

Factors Related to the Accuracy of Self-Reported Dietary Intake of Children Aged 6 to 12 Years Elicited with Interviews: A Systematic Review



Stefanie J. Sharman, PhD; Helen Skouteris, PhD; Martine B. Powell, PhD; Brittany Watson

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ABSTRACT

Background Understanding the relationship between children's dietary consumption and health is important. As such, it is crucial to explore factors related to the accuracy of children's reports of what they consumed.

Objective The objective was to evaluate factors related to the accuracy of self-reported dietary intake information elicited by interview methods from children aged 6 to 12 years.

Methods A systematic review of English articles using PsycINFO, PsycARTICLES, PsycEXTRA, PsycBOOKS, CINAHL Complete, Global Health, and MEDLINE Complete was performed. Search terms included *interview*, *diet*, *children*, and *recall*; studies were limited to those published from 1970 onward. Additional studies were identified using the reference lists of published articles. Studies that assessed children's dietary intake using direct observation, doubly labeled water, or the double-portion method and compared it with their recall of that intake (unassisted by parents) using an interview were included.

Results The 45 studies that met the inclusion criteria showed that specific interview techniques designed to enhance children's recall accuracy had little effect. Rather, the timing of the interview appeared most important: The shorter the retention interval between children's consumption and their recall, the more accurate their memories. Children's age, body mass index, social desirability, food preferences, and cognitive ability were also related to accuracy.

Conclusions Factors related to the accuracy of children's dietary reporting should be taken into consideration when asking about consumption. Further research is required to examine whether other interview techniques, such as those developed to enhance children's recall of repeated staged events, can improve children's dietary reporting accuracy.

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EXAMINING CHILDREN'S DIETARY INTAKE IS ESSENTIAL to understanding its relationship with health, including the adverse effects of childhood obesity.^{1,2} Investigating dietary intake also provides a method of evaluating the effects of dietary intervention programs, such as those designed to improve dietary intake in school-aged children over a 3-year period³ or to assess whether gluten- and casein-free diets improve core symptoms in children with autism spectrum disorders.⁴ Dietary interviews are one method used to examine dietary intake; clinicians and researchers rely on them to gather information about children's diet because they are time-efficient and relatively inexpensive.⁵ These interviews rely on children's memories of their intake during a particular time period (eg, 24-hour recalls conducted using computer-based software applications such as the Nutrition Data System for Research [University of Minnesota Nutrition Coordinating Center]). Thus, children may accurately recall foods that match what they consumed (ie, matches); they

may fail to report foods that they consumed (ie, omissions); or they may inaccurately report foods that they did not consume (ie, intrusions). Recalling dietary intake can be difficult because children may not encode the foods into their memories (eg, if they are not paying attention to what they are eating) or they may not retain memories of what they consumed (eg, due to forgetting over time; see Baranowski and Domel,⁵ for a description of the encoding, storage, and retrieval of dietary information).

Remembering what was consumed during a specific meal is particularly difficult because eating typically occurs on at least three occasions daily (breakfast, lunch, and dinner). These occasions are then repeated on a daily basis. Because eating events are repeated over time, specific memories about what was consumed during a particular meal become part of a network of generic dietary information.⁶ Although children are asked to recall specific memories about target meals, what they report may be a compromise between their specific memories and their general knowledge about their

diet.⁶ Thus, they may omit items that they consumed but were not part of their generic dietary network or they may intrude other items that were not consumed but were part of their dietary network.

When asking children to remember what they consumed, the questions asked influence the accuracy and completeness of their responses (see the research examining interviewing children about repeated staged events⁷⁻⁹)*. For example, children provide more accurate and detailed information in response to open questions (that encourage a descriptive answer; for example, “Tell me about the [item]”) than to closed questions (that encourage a specific one- or two-word answer; for example, “Was the [item] red?”).¹⁰⁻¹² The influence of question type has been investigated in research examining children’s dietary recall; for example, children provided with open-format prompts (to report what they had consumed starting with the first item that they ate or drank) had a lower intrusion rate than those provided with meal-format prompts (to report what they had consumed starting with breakfast).¹³

The aim of our systematic review was to examine factors related to the accuracy of children’s dietary recall. More specifically, it was to examine the accuracy of reports of dietary intake by children aged 6 to 12 years gathered using existing interview methods and the factors that were related to this accuracy, including interview conditions, interview techniques, environment-related factors, and child variables. Although the child variables (and some environment factors) were not experimentally manipulated, they were included because they demonstrated some statistically significant group differences, either alone or in combination with experimentally manipulated variables.

If the reviewed interview techniques increased the accuracy of children’s dietary recall, they may be incorporated into clinicians and researchers’ questions when asking children about what they consumed. In turn, improved accuracy of recall data would enable researchers to better evaluate the effect of dietary interventions, such as those that encourage children to eat more fruit and vegetables, in an effort to reduce childhood obesity.¹⁴

METHOD

No protocol for this review has been published. This review was informed by the preferred reporting items for systematic reviews and meta-analyses guidelines.¹⁵

Eligibility Criteria

Participants were children aged 6 to 12 years who participated in studies that measured dietary intake using gold-standard methods and were later interviewed about their intake. Gold-standard methods included observation, double portions, and doubly labeled water. Observations were made

**It should be noted that the research examining children’s memories for repeated events contains many differences to the research examining children’s memories for dietary intake. The main difference is that in the former, investigators have complete control over the event(s) that the children experience; in the latter, investigators have no control because children’s meals are typically provided by the school or their parents.*

by trained observers who recorded children’s consumption by taking notes¹⁶⁻²⁰ or taking photographs.²¹ In the double-portion method, children’s meals were duplicated; any leftovers were weighed to determine exactly how much of each food was consumed.^{22,23} In the doubly labeled water method, energy intake was estimated through examining the urine of children after they had consumed the water.²⁴

Studies needed to assess the accuracy of children’s dietary recall by examining the correspondence between the observed and recalled items (reported as a match rate [percentage] or as a correlation), the omission rate (percentage of items that the children were observed to have eaten, yet did not recall), and/or the intrusion rate (the percentage of items that children recalled as being consumed, but were not observed). No attempt was made to contact authors regarding unpublished articles or results because the focus of our review was published articles.

Information Sources

Studies were identified through electronic database searches and reference lists of articles. Studies were limited to those published in English from 1970 onward. This search was applied to PsycINFO, PsycARTICLES, PsycEXTRA, PsycBOOKS, CINAHL Complete, Global Health, MEDLINE Complete, Health Source-Consumer Edition, and Health Source: Nursing/Academic Edition. The last search was run on November 5, 2014.

Search

The following search terms were used in all databases: *interview, diet, children, school, breakfast, lunch, and recall*. Limiters were age group (6 to 12 years) and language (English). See [Figure 1](#) for an example search strategy.

Study Selection

Two reviewers independently performed the eligibility assessment; disagreements were resolved through discussion. The articles identified from the database search were screened for suitability via their titles and abstracts. First-level screening excluded articles if they did not include children aged 6 to 12 years; did not focus on recall accuracy established using interviews; if parents or caregivers assisted children; or if they did not assess dietary intake using direct observation, doubly labeled water, or the double-portion method. Second-level screening was completed if eligibility could not be determined on the basis of title and abstract, with studies read in full to deem whether they fit the criteria. The references lists of these articles were used to find other articles, which were also screened.

Data Collection Process. Data were extracted independently by two authors of this review; disagreements were resolved through discussion. To avoid double counting data from multiple reports of the same studies, studies that re-analyzed previously published data that answered the same research questions were not included in the review.²⁵⁻²⁸ There were a number of articles that described secondary analyses conducted on previously collected datasets; these were included because they answered new research questions²⁹⁻⁴² (these studies are indicated in the [Table](#)).

Studies that determined the effect of data collection methods (eg, in-person vs telephone interviews⁴³) were

Example Search Strategy using MEDLINE^a

1. diet\$^b.mp.^c
2. recall.mp.
3. interview.mp.
4. school.mp.
5. breakfast.mp. OR lunch.mp.
6. 1 and 2 and 3
7. limit 6 to Age (Child 6-12 years)
8. limit 7 to Date of publication (Jan 1970-Dec 2014)
9. 3 and 4 and 5
10. 8 and 9
11. limit 10 to Language (English)

^aAppropriate search terms used for other databases.

^b\$=any character.

^cmp.=multipurpose search; includes Title, Original Title, Abstract, Subject Heading, Name of Substance, and Registry Word fields.

Figure 1. MEDLINE search strategy for the systematic review examining factors related to the accuracy of self-reported dietary intake information of children aged 6 to 12 years elicited using interview methods.

included in the review along with those that also reported the results of other variables (eg, retention interval).^{39,44} Studies that did not report the effects of manipulations or the relationship of participant characteristics to recall accuracy were excluded.²²

Data Items

The items extracted from each study were the aim, characteristics of participants (eg, age, sex, and race/ethnicity), measures at consumption and recall, method, and results.

Risk of Bias

Within individual studies, risk of bias was examined using the Cochrane risk of bias tool.⁴⁵ No studies were excluded as a result of this assessment. Across studies, publication bias was not considered to have a large effect because all studies reported accuracy even when the manipulated factors of interest did not have a significant effect (eg, interview number,³³ location,⁴⁰ retention interval,⁴⁶ interview topic,⁴⁷ prompt type,⁴⁸ or food records⁴⁹).

