

# Reducing Children’s Susceptibility to Alcohol Use: Effects of a Home-Based Parenting Program

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Published online: 7 May 2016  
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**Abstract** This 4-year efficacy trial tested whether a home-based, self-administered parenting program could have a long-term effect on children’s cognitive susceptibility to alcohol use, and it tested hypothesized moderators and mediators of any such program effect. Using a two-group randomized controlled design, 1076 children (540 treatment; 536 control; mean age of 9.2 years at baseline) completed telephone interviews prior to randomization and follow-up interviews 12, 24, 36, and 48 months post-baseline. Mothers of children randomized to treatment received a 5-month-long parenting program during year 1, followed by two 1-month-long boosters in years 2 and 3. Exposure to the program was significantly inversely associated with susceptibility to alcohol use 48 months post-baseline ( $b = -0.03, p = .04$ ), with no variation in program effects by parental alcohol use or mother’s race/ethnicity or education, suggesting broad public health relevance of the parenting program. Path analyses of simple indirect effects through each hypothesized mediator showed that program exposure positively influenced parental communication to counter pro-drinking influences in the family and media domains and parental rule setting 36 months post-baseline; these variables, in turn, predicted reduced susceptibility to alcohol use 48 months post-baseline. Parallel (multiple) mediation analysis showed that the program had a significant indirect effect on susceptibility through parental rule setting. Together, the findings indicate that internalization

of protective alcohol-related expectancies and intentions is possible among children whose mothers provide early exposure to alcohol-specific socialization. Additional research is needed to link alcohol-specific socialization during childhood with adolescent drinking outcomes.

**Keywords** Parenting · Child · Susceptibility · Alcohol

## Introduction

Alcohol-related cognitions that develop during childhood, including expectancies and intentions, predict later likelihood of alcohol use initiation (Andrews et al. 2008; Cranford et al. 2010). In this study, we test a novel parenting program designed to enable parents to instill protective alcohol-related cognitions among children. Specifically, we test whether the parenting program reduces children’s cognitive susceptibility to alcohol use and we examine hypothesized moderators and mediators of any observed program effect on child susceptibility.

## Early Socialization About Alcohol

Parents are the primary agents of children’s early socialization about alcohol. The premise tested by this efficacy trial is that alcohol-specific socialization by parents strongly influences the valance of children’s alcohol-related cognitions. This premise is supported by research which shows that first consumption of alcohol generally occurs by sipping others’ drinks, usually drinks that belong to a parent (Donovan 2007; Jackson 1997; Warner and White 2003). Although sips of alcohol are typically not counted in measures of alcohol use onset, sipping a parent’s drink can be a powerful socialization experience. Being allowed to sip a parent’s drink, or to sip

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another person's drink in the presence of a parent, can instill the belief in children that parents are tolerant of, or at least will not punish, alcohol use.

Parents also may unwittingly reinforce children's acquisition of pro-use cognitions in ways that do not involve child consumption. For example, involving children in fetching and/or pouring drinks for adults and providing children with "mixed drinks" made without alcohol are socialization practices that have the potential to teach children to associate alcohol use with positive events and positive recognition by adults.

Research also shows that a substantial proportion of parents believe that there are benefits to exposing children to alcohol at home. Some believe that allowing sipping is a deterrent because children will not like the taste or that sipping removes the "forbidden fruit" appeal of alcohol (Jackson et al. 2012). As many as 40 % of parents espouse such beliefs (Jackson et al. 2012), and similarly, high percentages of third- to fifth-grade youth report having had a sip or taste of alcohol from a parent's drink (Donovan and Molina 2008).

### Cognitive Susceptibility to Alcohol Use

Children who internalize positive alcohol-related expectancies, attitudes, norms, and intentions are defined as having greater cognitive susceptibility than children who do not (Ennett et al. 2013). This susceptibility construct is implicit in models that conceptualize alcohol use as a developmental process that begins in childhood (Masten et al. 2008; Zucker et al. 2008); it is also consistent with the conceptualization of susceptibility to smoking, which has been tested as an indicator of future smoking risk among children and adolescents (Jackson 1998; Pierce et al. 1996). Longitudinal studies report that children's positive alcohol-related cognitions predict later alcohol use (Andrews et al. 2008; Cranford et al. 2010). These studies provide a clear indication that children can develop cognitive susceptibility to alcohol use—i.e., alcohol expectancies, attitudes, norms, and intentions that indicate a predisposition toward use. The parenting program tested in this study aimed to reduce children's susceptibility to alcohol use.

