 provides an overview of the literature search and the inclusion and exclusion criteria. Methodological approaches vary across studies of children's memory for repeated events that have important implications for conclusions that can be drawn. Sometimes authors examined children's memory for fixed details; sometimes they examined memory for details that changed in some but not all instances (e.g., hi/lo frequency details); and sometimes they examined details that varied across all instances (e.g., variable details). To study a narrow definition of accuracy, researchers must know the specific instance the child is asked to retrieve; therefore, the detail must not be the same in any two or more instances. To allow for a test of memory for an instance of a repeated event and analogous comparisons to memory for a single event (i.e., one instance of the same event), we narrowed our focus to studies that contained variable details of a repeated event. Deviations have been examined in relatively few studies (e.g., Brubacher, Glisic, et al., 2011; Connolly et al., 2016; Farrar & Goodman, 1992) and the way that deviations have been manipulated is quite different across studies. If a study included variable details with options that changed in each instance as well as fixed details, data for both variable and fixed details were extracted. However, fixed details do not provide a test of instance memory and we obtained limited data for fixed details. For these reasons, fixed details were not analyzed and we retained only studies that included options of variable details that changed across instances of a repeated event in this meta-analysis.

In the Appendix/Supplementary Materials (Appendix A and B respectively), we provide a complete list of: 1) excluded studies, and 2) included studies with descriptions of study characteristics (e.g., age of participants, number and spacing of repeated events, the target event, delay-to-test).

Final Dataset

A total of 31 experiments from 23 studies (21 published; 2 unpublished) met the inclusion criteria for the meta-analysis (N = 3099) and are asterisked in the References section. Experiments were divided into those (k = 19) containing a direct comparison between single-event (N = 925) and repeated-event (N = 1053) conditions and those (k = 12) containing only a repeated-event condition (N = 1121) and no single-event comparison condition. Publication dates ranged from 1997-2017. The search was concluded in 2018.

Data Extraction

Researchers have assessed memory for single and repeated events via free recall, cued recall, and recognition measures (not all experiments include each type of question). We extracted and analyzed a variety of response types for each of these measures, which are reported in Table 1 and described below. Researchers varied in whether means or proportions were reported, so we converted all means into proportions to facilitate comparisons across experiments. Data for all measures were independently extracted and coded by two authors with expertise in memory for repeated events. Intercoder agreement was 92.98% and all disagreements were resolved through discussion.

The following types of details could be reported in free and cued recall: correct detail (a detail that occurred in the target instance), internal intrusion (a detail that was experienced by the repeated-event group in a non-target instance), external intrusion error (a detail that was not experienced in any of the instances and was not suggested), suggestion (a detail that was not experienced in any of the instances and had been suggested sometime before the final memory interview), and don’t know (an expression of uncertainty). Although internal intrusions are not applicable for children in single-event conditions, details classified as internal intrusions in repeated-event conditions were sometimes reported in single-event conditions (i.e., by chance, single-event children reported details that had been

experienced in non-target instances by repeated-event children; some researchers included these guesses in external intrusion rates rather than reporting external and internal intrusions separately for single-event participants). In this meta-analysis, a narrow definition of accuracy consisted of correct details that occurred in the target instance and a broad definition of accuracy contained correct details that occurred in the target instance plus internal intrusions (i.e., experienced details across instances). Analyses for a broad definition of accuracy were only performed for studies from which we could compute a mean and standard deviation from the original dataset.

The recognition data were used to compute measures derived from signal detection theory (Green & Swets, 1966). Respondents could respond to recognition test items in the affirmative ("yes") or in the negative ("no") for experienced details (true details) or non-experienced and suggested (false details) that had not been experienced during any of the instances. A hit is a "yes" response for an experienced detail. A false alarm is a "yes" response for a non-experienced and suggested detail. The hit rate and false alarm rate can be used to compute measures that distinguish between sensitivity and response bias (MacMillan & Creelman, 1991). Sensitivity represents the ability to discriminate between true and false details and can be computed using the formula $d' = z(\text{hit rate}) - z(\text{false alarm rate})$. Response bias represents the inclination to respond in the affirmative or the negative and can be computed using the formula $c = -0.5 \times [z(\text{hit rate}) + z(\text{false alarm rate})]$. Although sensitivity and response bias are conventionally computed at the level of the participant, this approach is only possible if the hit and false alarm rates for each participant are available. We did not have access to these rates and researchers in the primary literature did not use this information to compute signal detection measures. Accordingly, we computed sensitivity and response bias using group-level hit and false alarm rates (see Table 1 for rate calculations across measures).

Moderator Variables

We coded two moderators: age (6.4 years and under, 6.5- to 8.4-year-olds, 8.5- to 10.0-year-olds) and delay between the target instance and the interview (less than one week, one week or more). These groupings were used because they are consistent with the groupings employed in the studies included in this meta-analysis. To minimize noise from differences in experimental procedures across studies, we only included within-study comparisons of age and delay in the moderator analyses.

Meta-analytic Procedure

Meta-analytic computations were performed using *Comprehensive Meta-Analysis* software (Version 2.0; Borenstein, Hedges, Higgins, & Rothstein, 2005). Hedge's *g* was computed to measure the size of the difference in response types for single- and repeated-event groups. Positive *g* values indicate an increase on a response type for the single-event group, whereas negative values indicate an increase for the repeated-event group. Effect sizes with 95% confidence intervals (reported in square brackets) that do not overlap with zero indicate a significant difference. Effect sizes were derived from means, standard deviations, and sample sizes for all response type measures except *d'* and *c*. For these two exceptions, the effect size was computed using group-level scores and *p* values obtained by estimating variance for group-level *d'* and *c* scores (Banks, 1970; Gourevitch & Galanter, 1967). All analyses were weighted using the random-effects model. The *Q* test of homogeneity was computed as a significance test for variability in effect sizes. I^2 was computed to measure the proportion of variability attributed to effect size heterogeneity, as opposed to sampling error. For all main effects, forest plots are reported to depict the effect size and 95% confidence intervals for each primary study.

We tested for the presence of outliers and publication bias. An effect size with a standardized residual greater than 1.96 was classified an outlier (Hedges & Olkin, 1985). Whenever an outlier was detected, we conducted a sensitivity analysis by removing outliers with an iterative procedure and assessing the change in effect size as each outlier was removed (Higgins, 2008). Publication bias was

first assessed via visual analysis of funnel plot symmetry and then formally assessed via a trim-and-fill procedure. An asymmetrical funnel plot is indicative of publication bias. The trim-and-fill procedure specifies the number of imputed studies that would be required to make the funnel plot symmetrical (Duval & Tweedie, 2000). Using this procedure, we computed an adjusted effect size indicative of how the observed effect size would change after incorporating the imputed effect sizes. If publication bias and outliers were detected, effect size estimates were always adjusted from the original, unadjusted estimate.

Results

Reported statistics include the number of studies (*k*), the number of participants (*N*), the weighted means (rates, *d', c*), the effect size (*g*) and 95% confidence intervals (*LL*, *UL*), the significance test (*z*, *p*), and the heterogeneity indices (*Q*, *df*, *p*, I^2). For consistency, *z* statistics are always reported as absolute values. Confidence intervals in text are reported in square brackets. Forrest plots are reported along with the main effect analyses to display the distribution of effect sizes in the primary studies. The data for these analyses are available here: osf.io/avycj

Single vs. Repeated Event Analyses

Table 2 presents statistics from the main effect comparisons between single- and repeated-event conditions on free recall, cued recall, and recognition tests. Statistics for moderator effects on the differences between single- and repeated-events are reported in Table 3 (for the age moderator analysis, we only found sufficient data to compare children 6.4 years or younger and children 6.5-8.4 years old, described as younger vs. older). We draw attention to all significant moderator effects in text.

Free and cued recall questions

Correct details (defined narrowly). Correct details, defined narrowly as correct recall of a target instance, were more likely to be recalled by single-event than repeated-event children. In free

and cued recall, the mean proportion of correct details was greater for the single-event group than for the repeated-event group, free recall: g = 0.93 [0.58, 1.27], cued recall: g = 1.46 [1.16, 1.75]. Significant heterogeneity of effect sizes was detected for both test formats (Figure 2). An outlier was detected in the cued recall analysis (Powell et al., 2000). With this outlier removed, the effect size for cued recall reduced to g = 1.36 [1.11, 1.62] and another outlier was detected (Connolly & Gordon, 2014). With the second outlier removed, the effect size for cued recall reduced to g = 1.27 [1.08, 1.45]. No publication bias was detected in free or cued recall of correct details.

Internal intrusions. Participants in the repeated-event conditions were more likely than participants in the single-event condition to report details that were experienced during non-target instances (for single-event children, this is a measure of reporting details experienced in non-target instances by repeated-event children by chance). Repeated-event participants recalled significantly more details from non-target instances than single-event participants, free recall: g = -0.97 [-1.55, -0.36], cued recall: g = -2.01 [-2.60, -1.43]. Significant heterogeneity of effect sizes was detected for free and cued recall of internal intrusions (Figure 3). In free recall, an asymmetrical funnel plot was suggestive of publication bias, leading to the imputation of one study via trim and fill analysis and a decrease in the adjusted effect size, adjusted g = -0.77 [-1.38, -0.16]. One outlier was detected in the cued recall analysis (Connolly et al., 2016, Exp. 2). With this outlier removed, the effect size for cued recall reduced to g = -1.73 [-2.17, -1.29].