RESULTS

Study Selection

Database searches returned 462 records, which were reduced to 427 after removing duplicates (see [Figure 2](#)). An additional 382 records were removed after reviewing the titles and abstracts. The full text of the remaining 45 articles was read in entirety to determine eligibility. The references lists of these articles yielded another 12 articles that were also read in their entirety. Of these 57 articles, 14 were excluded because they did not meet the inclusion criteria. The remaining 43 articles (containing 45 studies; two articles reported the results of two studies each^{30,32}) were read by all authors and deemed to be eligible for inclusion.

Summary of Included Studies

Details of the included articles' authors, aim, participants, dietary assessment, method, and results are summarized in the [Table](#).

Study Characteristics

Articles were published between 1973 and 2014.⁵⁰ All but three studies were conducted in the United States. Of those three, one was conducted in Denmark,²¹ one in Sweden,⁵¹ and one in the United Kingdom.⁵² Within the United States, 30 articles (describing 32 studies; two articles each described two studies^{30,32}) involved the same research team. This team investigated the influence of investigator-controlled manipulations on dietary reporting performance along with group differences (eg, sex and race/ethnicity) on accuracy. They also published articles describing secondary analyses on datasets that were collected previously; 14 articles (describing 16 studies) described the results of secondary analyses.

Across all studies, sample sizes ranged from 23¹³ to 625⁴⁹; 26 of the 45 studies had sample sizes >100 participants. Thirty-four studies (76%) focused solely on children aged 9 to 10 years (although these studies used data collected from 20 sets of children aged 9 to 10 years because some studies contained secondary analyses); two others compared 9- to 10-year-olds with other age groups (ages 6 to 7 years¹⁸ and 6 to 7, 7 to 8, and 8 to 9 years⁵³). Three other studies compared different age groups (5 to 6 vs 6 to 7 years⁵² and 8 to 9 vs 10 to 11 years^{47,50}). The remaining six studies examined age groups other than 9- to 10-year-olds: ages 6 to 8 years,⁵¹ 7 to 12 years,⁵⁴ 8 to 9 years,⁵⁵ 8 to 11 years,²³ 10 to 11 years,²¹ and 10 to 12 years.⁵⁶ Most studies contained equal numbers of boys and girls.

Establishing what Children Consumed

Children's consumption was established through direct observation or the double portion technique as no studies using doubly labeled water met the criteria. All but two

Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2003 ¹³ United States	To examine whether open vs meal prompts affect accuracy	23 Fourth-grade children (aged 9-10 y; mean=NR ^a) 13 F ^b , 10 M ^c 15 AA ^d , 8 W ^e	Consumption: Observation of school breakfast and lunch Recall: Open vs meal format 24hrDR ^f interview	Children's recall was compared with their intake observed earlier on the same day. Interviews were open-format (starting with the first item that children ate or drank) or meal-format (starting with breakfast).	Intrusion rates lower (8%) for open-format than meal-format (29%) interviews ($P=0.036$); number of inaccurate servings also lower for open-format (3.2) than meal-format (5.6) interviews ($P=0.050$). There was no difference in omission rates between open-format (34%) and meal format (35%) interviews ($P=0.910$).
Harrington and colleagues, 2009 ¹⁴ United States	To examine whether assignment to treatment group, or BMI ^g are related to accuracy	379 Fourth-grade children (aged 9-10 y, mean=10.1 y) 188 F, 191 M 150 AA, 217 W, 12 other	Consumption: Observation of school lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake of fruits and vegetables observed the previous day. Children's heights and weights were measured to calculate BMI.	Treatment assignment had no effect on accuracy for fruit ($P=0.489$) or vegetables ($P=0.272$). Higher BMI associated with higher fruit accuracy ($P=0.036$). No significant group differences for sex ($P>0.05$) or race ($P>0.05$)

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 1997 ¹⁶ United States	To examine whether retention interval affects accuracy	260 Fourth-grade children (aged 9-10 y; mean=NR); 98 AAF, 29 WF, 103 AAM, 30 WM	Consumption: Observation of school lunch Recall: 4-Phase interview: free report, cognitive aspects of free report, prompted report, and cognitive aspects of prompted report	Children's recall was compared with their intake observed 90 min earlier, the previous day, or 3 d earlier (interviewed on Monday following Friday's observation)	Intrusion rate increased with interval (same day: 5%, next day: 13%, Monday: 48%; $P<0.05$ for all). Omission rate also increased with interval (same day: 16%, next day: 32%, Monday: 62%; $P<0.05$ for all). No group differences for sex ($P>0.05$) or race ($P>0.05$).
Baxter and colleagues, 1998 ¹⁷ United States	To examine whether children's retrieval strategies were related to their recall accuracy	148 Fourth-grade students (aged 9-10 y; mean=NR); 54 AAF, 16 WF, 61 AAM, 17 WM	Consumption: Observation of school lunch Recall: 4-Phase interview	Children's recall was compared with their intake observed the previous day. How children retrieved each item was matched to 16 categories (eg, remember having some left over, remember because it was usual practice).	Overall, 11% of students had completely accurate recalls; all others had at least 1 intrusion or omission error. Three out of 16 retrieval categories had match rates $>90\%$; 10 had match rates from 80%-89%, and 3 had match rates from 75%-79%. Most common retrieval category was "usual practice."

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2000 ¹⁸ United States	To examine whether prompt method affects accuracy	96 First-grade (aged 6-7 y; mean=7.2 y) and fourth-grade children (aged 9-10 y; mean=10.1 y) Sex and race were stratified	Consumption: Observation of school lunch Recall: Free recall interview	Children's recall was compared with their intake observed the previous day. Interviews had 3 phases; free recall, nonsuggested prompted recall, and specific prompted recall (using preference prompts, food category prompts, or visual prompts).	Before specific prompting, first-graders' recall was less accurate than fourth-graders' recall ($P=0.01$). Of the 48 first-graders, 9 became more accurate and 21 became less accurate after specific prompting. Of the 49 fourth-graders, 12 became more accurate and 7 became less accurate after specific prompting. For both grades, there was no significant difference between the 3 specific prompt types ($P>0.05$ for all).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2002 ¹⁹ United States	To examine whether multiple observations and interviews affect accuracy	104 Fourth-grade children (9-10 years; mean=NR); 27 AAF, 28 WF, 24 AAM, 25 WM	Consumption: Observation of school breakfast and lunch. Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the previous day. Some children observed and interviewed once, some observed and interviewed twice, and some 3 times (≥ 25 d between observations).	Across all observations there was an omission rate of 51% and an intrusion rate of 39%. Mean number of inaccurate servings=7.1. Children's total inaccuracy decreased from the first to the third set of observations and interviews ($P=0.006$), but their overall consistency was low.
Baxter and colleagues, 2003 ²⁰ United States	To examine whether recall order affects accuracy	121 Fourth-grade children (aged 9-10 y; mean=10.2 \pm 0.6 y); 29 AAF, 29 WF, 31 AAM, 32 WM	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the previous day. Children were interviewed twice, once using forward-order prompting and once using reverse-order prompting, with 4 wk between interviews.	Boys had a higher omission rate during forward prompting (62%) than reverse prompting (53%), whereas girls had a higher omission rate during reverse prompting (61%) than forward prompting (53%) (interaction $P<0.008$)

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Lyng and colleagues, 2013 ²¹ Denmark	To examine dietary recall accuracy for packed lunch	114 Fifth-grade children (aged 10-11 y; mean=11.1±0.01 y) 65 F, 49 M	Consumption: Observation and photographs of packed school lunches Recall: Multiple-pass 24hrDR interview	Children's recall of their packed lunches was compared with their intake observed 90 min earlier	Interview data revealed significantly different match rates for girls (90%) and boys (84%) ($P=0.04$). Intrusion rates were lower for girls (15%) than boys (23%) ($P=0.05$).
Todd and Kretsch, 1986 ²³ United States	To examine recent immigrant and refugee children's dietary recall accuracy	102 children aged 8-11 y (mean=NR); 50% F, 50% M 30 Chinese, 31 Hispanic, 22 Filipino, 19 Cambodian	Consumption: Double portion technique (weighing food portions and leftovers) and observation for school breakfast and lunch Recall: Standard 24hrDR interview	Children's recall was compared with their intake observed the previous day. Interviews were conducted in the children's native language.	Chinese and Hispanic children overreported foods that had low consumption and underreported foods that had higher consumption. Filipino and Cambodian children did not show this pattern. No group differences for sex or age (P values >0.01).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 1999 ²⁹ United States	To examine whether meal salience and liking are related to accuracy	237 Fourth-grade children (aged 9-10 y, mean=NR); 89 AAF, 28 WF, 90 AAM, 30 WM (Secondary analysis of data ^{16,48,61}) ^h	Consumption: Observation of school lunch Recall: 4-Phase interview	Children's recall was compared with their intake observed the same day (within 90 min of observation) or the previous day. After the interview, children rated how much they liked each item.	Main courses were reported earlier in the interviews than expected by chance (compared with other meal components, such as condiments) ($P<0.001$). Foods liked "a lot" had higher match rates than foods "not liked a lot" in next-day interviews ($P<0.005$ for all).
Baxter and Thompson, 2002 ³⁰ United States	To examine whether asking children about 1 meal vs all meals affects accuracy	Study 1: 148 Fourth-grade children (aged 9-10 y; mean=NR); 54 AAF, 16 WF, 61 AAM, 17 WM Study 2: 104 Fourth-grade children (aged 9-10 y; mean=NR); 27 AAF, 28 WF, 24 AAM, 25 WM (Secondary analysis of data ^{16,19})	Consumption: Observation of school lunch Recall: 4-Phase interview	Children's recall was compared with their intake observed the previous day. In Study 1, children were asked to recall a single meal (lunch). In Study 2, children were asked to recall their lunch consumption as part of the larger 24hrDR interview.	For the single meal recall, omission rate (37%) and intrusion rate (15%) were much lower than for the 24-h recall (omission rate 55%, intrusion rate 34%) (no P values reported because analysis was retrospective comparison between 2 studies)