### A Program Promoting Protective Alcohol-Specific Socialization of Children

The program tested by this study was a home-based, self-administered parenting program called *Mysteries, Max, and Me—Discovering How to be Alcohol-free!* As described in detail elsewhere (Dickinson et al. 2014), the program materials were mailed to parents over 5 months and comprised five modules; each module included a parent magazine, a parent-child activity magazine, and supplies for completing each activity in the latter magazine. Each module had a main theme:

By reviewing the prevalence, precursors, and harms of early-onset alcohol use, the first module aimed to strengthen parental commitment to providing an alcohol-free childhood. The next modules focused on three primary domains of social influence about alcohol—media, peer group, and family—with content focused on increasing child awareness of and preparing the child to resist pro-alcohol influences within each domain. The final module focused on consolidating the main alcohol-free objective by engaging parents in setting family rules against child alcohol use, including establishing an agreement with the child not to have any alcohol, not even sips, and monitoring the child's opportunities to deviate from these established rules at home or elsewhere. Two annual booster modules reinforced the core program content.

The theoretical foundation and model of practice used to design the parenting program are also described in detail by Dickinson et al. (2014). Briefly, our approach to intervention assumes that alcohol-specific socialization is a gradual, cumulative process in which children receive inputs from multiple social sources: principally parents, but also other family members, friends and peers, teachers and religious leaders, and mass media (Johnson and Johnson 1995; Strasburger and Wilson 2002). Our approach was guided strongly by Darling and Steinberg's Integrative Model (Darling and Steinberg 1993), which provides a theory-based framework of the general categories of parenting variables targeted by the intervention. Specifically, parenting practices, parenting goals, and parenting style each contribute to children's socialization. In addition, principles and techniques of dialogue education (Vella 2002) informed our approach to program design. Specifically, we structured the program materials so that parents and children would engage in behaviors that, once accomplished, meet the program objectives. For example, rather than giving parents tips and recommendations that they might, at some point, employ with their children, we embedded direct experience with recommended behavioral objectives into each activity. Thus, parent-child communication activities were scripted to facilitate discussion of specific points. Role-play activities were developed to directly engage children in practicing specific refusal skills. Games were structured to provide children with specific knowledge about alcohol and its properties. Other activities were designed to engage parents in dialogue with children about their expectations and rules regarding alcohol and in supporting, through advice and modeling, development of the skills needed to refrain from sipping alcohol. Lastly, consistent with recommendations from experts in elementary education, a child-learning approach was used to sequence the activities within each parent-child activity magazine. This entailed beginning with direct instruction and then incorporating guided practice, independent practice, and summary. A variety of child-friendly activities (e.g., seek-and-find hidden pictures, interviews with parents, board

games, role-plays, mazes, art activities, scavenger hunts, and cartoon-based discussion activities) were incorporated into each activity magazine. We included play as much as possible, including utilizing a “detective” theme to engage children as detectives who solve mysteries and uncover facts in each magazine. All program materials were developed using iterative waves of formative research. Prototypes of each intervention activity were used at home by parent-child dyads, after which extensive debriefings occurred via 1-h telephone interviews with each parent, the materials were modified consistent with parental feedback, and the modified prototypes were evaluated. This formative evaluation was intended to optimize the appeal and usability of the intervention materials.

**Purported Moderators and Mediators of Program Effect**

We examine three factors that could moderate the effect of the parenting program on child susceptibility to alcohol use (see Fig. 1). Mothers’ motivation to use the program materials could vary by their own alcohol use. For example, those who use alcohol relatively infrequently might be more inclined than those who drink more frequently to assume that their children have little opportunity to be exposed to alcohol in a family context. Mothers’ race/ethnicity or educational attainment could also influence how they implement the program and thus moderate program effects. Research indicates that cultural norms associated with both parenting in general (Hill and Tyson 2008) and alcohol socialization (Reimuller et al. 2011) can vary by race/ethnicity. African-American parents, for example, may communicate less frequently with their children about alcohol than White parents (Reimuller et al. 2011). Prior research also shows that parents with higher education tend to be more tolerant of early exposure to alcohol than their sociodemographic counterparts (Ennett et al. 2001; Jackson et al. 2012; Reimuller et al. 2011), suggesting that parents with higher education might be less responsive to the program than parents with lower education.

We examine as mediators a set of child-reported variables indicative of exposure to the alcohol-specific parenting practices recommended by the intervention (see Fig. 1). These practices include three domains of maternal communication about alcohol use, rule setting about child alcohol use, and monitoring of children’s possible alcohol use. Any program effect on children’s susceptibility to alcohol use is expected to occur through children’s exposure to this intervention content.