Correct details (defined broadly). A further analysis was performed using the broad definition of accuracy that included items experienced during the target instance (correct) and items experienced by repeated-event children in non-target instances (internal intrusions). In free recall, the rates for single-event children and repeated-event children did not significantly differ, g = 0.14 [-0.07, 0.35]. The rates for single- and repeated-event children also did not significantly differ in cued recall, g = -

0.33 [-0.79, 0.13]. Significant heterogeneity was detected in cued recall, but not in free recall (Figure 4). No publication bias or outliers were detected.

External intrusions. External intrusions were significantly more likely to be reported for single event conditions than for repeated-event conditions, free recall: g = 0.15 [0.02, 0.27], cued recall: g = 0.55 [0.24, 0.87]. Significant heterogeneity was detected in cued recall, but not in free recall (Figure 5). No publication bias or outliers were detected.

Don't knows. The rates of don't know responses for single- relative to repeated-event conditions did not significantly differ. The differences were nonsignificant in both free recall: g = 0.09 [-0.98, 1.16], and cued recall: g = 0.11 [-0.17, 0.39]. Significant heterogeneity was detected in free and cued recall (Figure 6). In cued recall, an asymmetrical funnel plot was indicative of publication bias and the trim and fill procedure resulted in the addition of one study and a decrease in the adjusted effect size, adjusted g = 0.02 [-0.14, 0.19]. Also in cued recall, an outlier was detected (Connolly et al., 2016, Exp. 2). With this outlier removed, the estimate of the effect size reduced to g = -0.02 [-0.23, 0.20] and another outlier was detected (Powell et al., 1999). With the second outlier removed, the effect size estimate for cued recall increased to g = -0.09 [-0.27, 0.08].

Suggested details. The proportion of suggested details reported for single- and repeated-event conditions did not significantly differ, free recall: g = -0.20 [-0.55, 0.14], cued recall: g = -0.16 [-0.55, 0.23]. Significant heterogeneity was detected in cued recall, but not in free recall (Figure 7). In cued recall, an asymmetrical funnel plot was indicative of publication bias and the trim and fill procedure resulted in the addition of one study and a decrease in the adjusted effect size, adjusted g = -0.08 [-0.46, 0.30]. No outliers were detected.

A significant moderator effect of delay was detected in cued recall of suggested details, $Q(1)$ = 6.97, p = .008 (Table 3). At delays of less than one week, the proportion of suggested details reported

was numerically greater for repeated-event children (M = 0.10) than for single-event children (M = 0.08), g = -0.18 [-0.51, 0.15]. Conversely, at delays of one week or greater, the proportion of suggested details reported was significantly greater for single-event (M = 0.20) than repeated-event children (M = 0.11), g = 0.67 [0.13, 1.21]. Given that delay was only manipulated in three studies, we recommend caution in interpreting this moderator effect.

Recognition Questions

As previously discussed, recognition questions were only asked in suggestibility studies and so a false alarm is a "yes" response to a question about a non-experienced detail that had been suggested. On recognition tests, participants in the single-event conditions consistently outperformed participants in the repeated-event conditions (Figure 8). The hit rate for single-event groups was significantly higher than the hit rate for repeated-event groups, g = 0.38 [0.04, 0.73], with significant heterogeneity in effect sizes. No outliers or publication bias was detected. Single-event groups were also significantly less likely than repeated-event groups to make a false alarm, g = -0.24 [-0.46, -0.02], with no significant heterogeneity detected. An asymmetrical funnel plot for the false alarm analysis indicated the presence of publication bias, leading to the imputation of one study via trim and fill analysis and a decrease in the adjusted effect size to g = -0.18 [-0.41, -0.05].

Computation of the signal detection measure *d'* revealed significantly higher sensitivity for single-event groups relative to repeated-event groups, g = 0.23 [0.08, 0.39]. The higher sensitivity for single-event participants indicates they were better able to discriminate between correct and false details than were repeated-event participants. An asymmetrical funnel plot for the analysis of the sensitivity measure (*d'*) indicated the presence of publication bias, leading to the imputation of two studies via trim and fill analysis and a decrease in the adjusted effect size, adjusted g = 0.21 [0.07, 0.34]. No outliers were detected in the sensitivity analysis.

For the response bias measure, the single- and repeated-event groups produced *c* scores that did not significantly differ, g = -0.02 [-0.20, 0.17]. The *c* values in both conditions were negative (see Table 2), indicating the respondents were biased towards reporting that an item was experienced regardless of whether they had taken part in a single event or a repeated event. No outliers or publication bias were detected in the response bias analysis.

Repeated-Event-Only Analyses

We examined delay effects and age differences in all studies that contained a repeated event, including those that did not contain a single-event comparison group. Two significant effects of delay were detected (Table 4). In cued recall, delays of 7 days or more led to fewer correct details, g = 0.72 [0.52, 0.91], and more internal intrusions, g = -0.39 [-0.67, -0.12], compared with delays of less than 7 days. Two sets of age comparisons were performed: (Set 1) 6.4 years or under vs. 6.5-8.4 years and (Set 2) 6.5-8.4 years vs. 8.5-10.0 years (Table 5). In Set 1, the younger children reported fewer correct details in both free, g = -0.55 [-0.77, -0.33], and cued recall, g = -0.55 [-0.82, -0.29], and they also reported fewer internal intrusions in both free, g = -0.26 [-0.50, -0.03], and cued recall, g = -0.41 [-0.72, -0.10]. The only additional significant effect in Set 1 was for don't know responses in cued recall, which were reported more frequently by younger children than older children, g = 0.67 [0.36, 1.00]. In Set 2, two significant effects were detected: compared with the 8.5-10-year-olds, the 6.5-8.4-year-olds reported fewer correct details, g = -0.27 [-0.49, -0.05], and more don't knows, g = 0.43 [0.21, 0.65] in cued recall.

Discussion

Response Profiles of Repeated-event and Single-event Children When Asked to Describe an Instance

Our first goal in this meta-analysis was to provide a profile of responses for children who had experienced a repeated and single event. As described in the results section and illustrated in Figure 9, the typical repeated- and single-event response profiles have some different and some similar characteristics. Specifically, compared to single-event children, repeated-event children who are asked to recall a target instance provide: 1) fewer correct details in both free and cued recall, 2) a greater number of internal intrusions in free and cued recall, 3) fewer external intrusion errors in free and cued recall, and 4) a comparable number of "don't know" responses in free and cued recall. Points 1 and 2 are discussed in the next section. In regard to Points 3 and 4, if details are linked to memory for specific instances and memory for entire instances decays as predicted by FTT, one would expect repeated-event children to respond non-substantively (i.e., "don't know") or with details that had not occurred at all (i.e., external intrusions). In fact, repeated-event children were not more likely to respond "don't know" and they were less likely than single-event children to report an external intrusion. Importantly, there were few significant moderating effects of age, delay, and suggested details presented during a biasing interview in our comparisons between repeated- and single-event conditions. Although there was low power in the moderator analyses, the pattern of results suggests that the different reporting patterns for single and repeated events are similarly affected by these factors.

Narrow versus Broad Definition of Accuracy

Recall that a narrow definition of accuracy is often used in the repeated-event literature to reflect particularization requirements for discrete charges in most common-law jurisdictions which require children to describe each instance of abuse charged in as much detail as possible. When accuracy is defined narrowly, single-event children are substantially more accurate than repeated-event children. However, we argue that a narrow definition of accuracy understates repeated-event children's ability to report what happened. Our data support this conclusion (for a related idea on requesting

interviewees to report details from an event at a general or coarse-grain level in comparison to a fine-grain level, see Brewer, Vagadia, Hope, & Gabbert, 2018). Across studies that contained correct and internal intrusion data for both repeated- and single-event groups, the rate of correct responses was similar across groups when accuracy was defined broadly. This is consistent with the conclusion from the previous section; repeated-event children remember what happened as well as single-event children, but they have difficulty identifying when details happened.

It is possible that what repeated-event children are able to remember is a kind of list of experienced details that are not linked to individual instances. Thus, "remembering" an instance of a repeated event may not be reproductive in the sense that children retrieve memory for an entire instance of a repeated event. Rather, "remembering" an instance of a repeated event may be largely reconstructive such that children report what happened and attribute details to the instance in which it probably happened. This is consistent with script theory.

