What do preschoolers know about alcohol?
Evidence from the electronic Appropriate Beverage Task (eABT)

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Abstract

While much is known about alcohol use in adolescence and beyond, factors leading to such behaviors are rooted much earlier in life. To investigate what preschoolers (aged three to six) know about alcohol and adult alcohol use, we developed an electronic version (eABT) of the Appropriate Beverage Task (Zucker et al., 1995). Drawings of adults and children in 11 everyday scenarios and 12 photos of different beverages were shown on a touchscreen computer to 301 three- to six-year-olds (49.5% girls) from 37 preschools and seven nurseries in French-speaking Switzerland. First, the children assigned a beverage to each individual in each drawing, and then were asked if the beverage contained alcohol and if they knew its name. The results revealed that 68.1% correctly classified beer, white wine, red wine and champagne as alcoholic beverages, while 46.4% knew the drinks by name, compared to 83.2% and 73.1% for non-alcoholic beverages. Alcoholic beverages were assigned more often to men (42.2%) than to women (28.7%) or to children (12.7%), and more often to adults at a party (39.4%) than to those playing outdoors (34.7%). In conclusion, children as young as three often have some beverage-specific knowledge. From the age of four onwards, they begin to know that alcoholic beverages contain alcohol. Children aged six and over tend to have some knowledge of adult drinking norms, i.e. who is drinking and in what circumstances.

Keywords: Alcohol-related knowledge, drinking norms, Appropriate Beverage Task, preschool children, Switzerland

1. Introduction

While much is known about the myriad determinants of alcohol use and risky drinking in adolescence and beyond (Kuntsche, Rehm & Gmel, 2004; Windle, 2003), factors leading to such behaviors are rooted much earlier in life (Blinn-Pike et al., 1993; Donovan & Molina, 2011; Sartor, Lynskey, Heath, Jacob & True, 2007; Zucker, Donovan, Masten, Mattson & Moss, 2008, 2009). However, there is little scientific evidence on what young children actually know about alcohol and its use in grown-ups. Between the ages of three and six, children's cognitive and language abilities develop rapidly. They are, for example, able to classify objects according to nonobvious properties (categorization) and to make logically correct inferences based on these properties (Berk, 2013; Flavell, 1999; Ross, Gelman & Rosengren, 2005). Consequently, between 53% and 88% of children in this age group can identify whether beverages contain alcohol or not by sniffing or by sight, and such knowledge is age-graded (Fossey, 1993a, 1993b; Hahn et al., 2000; Jahoda, Davies & Tagg, 1980; Mennella & Forestell, 2008; Mennella & Garcia, 2000; Noll, Zucker & Greenberg, 1990; Tennant, 1979; Zucker, Kincaid, Fitzgerald & Bingham, 1995). In a doll-play scenario, 61.7% of two- to six-year-olds 'bought' alcohol with their doll from a miniature grocery store, of whom 58.1% named the beverage (beer, wine, etc.) correctly (Dalton et al., 2005). Preschoolers also have some knowledge of adult drinking norms. For example, when shown pictures of adults and children in different settings, three- to six-year-olds attributed alcoholic beverages twice as often to men as to women, and four times more often to the adults than to the children (Zucker et al., 1995). One study even found that children's alcohol-related knowledge between the ages of three and six is a predictor of early-onset drinking nine years later (Donovan et al., 2004).

Unfortunately, the scientific evidence that does exist originates from only a handful of studies using either small convenience samples, or community-based but high-risk samples.

Furthermore, all of them were conducted over a decade ago and in only two countries (US and UK). A major reason for this lack of scientific insight and the small sample size used by previous studies is the methodological challenge of surveying young children; they cannot read or write, have limited language skills, and are easily influenced by the interviewer or by the way questions are phrased (Blinn-Pike et al., 1993; Dalton et al., 2005). Age-appropriate methodologies, however, tend to be costly, coupled with the fact that study setups (e.g. arranging a doll play), recording the answers (e.g. with video cameras) and coding and entering them in an electronic database for analysis are all time- and labor-intensive.

