



## Review Article

# A systematic review of children's alcohol-related knowledge, attitudes and expectancies<sup>☆</sup>



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## ABSTRACT

Understanding the nature of, and transitions in, young children's alcohol-related knowledge and attitudes is important to determining the age at which we should start educating children about alcohol and informing our understanding of the focus of such education. This paper aimed to explore current literature on the alcohol-related knowledge, beliefs, attitudes and expectancies of children aged 12 years and under. Electronic databases were searched for papers published from January 2000–August 2016. Further papers were identified by a manual review of reference lists, and contacting corresponding authors of included papers. Papers that reported on children's knowledge or beliefs about alcohol, attitudes towards alcohol and/or expectancies regarding alcohol consumption were included. Seventeen cross-sectional, experimental or observational studies and seven longitudinal studies met the inclusion criteria. Data on key measures was tabulated. From a very young age children are aware of and able to identify alcohol, and have some knowledge of its effects; their attitudes become more positive with increasing age and these shifts appear to precede drinking initiation by some years. The small number of available studies, with different measures of knowledge, attitudes and expectancies, made assessment of bias unfeasible. Only three studies were published in the last five years. Children's knowledge of, and attitudes towards, alcohol form before they initiate alcohol use, and are likely acquired through observation. Alcohol-related education should commence before children begin drinking, and should encourage the delay of alcohol initiation, address social norms, and reduce positive expectancies.

## 1. Introduction

The child and adolescent brain undergoes dynamic changes which can be adversely and irrevocably affected by alcohol consumption (Bava and Tapart, 2010). Other harms associated with underage drinking include increased risk of injury (Hingson and Zha, 2009), regretted/unprotected sex (Kiene et al., 2009), and delinquency (French and Maclean, 2006). Furthermore, early initiation of alcohol use is associated with greater risk of binge drinking and alcohol-use disorders later in life (Ellickson et al., 2003; Hingson et al., 2006; Sartor et al., 2007).

There is a paucity of data on drinking prevalence among pre-adolescents (Donovan et al., 2004; Windle et al., 2008), but we know that by eighth grade, 26% of US adolescents have tried alcohol and 10% have consumed it in the last 30 days (Johnston et al., 2016). In Australia, 57% of 13-year-olds have tried alcohol and 11% have consumed it in the past month (White and Williams, 2016).

During adolescence, children face a range of developmental issues (such as changes in brain structure and function, changes in peer and romantic relationships, puberty, changing family and social roles) which have complex interactions with their decisions regarding alcohol consumption (Windle et al., 2008). However, the available research suggests that children's beliefs about, and early experience with, alcohol also predict later alcohol use and misuse (Donovan et al., 2004). This raises two important questions for parents and educators: *when* should we begin teaching children about alcohol?; and *what* is it that we need to teach them? Understanding the nature of – and transitions in – young children's alcohol-related knowledge and attitudes prior to alcohol initiation will inform the answers to these questions.

There is considerable evidence that children and adolescents overestimate the proportion of their peers who consume alcohol (social norm) (Glazer et al., 2010; Lintonen and Konu, 2004), and that these inflated perceptions can increase drinking intentions and behaviours (Wambeam et al., 2014). Understanding children's alcohol expectancies

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is important, given that higher positive alcohol expectancies have been shown to increase the likelihood of early alcohol use and hazardous drinking among children (Cruz and Dunn, 2003; Jester et al., 2015; Van Tyne et al., 2012).

This review sought to explore the current literature on the alcohol-related knowledge, beliefs, attitudes and expectancies of children aged 12 years and under; in order to inform our understanding of when and what we should start teaching children about alcohol.

## 2. Methods

### 2.1. Eligibility criteria

Studies of interest reported on children's knowledge or beliefs about alcohol, attitudes towards alcohol and/or expectancies regarding the effects of consuming alcohol. For the purpose of the review 'children' was defined as those aged 12 years or less. Due to the small number of studies, both cross-sectional and longitudinal studies were included.

### 2.2. Study selection

A three-stage approach was taken to identifying papers for inclusion in the review. The first stage was a systematic search of electronic databases (A + Education, Cochrane, Eric, Informit Complete, Proquest Health and Medical Collection, PsycInfo, Scopus and Web of Science). The keywords used were "alcohol" NEAR/5 child\* OR kinder\* OR preschool OR school AND knowledge OR attitude\* OR belie\*. The search was limited to articles written in English and published from 1 January 2000 onwards. Papers were excluded where data on children's knowledge, beliefs, attitudes or expectancies was not provided – such as studies that reported generically on exposure, opinion pieces, or policy/position statements – or where the sample was children older than 12 years of age.

The searches identified a total of 1573 unique articles; the abstracts of which were reviewed by the two authors to identify those that met the inclusion criteria. The second stage was a manual review of the reference lists of the articles that met the inclusion criteria; performed by the second author. As a final step, once the authors had identified all possible articles through database and manual searching, the second author contacted the corresponding author of each included paper enquiring whether they had authored any further studies that addressed this topic. A follow-up email was sent to corresponding authors approximately two weeks later for non-replies.

A total of 29 articles were identified as potentially relevant, with 12 of these articles being identified through the process of contacting corresponding authors. These articles were uploaded into Covidence software ([www.covidence.org](http://www.covidence.org)) for full-text review by both authors. Covidence provides an online platform for researchers to efficiently manage the review process by enabling them to independently screen articles, record (reasons for) inclusion/exclusion, and keep track of which articles have been reviewed by their co-researchers. Importantly, each reviewer cannot see the other's coding decisions until the process is complete. Conflicts identified during screening ( $n = 2$ ) were resolved by discussion and consensus within the pair. Five studies were excluded as they did not meet the selection criteria.

Thus a total of 24 papers were included in the review; 17 reported on cross-sectional, experimental or observational studies and seven on longitudinal studies (see Fig. 1 for PRISMA diagram).

### 2.3. Data extraction and quality

Data was extracted by the second author on study setting, study design, study participants, key outcomes assessed, measures used, analysis methods, key findings and study strengths and limitations. Where information important for the review was not reported in the original papers, the corresponding author was asked to provide this

information; for example, five papers did not report on the mean age and/or gender of participants, and 12 did not provide the date of data collection. In eight cases, no response was obtained or they were unable to provide these data. The small number of available studies, with different measures of knowledge, attitudes and expectancies; made assessment of bias unfeasible. Complete information describing the included studies can be found in Appendix Tables 1–3.

### 2.4. Data synthesis

Included studies were classified into, and data synthesized and reported by, three categories, depending on the focus of the study; knowledge, attitudes, and/or expectancies (a study could be classified in more than one category).