If the process of "remembering" an instance of a repeated event is largely reconstructive, the task of interviewers might be to help children to reconstruct what likely happened during particular instances to fulfill particularization requirements for discrete charges. Although reconstruction of particular instances is likely what happens when the repeated instances of abuse were very similar and occurred in close temporal proximity, the rhetoric is unsettling. Imagine that a person could be charged criminally for something that probably happened during particular instances. Alternatively, some jurisdictions have adopted continuous CSA statutes to account for how children remember repeated events (Woiwod & Connolly, 2017). In jurisdictions that have continuous CSA statutes, particularization requirements are relaxed; children report what generally happens and supply some details from different instances without the burden of attributing details to each instance charged. This

meta-analysis demonstrates that the evidentiary requirements of continuous CSA statutes reflect the capabilities of complainants of repeated abuse.

Suggestibility to Details Presented in a Biasing Interview

Researchers have posited that the type of question and the thematic relation between experienced and suggested details account for differences in suggestibility during an interview between repeated- and single-event children (Connolly & Price, 2006; Roberts & Powell, 2006). Due to lack of data, we were unable to test the effect of thematic relationship and so this possibility remains open. However, we found that the type of question accounts for some of the differences in repeated- and single-event children's suggestibility. There were no differences between repeated- and single-event children's suggestibility in response to free and cued recall. There were differences in responses to recognition questions. In response to recognition questions, single-event children had a higher hit-rate (i.e., "yes" responses for an experienced detail) and they were less likely to make a false alarm (i.e., "yes" responses for a suggested detail that was not experienced) compared to repeated-event children. We used the hit rate and false alarm rate to compute sensitivity and response bias (MacMillan & Creelman, 1991) and found a higher rate of sensitivity (i.e., ability to discriminate between true and false details) for single-event than repeated-event children, with similar bias among single-event and repeated-event children. This pattern is consistent with the possibility that repeated-event children were more suggestible than single-event children.

Differences in sensitivity can be explained by the source monitoring framework, which describes the decision-making process of attributing retrieved details to their source (e.g., Johnson, Hashtroudi, & Lindsay, 1993). In the presence of suggestion, the source monitoring framework would predict that suggested variable details that are highly similar to experienced details enhance suggestibility among both single- and repeated-event children. However, this effect would be

particularly pronounced for repeated-event children because of the larger number of sources (i.e., experienced details) that are similar to the suggestions (e.g., Lindsay et al., 1991).

Forensic interviewing protocols such as the NICHD Protocol caution against recognition questions (e.g., Lamb, Orbach, Hershkowitz, Horowitz, & Abbott, 2007). Our findings provide further reason to support this recommendation. Recognition questions are particularly problematic for repeated-event children, and we speculate especially so if the question contains information not already disclosed by the child (also see Brubacher et al., 2014).

Repeated-event Responses as a Function of Age and Delay

To further study the repeated-event response profile, we examined repeated-event studies that contained different ages and interview delays and found a predictable improvement in performance across ages. Consistent with the age groups used by researchers included in this meta-analysis, we examined three age groups (6.4 years or younger, 6.5 to 8.4 years, and 8.5 to 10.0 years). When we compared children's responses who were 6.4 years or under with children who were 6.5 to 8.4 years, we found that older children reported more correct responses and more internal intrusions in both free and cued recall. Older children were also less likely to respond "don't know" to a cued recall question. In analyses comparing 6.5- to 8.4-year-olds and 8.5- to 10.0-year-olds, older children reported more correct details and fewer "don't know" responses in cued recall.

It is well-known that memory declines over time. In our meta-analysis, we had sufficient data to compare repeated-event studies that included delays of less than one week and one week or more. We found that there was a higher rate of correct responses when the delay was less than one week than when it was one week or more. The rate of internal intrusions increased following a longer delay.

Limitations and Future Research

There are two types of details utilized by repeated-event researchers that enable a test of instance memory: variable details with options that predictably change across instances and deviation details that are unpredictable changes that occur in one instance. The typical repeated-event paradigm contains highly predictable changes and the data we present in this meta-analysis represent what children recall about variable details. Therefore, our conclusions can only apply when instances in the series are highly similar to each other; other accurate statements may have been provided by children but were not reported in the included studies. This experimental reality may not be reflected in all cases of child abuse, and in particular, those with varied forms of abuse. In this meta-analysis, we were unable to include deviation details because there was too much variability in how deviations were defined by researchers (e.g., Brubacher, Glisic, et al., 2011; Connolly et al., 2016; Farrar & Goodman, 1990, 1992). Based on our reading of the extant literature, we speculate that deviations that occur in one instance of a repeated event may enhance overall accuracy, particularly if a broad definition of accuracy is used. Future research on repeated events should consider instances that contain greater variability within the series and, in particular, with regard to details such as event structure and location.

Researchers in the repeated-event literature have often designated the last instance as the target instance; in 15 of the 23 studies that met the inclusion criteria for this meta-analysis, the last instance was the target instance. Directing children to the last instance does not necessarily underestimate (or overestimate) children's ability to recall instances. Connolly et al. (2016) found that children remembered the first and last instances better than the middle instances when asked to recall all instances after a short delay. Research suggests that repeated-event children’s reports of the first instance may be more accurate than their reports of any other instance, particularly after a lengthy delay (Connolly et al., 2016; Hudson, 1990; Woiwod, Coburn, Bernstein, Alder, & Connolly, 2017).

Therefore, whether a narrow or broad definition is applied, differences in recall between repeated- and single-event conditions may be smaller when repeated-event children are asked about the first instance.

Depending on a child's metacognitive development, accurate recall of instances by repeated-event children may increase if children are asked to report the time they remember "best"— a prompt that is often given in forensic interviews of children who allege repeated abuse (e.g., Brubacher, Glisic, et al., 2011; Brubacher et al., 2012; Lamb, Orbach, Hershkowitz, Esplin, & Horowitz, 2007). Future research should investigate differences in accuracy rates among children who are asked to recall the time they remember "best" compared to other instances. If children are asked to recall all instances of a repeated event, this enables a test of the time that children actually remember best.

The instances in the studies included in this meta-analysis occurred close together: within two weeks (20 experiments), within one week (6 experiments), or within two days (5 experiments). In many cases of repeated CSA, abuse occurs over a much longer period of time (see Connolly, Chong, Coburn, & Lutgens, 2015; Connolly & Read, 2006). Research on the temporal distance between instances suggests that encoding of individual instances is enhanced when spacing is distributed rather than massed (e.g., Bellezza & Young, 1998; Price et al., 2006). Future studies should seek to incorporate sessions that are distributed across several weeks or months.

The repeated-event literature has increased over the past 25 years, but we did not have many studies for some variables in this meta-analysis and were unable to examine some important variables, such as the type of detail suggested during a biasing interview. Complainants of CSA are often interviewed multiple times and these findings do not extend to repeated interviews (see Price et al., 2016). The repeated-event literature to date consists primarily of studies in which researchers have used predictable changes that occur across instances, spacing between instances which is shorter than may occur in repeated CSA, short delays to the interview, and a single interview. The next generation of

repeated-event studies would benefit from using paradigms that contain greater variability between instances, instances that are further spaced, interview delays that are months or years after the experienced event, and an interview protocol that follows current interviewing recommendations for complainants of repeated crimes, such as asking children to recall the time they "remember best." The repeated-event literature will best inform policy recommendations in the future if researchers include both a narrow and broad definition of accuracy and employ paradigms that more closely resemble the characteristics of repeated CSA cases.

Conclusions

When repeated- and single-event children's memory is compared, it is both remarkably similar and remarkably dissimilar, depending on the definitions adopted by researchers. When a narrow definition of accuracy is used, repeated-event children are much less accurate than single-event children. However, when accuracy is defined broadly, differences in accuracy between single-event and repeated-event children disappear. Interestingly, repeated-event children were less likely than single-event children to report a detail that had not been experienced and they were just as likely to provide a substantive response (i.e., no differences in "don't know" responses). Together, these data are consistent with the possibility that repeated-event children remember what happened as well as single-event children but have difficulty recalling when details happened. This suggests that "remembering" an instance of a repeated event is largely reconstructive rather than reproductive. A narrow definition of accuracy that presupposes that memory is reproductive is in line with jurisdictions that charge repeated CSA as discrete offenses. Some jurisdictions are more in line with a reconstructive approach to remembering repeated events and have adopted continuous CSA legislation that relaxes particularization requirements.