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2006 ³¹ United States	To examine whether BMI and sex are related to accuracy.	79 Fourth-grade children (aged 9-10 y; mean=NR); 20 AAF, 20 WF, 19 AAM, 20 WM (Secondary analysis of data ¹⁹)	Consumption: Observation of school breakfast and lunch on 3 separate days Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the previous day. They were observed and interviewed on 3 separate occasions (≥ 25 d between observations). Children's weight and height were measured.	Accuracy changed across the 3 trials according to BMI category (omission rate $P=0.028$; intrusion rate $P=0.083$). For healthy-weight children, accuracy improved over trials. For at-risk-of-overweight children, accuracy improved then stabilized. For overweight children, accuracy decreased then stabilized. Overall, boys were more inaccurate than girls ($P=0.049$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues 2007 ³² United States	To examine whether the number of interviews (Study 1) and recall order (Study 2) affect accuracy	Study 1: 104 Fourth-grade children (aged 9-10 y; mean=NR); 27 AAF, 28 WF, 24 AAM, 25 WM Study 2: 121 Fourth-grade children (aged 9-10 y; mean=NR); 29 AAF, 29 WF, 31 AAM, 32 WM (Secondary analysis of data ^{19,20})	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview.	Children's recall was compared with their intake observed the previous day. Study 1: Children interviewed once, twice, or 3 times (≥ 25 d between interviews). Study 2: All children interviewed twice, once by forward order (morning-to-evening) and once by reverse order (evening to morning) (≥ 29 d between interviews).	In Study 1, omission and intrusion rates were higher for breakfast than lunch (both $P < 0.006$). Children's reporting accuracy improved across interviews ($P = 0.026$). In Study 2, omission and intrusion rates were higher for breakfast than for lunch (both $P < 0.002$). Boys were more accurate when given reverse-order prompts; girls were more accurate when given forward-order prompts (interaction $P = 0.008$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2008 ³³ United States	To examine whether food availability is related to accuracy, and how consistent children's recall is over time	104 Fourth-grade children (aged 9-10 y; mean=10.2±0.5 y) 27 AAF, 28 WF, 24 AAM, 25 WM (Secondary analysis of data ¹⁹)	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the previous day. They were observed and interviewed once, observed and interviewed twice, or observed and interviewed 3 times.	Children had a higher intrusion rate for breakfast than lunch ($P<0.001$). For lunch, intrusion rate was related to food availability ($P=0.031$); for example, if apples available the day before the interview, they were more likely to intrude on children's recall than if they were available 2 or 3 d before the interview. No influence of interview number on recall (breakfast $P>0.206$, lunch $P>0.122$). No significant group differences for sex ($P>0.05$) or race ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2008 ³⁴ United States	To examine whether the availability of different foods is related to intrusions	121 Fourth-grade children (aged 9-10 y; mean=10.2±0.6) 29 AAF, 29 WF, 31 AAM, 32 WM (Secondary analysis of data ²⁰)	Consumption: Observation of school breakfast and lunch on 2 separate occasions (apart by at least 29 d) Recall: Multiple-pass 24hrDR interview conducted after breakfast on the day following observation	Children's recall was compared with their intake observed the previous day. They were observed and interviewed twice. In 1 interview, children were given forward-order (morning to evening) prompts; in the other they were given reverse-order prompts (evening to morning).	For lunch, intrusion rate was related to the availability of foods provided by the foodservice ($P=0.006$). For breakfast, intrusion rate was not related to food availability ($P=0.390$). No effect of prompt type (forward or reverse order; $P>0.05$) or interview number (first or second; $P>0.05$) on accuracy. No significant group differences for sex ($P>0.05$) or race ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2008 ³⁵ United States	To examine whether retention interval and children's food preferences are related to accuracy	286 Fourth-grade children (aged 9-10 y; mean=NR) (Secondary analysis of data ^{19,20,43})	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the same day or the previous day. They were interviewed using forward-order or reverse-order prompts. After the interview, they rated how much they had liked each item.	As the interval between observation and interview increased, so did the intrusion rate ($P=0.0102$). Liking ratings were highest for correctly recalled foods ($P<0.001$).
Baxter and colleagues, 2009 ³⁶ United States	To examine whether retention interval affects intrusions	60 Fourth-grade children (aged 9-10 y; mean=NR) 50% F, 50% M, 70% AA, 27% W, 3% other (Secondary analysis of data ⁵⁹)	Consumption: Observations of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the previous day (midnight to midnight) or the prior 24 h. They were interviewed in the morning, afternoon or evening.	As the interval between observation and interview increased, so did the intrusion rate (breakfast $P=0.0231$; lunch $P=0.0033$). Intrusions were more likely to be stretches than confabulations ($P=0.032$). No group differences for sex ($P>0.05$) or race ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Guinn and colleagues, 2008 ³⁷ United States	To examine whether BMI, sex, race, interval, and social desirability are related to intrusions	40 Fourth-grade children (aged 9-10 y; mean=NR) 50% F, 50% M 75% AA (Secondary analysis of data ⁴⁶)	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the same day (within 90 min of observation) or the previous day. Their height and weight were measured. Children also completed a social desirability scale.	Many interactions found. High-BMI girls had lowest intrusion rate (interaction $P=0.002$). For breakfast, AA children had lower intrusion rate than W children ($P=0.001$). For lunch, as social desirability increased, intrusions were more likely to be from the foods available but not actually on children's trays ($P=0.014$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Smith and colleagues, 2008 ³⁸ United States	To examine whether food availability is related to intrusions	69 Fourth-grade children (aged 9-10 y; mean=10.2±0.6 y) Approximately equal numbers of AAF, WF, AAM, WM (Secondary analysis of data ⁴³)	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake observed the same day. Interviews were conducted in person or by telephone.	Food availability influenced intrusion rate ($P=0.006$); intrusion rate higher for food items available the day immediately before or after observation, then lower for increasing number of days away from observation day. Neither sex nor race predicted intrusions (both P values >0.3).
Baxter and colleagues, 2009 ³⁹ United States	To examine whether observation affects accuracy	374 Fourth-grade children (aged 9-10 y; mean=10.1±0.8 y) 50% F, 50% M 96% AA (Secondary analysis of data ⁵⁷ and new data)	Consumption: Half the children had school breakfast and lunch observed Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the previous day or the prior 24 h. Interviews were conducted in the morning, afternoon, or evening.	Observation had no significant effect on children's recall accuracy ($P<0.0083$ for all naïve equivalence tests examining the null hypothesis that the groups were different)