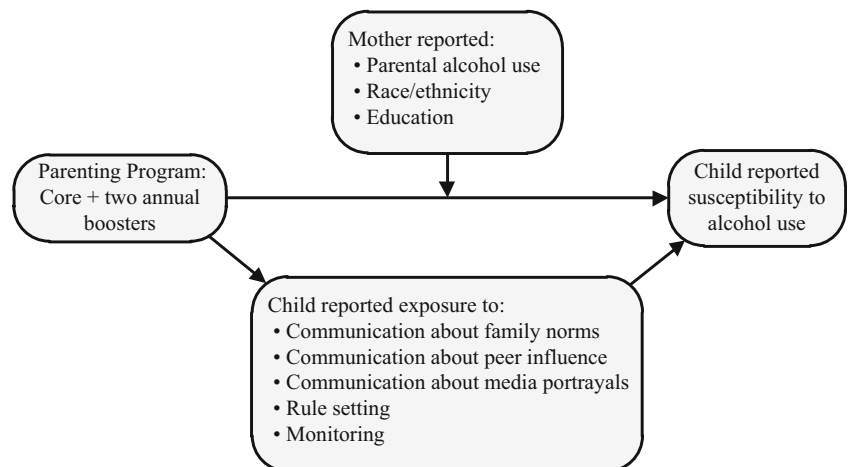
In summary, this study reports the effect of a parenting program on child susceptibility to alcohol use, whether the program’s effect on susceptibility varied by parent alcohol use, mother’s race/ethnicity, or mother’s educational attainment and whether child-reported measures of exposure to mothers’ parenting practices targeted by the program explain (i.e., mediate) any observed effect of the program on child susceptibility to alcohol use. To determine program effects most distant from exposure to the full intervention, we report on child susceptibility that was measured 4 years post-baseline or, equivalently, 1.5 years after delivery of the full program (the full program includes the core program plus two annual boosters; see Fig. 2). Similarly, the potential mediator variables were measured 6 months after the final booster to capture distant program effects while allowing a test of whether change in the mediators accounted for any change in child susceptibility to alcohol use.

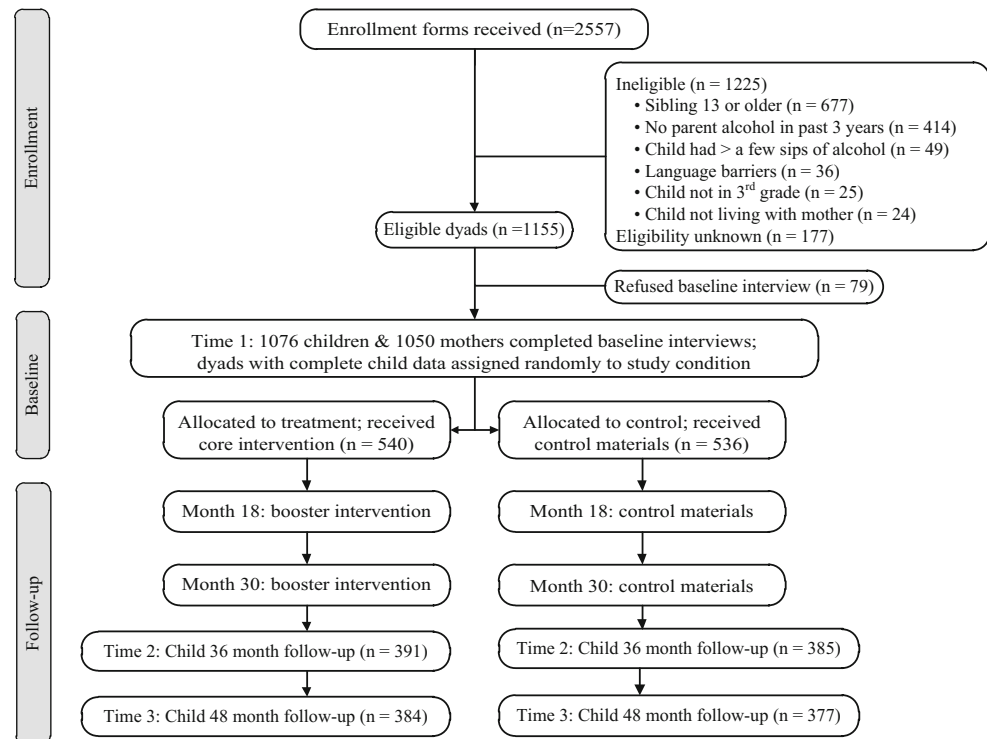
**Methods**

**Study Design and Sample**

We conducted a two-group randomized controlled efficacy trial of the parenting program. By design, the opportunity to participate in the trial was offered to mother/mother surrogates only and their third-grade children. Families were recruited from 72 school districts located in North Carolina (*n* = 68), South Carolina (*n* = 3), and Tennessee (*n* = 1); the districts

**Fig. 1** Conceptual model



**Fig. 2** Participant flow diagram

provided permission for recruitment materials to be distributed to families but were not otherwise involved in the research. A total of 2557 mothers returned a consent form and intake screener; a flow chart of the sample is shown in Fig. 2. Ineligible families had a sibling age 13 or older ( $n=677$ ), had no adults in the household who had consumed alcohol during the prior 3 years ( $n=414$ ), or were ineligible for the other reasons indicated in Fig. 2. Families with older siblings were excluded because of the potential influence of older siblings who may have initiated alcohol use. Families with adults who had consumed no alcohol in the preceding 3 years were excluded because the majority of the intervention content would be not relevant. Families in which the child had already initiated alcohol use by having more than a few sips were excluded because of the primary prevention focus on the intervention. Parents were not informed of these child alcohol use reports, however, and these 49 families received all the intervention materials as if they were in the trial.