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Table 1

Response types, descriptions, and rate calculations

Test	Response Type	Description	Rate Calculation
Free Recall	Correct Details (Narrow definition)	Report of detail from target instance	$\frac{M\ (\text{Correct Details Reported})}{\text{Number of Details in Target Instance}}$
	Internal Intrusions	Report of detail from non-target instance	$\frac{M\ (\text{Internal Intrusions Reported})}{\text{Number of Details in Target Instance}}$
	Correct + Int. I. (Broad definition)	Report of detail from target or non-target instance	$\frac{M\ (\text{Correct} +\ \text{Internal Intrusions Reported})}{\text{Number of Details in Target Instance}}$
	External Intrusion Errors	Report of detail from none of the instances and was not suggested	$\frac{M\ (\text{External Intrusions Reported})}{\text{Number of Details in Target Instance}}$
	Suggested Details	Report of nonexperienced, suggested detail	$\frac{M\ (\text{Suggested Details Reported})}{\text{Number of Suggested Details}}$
Cued Recall	Correct Details (Narrow definition)	Report of detail from target instance	$\frac{M\ (\text{Correct Details Reported})}{\text{Number of Cued Recall Questions for Target Instance Details}}$
	Internal Intrusions	Report of detail from non-target instance	$\frac{M\ (\text{Internal Intrusions Reported})}{\text{Number of Cued Recall Questions}}$
	Correct + Int. I. (Broad definition)	Report of detail from target or non-target instance	$\frac{M\ (\text{Correct} +\ \text{Internal Intrusions Reported})}{\text{Number of Cued Recall Questions for Target Instance}}$
	External Intrusion Errors	Report of detail from none of the instances and was not suggested	$\frac{M\ (\text{External Intrusions Reported})}{\text{Number of Cued Recall Questions}}$

	Don't Knows	Report of no answer due to uncertainty	$\frac{M\ (\text{Don't Knows Reported})}{\text{Number of Cued Recall Questions}}$
	Suggested Details	Report of nonexperienced, suggested detail	$\frac{M\ (\text{Suggested Details Reported})}{\text{Number of Suggested Details}}$
Recognition	Hit	Recognition of detail from target instance	$\frac{M\ (\text{Number of Target Instance Details Correctly Recognized})}{\text{Number of Recognition Questions for Target Instance Details}}$
	False Alarm	Recognition of suggested detail	$\frac{M\ (\text{Number of Suggested Details Falsely Recognized})}{\text{Number of Recognition Questions for Suggested Details}}$

Table 2
Main Effects for Comparisons between Single- and Repeated-Event Conditions

				Event Type		Effect Size & 95% CIs			Test of Null		Heterogeneity			
Test	Response Type	*k*	*N*	Single	Repeated	*g*	*LL*	*UL*	*z*	*p* ≤	*Q*	*df*	*p*≤	I^2
Free Recall	Correct Int.	11	1144	.28	.13	0.93	0.58	1.27	5.24	.001	74.50	10	.001	86.6
	Intrusion	6	459	.01	.18	-0.97	-1.55	-0.36	3.28	.001	40.11	5	.001	87.5
	Correct + Int. I. Ext.	6	459	.29	.27	0.14	-0.07	0.35	1.28	.202	6.12	5	.295	18.3
	Intrusion Suggested	8	975	.04	.03	0.15	0.02	0.27	2.23	.026	7.05	7	.424	0.6
	Recall Don't	4	299	.06	.08	-0.20	-0.55	0.14	1.15	.250	6.32	3	.097	52.5
	Know	2	166	.03	.01	0.09	-0.98	1.16	0.16	.876	9.87	1	.002	89.9
Cued Recall	Correct Int.	13	1051	.50	.29	1.46	1.16	1.75	9.64	.001	52.39	12	.001	77.1
	Intrusion	7	513	.03	.27	-2.01	-2.60	-1.43	6.75	.001	42.38	6	.001	85.8
	Correct + Int. I. Ext.	7	513	.57	.66	-0.33	-0.79	0.13	1.42	.155	36.85	6	.001	83.7
	Intrusion Don't	10	833	.13	.08	0.55	0.24	0.87	3.42	.001	43.40	9	.001	79.3
	Know Suggested	8	619	.17	.16	0.11	-0.17	0.39	0.75	.454	20.27	7	.005	65.5
	Recall	9	707	.14	.16	-0.16	-0.55	0.23	0.80	.426	50.66	8	.001	84.2
Recognition	Hit	6	619	.86	.81	0.38	0.04	0.73	2.17	.030	23.13	5	.001	78.4
	False Alarm	6	619	.38	.46	-0.24	-0.46	-0.02	2.14	.032	9.58	5	.088	47.8
	Sensitivity	6	619	1.50	1.02	0.23	0.08	0.39	2.91	.004	0.58	5	.989	0.0
	Response Bias	6	619	-0.42	-0.40	-0.02	-0.20	0.17	0.21	.837	6.76	5	.239	26.0

Note. Values for Event Type are *d'* scores for sensitivity, *c* scores for response bias, and rates for all other response types. Correct + Int. I. = Items from the target and non-target instances.

Table 3

Moderating Effects of Age and Delay in Comparisons between Single- and Repeated-Event Conditions

					Effect Size & 95% CIs			Test of Null		Moderator Test		
Test	Moderator	Response Type	Group	*k*	*g*	*LL*	*UL*	*z*	*p*≤	*Q*	*df*	*p*≤
Free Recall	Age	Correct Recall	Younger	3	0.60	-0.24	1.44	1.40	.161	0.11	1	.746
			Older	3	0.44	-0.01	0.90	1.91	.055			
		Ext. Intrusion	Younger	2	0.04	-0.40	0.48	0.18	.861	0.21	1	.650
			Older	2	0.17	0.19	0.04	0.90	.367			
Cued Recall	Age	Correct Recall	Younger	2	1.57	1.12	2.02	6.84	.001	0.31	1	.576
			Older	2	2.29	-0.20	4.79	1.80	.072			
		Suggested Recall	Younger	2	0.10	-0.73	0.95	0.25	.806	0.13	1	.719
			Older	2	-0.29	-2.24	1.67	0.29	.774			
	Delay	Correct Recall	Shorter	3	1.87	0.72	3.02	3.19	.001	0.02	1	.896
			Longer	3	1.96	1.33	2.59	6.14	.001			
		Ext. Intrusion	Shorter	3	0.49	0.16	0.83	2.90	.004	0.11	1	.744
			Longer	3	0.57	0.24	0.91	3.33	.001			
		Don’t Know	Shorter	3	0.13	-0.44	0.71	0.45	.652	<0.01	1	.961
			Longer	3	0.12	-0.22	0.45	0.68	.496			
		Suggested Recall	Shorter	3	-0.18	-0.51	0.15	1.08	.279	6.96	1	.008
			Longer	3	0.67	0.13	1.21	2.43	.015			

Note. Younger = 6.4 years or younger, Older = 6.5-8.4 years; Shorter Delay = Less than 7 days; Longer Delay = 7 or more days.

Table 4

Effects of Delay in Repeated-Event-Only Studies

Test	Response Type			Delay		Effect Size & 95% CIs			Test of Null		Heterogeneity			
		k	*N*	Shorter	Longer	*g*	*LL*	*UL*	*z*	*p*≤	*Q*	*df*	*p*≤	I^2
Cued Recall	Correct Recall	9	724	.42	.24	0.72	0.52	0.91	7.31	.001	11.81	8	.160	32.3
	Int. Intrusion	5	250	.27	.35	-0.39	-0.67	-0.12	2.79	.005	9.26	5	.099	46.0
	Ext. Intrusion	6	302	.08	.11	-0.05	-0.28	0.18	0.41	.681	5.41	5	.368	7.5
	Don’t Know	5	250	.12	.13	-0.04	-0.44	0.36	0.19	.847	10.23	4	.037	60.9
	Suggested Recall	5	250	.14	.19	-0.24	-0.54	0.06	1.57	.116	5.73	4	.220	30.2

Note. Shorter = less than 7 days; Longer = 7 days or more.

Table 5

Age Differences in Repeated-Event-Only Studies

Set	Test	Response Type			Age		Effect Size & 95% CIs			Test of Null		Heterogeneity			
			k	*N*	Younger	Older	*g*	*LL*	*UL*	*z*	*p*≤	*Q*	*df*	*p*≤	I^2
1	Free Recall	Correct Recall	5	331	.14	.27	-0.55	-0.77	-0.33	4.84	.001	1.44	4	.837	0.0
		Int. Intrusion	5	283	.14	.19	-0.26	-0.50	-0.03	2.18	.029	2.67	3	.445	0.0
		Ext. Intrusion	2	198	.05	.03	0.29	-0.01	0.60	1.90	.058	1.18	1	.277	15.2
	Cued Recall	Correct Recall	9	564	.27	.38	-0.55	-0.82	-0.29	4.11	.001	17.92	8	.022	55.4
		Int. Intrusion	3	163	.42	.51	-0.41	-0.72	-0.10	2.61	.009	0.89	2	.642	0.0
		Ext. Intrusion	3	176	.25	.16	0.20	-0.20	0.61	0.98	.327	3.78	2	.151	47.1
		Don’t Know	3	163	.22	.09	0.67	0.36	0.98	4.18	.001	0.58	2	.749	0.0
		Suggested Recall	3	172	.38	.51	-0.17	-0.85	0.52	0.48	.634	10.10	2	.006	80.2
2	Cued Recall	Correct Recall	2	333	.15	.19	-0.27	-0.49	-0.05	2.43	.015	1.04	1	.307	4.0
		Int. Intrusion	2	333	.40	.44	-0.19	-0.41	0.02	1.74	.081	0.14	1	.711	0.0
		Ext. Intrusion	2	333	.08	.09	-0.12	-0.34	0.09	1.14	.254	0.54	1	.461	0.0
		Don’t Know	2	333	.35	.26	0.43	0.21	0.65	3.86	.001	0.64	1	.425	0.0

Note. Set 1: Younger = 6.4 years or younger, Older = 6.5-8.4 years. Set 2: Younger = 6.5-8.4 years, Older = 8.5-10.0 years.