The 'knowledge' category included studies related to children's general awareness or knowledge of alcohol, such as their ability to identify alcohol products or their ability to identify the health effects of alcohol consumption. The 'attitudes' category included studies that explored children's reported liking of alcohol; attitudes towards alcohol users; and descriptive (what do others like me do) and injunctive (what do important others think I should do) norms regarding alcohol-related behaviour (Voogt et al., 2013). The 'expectancies' category included studies that assessed children's positive and/or negative alcohol expectancies (beliefs regarding the effects and outcomes of drinking alcohol); (Jester et al., 2015).

As the majority of the studies did not report data on differential responses by gender or race, and others reported only on these differences and not for the sample as a whole, within each category we have provided a sub-section on reported demographic differences.

## 3. Results

### 3.1. Children's knowledge of alcohol

Ten studies specifically examined children's knowledge of alcohol. Nine studies were conducted in the US (Andrews et al., 2003; Bridges et al., 2003; Dalton et al., 2005; Dunn and Goldman, 2000; Hahn et al., 2000; Mack, 2003; Mennella and Forestell, 2008; Rinehart et al., 2006; Sigelman et al., 2000) and one in Switzerland (Kuntsche et al., 2016).

Four studies utilised individual interviews in which children were shown pictures of alcohol products and asked to identify what was in the picture; two with kindergarten/pre-school aged children (Hahn et al., 2000; Kuntsche et al., 2016) and two with lower primary (Dunn and Goldman, 2000; Andrews et al., 2003). In all four studies more than half of the children correctly identified alcoholic beverages. Those studies that included more than one age group consistently found that students in higher grades identified more items; for example, Kuntsche et al. (2016) found that correct identification was almost twice as high among six-year-olds (82%) as three-year-olds (45%).

Two studies engaged children in activities to assess alcohol knowledge. In a structured observational study, 62% percent of the 120 two to six-year-olds "bought" alcohol in a role-play shopping scenario (Dalton et al., 2005), of whom 58% identified it by type (e.g. "beer", "wine"). The other study found that while a low proportion of the 145 five to eight-year-olds could identify the odors of alcohol by name (e.g., 11% for beer and whisky) this was similar to the rate of identification of odors liked by the majority of the children (e.g., 16% for cola) (Mennella and Forestell, 2008).

Four studies examined knowledge in more detail by asking questions about the health effects of alcohol. The first found no significant age differences for the open-ended measure of knowledge of alcohol effects among 217 first to sixth-graders, but a developmental trend of a reduction in mistaken ideas about alcohol's effects with increasing age (Sigelman et al., 2000). The second, with 217 first to sixth-graders, found knowledge of alcohol and understanding of how alcohol affects the body increased with age (Bridges et al., 2003). The third, with 317

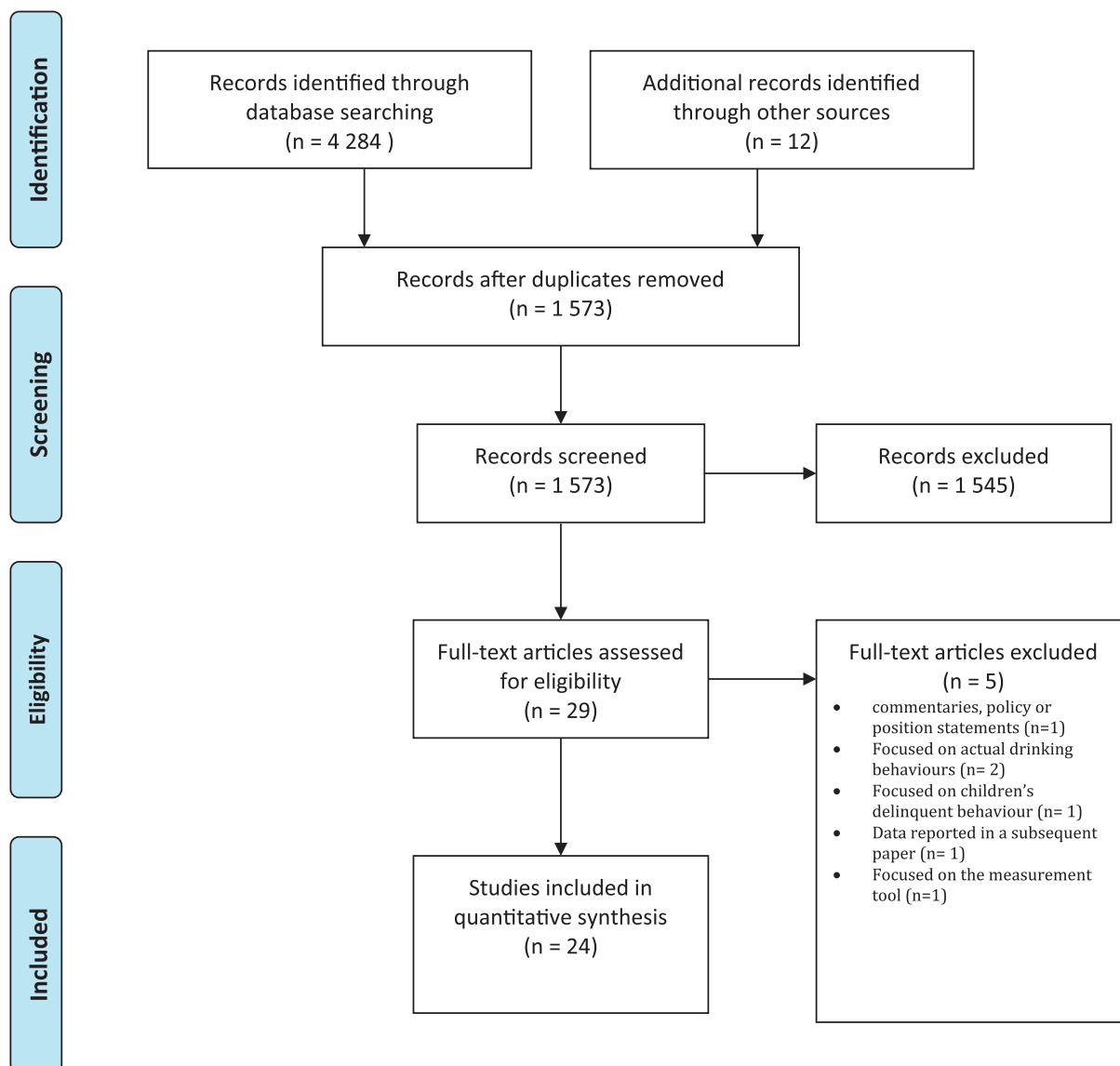


Fig. 1. Study selection.

third to sixth-graders, found children in higher grades were more likely to know that alcohol affects the brain, which in turn causes behavioural change but less likely to know that alcohol travels everywhere in the body (Mack, 2003). The fourth focused on racial differences, and did not report descriptive data for the full sample (Rinehart et al., 2006); this paper is discussed below.