Of the 1155 eligible children, 79 were refusals at baseline, and 1076 completed a baseline telephone interview and were randomized to condition ( $n=540$  treatment;  $n=536$  control) and were thus eligible for follow-up. Children completed four telephone interviews 12, 24, 36, and 48 months post-baseline; mothers completed telephone interviews at baseline and 12 and 24 months post-baseline. For the current study, we use data from the child and mother interviews at baseline (time 1; T1) and the two child interviews conducted after the intervention was completed at 36 months (time 2; T2) and 48 months (time 3, T3) (see Fig. 2).

The protocol for collecting data from telephone interviews of children and their mothers/mother surrogates was reviewed and approved by the Institutional Review Boards at the institutions of the investigators. Mothers provided written permission for their own and their child's participation in the full study; they also provided supplemental verbal permission each time that the household was called to conduct a child interview. Children provided verbal assent ahead of each of their interviews.

Families randomized to the treatment condition received the 5-month core intervention, implemented immediately after randomization, and two booster interventions, with the first delivered 18 months post-baseline and the second delivered 30 months post-baseline (see Fig. 2). Control families received an alternative treatment: a family obesity prevention program very similar in format and delivery to the treatment program. These materials facilitated parent-child interactions focused on eating healthy breakfasts and healthy snacks, involving children in food preparation, how to play active games indoors, and choosing active play that parents and children can do together.

## Measures

Measures include study condition (1 = assignment to treatment; 0 = assignment to control, i.e., alternate treatment), children's susceptibility to alcohol use, and the hypothesized moderator and mediator variables.

**Susceptibility to Alcohol Use** We used a previously constructed eight-item measure that assessed children's expectancies about alcohol (e.g., Drinking alcohol would get me into trouble with my parents), future intentions to use alcohol (e.g., Do you think that you will be drinking any beer, wine, or other drinks with alcohol when you are in middle school?), attitude toward alcohol use, and perceived peer norms for alcohol use (Ennett et al. 2013). Each item was coded to contrast children whose answers suggested any susceptibility to alcohol use (coded 1) to children with answers suggesting no susceptibility (coded 0). Responses were averaged so that the possible range of values for the summary measure was 0 to 1, with higher values indicating greater susceptibility to alcohol use. Susceptibility was measured at baseline and 48 months (T3) ( $\alpha=0.63$  and  $0.77$ , respectively).

**Moderator Variables** The moderators were parent alcohol use, mother's race/ethnicity, and mother's educational attainment, all based on mothers' reports. Parent alcohol use was measured by the average frequency of drinking in the past month by the parents in the household. Mothers answered separate questions about their own frequency of drinking and that of a father or other partner, if present in the home. Values ranged on a six-point scale from "none at all" to "almost every day." Responses were averaged to construct a measure comparable in two-parent and single-mother homes. Mothers identified their race/ethnicity as non-Hispanic White, non-Hispanic Black, Hispanic, or other race/ethnicity. Because of the small sample sizes in the Hispanic and other race/ethnicity categories, the categories were collapsed into non-Hispanic White and the other three categories combined. Educational attainment contrasted mothers who were high school graduates or less with those who had completed some college or vocational training or higher.

**Mediator Variables** Five hypothesized program effect mediators were measured at baseline and at the T2, the 36-month follow-up. For 45 of the 54 children in the analysis sample who were absent at 36 months, mediator values were substituted using the next most distal (from baseline) assessment of mediators, resulting in use of 24-month values for 36 children and 12-month values for 9 children. The measures include three multi-item scales of children's perceptions of mothers' communication regarding the following: family norms about alcohol use (six items, T1  $\alpha=0.72$ ; T2  $\alpha=0.77$ ), peer influence on alcohol use (three items, T1  $\alpha=0.60$ ; T2  $\alpha=0.73$ ), and alcohol portrayals in the media (three items, T1  $\alpha=0.78$ ; T2  $\alpha=0.81$ ). All items measured children's perceived frequency of communication, indicated by the response options never, once, or more than once. The scales were constructed by averaging children's responses to the constituent items; higher values indicate more frequent communication.

Children's reports of rules for alcohol use (e.g., did mother make a rule that says that the child is never allowed to have any kind of alcohol) were measured by three items; the dichotomized responses were averaged for the composite measure (T1  $\alpha=0.61$ ; T2  $\alpha=0.67$ ). A composite measure of children's perceptions of mother's monitoring of their alcohol use was formed from two items that asked (1) whether the child thought his/her mother would know if he/she was drinking alcohol with friends and (2) whether the mother would know if he/she got alcohol from the home; both items had yes (1) or no (0) responses that were averaged to create the measure. The items were significantly correlated (T1  $r=.22$ ,  $p<.001$ ; T2  $r=.26$ ,  $p<.001$ ).