To meet these challenges, we developed and tested an electronic version (eABT) of the Appropriate Beverage Task, originally devised by Zucker and colleagues (Zucker et al., 1995). Moreover, in any assessment of preschoolers' alcohol-specific knowledge it is important to investigate what young children know about beverages in general (e.g. that non-alcoholic drinks do not contain alcohol). To this end, we also evaluated children's knowledge of non-alcoholic beverages and used the results as a benchmark.

We tested the following six hypotheses. Hypothesis 1 expects that around 70% of three- to six-year-olds can correctly identify alcoholic beverages as containing alcohol (Fossey, 1993b; Hahn et al., 2000; Jahoda et al., 1980; Tennant, 1979; Zucker et al., 1995). Hypothesis 2 expects a high congruency of knowledge (a high test-retest reliability) of the content and names of both alcoholic and non-alcoholic beverages when repeating the eABT with the same children one week later. Hypothesis 3 posits that preschoolers will more often know the names of non-alcoholic beverages than those of alcoholic drinks, simply due to their personal experience with the former. Hypothesis 4 posits that girls' biological and sociocultural advantage in terms of early language development (Berk, 2013) may explain why previous studies found them to be better at recognizing alcoholic beverages and the role of drinking (Gaines, Brooks, Maisto, Dietrich & Shagena, 1988; Jahoda et al., 1980; Lang &

Stritzke, 1993). Consequently, we expect that girls will have greater knowledge of the names and content of both non-alcoholic and alcohol beverages. In Hypothesis 5, we predict that knowledge of the names and content of both non-alcoholic and alcoholic beverages will increase across age groups (Jahoda et al., 1980; Zucker et al., 1995) due to the fact that children's cognitive and language abilities develop considerably between the ages of three and six (Berk, 2013; Dalton et al., 2005; Flavell, 1999; Ross et al., 2005). In addition, in line with previous research (Lang & Stritzke, 1993; Zucker et al., 1995), we expect that preschoolers will perceive and already have some knowledge of gender-specific drinking norms, i.e. that men drink more than women (Kuntsche et al., 2004). Accordingly, Hypothesis 6 posits that the children will more often attribute alcoholic beverages to the men displayed in the eABT drawings than to the women.

2. Methods

2.1. Adaptation work and pre-tests

A professional artist updated and adapted the original drawings (Zucker et al., 1995) to the contemporary Swiss cultural context while keeping their content. Beverages were selected that were either commonly found in local shops (brands of beer, wine, etc.) or commonly consumed or popular among young children (soft drinks, water, etc.). Two series of pre-tests (one in the lab in the presence of Dr. Zucker and one under realistic conditions in one nursery) were conducted to ensure that the young participants were able to grasp the content of the scenes and identify the beverages in the pictures.

2.2. Sample

Having obtained the requisite authorization from the relevant authorities and the ethical commissions of Lausanne (Protocol 266/2012) and Geneva (Protocol 12-25), we randomly

selected 37 preschool classes (compulsory attendance from the age of 4 onwards) and seven nurseries (voluntary attendance) from different parts of French-speaking Switzerland (namely the cantons of Neuchâtel and Geneva and the city of Lausanne, wine-producing areas with frequent wine consumption, often together with meals: Kuntsche et al., 2015). We then informed preschool teachers, nursery staff and parents about the study. Out of 918 families approached, 319 (34.7%) children had one or both parents consent to their participation. This proportion is relatively high (a) compared to previous similar studies (Stone et al., 2013; Thompson, 1984; Tigges, 2003); (b) given that there was no direct contact with or incentives for the parents; (c) given that there were multiple steps in which the consent form could be forgotten or lost (researcher-to-school-to-home-to-school-to-researcher). Moreover, each region was represented by at least five institutions and at least 41 participating children. Urban and rural areas were equally represented. Eighteen children (5.6%) could not participate on the day for reasons such as illness. The final sample consists of 301 children aged between three and six (mean age=5.4, $SD = 0.8$, 49.5% girls).

Between February and July 2013 specially trained members of the research team visited the preschools and nurseries on a pre-arranged date. Upon arrival, they installed the touchscreen computer in a quiet and convenient place inside the school or nursery but outside the classroom and booted the eABT software developed specifically for the study. One by one, the children were called from the classroom to complete the eABT under the supervision of the research staff. As an incentive, preschool classes received CHF 100 (approximately USD 112) and nurseries CHF 200 when more than three children participated (CHF 70 otherwise). In addition, everyone in the class received a little gift (e.g. a pencil).