### 3.1.1. Demographic differences

Only one of the ten studies reported a gender difference (Andrews et al., 2003), with more boys than girls identifying alcohol (94% vs 83%; OR = 2.20,  $p < 0.001$ ). Three studies reported that minority children were more likely than White children to believe both correct and incorrect statements about long-term effects of alcohol (Bridges et al., 2003; Rinehart et al., 2006; Sigelman et al., 2000). Children were more likely to “purchase” beer or wine if their parents drank alcohol at least monthly (adjusted OR 3.04) or if they viewed PG-13 or R-rated movies (adjusted OR 5.10) (Dalton et al., 2005).

### 3.2. Children's attitudes towards alcohol (and drinkers)

Eight studies could be broadly categorised as assessing children's attitudes towards alcohol, although each utilised a different measure.

Six of the studies were conducted in the United States (Andrews et al., 2008; Andrews and Peterson, 2006; Bridges et al., 2003; Hahn et al., 2000; Mennella and Forestell, 2008; Prins et al., 2011), one in Switzerland (Kuntsche et al., 2016) and one in Australia (Cameron et al., 2003).

Two of the studies explored children's reported liking of alcohol; one by self-report and one based on liking of the smell of alcohol. In the Australian study 72% of the 233 grade 3, 5 and 7 children reported having tasted beer, 63% champagne, and 78% wine (Mack, 2003), with liking highest for champagne. A US study found the majority of the 145 five to eight-year-old participants disliked the odors of beer (77%) and whiskey (81%) (Mennella and Forestell, 2008).

Two longitudinal studies explored attitudes towards alcohol users among children in Western Oregon, US. The first, with 1075 first through fifth graders (at baseline), found 26% attributed ‘popular or liked by others’, 59% ‘exciting’, and 6% ‘cool or neat’ to alcohol users; there was an overall increase in positive attitudes towards alcohol users with increasing age, (Andrews and Peterson, 2006). The second found attitudes towards alcohol users among 712 s through fifth graders (at baseline) became more positive with increasing age, with those who initially held less favourable attitudes tending to increase the favourability of attitudes faster (Andrews et al., 2008).

Four studies examined perceived injunctive norms; one regarding parental supply (Hahn et al., 2000); one teenagers' and adults' drinking (Bridges et al., 2003); one adults' drinking (Rinehart et al., 2006); and one children's drinking (Prins et al., 2011). In the first, most of the 126 kindergarten children held negative attitudes towards alcohol use, but more than one-quarter said 'Bunchy Bear' felt happy that the parent was giving the child bear a sip of beer (Hahn, 1997). The second, with 217 first to sixth graders, found attitudes towards alcohol were less negative in higher grades than in lower grades (Bridges et al., 2003).

The third study (Rinehart et al., 2006) focused on racial differences which are reported in the subsection below. The fourth, a cohort-sequential longitudinal study with 452 children aged 8 or 10 at baseline, found a significant growth in children's acceptance of child sipping, drinking and drunkenness as they got older; acceptance of sipping increased nearly twice as much between age 11.5 and age 16 as between age 8.5 and age 11 (Prins et al., 2011).

The Swiss study examined perceived descriptive norms by asking 301 three-to six-year-olds to assign beverages to people of different ages (adults and children) and genders for 11 different scenarios. Alcoholic beverages were assigned more often to men (42%) than to women (29%;  $p < 0.001$ ) or to children (13%); and more often to adults at a party (39%) than to those playing outdoors (35%;  $p < 0.01$ ) (Kuntsche et al., 2016).

### 3.2.1. Demographic differences

Two studies reported gender differences. One found boys reported liking beer and champagne more than girls (Cameron et al., 2003); the other that girls held significantly more positive attitudes towards alcohol users than boys (Andrews and Peterson, 2006).

Two studies reported racial differences. One found non-minority children were more likely to say 'Bunchy Bear' felt happy that the parent was giving the child bear a sip of beer than were minority children (Hahn et al., 2000); whereas the other found Black children had less positive attitudes towards adult alcohol use than White children (Rinehart et al., 2006).

## 3.3. Children's alcohol expectancies

Thirteen studies assessed children's alcohol expectancies. Eleven were conducted in the United States (Bekman et al., 2011; Bridges et al., 2003; Copeland et al., 2014; Corvo, 2000; Donovan et al., 2009; Dunn and Goldman, 2000; Hipwell et al., 2005; O'Connor et al., 2007; Rinehart et al., 2006; Schell et al., 2005; Sigelman et al., 2002), one in Switzerland (Kuntsche, 2017) and one in Australia (Cameron et al., 2003). Ten were cross-sectional (Bekman et al., 2011; Bridges et al., 2003; Cameron et al., 2003; Corvo, 2000; Dunn and Goldman, 2000; Kuntsche, 2017; O'Connor et al., 2007; Rinehart et al., 2006; Schell et al., 2005; Sigelman et al., 2002), and three longitudinal (Copeland et al., 2014; Donovan et al., 2009; Hipwell et al., 2005).

### 3.3.1. Cross-sectional studies

A study exploring participants' alcohol expectancies through assessing first associates in an interview ( $N = 462$  s-fifth graders) or survey ( $N = 1003$  third, sixth, ninth and twelfth graders) found negative associations decreased with age (e.g., "bad" was the most frequent response of second graders, but decreased in each higher grade level) and positive associations increased (e.g., "happy" was uncommon among second-sixth graders but much greater among ninth graders) (Dunn and Goldman, 2000).

A study with a convenience sample of 121 five-to-25-year-olds found that only children aged 8-to-10-years were significantly less likely than college students to view alcohol as stimulating (Sigelman et al., 2002). Another study, with 217 first to sixth-graders, found positive alcohol expectancies increased with age; but there were no significant differences in negative expectancies between the age groups (Bridges et al., 2003).

An Australian study with 233 children in grades 3, 5 and 7 found older children endorsed both positive and negative alcohol expectancies more than younger children ( $F(2, 233) = 7.81, p < 0.005$ ) (Cameron et al., 2003). At all ages, children's positive alcohol expectancies were higher than negative expectancies for wine ( $t(232) = 3.50, p < 0.001$ ), but reversed for beer ( $t(232) = 3.04, p < 0.005$ ). Compared to non-alcohol stimuli (e.g., seafood, ice-cream, Coke, cough medicine), differences between positive and negative expectancies were much smaller for alcohol, indicating a more balanced or ambivalent expectancy configuration unique to alcohol ( $t(232) 1/4 2.05, p < 0.05, t(232) 1/4 3.54, p < 0.001, and t(232) 1/4 8.35, p < 0.001$  respectively).

A US questionnaire study with 1993 fourth graders and 1632 ninth graders found older students viewed alcohol's effects more positively than did younger students ( $d = 1.16, p < 0.001$ ) and were more likely to believe alcohol consumption increases the likelihood of both positive and negative outcomes ( $d = 0.46, p < 0.001$ ) (Schell et al., 2005).