### Statistical Analysis

Preliminary analyses were conducted to examine the following: sample demographic characteristics, baseline equivalence between the treatment and control groups on the variables used in the analysis, attrition and differential attrition by study condition, and correlations between the hypothesized mediator variables.

We used an intent-to-treat approach, whereby analyses were based on the study condition to which families were assigned. Primary analyses were conducted in several steps. First, we used linear regression to examine whether the program effect was moderated by any of the three potential moderator variables. Moderation was assessed by regressing study condition, the putative moderator, the interaction between study condition and the moderator, and the baseline value of child susceptibility to alcohol use on child susceptibility at the final assessment, T3. As reported below, given no evidence of program moderation, we proceeded with analysis of program effects and mediation with no further consideration of moderation.

Second, we used path analyses to examine the total and indirect (mediated) effects of the parenting program on children's susceptibility to alcohol use at T3. The total effect of the program was estimated by regressing the susceptibility outcome on study condition (referred to as the *c* path), controlling for baseline susceptibility scores. Indirect effects were then examined using a model-building approach recommended by Mackinnon (2008). Specifically, we first estimated separate "simple" mediation models for each of the five putative mediators. In each of these five models, to preserve appropriate temporal ordering, the mediators were those measured at 36 months (T2) and child susceptibility was measured at 48 months (T3). To reflect the hypothesized mediation process, longitudinal pathways were estimated from study condition (treatment versus control) to the T2 measure of

the mediator (path *a*) and from the T2 measure of the mediator to the T3 measure of child susceptibility (path *b*). In addition, a direct path (path *c'*) was estimated from study condition to the T3 measure of child susceptibility. All models included baseline values of the constituent predictors (child susceptibility and the mediator) to allow change in the variables to be modeled. The presence of statistical mediation was determined via assessment of the indirect (mediated) effect of study condition on T3 child susceptibility through the T2 mediator (Fairchild and Mackinnon 2009; Preacher and Hayes 2008). For each model, indirect effects were calculated as the product of the parameter estimates for path *a* and path *b* and standard errors and bias-corrected bootstrapped confidence intervals for indirect effects were based on 5000 bootstrap resamples. Bootstrapping is a non-parametric method of estimating standard errors and confidence intervals that does not make assumptions about the sampling distribution of the indirect effect and provides more accurate type I error rates and greater power for detecting indirect effects than competing methods (Mackinnon et al. 2004; Preacher and Hayes 2008).

Third, we followed the simple mediation analysis with a parallel (multiple) mediation analysis in which the five hypothesized mediators were simultaneously examined, following the same modeling steps and with the same controls as described for the simple mediation models. Based on modification indices, we also added an additional path between the T1 measure of mother communication about family norms and the T2 measure of communication about peer influence. We expected the program to have a significant effect on all five mediators assessed independently but, given the correlations among the mediators, were interested to learn which, if any, had unique effects on child susceptibility to alcohol use when all were examined together.

Finally, we present effect sizes, Cohen's *d*, for program effects on child susceptibility to alcohol use and the putative mediators, measured at 48 and 36 months post-baseline, respectively. The means for the treatment and control condition are adjusted for the baseline value of the focal variable.

All models were estimated using Mplus version 7.11 (Muthén and Muthén 2015). Missing data were handled using full-information maximum likelihood estimation (Schafer and Graham 2002). Model fit was evaluated by the Tucker-Lewis index (TLI), the Comparative Fit Index (CFI), and the root-mean-square error of approximation (RMSEA). In addition to the control variables indicated for each analysis, all models controlled for child age because, as reported below, the treatment and control groups differed significantly on this variable at baseline.

## Results

### Sample Description

Most children lived in two parent households in which mothers/mother surrogates resided with fathers/father surrogates or other adult caretakers (85.0 %). The average age of children at baseline was 9.2 years (SD=0.4); about equal proportions were girls (51.9 %) and boys (48.1 %). The majority of the mothers were either White non-Hispanic (69.0 %) or Black non-Hispanic (21.3 %); the remaining 9.7 % were approximately equally divided between those who were Hispanic or of other race/ethnicity. The sample distribution by race/ethnicity is very similar to the population distribution in North Carolina (where 95 % of cases resided) (US Census Bureau 2012). Approximately half of the mothers (49.24 %) had obtained a bachelor's degree or higher; the remainder reported some college or vocational training (35.7 %) or high school graduate or lower (15.1 %). The study sample overrepresents the proportion of adults with higher educational attainment, which is approximately 27 % for the state (US Census Bureau 2012). Most mothers worked for pay full-time (41.1 %) or part-time (29.9 %); 29.0 % of mothers did not work for pay. Parents' frequency of alcohol use ranged from none at all in the past month (1) to almost every day (6) with an average of 2.5 (SD=1.2) or between about one and a few days a month.