To assess test-retest reliability, eight preschool classes and one nursery were randomly selected in which the same team of researchers conducted the eABT with the same children

one week later. This sample consisted of 50 children aged between three and six (mean age=5.23, $SD = 0.86$, 54.0% girls).

2.3. Procedure

The eABT software was written in the scripting language PHP using a MySQL database so that it could be installed on a standalone computer or on a distant Internet webserver. Compliant with HTML5/CCS3 standards, the eABT can be displayed on any Internet browser. The layout was specially designed to fit the 20-inch touchscreen PC (Sony Vaio Tap 20) that we used to collect the data. To train the children for the task, hand drawings of animals (cat, dog, rabbit, cow and squirrel) appeared in the top half of the screen, with 12 pictures of animal-relevant foods (milk, nuts, apple, a bone, grass, carrots, etc.) in the bottom half. An arrow pointed to one of the animals and the interviewer asked the child to indicate which of the foods he or she thought the animal would eat. When the child touched the image of their chosen food item, the answer was automatically stored in a database and the arrow moved on to the next animal. After these two practice rounds, the children were shown, in random order, 11 drawings of individuals in everyday settings. In all cases, they comprised people of different ages (adults and children) and genders (Table 1). At the bottom of the screen were images of four alcoholic drinks (beer, white wine, red wine, champagne) and eight non-alcoholic drinks (water, tea, orange juice, hot chocolate, cola, children's champagne [sparkling soda], fruit cordial and ice tea; see Figure 1 for an example). Again, the interviewer asked the child to touch the picture of the beverage which he or she thought the person at whom the arrow was pointing would drink. The arrow then moved to the next person until the child had chosen a beverage for everyone shown in that setting. The process was then repeated for the following scenario until all 11 scenarios were completed. At that point, only

the beverage gallery was displayed on the screen and the child was asked whether he or she knew if the drinks contained alcohol or not, and whether he or she could name them.

---Table 1 and Figure 1 about here---

2.4. Measures

Content, name. For alcoholic and non-alcoholic beverages separately, a mean score was calculated for the percentage of beverages correctly classified as being alcoholic or non-alcoholic and for the percentage of those correctly identified by name (beer, water, tea, etc.).

Persons. This mean score is the percentage of children, women and men in the 11 scenarios (see Table 1) who were assigned an alcoholic beverage.

Settings. This mean score is the percentage of adults shown in specific settings (outdoors, meals, party) who were assigned an alcoholic beverage.

2.5. Analytic Strategy

There were no missing values since all of the children provided an answer for all scenarios and all beverages. Answers were not clustered within classes/nurseries (intraclass correlation coefficients [ICC] for all mean scores were less than .001). For the test-retest reliability analysis, we used dependent sample t-tests and ICC type 2,1. Values greater than 0.75 were considered excellent, 0.75 to 0.40 fair, and under 0.40 poor (Shrout & Fleiss, 1979; Yen & Lo, 2002). We performed one-sample t-tests to ascertain whether one score differed significantly from another (e.g. whether children knew more about non-alcoholic than alcoholic beverages) or whether the answers were random choices. We carried out a multiple regression to test for gender and age differences (independent variables) across the various scores (dependent variables).

3. Results

3.1. Beverage-specific knowledge

The children identified 68.1% of the alcoholic beverages as containing alcohol (about two to three out of four), and were able to name 46.6% of them (Table 2). There were no large differences concerning the specific beverages, with 69.8%, 67.4%, 64.5%, and 70.8% of children correctly classifying beer, white wine, red wine, and champagne respectively as alcoholic drinks. However, the scores differed considerably when it came to naming beverages, with 57.1%, 38.5%, 66.1%, and 23.9% of the children knowing the names of beer, white wine, red wine, and champagne, respectively. Knowledge of alcoholic beverages was significantly lower ($\Delta_{\text{Content}}=-15.1\%$, $t=-7.2$, $p<.001$; $\Delta_{\text{Name}}=-26.7\%$, $t=-14.9$, $p<.001$) than that of non-alcoholic beverages. For the latter, 83.2% were correctly classified as alcohol-free (about six to seven out of eight) and 73.1% of them were known by name.