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2009 ⁴⁰ United States	To examine whether retention interval and location affect accuracy	374 Fourth-grade children (aged 9-10 y; mean=10.0±0.9 y); 50% F, 50% M 96% AA (Secondary analysis of data ⁵⁷)	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the previous day or the prior 24 h. Interviews were conducted in the morning, afternoon, or evening. Children ate breakfast in the classroom or cafeteria.	Accuracy was best for shortest retention intervals; it decreased as retention interval increased ($P<0.0003$ for all). No significant effect of location ($P>0.05$); no significant group differences for sex ($P>0.05$).
Guinn and colleagues, 2010 ⁴¹ United States	To examine whether BMI, interval, and social desirability are related to accuracy	479 Fourth-grade children (aged 9-10 y; mean=NR) 238 F, 241 M (Secondary analysis of data ^{39,57})	Consumption: Two-thirds of children had school breakfast and lunch observed Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the previous day or the prior 24 h. Interviews were conducted in the morning, afternoon, or evening. Children's social desirability measured along with their heights and weights.	No effect of observation on accuracy. As social desirability increased, accuracy decreased (children reported consuming less energy than they had actually consumed; $P=0.030$). As BMI increased, accuracy increased (lower inflation ratio; $P<0.001$). No significant group differences for sex ($P>0.05$) or race ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Smith and colleagues, 2011 ⁴² United States	To examine whether cognitive ability is related to accuracy	325 Fourth-grade children (9-10 years; mean=10.0±0.9 y) 164 F, 161 M, 312 AA (Secondary analysis of data ⁵⁷)	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the previous day or the prior 24 h. Interviews were conducted in the morning, afternoon, or evening. Children completed an achievement test covering 4 areas: language arts, mathematics, science, and social studies.	As children's cognitive ability scores increased, their intrusion and omission rates decreased (intrusion $P=0.001$, omission $P<0.001$). This relationship was stronger for girls than for boys (intrusion $P=0.01$, omission $P=0.001$).
Baxter and colleagues, 2003 ⁴³ United States	To examine whether in-person vs telephone interviews affect accuracy	69 Fourth-grade children (aged 9-10 y; mean=NR); 19 AAF, 16 WF, 18 AAM, 16 WM	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the same day. Interviews were conducted in-person interview or by telephone.	No differences between in-person and telephone interviews for omission rates (in-person: 34%, telephone: 32%) and total inaccuracy (in-person: 4.6 servings, telephone: 4.3 servings) ($P>0.096$ for all).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Smith and colleagues, 2007 ⁴⁴ United States	To examine whether observation affects accuracy	120 Fourth-grade children (aged 9-10 y; mean=NR); 45 AAF, 13 WF, 2 other F, 39 AAM, 18 WM, 3 other M	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Half of children had meals observed. Children's recall was compared with their intake the previous day or the prior 24 h. Interviews were conducted in the morning, afternoon, or evening.	No significant effect of observation on children's dietary reports ($P>0.6$ for all). Children who reported about the prior 24 h were more accurate than those who reported about the previous day ($P<0.005$).
Baxter and colleagues, 2006 ⁴⁶ United States	To examine whether BMI, sex, and retention interval are related to accuracy	40 Fourth-grade children (aged 9-10 y; mean=NR) 20 high BMI, 20 low BMI, 30 AA, 10 W, 20 F, 20 M	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the same day or the previous day	High-BMI children had higher kilocalorie omission rate than low-BMI children ($P<0.05$). High-BMI girls had a lower kilocalorie intrusion rate than high-BMI boys; low-BMI girls had a higher kilocalorie intrusion rate than low-BMI boys (interaction $P<0.04$). No significant effect of retention interval on accuracy ($P<0.11$ for all); no significant group differences for sex ($P>0.05$) or race ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues 2013 ⁴⁷ United States	To examine whether interviewing children about diet alone vs diet and physical activity affects accuracy	32 Third-grade (aged 8-9 y; mean=NR) and fifth-grade children (aged 10-11 y; mean=NR); 50% F, 50% M	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the same day or the previous day. Interviews focused on diet only or diet and physical activity simultaneously.	Interview focus had no effect on accuracy ($P>0.48$). Compared with same-day interviews (omission rate 28%, intrusion rate 20%), next-day interviews had a higher omission rate (54%) and intrusion rate (45%) ($P=0.05$). No significant group differences for age ($P>0.27$) or sex ($P=0.68$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 1994 ⁴⁸ United States	To examine whether verbalizing retrieval strategies affects accuracy	24 Fourth-grade children (aged 9-10 y; mean=NR); 7 AAF, 5 WF, 6 AAM, 6 WM	Consumption: Observation of school lunch Recall: Integrated or nonintegrated interview	Children's recall was compared with their intake within 90 min of meal. In integrated interviews, children described how they remembered consuming each item as they reported it. In nonintegrated interviews, children recalled all consumed items first, before describing how they had remembered each item.	There was no difference in the omission rates between integrated (31%) and nonintegrated (23%) interviews ($P>0.05$). There was also no difference in intrusion rates (both 8%; $P>0.05$). Children in the nonintegrated condition had a lower omission rate for condiments than those in the integrated condition ($P<0.05$). They were also more accurate in their responses to the prompts than those in the integrated condition ($P<0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Lytle and colleagues, 1998 ⁴⁹ United States	To examine whether using nonquantifiable food records affects accuracy	625 Fourth-grade children (aged 9-10 y; mean=NR); 51% F, 49% M, 15% AA, 52% W, 30% Asian, 3% other	Consumption: Observation of school lunch Recall: Multiple-pass 24hrDR interview. Food records used to record the food and drinks consumed.	Children's recall was compared with their intake the previous day. Half of students used food records to record their intake 24 h before recall. They were able to use these records during the interview.	There was no difference in recall accuracy between children who kept food records and those who did not ($P>0.274$ for all)

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2014 ⁵⁰ United States	To examine whether interviewing children about diet and/or physical activity, and interval, affect accuracy	144 Third-grade (aged 8-9 y) and fifth-grade (aged 10-11 y) children; 50% F, 50% M, 66% AA, 13% W, 12% Hispanic, 9% other	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the same day or the previous day. Interviews focused on diet only, physical activity only, or diet and physical activity.	Interview content interacted with retention interval and grade on intrusion rate ($P=0.0004$). For third-graders, intrusion rate was lower when they were interviewed about diet and physical activity than diet only for previous-day recalls than same-day recalls. For fifth-graders, intrusion rate was lower when they were interviewed about diet only than diet and activity for previous-day recalls than same-day recalls.

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Hunsberger and colleagues, 2013 ⁵¹ Sweden	To examine children's dietary recall accuracy	25 Children aged 6-8 y (mean=6.6 y, standard deviation=NR); 13 F, 12 M	Consumption: Observation of school lunch and duplicate plate method Recall: Computer-assisted 24hrDR interview	Children's recall was compared with their intake the previous day. Observers duplicated children's plates of food and then observed dropped, spilled, or exchanged items. Leftovers were weighed.	Children's recall was accurate: There was no difference between weighed and reported consumption (correlation $r=0.92$; $P<0.001$)
Warren and colleagues, 2003 ⁵² United Kingdom	To examine children's dietary recall accuracy	203 First-grade (aged 5-6 y; mean=NR) and second-grade children (aged 6-7 y; mean=NR) 100 F, 103 M	Consumption: Observation of school lunch or packed lunch Recall: Free recall interview with prompts	Children's recall was compared with their lunch intake during the previous 2 h. Interview consisted of free recall followed by nondirective prompts (eg, "Is that everything?" or "Did you eat anything else?")	Recall more accurate for children eating packed lunch (70% match rate) than school lunch (58% match rate) ($P<0.01$). Older children (aged 6-7 y) had more accurate recall than younger children (aged 5-6 y) ($P<0.01$). Compared with free recall, nondirective prompts increased foods accurately recalled from 66% to 80% ($P<0.001$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Emmons and Hayes, 1973 ⁵³ United States	To examine whether age is related to accuracy	36 First-grade (6-7 y; mean=NR), 42 second-grade (7-8 y), 39 third-grade (8-9 y), and 34 fourth-grade (9-10 y) children	Consumption: Observation of school lunch Recall: Standard 24hrDR interview	Children's recall was compared with their intake the previous day	The correlations between children's observed and recalled calorie consumption improved with age. For first-graders $r=0.36$ ($P<0.05$), for second-graders $r=0.23$ ($P>0.05$), for third-graders $r=0.49$ ($P<0.01$), and for fourth-graders $r=0.77$ ($P<0.01$).
Reynolds and colleagues, 1990 ⁵⁴ United States	To examine dietary recall accuracy in children with diabetes	75 Children (aged 7-12 y; mean=NR); 49% F, 51% M, 93% W	Consumption: Observations of meals on 3 d Recall: 24hrDR interview	Children's recall was compared with their intake the previous day	Children underestimated the number of meals and snacks they had consumed ($P<0.0001$). Children's age did not significantly predict their underestimation ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Weber and colleagues, 2004 ⁵⁵ United States	To examine dietary recall accuracy in American Indian children	80 Third-grade children (aged 8-9 y; mean=NR); 100% children from American Indian Nations	Consumption: Observation of school breakfast and lunch Recall: 24-h food records and multiple-pass 24hrDR interview	After training, children completed food records for 24 h. Children's recall was compared with their intake the same day (breakfast) and the previous day (lunch). Food records were used as memory aids during the interview.	There was no significant difference between observed and recalled energy for breakfast ($P=0.06$) or lunch ($P=0.41$)
Carter and colleagues, 1981 ⁵⁶ United States	To examine dietary recall accuracy in children with chronic diseases	28 children (aged 10-12 y; mean=NR)	Consumption: Observation of 3 meals on 1 d Recall: Standard 24hrDR interview	Children with diabetes, cystic fibrosis, and asthma had their recall compared with their intake the previous day	Sex and disease interacted such that F with cystic fibrosis, M with asthma, and F with diabetes overestimated their intake ($P<0.05$ for all). M with cystic fibrosis, F with asthma, and M with diabetes did not overestimate intake ($P>0.12$ for all).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baxter and colleagues, 2009 ⁵⁷ United States	To examine whether retention interval affects accuracy	374 Fourth-grade children (aged 9-10 y; mean=10.0±0.9 y); 50% F, 50% M, 96% AA	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared to their intake the previous day or the prior 24 h. Interviews were conducted in the morning, afternoon, or evening.	Children's omission rates, intrusion rates, and total inaccuracy were lower when asked about the prior 24 h than the previous day ($P<0.004$ for all). Furthermore, they were lower for prior-24-h recalls in the afternoon and evening than for previous-day recalls in the afternoon and evening ($P<0.004$ for all). No group differences for sex ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Baranowski and colleagues, 2002 ⁵⁸ United States	To examine whether a computer-based interview vs person-based interview affects accuracy	138 Fourth-grade children (aged 9-10 y; mean=9.6 y 55% F, 45% M, 30% AA, 34% W, 15% Hispanic, 21% other	Consumption: Observation of school lunch. Recall: FIRSSt: An interactive multimedia program that simulates a standard 24hrDR, and a standard 24hrDR interview	Children's recall was compared with their intake the previous day. They had a standard 24hrDR or a FIRSSt interview.	Compared with observation, there was a lower match rate for the FIRSSt (46%) than the standard interview (59%) ($P<0.01$). There was a higher intrusion rate for the FIRSSt (24%) than the standard interview (17%) ($P<0.05$). There was no difference in the omission rate the FIRSSt (30%) than the standard interview (24%) ($P>0.05$). No significant group differences for sex ($P>0.05$) or race ($P>0.05$).
Baxter and colleagues, 2004 ⁵⁹ United States	To examine whether retention interval affects accuracy	60 Fourth-grade children (aged 9-10 y; mean=NR); 50% F, 50% M, 70% AA, 27% W, 3% other	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview about previous day or prior 24 h	Children's recall was compared with their intake the previous day or the prior 24 h. Interviews were conducted in the morning, afternoon, or evening.	Children's omission rates, intrusion rates, and total inaccuracy were lower when asked about the prior 24 h than the previous day ($P<0.01$ for all). No group differences for sex ($P>0.05$).