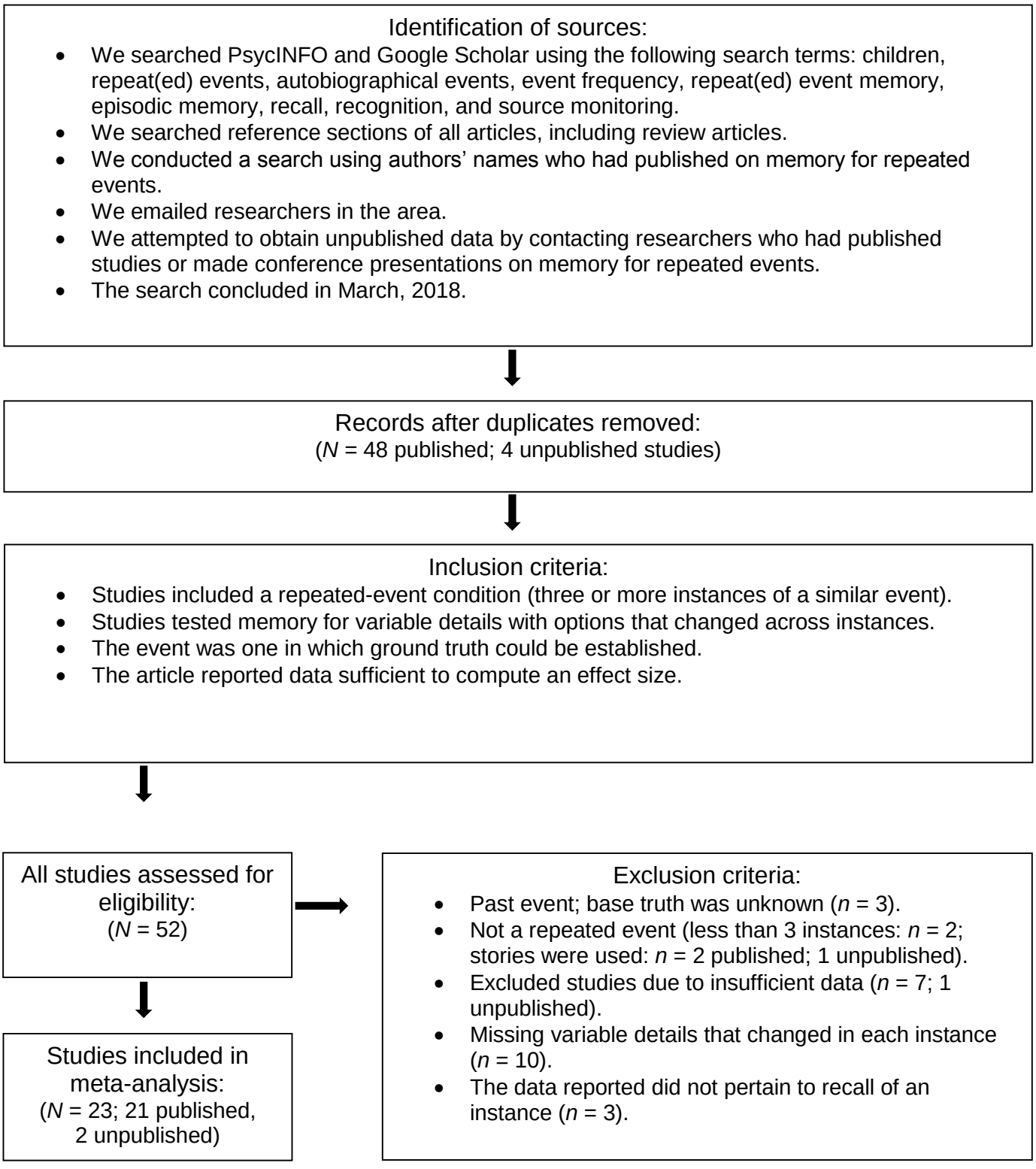

Figure 1. Flow chart for the search, inclusion, and exclusion criteria for this meta-analysis in accordance with PRISMA guidelines (Moher et al., 2009).

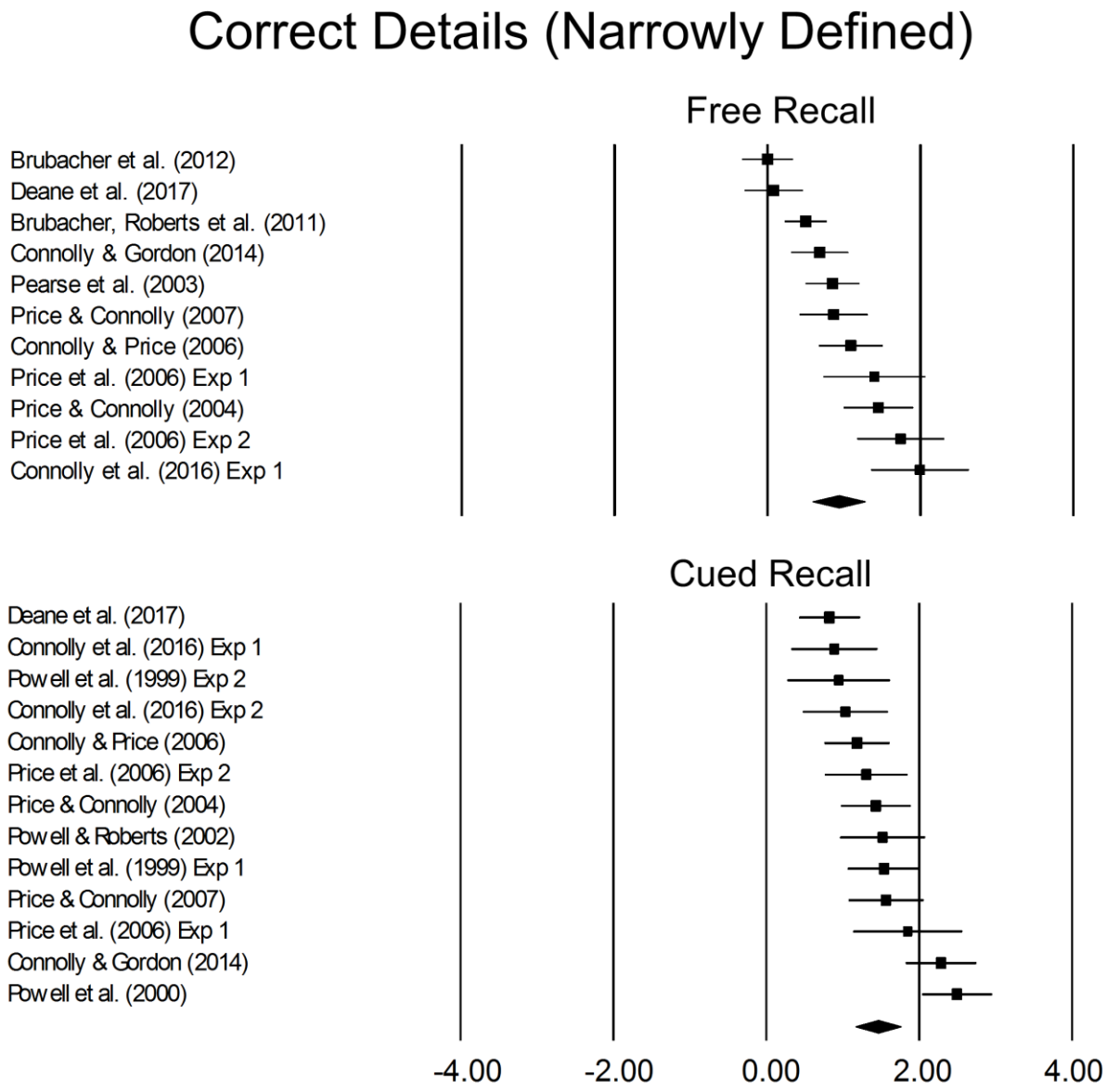

Figure 2. Forest plot for comparison between single- and repeated-event conditions in free recall and cued recall of correct details (narrowly defined to include only detailed experienced during a target instance). Individual effect sizes are depicted as rectangles, with 95% confidence intervals depicted as horizontal lines. The average weighted summary effect size and 95% confidence intervals are depicted as a diamond. All effect sizes are Hedges' g. Positive g values indicate an increase in correct details for the single-event group. Negative values indicate an increase in correct details for the repeated-event group.