### Baseline Equivalence, Attrition, and Differential Attrition

Randomization resulted in baseline equivalence between conditions on all measures except child age (treatment  $M=9.14$  years (SD=0.40), control  $M=9.22$  years (SD=0.43),  $t(1074)=3.20$ ,  $p<.001$ ). At T3, retention rates did not differ by study condition; 71 % ( $n=384$ ) and 70 % ( $n=377$ ) of treatment and control cases, respectively, were present. Logistic regression was used to examine baseline predictors of dropout at T3. The only variable associated with dropout was mother's education; higher levels of education were associated with lower odds of dropout. However, there was no difference by study condition in loss to follow-up by mother's education or by any other variable in the study (i.e., there was no differential attrition).

### Correlations Between the Mediator Variables

As expected, the five mediator variables were all positively and significantly correlated with each other at T2; the correlations range between 0.11 and 0.66. The communication and rule setting variables all were correlated at  $r=.43$  or higher; the monitoring variable had the smallest correlations, with  $r=.16$  or lower.

**Program Effect on Child Susceptibility to Alcohol Use and Moderation of Program Effect**

None of the interaction terms between study condition and the moderators approached statistical significance, indicating that the program’s impact on child susceptibility did not vary by parent alcohol use, mother’s race/ethnicity, or mother’s educational attainment (results not shown). Results of the *c* path model estimating the total effect of the program on child susceptibility to alcohol use indicated that, as expected, program exposure was significantly inversely associated with susceptibility to alcohol use at 48-month follow-up ( $b = -0.03, p = .04$ ).

result in increased perceived parental monitoring of child alcohol use.

Also consistent with expectations, the coefficients for the *b* paths show that all five of the mediators significantly and inversely predicted child susceptibility to alcohol use at 48 months follow-up (i.e., 1.5 years after the program ended) (Table 1). The indirect effect of the parenting program on child susceptibility was significant for communication about family norms, communication about media portrayals, and rule setting about child use. The indirect effect was marginally significant for communication about peer influence and was not supported for perceived parental monitoring.

**Program Effect on Child Susceptibility to Alcohol Use: Simple Mediation Analysis**

Each single-mediator model fits the data well; across all models, the CFI was greater than 0.95, the TLI was greater than 0.95, and the RMSEA was less than 0.05 (Hu and Bentler 1999). Consistent with expectations, the *a* path coefficient for each of the single-mediator models indicates that the program was positively associated with four of the five mediators 36 months post-baseline or 6 months after the program ended (see Table 1). Specifically, relative to controls, children in the treatment condition reported increased maternal communication in all three communication domains (marginal effects for communication about peer influence;  $p = .058$ ) and in setting rules to prevent child alcohol use. Contrary to expectations, the program did not

**Program Effects on Child Susceptibility to Alcohol Use Through Child-Reported Mediators: Parallel Mediation Analysis**

The parallel mediation model also fits the data well (CFI = 0.97; TLI = 0.95; RMSEA = 0.04, 95 % CI 0.03–0.05). Consistent with findings from the single-mediator models, significant program effects were maintained for the three domains of maternal communication (marginal effect for peer influence) and for rule setting about child alcohol use, but not for parental monitoring (Table 2, *a* paths). Contrary to findings from the single-mediator models, however, rule setting and monitoring were the only hypothesized mediators that significantly predicted reduced child susceptibility (*b* paths). Analysis of indirect effects suggests that program exposure indirectly influenced susceptibility through rule setting (indirect effect =  $-0.005$ ; 95 % CI  $-0.01, -0.001$ ); no other

**Table 1** Parenting program effect on child susceptibility to alcohol use through child-reported mediators: simple mediation analysis ( $N = 1076$ )

Predictor	Mediator	Path			Indirect effect	
		<i>a</i>	<i>b</i>	<i>c'</i>	Point estimate	[95 % CI]
Model 1						
Condition	Communication: family norms	0.10 (0.04)*	-0.04 (0.01)**	-0.02 (0.01) ^	-0.004	[-0.008, -0.001]*
Model 2						
Condition	Communication: peer influence	0.09 (0.05) ^	-0.03 (0.01)**	-0.02 (0.01) ^	-0.002	[-0.007, 0.000]^
Model 3						
Condition	Communication: media portrayals	0.23 (0.05)***	-0.03 (0.01)**	-0.02 (0.01)	-0.006	[-0.013, -0.002]**
Model 4						
Condition	Rule setting to prevent child use	0.07 (0.03)**	-0.08 (0.02)***	-0.02 (0.01)	-0.005	[-0.011, -0.001]*
Model 5						
Condition	Monitoring to prevent child use	0.02 (0.02)	-0.17 (0.04)***	-0.02 (0.01) ^	-0.003	[-0.009, 0.001]