A study assessing both explicit and implicit alcohol expectancies among 76 children ( $M_{age} = 11.8$  years) found that, independent of age, children held higher negative than positive alcohol expectancies ( $B = 3.20, t(74) = 12.34, p < 0.001$ ), however increasing age was associated with greater positive expectancies ( $r = 0.23, p < 0.05$ ) (O'Connor et al., 2007). In the experimental component of the study strong implicit positive expectancies, based on faster identification of positive targets following an alcohol prime versus non-alcohol prime, were evident regardless of age. Another study, with 299 children in grades three to six found that positive ( $r = 0.25, p < 0.01$ ), negative ( $r = 0.19, p < 0.05$ ) and sedating ( $r = 0.12, p < 0.01$ ) alcohol expectancies increased with age (Bekman et al., 2011).

Three studies (Corvo, 2000; Kuntsche, 2017; Rinehart et al., 2006) focused primarily on racial or gender differences in expectancies, and are described in the demographic section below.

### 3.3.2. Longitudinal studies

A four year longitudinal study ( $N = 1161; M_{age} = 8.7$  years baseline; 56% African American; 100% female) found positive expectancies increased ( $F = 15.11, 2/1833$  df,  $p < 0.001$ ) and negative expectancies decreased ( $F = 29.28, 2/1776$  df,  $p < 0.001$ ) significantly with increasing age of the cohort (Hipwell et al., 2005).

A three year longitudinal study ( $N = 378$ ; aged 8-or-10-years at baseline,  $M_{age} = 9.5$ ; 47% female; 73% White) found children increasingly adopted both the positive and negative consensual adult (socially shared) outcomes expectancies as they moved into adolescence (significant cohort main effect and cohort-by-time interaction, all  $ps < 0.05$ ) (Donovan et al., 2009). Beliefs about alcohol effects widely endorsed by adults were more likely to be adopted by children as they moved into adolescence than those endorsed by half or a minority of adults. Both positive and negative consensual expectancies were adopted at a faster rate between ages 8.5 and 11.5 than between ages 12 and 13.5., and there was no further growth in negative expectancies between ages 12 and 13.5.

Finally, a two year longitudinal study ( $N = 277$ , sixth-graders,  $M_{age} = 9.0$ ; 49% female) found significant main effects for grade on positive alcohol expectancy change for Global Positive Transformations at 12 and 18 months, Social Behaviour Enhancement or impediment at 6 and 12 months, and Relaxation/Tension Reduction at 6 and 18 months; lower grades did not differ from each other, but differed significantly from the higher grades (Copeland et al., 2014).

### 3.3.3. Demographic differences

The Swiss found girls (only) endorsed positive alcohol expectancies more frequently than negative expectancies ( $\Delta M = 0.85, t = 4.2, p < 0.001$ ); girls also scored significantly higher on positive sedation expectancies (e.g. become calm) and lower on negative sedation expectancies (e.g. become sad) than boys (Kuntsche, 2017).

Three studies explored racial differences. The first ( $N = 69$ ; 49%

Black, 36% White and 14% Other) found positive and negative alcohol expectancies were significantly higher for Black children than White children ( $p = 0.04$ ), with the variance predominantly in a sub-scale that measured beliefs on how alcohol effects arousal and aggression ( $p = 0.003$ ) (Corvo, 2000). The four year girls-only longitudinal study (Hipwell et al., 2005) found a significant interaction between race and change in positive ( $F = 5.58$ , 2/1824 df,  $p < 0.01$ ) and negative ( $F = 3.19$ , 2/1766 df,  $p < 0.05$ ) expectancies; for example, African American girls held more positive expectancies at age 8, but showed little change with development, whereas Caucasian girls reported increasingly positive expectancies with age. In contrast, a study which collected data from three independent samples of varying racial composition and gender (between 40 and 60% Black, 50–58% female) found few racial differences in alcohol expectancies (Rinehart et al., 2006).

One study (Bekman et al., 2011) found that children with more enhanced cognitive abilities (i.e. concept formation and articulation, and categorization) held more positive expectancies.

#### 4. Discussion

The review identified a surprisingly small number of studies exploring children's alcohol knowledge, attitudes and expectancies. The diversity of the studies – in sample sizes, methodologies and analyses – limits the capacity to synthesise findings and draw clear conclusions about these important predictors of future drinking. However, the consistency of findings across studies on specific aspects allows us to draw some preliminary conclusions and make suggestions for future research.

##### 4.1. Knowledge

It is clear that from a very young age children are aware of, are able to identify, and have some knowledge of the effects of alcohol. Children as young as pre-school (Dalton et al., 2005; Kuntsche et al., 2016) and early primary (Andrews et al., 2003; Hahn et al., 2000) were able to identify alcohol and had beverage-specific knowledge; and knowledge of the effects of alcohol increased with age (Mack, 2003). The finding that more than half of pre-schoolers 'purchased' alcohol when role-playing (Dalton et al., 2005) suggests they see alcohol as a normal commodity (Babor, 2003) and part of life as an adult.

##### 4.2. Attitudes

While there is a need for more research to explore age differences in children's attitudes towards alcohol, including perceived descriptive and injunctive norms, it is evident that attitudes become more positive with increasing age. It appears that positive attitudes towards alcohol per se may increase in middle primary years (Bridges et al., 2003), and towards child/youth drinking in late primary (Prins et al., 2011); suggesting these shifts precede drinking initiation by some years. Thus, interventions targeting primary-school aged students (pre-drinkers) could usefully focus on delaying or preventing the formation of positive attitudes towards alcohol and youth drinking.

Children as young as six years had some knowledge of adult drinking norms, such as who drinks alcohol and in what situations (Kuntsche et al., 2016), suggesting knowledge about alcohol is socially acquired from observation of adults and perhaps also from exposure to messages in the media (Hahn et al., 2000). Previous research has demonstrated that media literacy programs can serve to teach children to more critically receive pro-alcohol messages in the media (Gordon et al., 2016), and that interventions targeting parents can increase their awareness of the influence of their alcohol-related attitudes on their children's drinking (Koutakis et al., 2008).

##### 4.3. Expectancies

Children of all ages hold both positive and negative alcohol expectancies, and are more ambivalent about alcohol than other substances, with several studies finding positive expectancies are higher than negative expectancies. The increase in positive expectancies with age was fairly consistent across studies (Bekman et al., 2011; Bridges et al., 2003; Cameron et al., 2003; Copeland et al., 2014; Donovan et al., 2009; Hipwell et al., 2005; Schell et al., 2005); whereas results were inconsistent for negative expectancies, with the majority of studies finding they increase (Bekman et al., 2011; Cameron et al., 2003; Donovan et al., 2009) but one that they decrease (Prins et al., 2011) with age. In combination, these findings suggest educational interventions (and perhaps family-based communications) could be more effective in delaying alcohol initiation by focusing on reducing positive expectancies of alcohol consumption and reinforcing positive expectancies of abstinence, rather than on increasing negative alcohol expectancies (the focus of many of the messages conveyed in school education and media campaigns). As Cameron notes, "Children have become discriminant evaluators of alcohol-related information and practices by the time they are about ten years old...important to enhance this capacity by promoting the positive aspects of *not drinking*" (Cameron et al., 2003) (pp. 693–696).