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Lytle and colleagues, 1993 ⁶⁰ United States	To examine children's dietary recall accuracy	49 Third-grade children (aged 9-10 y; mean=NR); no other details provided	Consumption: Observation of school lunch and breakfast Recall: Food records and multiple-pass 24hrDR interview	Children's recall was compared with their intake the previous day. Children completed food records to use as memory aids during the interview.	No significant differences between observed and recalled nutrient intakes ($P>0.05$). Children correctly reported 78% of food consumed (69% for breakfast and 83% for lunch).
Baxter and colleagues, 1997 ⁶¹ United States	To study whether retrieval categories are related to accuracy	89 Fourth-grade students (aged 9-10 y; mean=NR); no other details provided	Consumption: Observation of school lunch Recall: 4-Phase interviews were conducted within 90 min of lunch	Children's recall was compared with their intake of lunch (up to 90 min previously). Recall was examined for retrieval categories generated by psychologists.	Overall, 40% of students had completely accurate recalls; others had at least 1 intrusion or omission error. Twelve out of 16 retrieval categories had match rates $>90\%$ (eg, order in which foods were consumed). Other 4 categories had match rates of 76%-89%.

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Table. Summary of studies examining factors related to the accuracy of self-reported dietary information of children aged 6 to 12 years elicited with interviews (continued)

Authors, year, and location	Aim	Participants	Measures	Method	Results
Crawford and colleagues, 1994 ⁶² United States	To examine whether the use of 24hrDR, 3-d food records or FFQ ^j affect accuracy	60 Fourth-grade children (aged 9-10 y; mean=NR); 100% F, 50% AA, 50% W	Consumption: Observation of school lunch Recall: Standard 24hrDR interviews, 3-d food records, and 5-d FFQs	1 Group of children had their recall compared with their intake from the previous day. A second group completed a 3-d food record and a third group completed a 5-d FFQ.	The 3-d food record had the lowest omission rate (25%), followed by the 24hrDR (30%), and the FFQ (46%) The 3-d food record had the lowest intrusion rate (10%), followed by the 24hrDR (33%) and the FFQ (40%).
Baxter and colleagues, 2008 ⁶³ United States	To examine intrusions in breakfast recall accuracy	337 Fourth-grade children (aged 9-10 y; mean=NR) Approx. 50% F; 57% AA (Secondary analysis of data ^{13,20,43,46,59})	Consumption: Observation of school breakfast and lunch Recall: Multiple-pass 24hrDR interview	Children's recall was compared with their intake the previous day. They had weight and height measurements taken.	Children had a lower intrusion rate when they correctly reported consuming a hot or cold breakfast option than if they incorrectly reported the hot or cold option ($P<0.001$). No significant group differences for sex, race, age, or BMI ($P>0.05$ for all).

^aNR=not reported.^bF=female.^cM=male.^dAA=African American.^eW=non-Hispanic white.^f24hrDR=24-hour dietary recall.^gBMI=body mass index.^hThe analyses were conducted on previously collected datasets.ⁱFFQ=food frequency questionnaire.^jFIRSt=Food Intake Recording Software System.

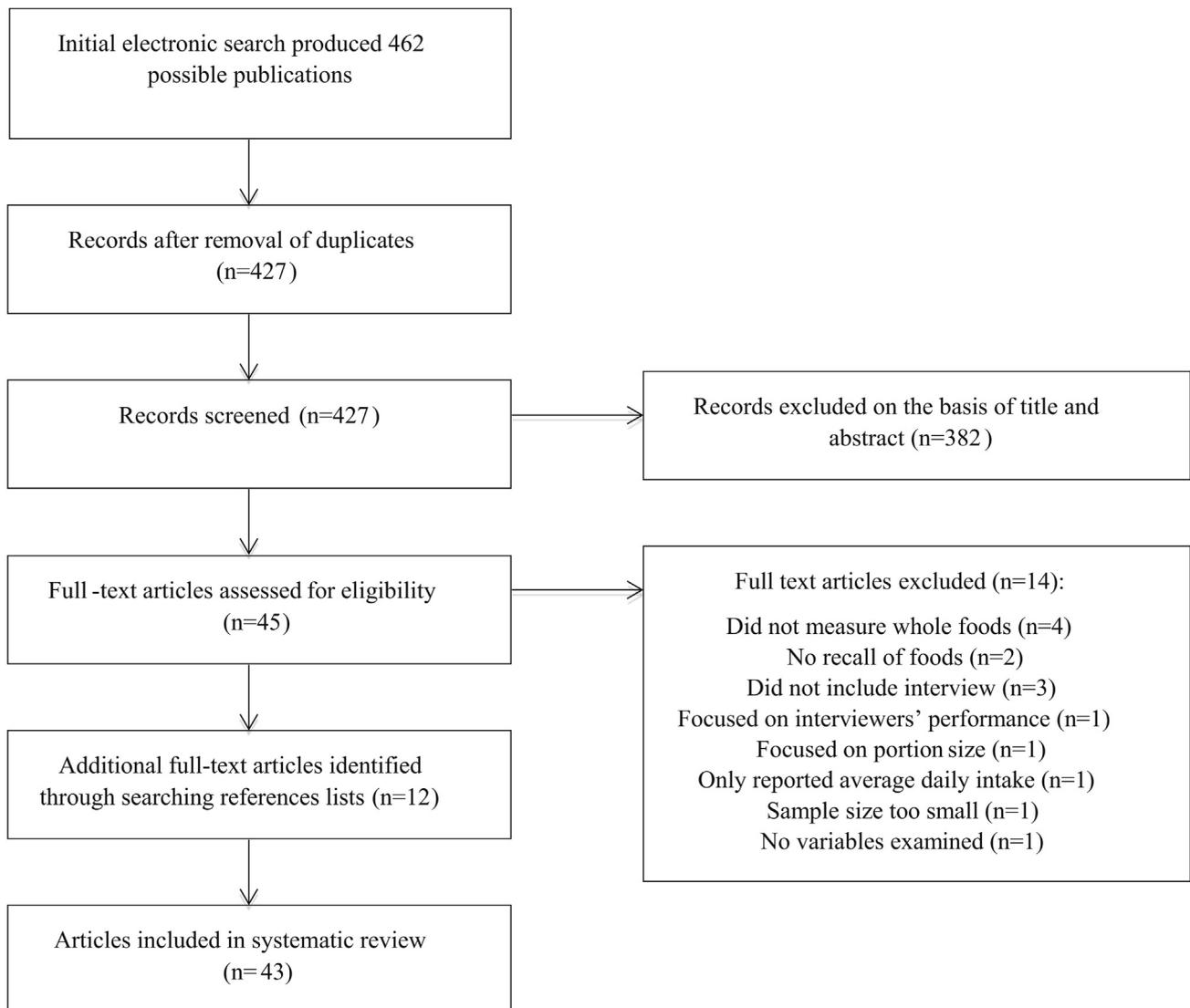


Figure 2. Flowchart and inclusion process for the systematic review examining factors related to the accuracy of self-reported dietary intake information of children aged 6 to 12 years elicited using interview methods.

studies^{23,51} relied on direct observations and recordings of school breakfasts and lunches by trained observers. In the other two, what children consumed was established using the double-portion technique.

Characteristics of the Dietary Intake Assessments

When interviewing children about their dietary intake, most studies (29 out of 45) used multiple-pass 24-hour dietary recall (24hrDR) interviews (see Figure 3 for details of each interview technique). Six studies used standard 24hrDR interviews, and three studies used free recall interviews with or without follow-up prompts. Others used different methods.

Researchers systematically manipulated retention intervals between meals and interviews to determine the effect on children's dietary recall; thus, retention intervals included interviews conducted immediately after the meal,⁴⁷ within 90 minutes of the meal,¹⁶ later the same day,^{40,57} the next day,^{40,57,58} or the Monday after a Friday meal.¹⁶ Other studies

compared recall of items consumed during the previous day (ie, midnight to midnight) to items consumed during the prior 24 hours (eg, the 24 hours before a 2 PM interview).^{39-42,57,59} Also, some interviews were about one target meal and others about all meals from the specified time period.³⁰

Interviews also varied in their delivery of prompts, with interviews involving forward-order and reverse-order prompting,^{20,30,32} and the use of visual prompting or food category prompting.^{18,60} Several studies also used prompts designed to tap into cognitive processes and memory to assist recall, most commonly delivering prompts to facilitate children's memories of their consumption.^{16,29,61}

Food records were used in four studies. Lytle and colleagues^{49,60} used food records in addition to 24hrDR interviews. Crawford and colleagues⁶² compared the accuracy of 24hrDRs with 3-day food records and food frequency questionnaires against direct observation. Finally, Weber and colleagues⁵⁵ used food records to help children's recall during

the 24hrDR interviews. Across the four studies, children kept the food records for different lengths of time, from 24 hours to 3 days.