The parenting program effect is estimated on each mediator measured 36 months post-baseline and on child susceptibility to alcohol use measured 48 months post-baseline. Within each model, the *a*, *b*, and *c'* paths are unstandardized and adjusted for the baseline values of the mediator, child susceptibility, and child age. Bias-corrected bootstrapped confidence intervals were calculated for the indirect effect

^ $p < .1$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

**Table 2** Parenting program effect on child susceptibility to alcohol use through child-reported mediators: parallel mediation analysis ( $N=1076$ )

Predictor	Mediator	Path		Indirect effect	
		<i>a</i>	<i>b</i>	Point estimate	[95 % CI]
Condition	Communication about family norms	0.10 (0.04)*	0.02 (0.02)	0.002	[-0.002, 0.008]
	Communication about peer influence	0.08 (0.05)^	-0.01 (0.0)	-0.001	[-0.004, 0.001]
	Communication about media portrayals	0.23 (0.05)***	-0.01 (0.01)	-0.002	[-0.008, 0.001]
	Rule setting to prevent child use	0.06 (0.03)*	-0.08 (0.02)**	-0.005	[-0.01, 0.001]**
	Monitoring to prevent child use	0.02 (0.02)	-0.14 (0.04)***	-0.015	[-0.04, 0.009]

The parenting program effect is estimated on each mediator measured 36 months post-baseline and on child susceptibility to alcohol use measured 48 months post-baseline. The *a* and *b* paths are unstandardized and adjusted for baseline values of the mediators, child susceptibility, and child age.  $c' = 0.015$  (0.013),  $p = .23$ . Bias-corrected bootstrapped confidence intervals were calculated for the indirect effect

^ $p < .1$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

indirect effects were statistically significant in the parallel mediation model.

### Program Effect Sizes

As shown in Table 3, the parenting program produced a small effect on child susceptibility to alcohol use at 48-month follow-up (Cohen's  $d = 0.12$ ). Effect sizes for the five variables examined as potential mediators of program effects ranged from 0.08 to 0.29.

### Discussion

The principal aim of this efficacy trial was to assess whether a home-based, self-administered parenting program could have an effect on children's cognitive susceptibility to alcohol use. The results showed that 4 years post-baseline—1.5 years following the conclusion of the program—susceptibility was significantly lower among children in the treatment group. The effect of the parenting program on child susceptibility did not vary by parents' alcohol use or by mother's race/ethnicity or educational attainment. The implications of these findings can

be considered both temporally and developmentally. From a temporal perspective, the finding suggests that *internalization* of protective alcohol-related expectancies and intentions is possible among children whose parents provide early exposure to alcohol-specific socialization. That is, the observed effect on cognitive susceptibility at 48 months is unlikely to be due to simple recall of parental socialization among children in the treatment group; rather, the effect is more likely due to greater private acceptance or internalization of protective cognitions among treated children. Even so, the program's long-term effect on children's susceptibility to alcohol use was small.

From a developmental perspective, we note that the observed effect on susceptibility occurred among children who progressed from middle childhood to early adolescence during the course of the study (i.e., children were in third grade (mean age of 9.2 years) at baseline and in seventh grade (mean age 13.2 years) at follow-up). Hence, this finding implies that intervening during middle childhood has the potential to instill protective alcohol-related cognitions that can endure into early adolescence. This aspect of the main study finding is important because initiation of alcohol use increases substantially in early to mid adolescence (Johnston et al. 2011). Hence, it is at

**Table 3** Effect sizes for adjusted parenting program effects on child-reported susceptibility to alcohol use and five hypothesized mediator variables ( $N=1076$ )

Outcome	Treatment Mean (SD)	Control Mean (SD)	Cohen's <i>d</i>
Susceptibility to alcohol use	0.19 (0.21)	0.22 (0.21)	0.12
Communication about family norms	1.34 (0.65)	1.24 (0.64)	0.16
Communication about peer influence	0.89 (0.75)	0.80 (0.74)	0.12
Communication about media portrayals	1.09 (0.85)	0.86 (0.84)	0.27
Rule setting to prevent child use	0.62 (0.42)	0.55 (0.42)	0.16
Monitoring to prevent child use	0.93 (0.25)	0.91 (0.24)	0.08

The parenting program effect is estimated on the hypothesized mediators measured 36 months post-baseline and on child susceptibility to alcohol use measured 48 months post-baseline. Means are adjusted for baseline values of the hypothesized mediator and child age



this phase of development that lower susceptibility is most likely to become protective.