The finding that with increasing age children are more likely to endorse the beliefs of adults, and to adopt adults' positive and negative expectancies (Donovan et al., 2009), suggests interventions to delay children's drinking initiation may need to focus on the messages conveyed by parents and other key adults. These include both the conversations adults have with children about alcohol and the attitudes and behaviours they display in relation to their own drinking. While only specifically reported in one study (Donovan et al., 2009), the finding that consensual expectancies were adopted at a faster rate between ages 8.5 and 11.5 than between ages 12 and 13.5, and that negative expectancies did not increase between ages 12 and 13.5, suggests early adolescence may be a key time to intervene with educational messages and other strategies to delay or reduce the shift towards a positive view of the role of alcohol.

There is some evidence from the existing literature of other factors that are associated with alcohol expectancies; such as cognitive ability and sensation seeking (Bekman et al., 2011), personality traits including physical aggression (Chung et al., 2008), and ethnicity (Hahn et al., 2000; Hipwell et al., 2005; Mack, 2003). While these factors are less amenable to intervention, there is emerging evidence that specific personality traits including anxiety sensitivity, negative thinking, impulsivity and sensation seeking, can be targeted through alcohol education (Newton et al., 2016).

##### 4.4. Limitations

The current review was limited to peer-reviewed papers written in English and published from the year 2000 onwards. These papers reported on data collected between 1997 and 2013 (noting that some may have been earlier as many studies did not state when data was collected), with only one utilising data collected in the last 5–10 years. The small number of published papers, and the diversity of their study designs and foci, made assessment of bias of individual studies unfeasible and limited the ability to draw definitive conclusions. We were also limited by the lack of availability of key data for some studies; we tried to address these gaps by contacting the papers' authors but in some cases were still not able to obtain this information. The need for more comprehensive studies is evident in the non-representative nature of much of the data; with a number of studies using small samples (Cameron et al., 2003; Corvo, 2000; Sigelman et al., 2002), convenience samples (Dalton et al., 2005), specific cohorts such as only Catholic school students (Bridges et al., 2003; Mack, 2003; Rinehart et al., 2006; Sigelman et al., 2000) and/or reporting low consent rates

(Hahn et al., 2000; Kuntsche et al., 2016).

## 5. Conclusion

Parents and educators often ask: *when* should we start teaching children about alcohol (how young is too young); and *what* should we teach them? These studies highlight that children's knowledge of, and attitudes towards, alcohol form well before they initiate alcohol use, and are likely acquired through observation in the media and social situations. There is a need for more research, ideally large-scale longitudinal studies, to determine when, and why, children's attitudes towards alcohol move from being negative to positive. However, based on

the currently available literature, it appears that we should start talking to children about alcohol when they are in middle primary; and that education programs should focus on delaying initiation to alcohol use, reducing perceived social norms, and decreasing positive alcohol expectancies.

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## Appendix A

Table 1  
Children's knowledge of alcohol.

Citation	Data collected	Study design	Demographics	Measures	Key findings
Andrews et al., 2003	Western Oregon, US Data collected 1998–2001	Cohort-sequential (cross-sectional and 3 year longitudinal)	$N = 653$ $M_{\text{age}} = 8.02$ , $SD = 0.38$ 50% female (T1) 84% White	Shown pictures depicting wine, beer & hard liquor Scored as correctly identifying the substance if s/he could name it or describe its effects	Almost all identified alcohol (1st grade, boys: 93%, girls: 83%; 2nd grade, boys: 93%, girls 85%; 3rd grade, boys: 96%, girls 92%). Identification increased with grade (OR = 1.56, 95% CI = 1.19, 1.95, $p < 0.001$ ). More boys than girls identified alcohol (boys: 94%; girls: 83%; OR = 2.20, 95% CI = 1.44, 3.34; $p < 0.001$ )
Bridges et al., 2003	US (area not specified) Year of data collection not specified	Cross-sectional	$N = 217$ , 6 to 12 year olds $M_{\text{age}}$ not indicated 54% female 48% White non-Hispanic, 39% African American	Six knowledge items e.g. does wine contain alcohol? Twelve true or false items on long-term health effects Several scenarios in which a teenager experienced a specific behavioural change (causal understanding)	Familiarity with alcohol increased with grade ( $F(3210) = 39.83$ , $p < 0.01$ ). Understanding of how alcohol affects the body increased with grade ( $F(3210) = 40.69$ , $p < 0.01$ ) Children were more knowledgeable about, and endorsed more true long-term health effects for, alcohol than cocaine, $t(426) = -9.25$ , $p < 0.0001$ , two-tailed. 62% of the children bought alcohol, of whom 58% identified it by type (eg, “beer”, “wine”, or “booze”). Children more likely to buy beer or wine if parents drank alcohol at least monthly (adjusted OR, 3.04; 95% CI, 1.02–9.10) or if they viewed PG- 13- or R-rated movies (adjusted OR, 5.10; 95% CI, 1.14–22.90).
Dalton et al., 2005	New Hampshire, US Year of data collection not specified	Structured observational	$N = 120$ , 2 to 6 year olds, $M_{\text{age}} = 3.6$ , SD not specified Ethnicities not specified	Students' selection of alcohol products from a role-playing scenario	Mean number identified was 2.77 (only asked to identify one); higher grades identified more items Beverages most frequently identified were beer (57%), Budweiser (29%) and wine (5%).
Dunn and Goldman, 2000	Florida, US Year of data collection not specified	Cross-sectional	$N = 462$ , 2nd–5th graders; $M_{\text{age}} = 8.90$ , $SD = 0.56$ 92% Caucasian	Shown photographs of nine popular beverage containers and asked to identify one	56% correctly identified alcoholic beverages; 50%
Hahn et al., 2000	Kentucky, US Data collected	Cross-sectional	$N = 126$ kindergarten	Shown 18 pictures from child drug awareness inventory (CDAI) (Hahn,	