Factors Related to Accuracy

The influence of interview conditions (eg, retention interval, number of observations and interviews, interview topic, and interview mode), interview techniques (eg, prompt type and memory aids), and environment-related factors (eg, food availability, type of lunch, and meal location) on recall accuracy was examined. Group differences for child variables (eg, age, sex, race/ethnicity, chronic disease, social desirability, body mass index [BMI], food preferences, cognitive ability, and children's reported retrieval strategies) were also examined. The order in which the variables were reviewed reflects the order of their predicted importance on children's recall accuracy.

Interview Conditions

Retention Interval. Overall, as the retention interval increased, children's recall accuracy decreased. In the first published study, children recalled what they had consumed the same day that lunch was observed, the next day, or the Monday after Friday's lunch.¹⁶ Match rates declined with increasing interval, whereas intrusion rates increased (P values <0.05). Similarly, studies in which children recalled what they had consumed the same day as the observation or the next day showed that accuracy decreased over time (P values <0.002 ³⁵ and $P=0.0014$ ⁵⁰).

In a series of studies, Baxter and colleagues^{36,37,39,40,44,46,47,57,59} asked children to recall what they had consumed the "previous day" (ie, from midnight to midnight) or the "prior 24-hours" (eg, if interviewed at 2 PM, the target period was from 2 PM the day before). When combined with interviews that took place in the morning, afternoon, or evening, there were six possible retention intervals. The accuracy of children's recall of two observed school meals—breakfast and lunch—was scored. Children interviewed about the prior 24 hours were more accurate about these meals than those interviewed about the previous day ($P=0.0231$ for breakfast; $P=0.0033$ for lunch,³⁶ $P=0.050$ for breakfast; $P=0.025$ for lunch,³⁷ P values <0.0032 ,³⁹ $P<0.005$,⁴⁴ $P=0.05$,⁴⁷ P values <0.0001 ,⁵⁷ and P values <0.01 ⁵⁹). Indeed, accuracy was best for shorter retention intervals (P values <0.01).⁴⁰ Although one study showed that retention interval had no significant effect on accuracy, the pattern of means was consistent with the means in the studies described above (P values <0.11).⁴⁶

Other studies have examined children's recall for breakfast and lunch; they demonstrated that accuracy was higher for lunch than for breakfast, because lunch was closer in time to the interview ($P<0.006$ ³² and $P=0.001$ ³³).

Number of Observations and Interviews. Repeating the number of observation periods and interviews yielded mixed findings. In one study, children were observed and interviewed on one, two, or three separate occasions.¹⁹ Although children's total inaccuracy decreased from the first to the third recall ($P=0.006$), the overall consistency of children's responses was low. In another study, using the same three observation and interview cycles, number of repetitions did

not affect accuracy ($P>0.206$ for breakfast; $P>0.122$ for lunch).³³

Interview Topic. Interview topic was examined in three studies. One study examined the effect of interviewing children about one meal vs all meals.³⁰ Children who were asked to recall only their lunch consumption were more accurate about this meal than those who were asked to recall all meals from the previous day (no P values were reported as the analysis compared data across two different studies).

Two studies examined whether interviewing children about diet in conjunction with physical activity (vs diet alone) might enhance their dietary recall.^{47,50} Accuracy was assessed using children's recall of two school meals (breakfast and lunch). One study showed that simultaneously asking about physical activity did not affect children's dietary recall accuracy ($P>0.48$).⁴⁷ The other study found complex interactions between interview topic, retention interval, and grade ($P=0.0004$).⁵⁰ Neither study recommended interviewing children about diet and physical activity simultaneously as a method to improve dietary recall accuracy.

Interview Mode. 24hrDRs typically involve a computer-assisted face-to-face interview. Two studies examined the effect of interview mode on children's recall accuracy. One investigated whether interviewing children about their consumption of school breakfast and school lunch via telephone affected their recall accuracy compared with face-to-face interviews.⁴³ Interview mode did not affect the accuracy of children's recall ($P>0.096$).

Another study examining interview mode determined the effectiveness of a computer program designed to mimic a multiple-pass interview method. Children's reports were less accurate in the computer procedure than in the face-to-face interview ($P<0.05$).⁵⁸

Interview Techniques

Prompt Type. Studies that compared forward-order prompts (asking children to recall the most distant to most recent items) with reverse-order prompts (asking children to recall the most recent to most distant items) found that order interacts with sex to affect accuracy: girls were more accurate when given forward-order prompts, whereas boys were more accurate when given reverse-order prompts (interaction $P<0.008$),²⁰ (interaction $P=0.006$).³²

Another study examined children's recall accuracy in response to open-format prompts (starting with the first time an item was consumed and moving through each eating occasion without using meal names) and meal-format prompts (starting with breakfast and moving through each meal in turn).¹³ Children were interviewed about their breakfast and lunch consumption in the evening of the day of observation. Their recall was more accurate for the open prompts than the meal prompts ($P=0.036$ for intrusion rates; $P=0.050$ for total inaccuracy).

In another study, prompt type both increased and decreased recall accuracy. Baxter and colleagues¹⁸ interviewed children aged 6 to 7 and 9 to 10 years using free recall, nonsuggestive prompting (eg, "Did you eat anything else at lunch?"), and then specific prompting. During specific prompting, children were given preference prompts (eg,

<p>Interview method</p> <p>Multiple-pass protocol with 4 passes Includes the Nutrition Data System for Research (Nutrition Coordinating Center, University of Minnesota)</p> <p>First pass (quick list) Children were told that the interviewer wanted to know about everything that they ate or drank that day. A quick list was obtained by asking, "After you got up yesterday morning, when was the first time that you had something to eat or drink?" "What did you eat or drink at that time?" "Did you eat or drink anything else at that time?" "When was the next time after [first occasion] that you had something to eat or drink?" "What did you eat or drink at that time?" "Did you eat or drink anything else at that time?"... "Can you remember any other times yesterday that you had something to eat or drink?"</p> <p>Second pass (review quick list) Interviewer repeats back each item reported at each time for child to review. "After you got up today, the first time you ate was at [time]. You ate [all foods] and drank [all drinks]. Can you think of anything else that you ate at that time? Can you think of anything else that you drank at that time?"</p> <p>Third pass The name of each meal was obtained by asking, "What was the name of the meal you ate at [time]?" The location was obtained by asking, "Where did you eat this?" Also obtained were additions ("Did you add anything to the [name of item]?"), details ("What kind of ___ was it?"), and amounts consumed ("How much of your serving of ___ did you eat [or drink]?" none, taste, a little bit, half, most, all, more than one serving).</p> <p>Fourth pass Each eating occasion reviewed with child for correctness and child is asked whether he or she ate or drank anything else. ("At [time] for [meal] at [location], you ate [amount] of [food] or drank [amount] of [drink]. Is this correct? Did you eat or drink anything else at that time?... Can you remember any other times yesterday that you had something to eat or drink?")</p> <p>Used by Baxter and colleagues,^{19,20,30[Study 2],31,32[Studies 1 and 2],33-36,39,40,43,46,47,50,57,59,63a} Guinn and colleagues,^{37,41} Harrington and colleagues,¹⁴ Lyng and colleagues,²¹ Lytle and colleagues,^{49,60} Smith and colleagues,^{38,42,44} and Weber and colleagues.⁵⁵</p>
<p>24hrDR^b interview No or limited further information given (eg, "included probing questions" and "opened-ended style").</p> <p>Used by Baranowski and colleagues,^{58c} Carter and colleagues,⁵⁶ Crawford and colleagues,⁶² Emmons and Hayes,⁵³ Reynolds and colleagues,⁵⁴ and Todd and Kretsch.²³</p>
<p>Free-recall, followed by nonsuggestive and/or specific prompts Used by Baxter and colleagues,^{18,48} and Warren and colleagues.⁵²</p>
<p>Food Intake Recording Software System multiple-pass method (adapted for computer administration) Children identify their first eating event in past 24 hours and record all foods that they consumed. Children identify the foods from different groups. For each food, children identify the portion size. Once all foods have been recorded for the first event, children review the information and edit it as necessary. Next, children identify the next eating event and complete the same process as above.</p> <p>Used by Baranowski and colleagues.⁵⁸</p>
<p>Self-Administered Children and Infants Nutrition Assessment Children are led through each of 6 possible meal occasions (breakfast, morning snack, lunch, afternoon snack, dinner, and evening snack). For each, they select the food items that they consumed as well as the portion size.</p> <p>Used by Hunsberger and colleagues.⁵¹</p>
<p>Four recall phases</p> <p>Phase 1 (Free report) No details provided about question(s).</p> <p>Phase 2 (Cognitive aspects of free report) Children asked how they remembered information reported during the free report phase.</p> <p>Phase 3 (Prompted report) Children asked if anything else was eaten; each item and the amount reported was repeated back to the child, they were asked questions to clarify details and amounts.</p> <p>Phase 4 (Cognitive aspects of prompted report) Children asked how they remembered information reported during the prompted report phase.</p> <p>Used by: Baxter and colleagues,^{16,17,29,30[Study 1],61}</p>
<p><i>(continued on next page)</i></p>

Figure 3. Detailed descriptions of the interview methods used in studies examining factors related to the accuracy of self-reported dietary information provided by children aged 6 to 12 years.