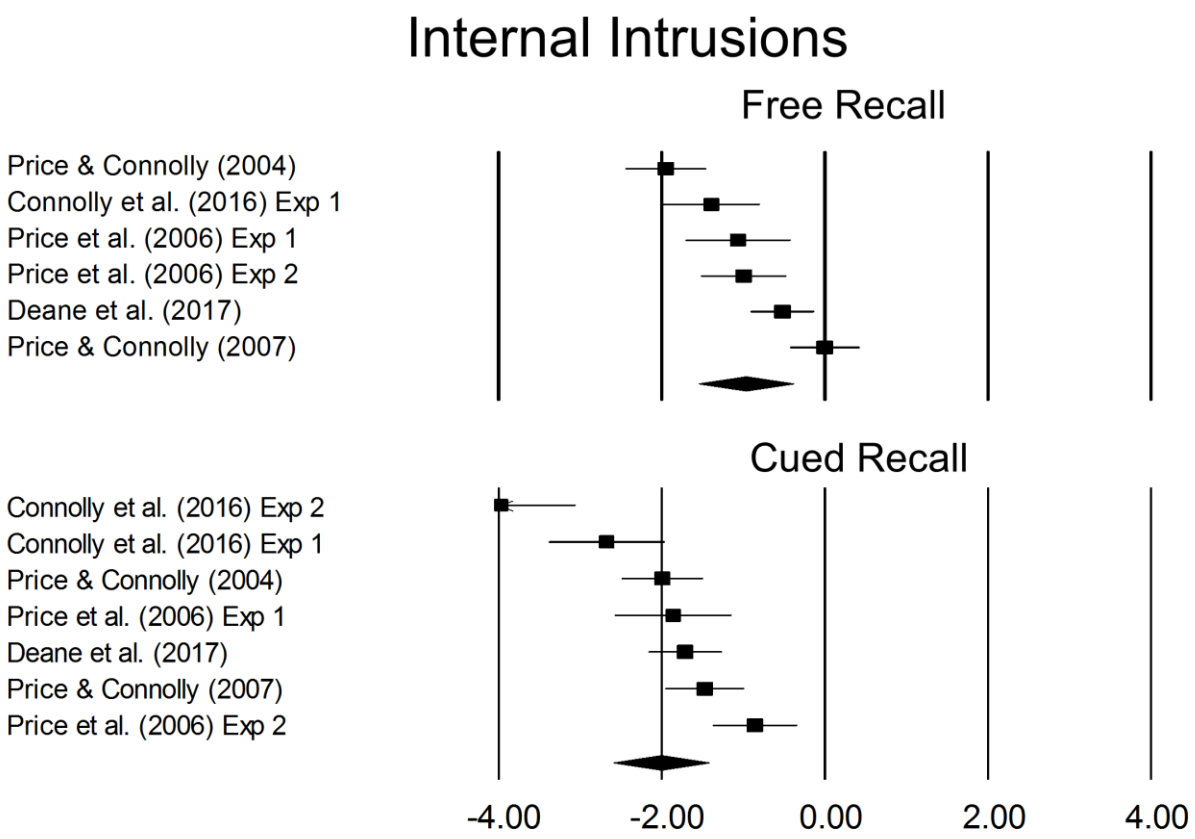

Figure 3. Forest plot for comparison between single- and repeated-event conditions in free recall and cued recall of internal intrusions. Individual effect sizes are depicted as rectangles, with 95% confidence intervals depicted as horizontal lines. The average weighted summary effect size and 95% confidence intervals are depicted as a diamond. All effect sizes are Hedges' g. Positive g values indicate an increase in internal intrusions for the single-event group. Negative values indicate an increase in internal intrusions for the repeated-event group. The horizontal line with an arrow indicates that the confidence interval exceeds Hedges' g = -4.00.

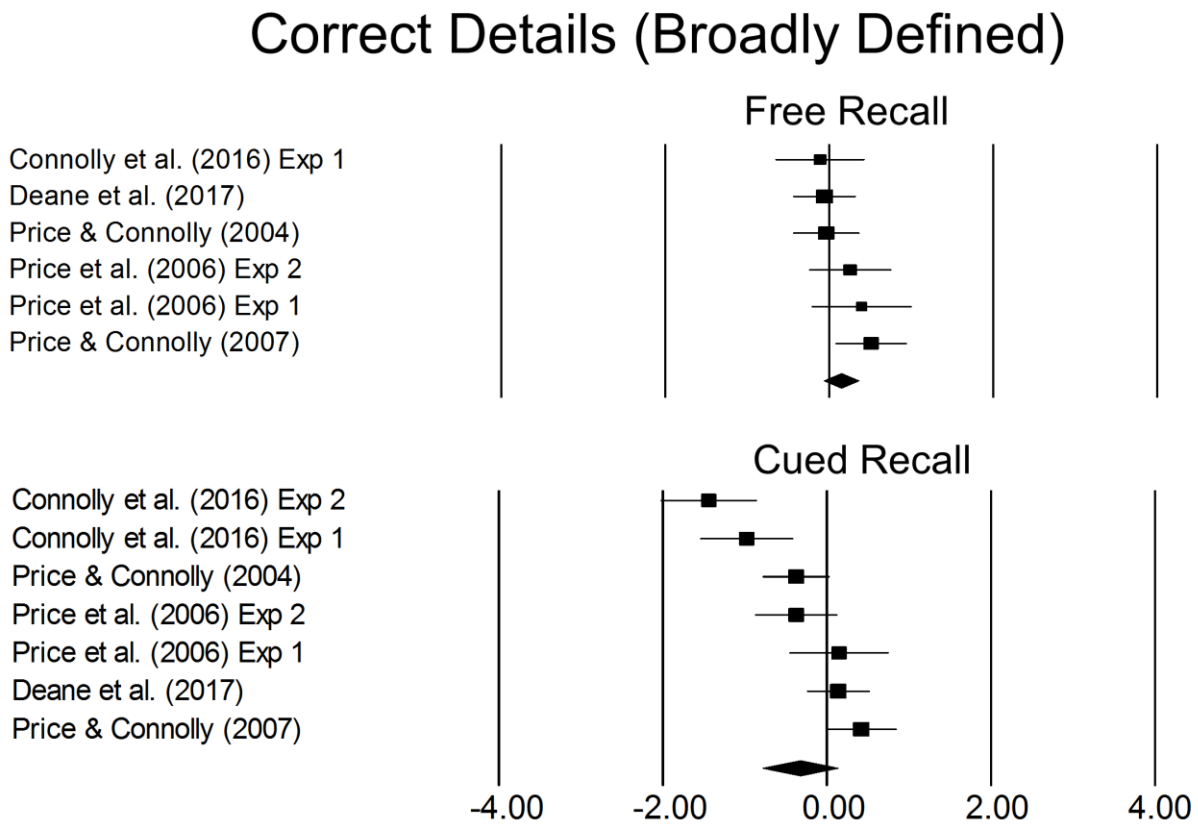

Figure 4. Forest plot for comparison between single- and repeated-event conditions in free recall and cued recall of correct details (broadly defined to include details experienced in both target and non-target instances). Individual effect sizes are depicted as rectangles, with 95% confidence intervals depicted as horizontal lines. The average weighted summary effect size and 95% confidence intervals are depicted as a diamond. All effect sizes are Hedges' g. Positive g values indicate an increase in correct details, broadly defined, for the single-event group. Negative values indicate an increase in correct details, broadly defined, for the repeated-event group.