	November 1997–February 1998		children $M_{age} = 5.8$ years, SD = 0.4 56% female 70% Caucasian (non-minority), 22% African American	1997)	recognised drinking and driving.
Kuntsche et al., 2016	Cantons of Neuchatel and Geneva and the city of Lausanne, Switzerland Data collected 2013	Cross-sectional	$N = 301$ , 3 to 6 year olds $M_{age} = 5.4$ , SD = 0.8 50% female	Electronic version (eABT) of appropriate beverage task (Zucker et al., 2015)	68% correctly identified beer, white wine, red wine and champagne as alcoholic beverages. 46% knew beverages by name, compared to 83% and 73% for non-alcoholic beverages. Correctly classified alcoholic beverages almost twice as high among six-year-olds (82%) as three-year-olds (45%).
Mack, 2003	Washington, DC, US Year of data collection not specified	Cross-sectional	$N = 317$ , 3rd–6th graders $M_{age}$ not specified 56% female 33% White non-Hispanic and 68% African-American	Three scales (drug goes everywhere, brain mediates drug effect, drug has stimulant/depression effects)	No racial differences in understanding of how drugs affect the body, beliefs about the long-term health effects, or expectancies about the behavioural effects of using drugs. Grade significant predictor of knowledge for both races. Children in higher grades less likely to know alcohol travels everywhere in the body ( $r(316) = -0.16, p < 0.01$ ) and more likely to know alcohol causes behavioural change ( $r(317) = 0.35, p < 0.01$ ).
Mennella and Forestell, 2008	Pennsylvania, US	Cross-sectional	$N = 145$ , 5–8 year olds $M_{age} = 6.3$ , SD = 0.15 54% female 49% African American, 34% Caucasian	Children smelt and identified odors of alcohol and non-alcohol products (Mennella and Garcia, 2000; Schmidt and Beauchamp, 1988)	< 11% could identify alcohol odors by name.
Rinehart et al., 2006	US (area not specified) Year of data collection not specified	Cross-sectional	Three independent samples ( $N = 181$ , $N = 287$ , $N = 234$ ) Study 1 – 1st–6th graders, Studies 2 & 3 – 3rd–6th graders Gender & race varied: 50–58% female; 40–61% Black	Four scales (familiarity, drug goes everywhere, brain mediates effects, drug has depressant effects); total of 24 items Three scales (true long term effects, false long-term effects, social effects); total of 12 items	Black children more likely to attribute negative long-term health and social effects to alcohol, but few significant race differences in knowledge or expectancies regarding short-term effects of use.
Sigelman et al., 2000	Washington, DC, US Data collected 1997–2001	Cross-sectional	$N = 217$ $M_{age} = 8.71$ , SD not specified 53% female 48% White, 39% African American	Students verbally responded what they thought would happen if someone drank a large quantity of alcohol every day for a number of years (converted to 11 dichotomous variables) 4-point scale on long-term health effects of alcohol (definitely will not happen to definitely will	No significant age, race or gender differences for open-ended measure of knowledge Children perceived cocaine more likely than alcohol to result in death (chi-square = 10.68, $p < 0.001$ , but less likely to result in sickness, chi-square = 5.31, $p < 0.05$ ). Other

happen)

perceived effects of the two drugs were similar. No grade differences in endorsement of true health effects of alcohol. Reduction in mistaken ideas about alcohol's effects with age; 1st-2nd and 3rd-4th graders more likely than 5th–6th graders to attribute tobacco effects to alcohol.

**Table 2**  
Children's attitudes towards alcohol (and alcohol users).

Citation	Data collected	Study design	Demographics	Measures	Key findings
Andrews and Peterson, 2006	Western Oregon, US Data collected 1998–2001	Cohort-sequential (cross-sectional and 4 year longitudinal)	$N = 1075$ , 1st–5th graders $M_{\text{age}} = 9.0$ , $SD = 1.45$ 50% female 86% White	Attitudes (alcohol users) Three-item, 3-point scale. Asked if kids who drink alcohol are 'cool or neat', 'exciting', or 'popular or liked by other kids.'	26% attributed 'popular or liked by others', 59% attributed 'exciting', and 6% attributed 'cool or neat' to alcohol users. 1st, 2nd and 3rd graders' attitudes significantly more positive than 4th and 5th graders'; 7th graders' attitudes significantly more positive than 4th–6th; and 8th graders' attitudes significantly more positive than the attitudes of students in all the other grades. Girls had more positive attitudes of alcohol users than boys [ $F(1,3991) = 6.06$ , $p < 0.05$ ].
Andrews et al., 2008	Western Oregon, US Data collected 1998–2004	Cohort-sequential (cross-sectional and 7 year longitudinal)	$N = 712$ , 2nd–5th graders (T1) $M_{\text{age}} = 9.47$ , $SD = 1.15$ 50% female. Caucasian 87%	Attitudes (alcohol users) Three-item, 3-point scale. Asked if kids who drink alcohol are 'cool or neat', 'exciting', or 'popular or liked by other kids.' Norms Second and third graders shown picture of alcoholic beverages and asked if kids in the neighbourhood or their friends ever drink the product Fourth through eighth graders asked how many of the kids at school or in the neighbourhood have tried a drink of alcohol [beer, wine, or hard liquor] and if any friends drink alcohol	Attitudes and descriptive norms increased over time No significant gender differences in attitudes or descriptive norms Those with less favourable initial attitudes towards alcohol users increased favorability of attitudes faster ( $r = -0.36$ , $p < 0.05$ ). Association between attitudes towards alcohol users and descriptive norms ( $r = 0.69$ , $p < 0.011$ ).
Bridges et al., 2003	US (area not specified) Year of data collection not specified	Cross-sectional	$N = 217$ 1st through 6th graders (6 to 12 years old) $M_{\text{age}}$ not stated 54% female 48% White non-Hispanic, 39% African American	Injunctive norms Asked whether it's ok or a bad idea for a teenager to drink, and whether it's ok for an adult to drink.	Attitudes towards alcohol use less negative in higher grades than in lower grades. Attitudes ranged between "a kind of bad idea [1]" and "a kind of okay idea [2]", with scores of 0.98 for 1st and 2nd graders, 1.32 for 3rd and 4th graders, and 1.24 for 5th and 6th graders.