The parenting intervention aimed to engage parents in communicating with children regarding family norms about alcohol use (e.g., explaining that alcohol is an adult beverage and that consuming alcohol can be harmful for children), about media portrayals of alcohol use (e.g., rebutting pro-use portrayals as they appear in advertisements, movies, literature, and other media), and about peer influence (e.g., asking children about peer interest in trying alcohol). Building on these communication goals, the program aimed to engage parents in setting rules that reinforce communicated norms (e.g., establishing a social contract against sipping beer, wine, or any other kind of alcohol) and in monitoring practices that enforce child compliance with communicated norms (e.g., ensuring that children cannot access alcohol at home). The present study found that the intervention significantly increased children's reported exposure to each type of parenting practice except parental monitoring (marginally significant for communication about peer influence). These findings might indicate that mothers in the treatment group found it more feasible to implement the recommended communication and rule setting practices than to implement the monitoring practices. It is also possible that whereas children would have been fully cognizant of their exposure to the communication and rule-setting components of the program, they might not have been cognizant of the monitoring component. Such variation in child awareness is possible because the program engaged children as active receivers of parental communications about family norms, media portrayals, and peer influence (by, for example, having children interview parents about family norms or notify parents when they noticed media portrayals of alcohol use); likewise, children participated directly with parents in rule-setting activities (by, for example, filling in and signing a social contract against using alcohol). In contrast, children would not have been involved in any direct manner in the recommended parental monitoring activities.

The five parenting practice variables targeted by the program were tested initially as separate mediators of the observed program effect on child susceptibility. The results showed that each parenting variable was a significant inverse predictor of child susceptibility and that three of the five variables (communication about family norms; communication about media portrayals; rule setting) mediated the direct association between the program exposure and child susceptibility. When all five purported mediators were tested simultaneously, program effects on all mediators except parental monitoring were evident (again, with a marginally significant effect on communication about peer influence). This

parallel mediation analysis also revealed that parental rule setting was the only mediator that accounted for the observed program effect on child susceptibility to alcohol use. It is possible that the relatively strong correlations between the communication and rule setting variables may have contributed to increased sampling variance in estimates of the *b* path and reduced our power to detect indirect effects through the communication variables (Hayes 2013). Even so, that rule setting emerged as the single mediator is consistent with the design of the intervention, whereby rule setting was used to consolidate what the parent had communicated to the child about alcohol. This finding is also consistent with the conclusion of a recent Cochrane Library review of family programs for youth smoking prevention (Thomas et al. 2015), namely that the most effective interventions were those that promoted authoritative parenting that involved rule setting. Although Thomas et al. (2015) focus on family programs targeting child smoking instead of child alcohol use, the family-based interventions examined in this review are highly similar to that tested by the present study.

The results of the study analyses suggest avenues for strengthening program effects on child susceptibility. These include enhancing the booster modules so that participants would receive repeated exposure to a greater amount of the core program content and expanding program content focused on rule setting during both the core and booster phases.

This study had several limitations that qualify the conclusions that can be drawn. A non-probability sample was used, which limits the generalizability of the findings. Generalizability was further limited by excluding parents who had not consumed alcohol within the past 3 years and by excluding children who had had more than a few sips of alcohol prior to baseline. The sample is from the Southern region of the USA, and mothers with higher education were disproportionately represented compared with population estimates for North Carolina, where the majority of families lived. In addition, mothers with lower education were more likely to be lost to follow-up. However, there was no difference by study condition in loss to follow-up by mother's educational attainment (i.e., no differential attrition) and mother's education did not moderate the effect of treatment condition on child susceptibility to alcohol use. Another limitation pertains to the use of school-based recruitment; it is possible that incorporating the intervention into pediatric clinics or other medical settings would improve both the reach and efficacy of the parenting program (Prado et al. 2015). As regards measurement, our measure of child susceptibility to alcohol use, although developed for a prior study, has not been validated as a predictor of initiation of youth

drinking outcomes. In addition, parent alcohol use, as reported by mothers, may have been underreported (Sobell and Sobell 2003). Moreover, all measures were obtained using self-report. Finally, the measurement protocol did not include assessment of fidelity of utilization of program materials by mothers in the treatment condition. Such data, which should be collected in future research, would enable a more informative interpretation of the study findings, by, for example, indicating whether degree of utilization was associated with achievement of rule setting, the key mediator of program effect.

## Conclusion

Taken together, the findings from this efficacy trial demonstrate that there is a role for early intervention that reaches children during the preparatory phase of alcohol use and engages parents in providing broad socialization to prevent later use. The home-based, self-help program tested by the present study significantly lowered children's susceptibility to initiating alcohol use. Importantly, this effect was evident 1.5 years after delivery of the full intervention. The results also suggest that even if parenting programs increase parental communication about pro-drinking influences within family, peer, and media domains, parental rule setting that can safeguard children from these influences is necessary to lower children's long-term susceptibility to alcohol use.

## Compliance with Ethical Standards

**Funding** National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Grant No. R01AA016300 (Christine Jackson, PI).

**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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