---Table 2 about here---

Results from the test-retest analyses revealed that average knowledge was largely the same one week later for alcoholic beverages but had slightly increased for non-alcoholic beverages (bottom of Table 2). However, none of the T_1 - T_2 differences were significant (detailed results on request) and ICC values ranged from .82 to .94.

No significant gender differences were found for alcoholic beverages. However, a multiple regression adjusted for age effects showed that girls more often identified non-alcoholic beverages as not containing alcohol and more often knew the beverage name (Table 2). Knowledge of beverage-specific content and names increased significantly across age categories. For example, the share of correctly classified alcoholic beverages was almost twice as high among six-year-olds (81.8%) as it was among three-year-olds (44.8%). Only in the 4+ age group ($\Delta=9.5\%$, $t=2.1$, $p<.05$) was the classification of alcoholic beverages significantly different from the 50% random choice. The six-year-olds even knew the name of

more than half of the alcoholic beverages, compared to less than one-third of three-year-olds. Whereas three-year-olds correctly classified two-thirds of non-alcoholic beverages as alcohol-free, this knowledge increased steadily with age, and by the age of six 90% of the children got it right.

3.2. Scenario-based knowledge

Out of the 16 children shown in the 11 drawings, an average of two (12.6%) were given an alcoholic beverage to drink (Table 3). However, this share was significantly lower in the responses given by girls and by older children. An average of 28.7% of women in the scenarios were given an alcoholic beverage, which is much lower ($\Delta=-4.6\%$, $t=3.8$, $p<.001$) than the random choice (four alcoholic beverages out of 12). There were no gender or age effects among the children who gave women alcoholic beverages. In 42.2% of cases, the men in the scenarios were assigned alcoholic beverages to drink. This proportion was significantly higher than for women ($\Delta=13.5\%$, $t=10.1$, $p<.001$), and higher than the random choice ($\Delta=8.9\%$, $t=6.8$, $p<.001$). Although gender differences were not significant, older children (44.6% among 5 and 6-year-olds) more frequently assigned an alcoholic beverage to men ($\Delta=8.0\%$, $t=4.9$, $p<.001$) than younger children did (36.6% among the three-to-four age group); the latter was not significantly different from the random choice ($\Delta=3.2\%$, $t=1.5$, n.s.).

---Table 3 about here---

When adults were shown in an outdoor setting (either playing with children or having a picnic), slightly more than one-third was given an alcoholic beverage to drink, which is not significantly different from the random choice ($\Delta=1.4\%$, $t=0.9$, n.s.). This proportion was slightly higher (36.3%) for adults shown having lunch or dinner with children, though it was still not significant ($\Delta=3.0\%$, $t=1.9$, n.s.). In both cases, there were no significant gender or age differences. Compared to the random choice, adults at an adult-only party were more

likely to be assigned an alcoholic beverage ($\Delta=6.1\%$, $t=3.7$, $p<.001$) than the grown-ups shown playing or picnicking outdoors ($\Delta=4.7\%$, $t=2.9$, $p<.01$) but not than the adults shown having a meal with children ($\Delta=3.1\%$, $t=1.9$, n.s.). Although gender differences were not significant, the same does not apply to age differences, with older children more frequently assigning alcoholic beverages to adults shown in an adult-only party setting.

4. Discussion

In this study we developed and tested the eABT, an electronic method to assess young children's beverage-specific knowledge. The results were consistent with previous evidence (Fossey, 1993b; Hahn et al., 2000; Jahoda et al., 1980; Tennant, 1979; Zucker et al., 1995) and support Hypothesis 1, i.e. that three- to six-year-olds can correctly identify more than two-thirds of the alcoholic beverages as containing alcohol. This suggests that alcohol use is quite visible in the lives of preschoolers.