Interview method
<p>Adapted multiple-pass protocol with 4 passes</p> <p>Open format</p> <p>Quick list “Tell me everything you ate and drank today. Include everything you ate and drank...even snacks. Did you eat or drink anything else today?”</p> <p>Forgotten foods list “In addition to the foods you have already told me, did you have any other ____ today? [(1) drinks, (2) fruits, (3) vegetables, (4) bread, crackers, cereals, (5) desserts, (6) anything else].”</p> <p>Detailed list Child asked about name of meal for each item, time he or she began eating each meal, where each meal was eaten, whether anything was added to each food item, and details and amounts for each food.</p> <p>Final review Each eating occasion reviewed and child is asked: “Is this correct?” Child asked if anything was consumed before first meal, between meals, and after latest meal. Finally, he or she is asked, “Did you eat or drink anything else today?”</p> <p>Meal format</p> <p>Quick list: “Did you have ____ today? [(1) breakfast, (2) lunch, (3) dinner, (4) anything between breakfast and lunch, (5) anything between lunch and dinner, (6) anything after dinner].” If yes, “What did you eat or drink...?”</p> <p>Forgotten foods list “In addition to the foods you have already told me, did you have any other ____ today? [(1) drinks, (2) fruits, (3) vegetables, (4) bread, crackers, cereals, (5) desserts, (6) anything else].”</p> <p>Detailed list Child asked about time he or she began eating each meal, where each meal was eaten, whether anything was added to each food item, and details and amounts for each food.</p> <p>Final review Each eating occasion reviewed and child is asked: “Is this correct?” Child asked whether he or she ate or drank anything else. Finally, he or she is asked, “Did you eat or drink any other meals or snacks today?”</p> <p>Used by Baxter and colleagues.¹³</p>
<p>^aBaxter and colleagues^{47,50} only used three passes.</p> <p>^b24hrDR=24-hour dietary recall interview.</p> <p>^cBaranowski and colleagues⁵⁸ appears in two categories because two different methods were compared.</p>

Figure 3. (continued) Detailed descriptions of the interview methods used in studies examining factors related to the accuracy of self-reported dietary information provided by children aged 6 to 12 years.

“What did you eat or drink that you liked?”), food category prompts (eg, “Have you told me about all the ____ you had?” [categories included drinks, desserts, fruits, and vegetables]), or visual prompts (eg, “Close your eyes and picture what your lunch looked like”). Before specific prompting, first-graders were less accurate than fourth-graders ($P<0.01$). After specific prompting, nine (of 48) first-graders and 12 (of 48) fourth-graders had more accurate recall (ie, had fewer omissions and intrusions). However, 21 first-graders and seven fourth-graders also had less accurate recall. For both age groups, there was no difference in accuracy between the three prompt types ($P>0.05$).

Memory Aids. In one study, a group of children aged 9 to 10 years used their previously completed food records as memory aids during recall interviews.⁴⁹ These records did not improve their accuracy compared with students who did not complete records ($P>0.274$ for all comparisons). In two other studies, all children kept food records and used them as memory aids during a later interview; no control groups were included to examine the effectiveness of these aids.^{55,60} These studies showed no significant differences between observed and recalled consumption ($P>0.05$).^{55,60}

In one final study, girls' accuracy using 24hrDR interviews was compared with a second group who completed a frequency questionnaire to recall the number of times they had consumed certain foods during the past 5 days.⁶² Both recall groups were compared with a third group who kept 3-day

food records. Girls given the frequency questionnaire had less-accurate recall than girls given the 24hrDR ($P<0.05$). The food record group was the most accurate overall, which probably reflected their limited reliance on memory: girls recorded what they had consumed as soon as possible after the meals.

Environment Factors

Food Availability. Two studies have shown that when children make errors in recalling their dietary consumption, one source of these errors is the food available in their environment.^{33,38} Intrusion rates were higher for foods that were available closer to the observation day ($P=0.031$ ³³ and $P=0.007$ ³⁸). For example, children were more likely to falsely recall consuming items that had been available the day before observation compared with items that had been available 2 days before the observation.

Type of Lunch. One observational study showed that recall accuracy was higher for packed lunches (bought from home) than school lunches ($P<0.01$).⁵²

Meal Location. Baxter and colleagues⁴⁰ investigated the effect of meal location: Children consumed school breakfast in their classroom or the cafeteria. Location had no effect on accuracy ($P>0.05$).

Child Variables

Age. Five studies showed significant group differences for age.^{18,50,52-54} One study demonstrated that children aged 10 to 11 years had more accurate recall than children aged 8 to 9 years ($P=0.0233$).⁵⁰ One study demonstrated that dietary recall in children aged 9 to 10 years was more accurate than children aged 6 to 7 years ($P=0.01$)¹⁸; another showed that the correlations between children's observed and recalled calorie consumption improved with age (first-graders: $r=0.36$, $P<0.05$; second-graders: $r=0.23$, $P>0.05$; third-graders: $r=0.49$, $P<0.01$; and fourth-graders: $r=0.77$, $P<0.01$).⁵³ One study revealed that children aged 6 to 7 years had more accurate recall than children aged 5 to 6 years ($P<0.01$).⁵² Another showed that recall of calorie, carbohydrate, and fat consumption was more accurate in children aged 11 to 12 years than in children aged 9 to 10 and 7 to 8 years ($P<0.01$).⁵⁴ Other studies failed to find significant group differences, which may have been due to a small sample sizes ($N=32$; no difference in accuracy between children aged 8 to 9 and 10 to 11 years [$P>0.27$]),⁴⁷ a sample containing only older children (aged 10 to 12 years; $P>0.05$),⁵⁶ or a conservative alpha level (aged 8 to 11 years; $P>0.01$).²³

Sex. Fifteen studies reported no significant group differences between boys' and girls' recall accuracy ($P>0.01$ ²³ and $P>0.05$ ^{14,16,33,34,36,38,40,41,46,47,57-59,63}). Two studies showed significant group differences. In one, girls recalled their packed lunch consumption more accurately than boys ($P=0.05$).²¹ In the other, boys were more inaccurate overall than girls ($P=0.049$).³¹

Race/Ethnicity. Ten studies found no significant group differences between non-Hispanic white and African-American children's recall ($P>0.05$).^{14,16,33,34,36,38,41,46,58,63} Only one study—using samples of recent immigrant and refugee children—showed significant differences among race and ethnic groups (P values <0.01).²³ Chinese and Hispanic children overreported foods of which they had consumed small amounts and underreported foods of which they had consumed large amounts; Filipino and Cambodian children did not show this pattern.

Disease. The one study comparing recall accuracy of children with three types of chronic disease (diabetes, cystic fibrosis, and asthma) found significant sex \times group interactions for recalled calorie intake (but not protein intake) ($P<0.05$).⁵⁶ Specifically, girls with cystic fibrosis, girls with diabetes, and boys with asthma recalled significantly more calories than they consumed (P values <0.05). Boys with cystic fibrosis, boys with diabetes, and girls with asthma did not recall more calories than they consumed (P values >0.12). In another study, Reynolds and colleagues⁵⁴ demonstrated that all children with diabetes omitted food items from their recall; that is, they recalled consuming fewer meals and snacks than had been observed ($P<0.0001$).

Social Desirability. Two studies examined the relationships between children's social desirability and their dietary recall.^{37,41} One showed that, for breakfast, as children's social desirability ratings increased, they reported eating fewer items ($P<0.001$). For lunch, as their social desirability

increased, they were more likely to report items that had been available but they had not actually consumed ($P=0.014$).³⁷ The other study showed that as children's social desirability ratings increased, they erroneously reported consuming less ($P=0.030$).⁴¹

BMI. Group differences in dietary recall accuracy between children with higher BMIs and lower BMIs were examined in five studies.^{14,31,37,41,46} One study found that children with high BMI had a higher omission rate than children with low BMI ($P<0.05$). Girls with high BMI had a lower intrusion rate than boys with high BMI; girls with low BMI had a higher intrusion rate than boys with low BMI (interaction $P<0.04$).⁴⁶ Guinn and colleagues³⁷ later replicated the finding that high-BMI girls had a lower intrusion rate than any other group (interaction $P=0.002$). However, in another study, Guinn and colleagues⁴¹ also found that as BMI increased, children's intrusion rate decreased, regardless of sex ($P<0.001$).⁴¹ One other study showed that the higher the children's BMIs, the more accurate their recall of fruit consumption ($P=0.036$).¹⁴

When children were observed and interviewed on three separate occasions, BMI interacted with repetition ($P=0.028$ for omission rate; $P=0.083$ for intrusion rate).³¹ For healthy-weight children, accuracy improved over three cycles of observation and recall interviews. For at-risk-of-overweight children, accuracy increased from the first to second repetition and then stabilized. For overweight children, accuracy decreased from the first to second repetition and then stabilized.