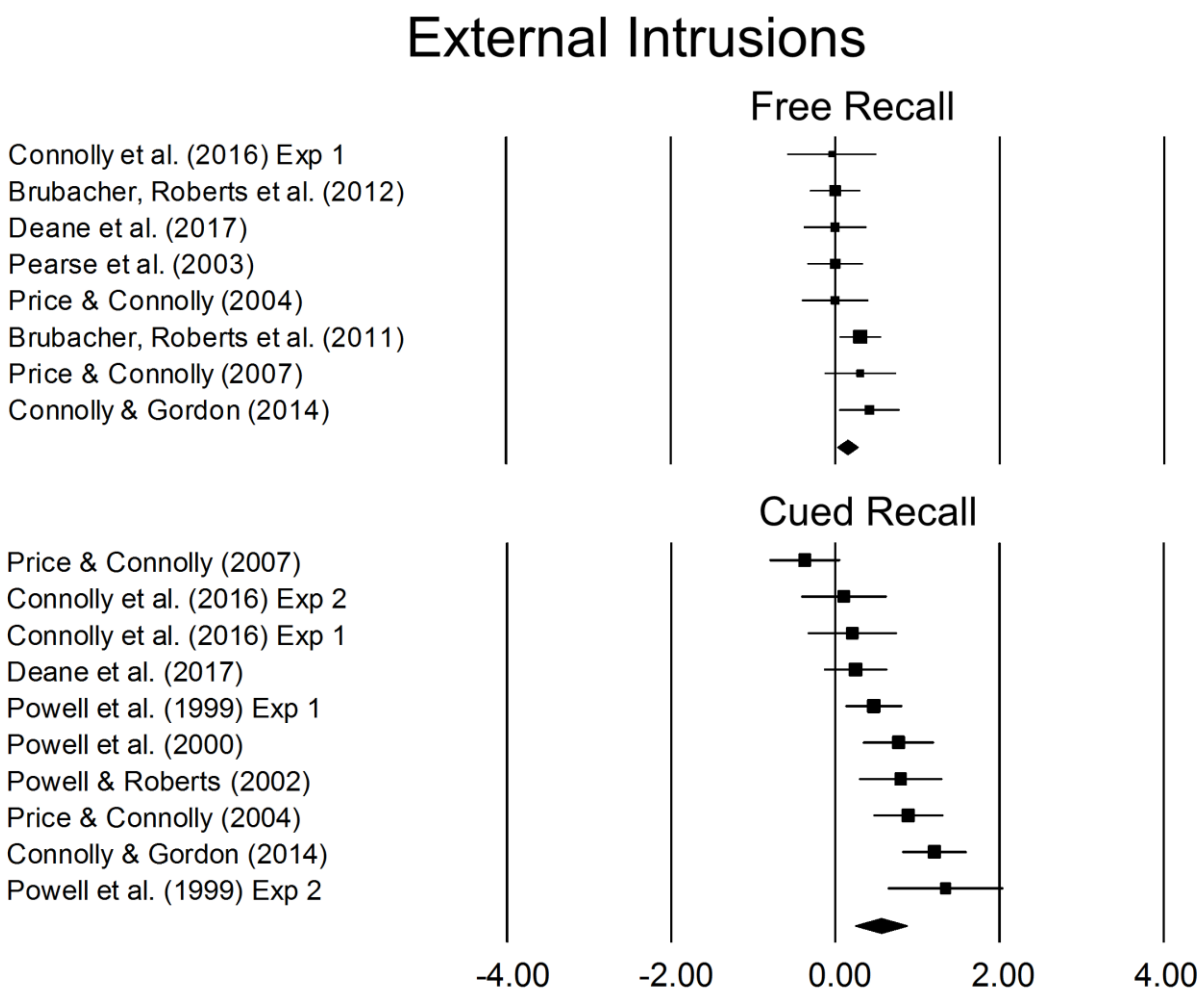

Figure 5. Forest plot for comparison between single- and repeated-event conditions for external intrusions in tests of free recall and cued recall. Individual effect sizes are depicted as rectangles, with 95% confidence intervals depicted as horizontal lines. The average weighted summary effect size and 95% confidence intervals are depicted as a diamond. All effect sizes are Hedges' g. Positive g values indicate an increase in external intrusions for the single-event group. Negative values indicate an increase in external intrusions for the repeated-event group.

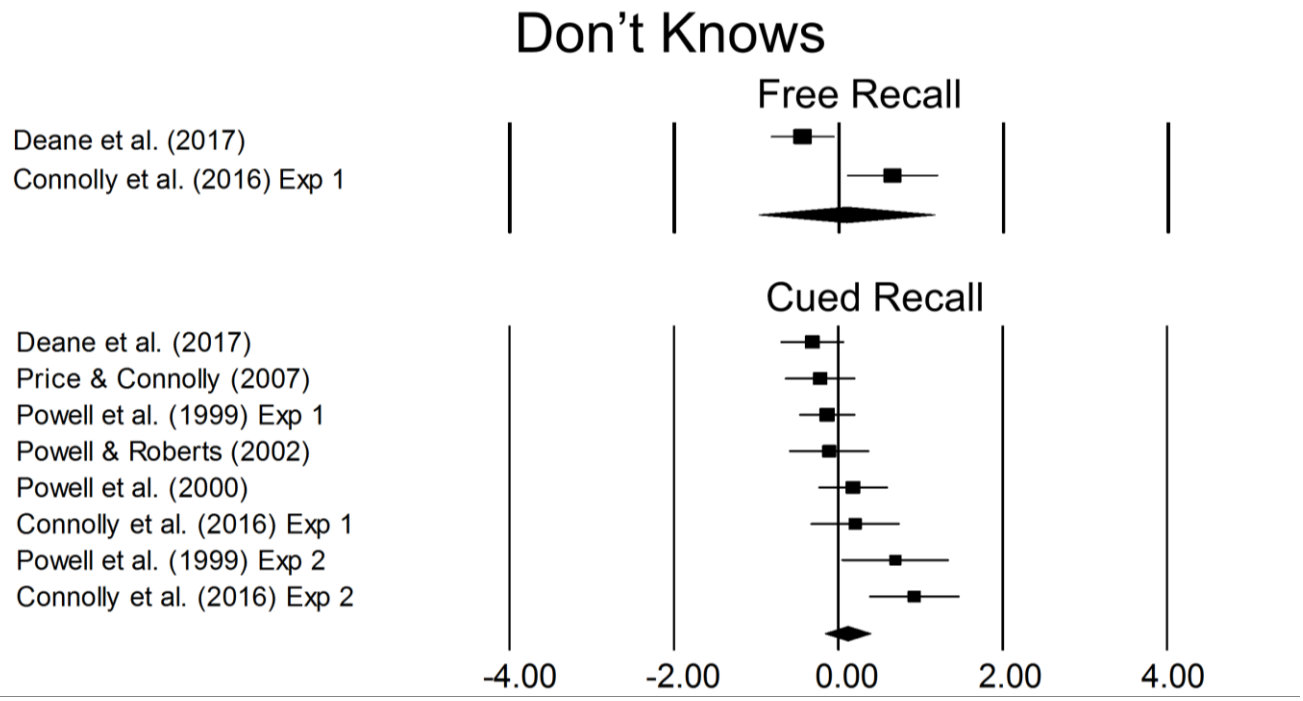

Figure 6. Forest plot for comparison between single- and repeated-event conditions for don't knows in tests of free recall and cued recall. Individual effect sizes are depicted as rectangles, with 95% confidence intervals depicted as horizontal lines. The average weighted summary effect size and 95% confidence intervals are depicted as a diamond. All effect sizes are Hedges' g. Positive g values indicate an increase in don't knows for the single-event group. Negative values indicate an increase in don't knows for the repeated-event group.

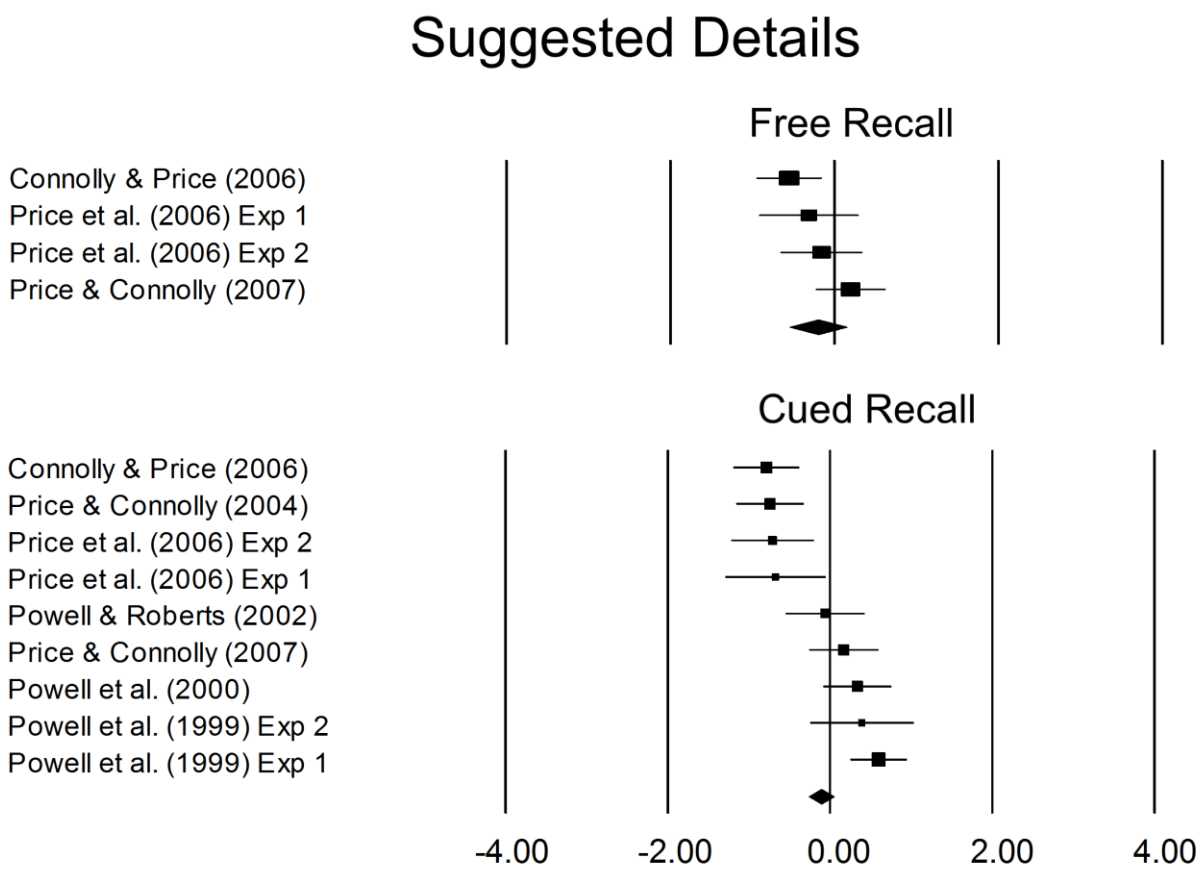

Figure 7. Forest plot for comparison between single- and repeated-event conditions for free recall and cued recall of suggested details. Individual effect sizes are depicted as rectangles, with 95% confidence intervals depicted as horizontal lines. The average weighted summary effect size and 95% confidence intervals are depicted as a diamond. All effect sizes are Hedges' g. Positive g values indicate an increase in suggested details for the single-event group. Negative values indicate an increase in suggested details for the repeated-event group.