Test-retest values of .82 or higher demonstrated excellent reliability (Shrout & Fleiss, 1979; Yen & Lo, 2002) of the eABT scores, thus supporting Hypothesis 2. Moreover, for all four beverage mean scores, the percentage of knowledge either remained stable or increased slightly (but non-significantly). This is to be expected when conducting the same task with the same children one week later, and these indicators underscore the validity of the present findings. Coupled with the user-friendly and cost-effective nature of the method for both children (who simply have to touch the picture of their chosen beverage on the screen) and the researchers (who directly obtain a database without coding or data entry), the eABT appears an appropriate and effective method of collecting beverage-specific knowledge from preschoolers.

Concerning preschoolers' knowledge of non-alcoholic beverages, for which they typically can draw on personal experience, the study findings support Hypothesis 3, i.e. three-

to six-year-olds can correctly identify the content and name of non-alcoholic beverages more often than they can for alcoholic beverages. This was more common among girls, which supports Hypothesis 4 and may be related to the fact that their language development is more advanced at this age (Berk, 2013). In contrast to previous studies (Gaines et al., 1988; Jahoda et al., 1980; Lang & Stritzke, 1993) and contrary to Hypothesis 4, the percentage of alcoholic beverages correctly identified as containing alcohol and recognized by name was only slightly (and not significantly) higher among girls. Similarly, no difference in alcohol assignment emerged when boys and girls were asked what beverage the adults in each scenario were drinking. It appears that knowledge of beverage-specific content and names and drinking norms depends more heavily on parental drinking habits and environmental factors other than the child's gender (Blinn-Pike et al., 1993; Zucker et al., 1995).

Not surprisingly, children between the ages of three and six are increasingly precise about the content and the name of both alcoholic and non-alcoholic beverages, thus supporting Hypothesis 5 and reflecting the increased cognitive and language abilities across this age group (Berk, 2013; Dalton et al., 2005; Flavell, 1999; Jahoda et al., 1980; Ross et al., 2005; Zucker et al., 1995). In relation to the correct identification of alcoholic and non-alcoholic beverages, it is interesting to note that the knowledge gap narrows across age groups. This is mainly due to the fact that three-year-olds already have considerable knowledge of non-alcoholic beverages.

Even children as young as three have some knowledge of drinking norms, i.e. that young children usually do not drink alcohol and that adults do. Participants in this age group gave more than three-quarters of the children in the 11 scenarios non-alcoholic beverages to drink, and this knowledge further increased across the age groups. As regards alcohol drinking norms, the findings of our study are consistent with previous research (Lang & Stritzke, 1993; Zucker et al., 1995) and support Hypothesis 6, i.e. men are assigned alcoholic

beverages more often than women (significant only among children aged five and six). The same applies to the adult-only party scenario. When taken together, it appears that from age five onwards but not before, preschoolers have a certain level of reliable knowledge about adults' drinking norms, i.e. alcohol tends to be consumed by men and more often at parties.

4.1. Limitations and future research

Despite the fact that we randomly selected classes from different institutions (preschools, nurseries) and different regions, we cannot guarantee that the results are representative for all preschoolers in Switzerland. More research is needed, particularly for non-industrialized countries, to generate a more complete picture of what preschoolers know about alcohol. Future studies should also pay attention to obtaining high participation rates, e.g. by sending reminders to parents. Data from other sources such as parents is also required in order to investigate the origins of the alcohol-specific knowledge of preschoolers reported here.

4.2. Conclusions

The results of this age-appropriate data collection technique indicate that from the age of four onwards, children begin to acquire knowledge of the alcoholic content of beverages and that from the age of five they have some knowledge of adult alcohol consumption norms. While girls know more about non-alcoholic beverages and are aware that young children usually do not drink alcohol, the absence of gender differences in relation to knowledge of alcohol content, name or alcohol consumption norms suggests that parental drinking habits and environmental factors other than the child's gender may be at play here. Preliminary evidence suggests that a combination of parental drinking patterns and children's early attainment of precocious knowledge create a risk matrix for early alcohol initiation in adolescence (Zucker,

Jester, Fitzgerald, Puttler & Wong, 2003). However, further longitudinal studies from different countries are needed to come to firmer conclusions in this respect.