Cameron et al., 2003	Large Australian city Year of data collection not specified	Cross-sectional	$N = 233$ , 3rd, 5th and 7th graders $M_{\text{age}} = 10.1$ , $SD = 0.41$ 52% female 81% Australian	Attitudes Four-point scale indicating degree of liking beer, champagne and wine	Attitudes towards alcohol use less negative than attitudes towards cocaine use in all age groups ( $t(426) = 6.99$ , $p < 0.0001$ ). Degree of liking each substance between 'a little [1]' and 'quite a bit [2]', with scores of 1.28 for beer, 1.46 for champagne, and 1.27 for wine. Boys liked beer and champagne more than girls ( $t(162) = 2.96$ , $p < 0.05$ , and $t(139) = 3.43$ , $p = 0.001$ ) Non-minority children more likely to say 'bunchy bear' happy that parent was giving child a sip of beer (44% vs. 0%; $p$ -value for Fisher's exact test = 0.05).
Hahn et al., 2000	Kentucky, US Data collected November 1997–February 1998	Cross-sectional	$N = 126$ kindergarten children $M_{\text{age}} = 5.8$ years, $SD = 0.4$ 56% female 70% Caucasian, 22% African American	Injunctive norms Shown 18 pictures from child drug awareness inventory (CDAI) (Hahn, 1997) and rated actions as good or bad e.g. giving child sip of alcohol	Alcoholic beverages assigned more often to men (42%) than women (29%) ( $p < 0.001$ ) or children (13%); and more often to adults at a party (39%) than those playing outdoors (35%) ( $p < 0.01$ ).
Kuntsche et al., 2016	Cantons of Neuchatel and Geneva and the city of Lausanne, Switzerland Data collected 2013	Cross-sectional	$N = 301$ three-to six-year-olds $M_{\text{age}} = 5.4$ , $SD = 0.8$ 50% female	Descriptive norms Assigned beverages to people of different ages and genders for 11 different scenarios	Majority disliked the odors of beer (77%) and whiskey (81%). Children whose mothers drank to escape chose beer less often as the preferred odor than children of non-escape drinkers ( $p < 0.05$ ). Significant growth in children's acceptance of child sipping, drinking, and drunkenness as they got older. For acceptance of sipping, nearly twice as much growth from age 11.5 through age 16 years, compared to ages 8.5–11 years. For acceptance of child drinking, substantial growth from age 12 through age 16 years. For acceptance of drunkenness, significant growth from age 12 through age 16 years. Girls and boys displayed the same growth curves over time.
Mennella and Forestell, 2008	Pennsylvania, US Year of data collection not specified	Cross-sectional	$N = 145$ , 5–8 year olds $M_{\text{age}} = 6.3$ , $SD = 0.15$ 54% female 49% African American	Attitudes Sensory testing method – children smelt an odor and placed it in a category to indicate like or dislike of the odor (Mennella and Garcia, 2000; Schmidt and Beauchamp, 1988).	Children whose mothers drank to escape chose beer less often as the preferred odor than children of non-escape drinkers ( $p < 0.05$ ). Significant growth in children's acceptance of child sipping, drinking, and drunkenness as they got older. For acceptance of sipping, nearly twice as much growth from age 11.5 through age 16 years, compared to ages 8.5–11 years. For acceptance of child drinking, substantial growth from age 12 through age 16 years. For acceptance of drunkenness, significant growth from age 12 through age 16 years. Girls and boys displayed the same growth curves over time.
Prins et al., 2011	Pennsylvania, US Data collected late 2001–early 2002	Cohort-sequential longitudinal (cross-sectional and longitudinal)	$N = 452$ , 8 or 10-years old (T1) $M_{\text{age}} = 9.52$ , $SD = 1.03$ Ethnicities not specified	Injunctive norms Ten-item scale assessed acceptability of child alcohol use	Significant growth in children's acceptance of child sipping, drinking, and drunkenness as they got older. For acceptance of sipping, nearly twice as much growth from age 11.5 through age 16 years, compared to ages 8.5–11 years. For acceptance of child drinking, substantial growth from age 12 through age 16 years. For acceptance of drunkenness, significant growth from age 12 through age 16 years. Girls and boys displayed the same growth curves over time.
Rinehart et al., 2006	US (area not specified) Year of data collection not specified	Cross-sectional	Three independent samples ( $N = 181$ , $N = 287$ , $N = 234$ ) Study 1 – 1st-6th graders, Studies 2 & 3 – 3rd-6th graders Gender and race varied across samples: 50–58% female; 40–61% Black; 38.7–60.3% White	Injunctive norms Five items assessed attitudes towards adult alcohol use	In all samples, black children had less positive attitudes towards adult alcohol use than White children
Sigelman et al.,	Northern	Cross-	$N = 121$ total	Attitudes	Children tended to

2002	Virginia and Washington, DC, US Year of data collection not specified	sectional	$N = 21$ five-to-seven-year-olds; $N = 25$ eight-to-ten-year-olds; $N = 31$ eleven-to-fourteen-year-olds; $N = 44$ eighteen-to-twenty-five-year-olds $M_{\text{age}} = 11.4$ , SD not specified Minority group members (African Americans, Hispanic Americans, Asian Americans), differed significantly between the groups (from 29% to 90%)	Three questions on if it's a good idea or bad idea (then 'really' good/bad or 'just sort of a good/bad idea) for an adult to drink a lot of alcohol, 15-year old to try some alcohol at a party such to see what it is like, and for people who drink alcohol to stop drinking it.	overgeneralise beliefs about alcohol to cocaine. Youngest children (5–7 years) saw cocaine as more likely than alcohol to cause drunkenness. $F(1,19) = 2.54, p < 0.05$ . Only children aged 8 to 10 were significantly less likely than college students to view alcohol as stimulating. Ethnic differences were not evident for 12 and under.
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Table 3  
Children's alcohol expectancies.

Citation	Data collected	Study design	Demographics	Measures	Key findings
Bekman et al., 2011	Hillsborough County, US Year of data collection not specified	Cross-sectional	$N = 299$ $M_{\text{age}} = 9.36$ years, SD = 1.01 Sex not specified 44% White/Caucasian, 21% Hispanic/Latino, 24% Other.	41-item Memory Model-Based Expectancy Questionnaire (MMBEQ) (Dunn, 1999)	Positive ( $r = 0.25, p < 0.01$ ), negative ( $r = 0.19, p < 0.05$ ) and sedating $r = 0.12, p < 0.01$ ) expectancies increased with age. Cognitive skill in concept formation and articulation, and categorization correlated with positive alcohol expectancies ( $\beta = 0.08, 95\% \text{ CI } [0.05, 0.11], z = 2.65, p < 0.01$ ). Sensation seeking associated with positive ideas about alcohol, but not with MMBEQ subscales.
Bridges et al., 2003	US (area not specified) Year of data collection not specified	Cross-sectional	$N = 217$ 1st through 6th graders (age from 6 to 12) $M_{\text{age}}$ not stated 54% female 48% White non-Hispanic, 39% African American	28-items based on related studies	Children strongly believed alcohol use unlikely to lead to positive short-term outcomes and likely to lead to negative short-term outcomes. 5th/6th graders significantly more likely to hold positive expectancies than 1st-4th graders ( $F(3210) = 8/19, p < 0.01$ )
Cameron et al., 2003	Large Australian city Year of data collection not specified	Cross-sectional	$N = 233$ children in 3rd, 5th and 7th grade $M_{\text{age}} = 10.1$ , SD = 0.41 52% female 81% Australian	Adapted version of alcohol expectancy questionnaire (Dunn and Goldman, 1998)	Older children endorsed alcohol expectancies more than younger children ( $F(2, 223) = 7.81, p < 0.005$ ) Compared to non-alcohol stimuli, differences between positive and negative expectancies much smaller for all of alcohol items, indicating more balanced or ambivalent expectancies unique to alcohol ( $t(232) 1/4 2.05, p < 0.05, t(232) 1/4 3.54, p < 0.001, \text{ and } t(232) 1/4 8.35, p < 0.001, \text{ respectively}$ ).
Copeland et al., 2014	Louisiana, US Year of data collection not specified	2 year longitudinal	$N = 277$ 2nd–6th grade students $M = 9.04$ years, SD = 1.48 49% female 93% White	Alcohol Expectancy Questionnaire-Adolescent (AEQ-A; Christiansen et al., 1995) – 90 statements about possible effects of alcohol, with seven scales	Significant grade effects on positive alcohol-expectancy change for global positive transformations at 12 and 18 months, social behaviour enhancement or impediment at 6 and 12 months, and relaxation/tension reduction at 6 and 18 months; lower grades did not differ from each other, but differed