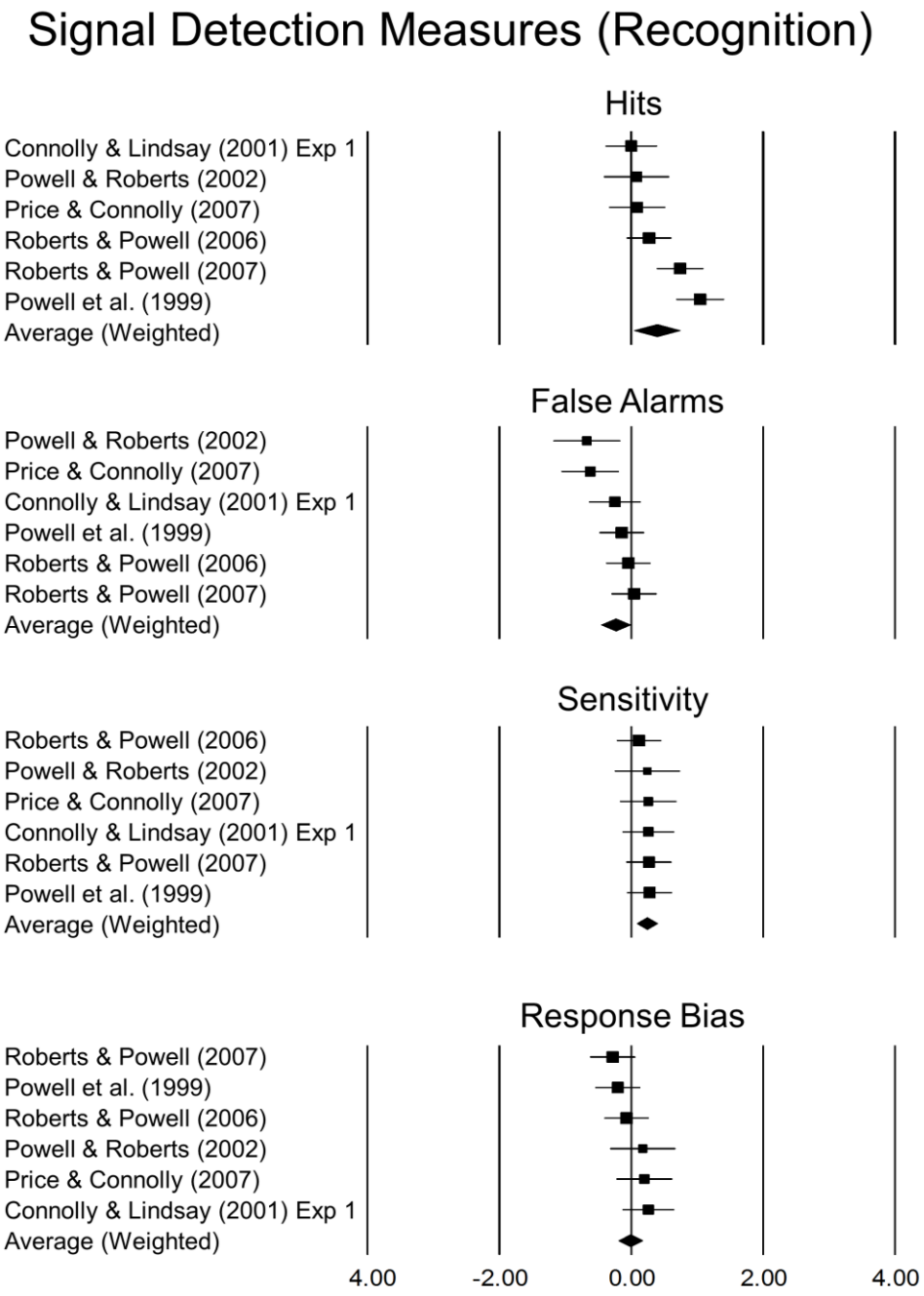

Figure 8. Forest plot for comparison between single- and repeated-event conditions in hits, false alarms, sensitivity (d') and response bias (c). Individual effect sizes are depicted as rectangles, with 95% confidence intervals depicted as horizontal lines. The average weighted summary effect size and 95% confidence intervals are depicted as a diamond. All effect sizes are Hedges' g. Positive g values indicate an increase in a given response type for the single-event group. Negative values indicate an increase in a given response type for the repeated-event group.

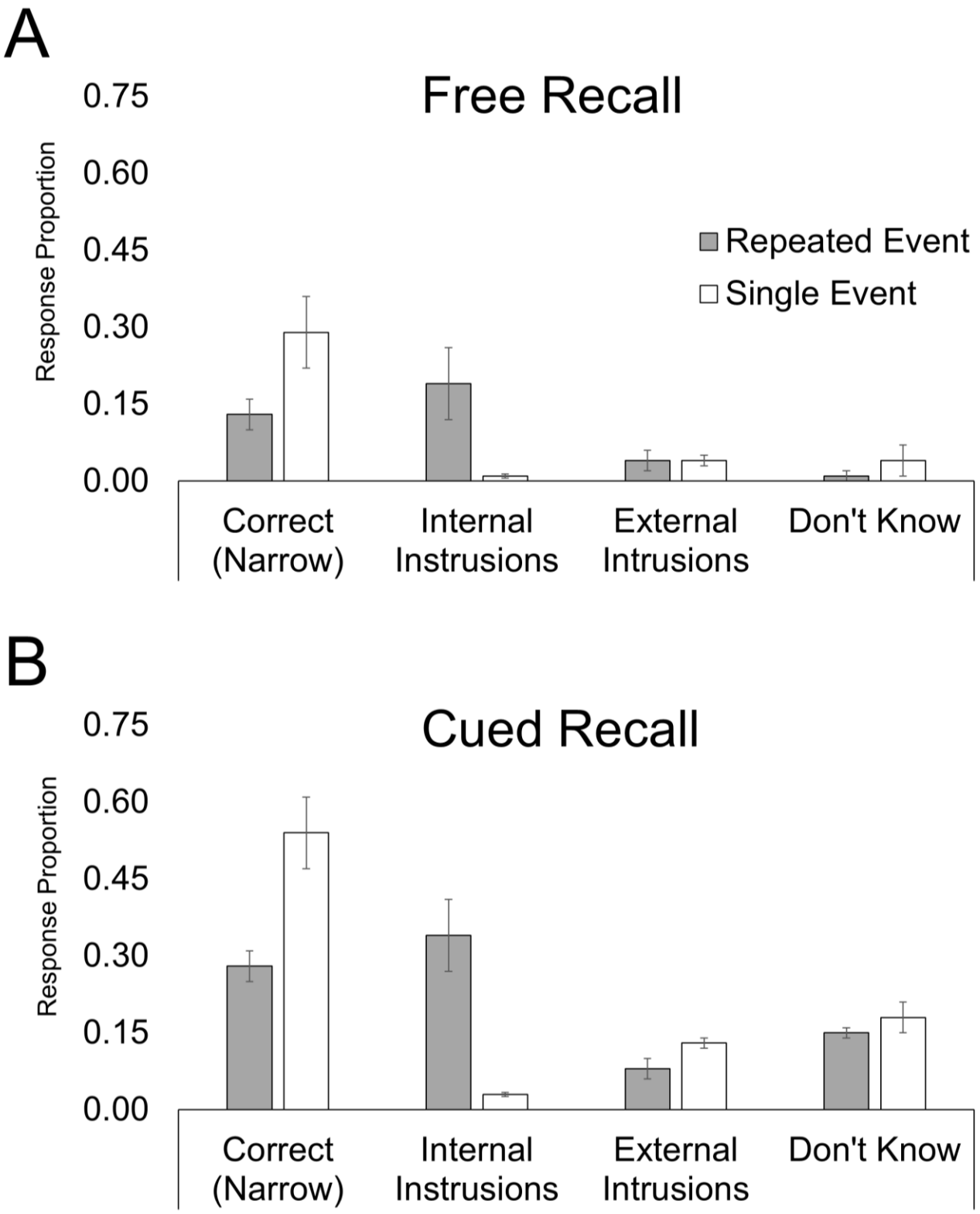

Figure 9. Profiles of repeated-event (RE) and single-event (SE) children's responses in free and cued recall (Panels A and B, respectively). Data are unweighted means from experimental comparisons between RE and SE. Error bars are standard errors.