More generally, despite considerable differences in drinking culture (Kuntsche et al., 2015), the present study corroborates earlier work from the US and the UK. With the development of a convenient data collection technique for both the researchers and the young participants, the present study lays the groundwork for future research that should aim to test whether alcohol-related knowledge at an early age – in conjunction with the risk provided by a heavy-drinking family environment – puts individuals at increased risk for early alcohol imitation and progression into risky drinking patterns later in life (Zucker et al., 2003).

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Table 1: eABT scenario descriptions, incl. number and type of individuals featured therein

Content displayed	Children		Adults	
	Male	Female	Male	Female
Family dinner (cheese fondue; Figure 1)	1	1	1	1
Family lunch	1	1	1	1
Family picnic outdoors	1	1	1	1
Family playing a ball game outdoors	1	1	1	1
Watching television	0	0	1	0
Watching television	0	0	0	1
Romantic scene on the sofa	0	0	1	1
Two children having lunch	0	2	0	0
Two children having lunch	2	0	0	0
Birthday party	2	2	0	0
Adult-only party	0	0	2	2
Total number of persons	8	8	8	8

Table 2: Total percentage of content (with or without alcohol) and names of the non-alcoholic and alcoholic beverages correctly identified by preschoolers, according to gender, age and test-retest reliability (ICC)

	Alcoholic beverages		Non-alcoholic beverages	
	Content	Name	Content	Name
Total	68.1%	46.4%	83.2%	73.1%
Gender				
Boys (n=152, 50.5%)	66.3%	44.7%	80.4%	70.1%
Girls (n=149, 49.5%)	70.0%	48.2%	86.1%	76.1%
Difference ¹	.04	.05	.12*	.14**
Age				
3-year-olds (n=24, 8.0%)	44.8%	32.3%	65.6%	58.3%
4-year-olds (n=66, 21.9%)	59.5%	42.8%	77.5%	67.2%
5-year-olds (n=125, 41.9%)	67.9%	46.6%	85.4%	73.0%
6-year-olds (n=85, 28.2%)	81.8%	52.9%	89.3%	81.8%
Difference ¹	.31***	.21***	.32***	.37***
Test-retest (n=50)				
T ₁ , T ₂	60.0%, 60.0%	41.5%, 42.0%	75.0%, 79.5%	70.5%, 73.8%
ICC _{2,1} (95% CI)	.94 (.89 - .96)	.82 (.69 - .90)	.90 (.83 - .94)	.84 (.71 - .91)

Note. ¹Multiple regression analysis with gender and age as independent variables

(standardized beta coefficients shown here); * p<.05; ** p<.01; *** p<.001; ICC: intraclass correlation coefficient type 2,1; CI: confidence interval

Table 3: Preschooler assignment of alcoholic beverages (%) to individuals and across eABT scenarios

	Individuals ¹			Settings ²		
	Children (n=16) ¹	Women (n=8) ¹	Men (n=8) ¹	Family outdoors (n=4) ²	Family meals (n=4) ²	Adult-only party (n=4) ²
Total	12.6%	28.7%	42.2%	34.7%	36.3%	39.4%
Gender						
Boys (n=152, 50.5%)	16.5%	30.6%	40.5%	37.0%	35.5%	38.8%
Girls (n=149, 49.5%)	8.7%	26.8%	44.0%	32.4%	37.1%	39.9%
Difference ³	-.26***	-.09	.07	-.09	.03	.01
Age						
3-year-olds (n=24, 8.0%)	24.0%	32.3%	37.0%	34.4%	35.4%	31.3%
4-year-olds (n=66, 21.9%)	14.7%	22.0%	36.6%	30.3%	33.3%	28.0%
5-year-olds (n=125, 41.9%)	11.3%	29.3%	45.8%	38.9%	35.9%	41.5%
6-year-olds (n=85, 28.2%)	9.9%	32.2%	42.6%	32.1%	39.4%	47.4%
Difference ³	-.24***	.11	.12*	.03	.07	.23***

Note. ¹Across settings; ²only adults taken into account; ³results of a multiple regression analysis with gender and age as independent variables

(standardized beta coefficients shown here); * p<.05; ** p<.01; *** p<.001

Figure 1: Screenshot of one of the 11 eABT scenarios