Corvo, 2000	Cleveland, OH, US Year of data collection not specified	Cross-sectional	$N = 69$ Black ( $N = 34$ ), white ( $N = 25$ ), and other ( $N = 10$ )	39 item yes/no scale - Children's Alcohol-Related Expectancies (CARE) questionnaire	significantly from higher grades. Significantly higher scores for black children than white children ( $p = 0.04$ ). Most variance in sub-scale on arousal and aggression beliefs ( $p = 0.003$ ).
Donovan et al., 2009	Pennsylvania, US Baseline data collected late 2001-early 2002	Cohort-sequential (cross-sectional and 3 year longitudinal)	$N = 504$ $M_{age} = 6.2$ , SD not specified 47% female 73% White; 24% African-American	Agreement with expectancies (6 consensual positive alcohol, 13 consensual negative, 6 nonconsensual positive and negative and 2 consensual nonexpectancies)	Children increasingly adopted consensual adult (socially shared) positive and negative outcome expectancies with age Beliefs about alcohol effects widely endorsed by adults more likely to be adopted by the children as they moved into adolescence than those endorsed by only half or fewer adults
Dunn and Goldman, 2000	Florida, US Year of data collection not specified	Cross-sectional	$N = 1465$ $M_{age} = 10.97$ , SD = 0.64 Interviews $N = 462$ 2nd–5th graders; $M_{age} = 8.90$ , SD = 0.56 92% Caucasian Surveys $N = 1003$ 3rd, 6th, 9th, and 12th grade students; $M_{age} = 13.03$ 69% Caucasian	Interviews: asked “how do people feel when they drink alcohol?” Survey: write down as many words or phrases they could think of for how people feel when they drink alcohol	“Bad” most frequent response of 2nd graders, decreased with age; “happy” greater among 9th graders “Cool” peaked in frequency among 5th graders
Hipwell et al., 2005	Pittsburgh, US. Data collected 1999	4 year longitudinal	$N = 1161$ preadolescent girls $M_{age} = 8.7$ years, SD = 0.37 (baseline) 56% black, 44% white	Children's Expectancy Questionnaire-Revised (CEQ-R; Dunn and Goldman, 1998) (8 positive and 11 negative alcohol expectancies)	Positive expectancies increased significantly over time ( $F = 15.11$ , 2/1833 df, $p < 0.001$ ). Negative expectancies decreased over time in linear fashion ( $F = 29.28$ , 2/1776 df, $p < 0.001$ ); significant reduction in strength of effects between ages 8 and 9. Significant interaction between race and change in positive ( $F = 5.58$ , 2/1824 df, $p < 0.01$ ) and negative expectancies significant interaction between race and change in expectancies ( $F = 3.19$ , 2/1766 df, $p < 0.05$ ).
Kuntsche (2017)	Cantons of Neuchatel and Geneva and the city of Lausanne, Switzerland Data collected 2013	Cross-sectional	198 three-to-six-year-olds (3%, 17%, 43%, and 37% aged 3, 4, 5, and 6, respectively) 53% female	12-items using Berkeley Puppet Interview (BPI)	Girls endorsed positive alcohol expectancies more frequently than negative ( $\Delta M = 0.85$ , $t = 4.2$ , $p < 0.001$ ). Girls scored significantly higher on positive sedation expectancies and lower on negative sedation expectancies than boys. No significant age difference in any expectancy dimension.
O'Connor et al., 2007	US (area not specified) Year of data collection not specified	Cross-sectional	$N = 76$ ; 70% male $M_{age} = 11.8$ years (range 10–14) 74% Caucasian, 13% African American	21-item, 11-point scale –rated likelihood of negative and expectancies at a party Priming task (implicit expectancies) included alcohol, non-alcohol, and non-cigarette primes.	All ages perceived costs of drinking alcohol as more likely than benefits ( $B = 3.20$ , $t(74) = 12.34$ , $p < 0.001$ ). Older age associated with greater perceived likelihood of benefits of alcohol use ( $r = 0.23$ , $p < 0.05$ ); strong positive implicit alcohol use cognitions regardless of age

Rinehart et al., 2006	US (area not specified) Year of data collection not specified	Cross-sectional	Three independent samples ( $N = 181$ , $N = 287$ , $N = 234$ ) Study 1 – 1st–6th graders, studies 2 & 3 – 3rd–6th graders Gender varied across samples: 50–58% female; racial composition varied: 40–61% Black	Three scales (loss of control, positive affect, stimulant effects); total of 22 items	Black children more likely to attribute negative long-term health and social effects to alcohol, few significant race differences in knowledge or expectancies regarding short-term effects of use.
Schell et al., 2005	South Dakota, US Data collected 2000	Cross-sectional	$N = 3625$ students (1993 4th grade and 1632 9th grade) $M_{age}$ not stated 50% female 85% Caucasian non-Hispanic, 11% American Indian, 4% other ethnicity.	23-item measure; some items based on AEQ-A; > Christiansen et al., 1982).	Older students viewed alcohol's effects more positively (Cohen's $d = 1.16$ , $p < 0.001$ ) Older students believed alcohol has larger impact on all outcomes ( $d = 0.46$ , $p < 0.001$ ) Significant differences in interpretation of alcohol expectancies items across cohorts.
Sigelman et al., 2002	Northern Virginia and Washington, DC Year of data collection not specified	Cross-sectional	$N = 121$ $M_{age} = 11.4$ , SD not specified (range 5 to 25) Minority group members differed significantly between the groups (from 29% to 90%)	17-item, 3-point scale (drunkenness, pathology, stimulant effects and elation/empowerment)	Children overgeneralised beliefs about alcohol to cocaine. Only children aged 8–10 significantly less likely than college students to view alcohol as stimulating. Ethnic differences not evident for 12 and under.

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