Food Preferences. Children's liking of foods was related to their accuracy ($P<0.001$).²⁹ Food items that children "liked a lot" were recalled more accurately than food items that were "not liked a lot." The intrusion rate was also lower for foods "liked a lot" than those that were "not liked a lot" ($P<0.005$). Later research supported this finding: Children's liking ratings were higher for accurately recalled items than for inaccurately recalled items ($P<0.001$).³⁵

Cognitive Ability. Children's dietary reporting accuracy was related to their cognitive ability (as measured by achievement test scores in language arts, mathematics, social studies, and science).⁴² Controlling for other variables manipulated and measured in the study, as achievement test scores increased, omission and intrusion rates decreased ($P<0.001$ for omission rate; $P=0.001$ for intrusion rate).

Children's Reported Retrieval Strategies. Children's reported retrieval strategies were related to recall accuracy. In one study, half of children reported everything that they had consumed (free recall) then answered specific prompts.⁴⁸ Children then described how they remembered what they had consumed (nonintegrated condition). The other half of the children told the interviewer how they remembered each item as they reported it (integrated condition). Although there were no differences in accuracy for free recall ($P>0.05$), for prompted recall children in the nonintegrated condition gave more accurate responses than children in the integrated condition ($P<0.05$).

In two other studies, the retrieval strategies that children reported using to remember what they ate were examined.^{17,61} In one study, a panel of independent raters

developed categories based on children's responses from a 24hrDR study.⁶¹ The 16 retrieval categories included the oral cue still being present ("I can still taste it"), whether the item was added to something ("I ate it [dressing] with my salad"), and whether it was usual practice ("We always have milk"). Of the categories, five had 100% match rates when children used these recall strategies (oral cue still present, added to something, order items were consumed, semantic preferences, or physiologic cue).

In another study, children described how they had remembered each item; their responses were categorized using the 16 categories.¹⁷ Three categories had accuracy rates higher than 90% (portion left over, second helping, or added to something). The three categories with the lowest accuracy rates (<80%) were "I just ate"/"I don't know," interactions with other people, and order items were consumed.

DISCUSSION

Our systematic review included and evaluated 45 studies assessing factors related to the accuracy of recall of dietary intake by of children aged 6 to 12 years. Although many child-related variables, such as age, BMI, social desirability, food preferences, and cognitive ability showed significant relationships with accuracy, interview factors—apart from retention interval—had smaller effects. Studies in which retention interval was manipulated consistently demonstrated that the longer the delay between consumption and recall, the lower children's accuracy.^{37,39,40,42,44,57,59} This finding is consistent with cognitive and neuropsychological research showing that memories become less available over time, which reduces recall accuracy.⁶⁴ Even with the shortest-possible retention interval (recall immediately after consumption), children's match rates were still not high (eg, 65%⁴⁸).

Factors that increased children's cognitive load (ie, increased the amount of information that they needed to process at one time) appeared to decrease children's recall accuracy. For example, asking children to think aloud about how they remembered each food item while recalling it decreased their accuracy compared with students who performed the think aloud task after recall was complete.⁴⁸ It is possible that asking children to think aloud while remembering what they had consumed was cognitively demanding and may have reduced their ability to retrieve dietary information. Asking children to recall all meals within a 24-hour period decreased their accuracy of the target meal (lunch) compared with children who only recalled the target meal.³⁰ That being said, methods that should have reduced children's cognitive load—that is, the availability of food records—did not increase their recall accuracy.⁴⁹

In studies that examined the effects of specific prompts on children's recall accuracy, the findings were mixed. Compared with free recall, prompting was shown to increase accuracy in children aged 9 to 10 years (but only when children did not complete a simultaneous think-aloud task⁴⁸); in another study, it increased accuracy for 19% of 6- to 7-year-olds and 25% of 9- to 10-year-olds but decreased accuracy for 44% of 6- to 7-year-olds and 15% of 9- to 10-year-olds.¹⁸ These results are also consistent with the finding that children's dietary recall was more accurate when they were interviewed using an open format (no specific prompts used;

"Tell me everything that you ate and drank today") than a meal format (with specific meal prompts used; "Did you have breakfast today? What did you eat or drink?").¹³

When children make errors in recalling what they consumed, one source of these errors was the food available in their environment.^{33,38} Children were more likely intrude items that were available more recently (as opposed to distantly), which suggests that they remembered items that had been available on the days surrounding the target day, but misattributed those items to the target day itself. In other words, the children had difficulty monitoring the source (correct day and specific meal) of the items. Source monitoring is the process through which children infer the source of a memory using the characteristics of that memory and their general knowledge of the world.^{65,66} Their ability to make these inferences increases with age,⁶⁷ which fits with the finding that the accuracy of children's dietary recall also improves with age.

Researchers examining children's memories for repeated staged events have developed interview techniques to improve children's source monitoring; that is, their ability to remember what occurred and to attribute it to the correct source (day).⁶⁸⁻⁷⁰ In these experiments, children participate in staged events that follow the same structure each time (eg, reading a book followed by playing a game and then doing a puzzle) over a number of days. Some of the activities change slightly (eg, a different book is read on each occasion) and some stay the same (eg, the game is always the same). After almost 20 years of conducting these experiments, a number of interview techniques have been developed to enhance children's source monitoring.⁹ For example, children who practice recalling a repeated event (eg, weekly swimming lessons) report more accurate information when interviewed about a (different) repeated target event.⁷¹ Similarly, giving children source monitoring training (using analogous events) improves their recall accuracy of a target event.⁷² In one very recent experiment, children were asked to think of multiple instances of a repeated event before deciding in which one a particular detail occurred; this improved their source monitoring accuracy.⁷³ Future research examining children's dietary recall could incorporate such techniques—by asking children to practice recalling an analogous event, such as a daily writing lesson, before asking about diet—to determine whether these techniques encourage more accurate reporting. Such techniques may enhance children's ability to recall not only what they ate, but also the occasion during which they ate it.

The findings of our review revealed some significant gaps in the literature. First, the majority of studies were conducted with children aged 9 to 10 years, which limits the application of the results to children with different developmental and cognitive levels. Examining children outside this age range creates a more comprehensive picture of the developmental conditions in which children are able to recall dietary intake accurately. Second, all but three studies^{21,51,52} were conducted in the United States, predominantly in schools that provided breakfast and lunch (albeit see Lyng and colleagues²¹ and Warren and colleagues⁵²). Although school-provided meals are easy to observe, it is questionable whether the results can be generalized to other meals. It is possible that school-based meals follow a pattern, such that hotdogs are an option every Monday and when there are hotdogs, custard is always the dessert. Other meals, such as

lunches bought from home, may not follow such a pattern. Furthermore, the lack of cultural variability from these US-based studies, which sampled predominantly African-American children and non-Hispanic white children (although see Todd and Kretsch²³ and Weber and colleagues⁵⁵), also limits generalizability of the results to other races/ethnicities. Third, given the group differences found for many of the child variables—BMI, in particular—on accuracy, there is a need to consider body image and dietary restriction behaviors in children because these factors may also influence their dietary recall.⁷⁴⁻⁷⁶ It is important to note when considering these gaps in the literature that our systematic review did not include unpublished data. Thus, some of these concerns may have been addressed.

Recommendations

Based on the studies examined in our review, we recommend that researchers conduct interviews with children about their dietary intake as soon as possible after the eating occasion, ask about one target meal instead of all meals, ask about diet alone (rather than diet and physical activity), and obtain copies of foodservice records to check for intrusions in children's recall. Researchers may also consider interviewing girls using forward-order prompts and boys using reverse-order prompts. Children may also be provided with retrieval cues (eg, "I can still taste it") to enhance their recall accuracy. Finally, researchers should also take into account children's age, BMI, food preferences, and cognitive ability when considering the accuracy of their recall.

Future research should determine whether children's accuracy could be further improved through the use of interview techniques from other literature that have been demonstrated to improve the accuracy of children's recall through enhancing their source monitoring ability. One final recommendation is to use—once their validity has been established—new interview methods that have been made possible with advances in technology. These methods, such as self-administered computer-based multiple pass interviews⁷⁷ and interactive portion size assessment systems,⁷⁸ may also enhance children's dietary reporting accuracy.

Clinical Implications

Factors related to children's dietary intake reporting have clinical importance. Individuals involved in the care of children at all development levels need to be able to accurately assess children's dietary consumption to determine appropriate interventions and to assess whether those interventions are effective. This is important for children in all weight status categories, including those with eating disorders and medical issues affecting diet and weight.

CONCLUSIONS

The overall goal of our systematic review was to determine the factors related to the accuracy of children's dietary recall established using interview methods and to provide directions for future research. Studies conducted have tended to focus on children aged 9 to 10 years, and have focused only on variations of the 24hrDR method to assess children's dietary intake. Further research is required to expand our knowledge using different interview techniques to improve recall accuracy.

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AUTHOR INFORMATION

S. J. Sharman is a senior lecturer, H. Skouteris is a professor, M. B. Powell is a personal chair, and B. Watson is a research assistant, School of Psychology, Deakin University, Melbourne, Australia.

Address correspondence to: Stefanie J. Sharman, PhD, School of Psychology, Deakin University, 221 Burwood Highway, Burwood, VIC 3133, Australia. E-mail: stefanie.sharman@deakin.edu.au

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