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Optimizing Timing and Dosage: Does Parent Type Moderate the Effects of Variations of a Parent-Based Intervention to Reduce College Student Drinking?

Lindsey Varvil-Weld, Nichole Scaglione, Michael J. Cleveland, Kimberly A. Mallett, Rob Turrisi, and Caitlin C. Abar

Department of Biobehavioral Health, The Pennsylvania State University; Prevention Research Center, The Pennsylvania State University; Department of Biobehavioral Health and Prevention Research Center, The Pennsylvania State University; and Center for Alcohol and Addiction Studies, Brown University

Abstract

Research on parent-based interventions (PBIs) to reduce college student drinking has explored the optimal timing of delivery and dosage. The present study extended this work by examining the effectiveness of three different PBI conditions on student drinking outcomes as a function of parenting types and students' pre-college drinking patterns. Four hypotheses were evaluated (early intervention, increased dosage, invariant, and treatment matching risk). A random sample of 1900 college students and their parents was randomized to four conditions: 1) pre-college matriculation, 2) pre-college matriculation plus booster, 3) post-college matriculation, or 4) control, and was assessed at baseline (summer prior to college) and 5-month follow-up. Baseline parent type was assessed using latent profile analysis (positive, pro-alcohol, positive, anti-alcohol, negative mother and *negative father*). Student drinking patterns were classified at baseline and follow up and included: non-drinker, weekend light drinker, weekend heavy episodic drinker, and *heavy drinker*. Consistent with the treatment matching risk hypothesis, results indicated parent type moderated the effects of intervention condition such that receiving the intervention prior to college was associated with lower likelihood of being in a higher-risk drinking pattern at follow up for students with *positive*, *anti-alcohol* or *negative father* parent types. The findings are discussed with respect to optimal delivery and dosage of parent-based interventions for college student drinking.

Keywords

college student drinking; parent-based intervention; parenting styles

High-risk college student drinking and related consequences are a widespread problem (Johnston, O'Malley, Bachman, & Schulenberg, 2011). Universally implemented parent-based interventions (PBIs) have shown promise in reducing student drinking (e.g., Cleveland, Lanza, Ray, Turrisi, & Mallett, 2012; Testa, Hoffman, Livingston, & Turrisi, 2010; Turrisi et al., 2009; Wood et al., 2010). The PBI consists of a handbook that provides information about college student alcohol consumption and encourages parents to discuss this information using an empathic and conversational style (see Turrisi, et al., 2001 for a full description of the handbook). The PBI has traditionally been delivered in the summer prior to college entrance to coincide with this high-risk transition period, and has been

shown to reduce drinking and consequences during the first year of college (Cleveland et al., 2012; Turrissi, Jaccard, Taki, Dunham, & Grimes, 2001).

In a recent extension of work in this area, Turrissi and colleagues (2012) examined the optimal timing of delivery and dosage of PBIs. They compared the efficacy of three PBI conditions in a sample of first-year college students with diverse drinking histories: 1) the handbook alone, delivered prior to college matriculation as in past studies (PCM), 2) the handbook delivered prior to college matriculation with boosters delivered early in the first semester prompting parents to talk with their teens on specific occasions such as move-in week, parents' weekend, and students' first visit home (PCM+B), and 3) the handbook alone, delivered after college matriculation (ACM). Findings indicated the PCM condition was most effective, especially for students who were heavy drinkers at the time of college matriculation. The inclusion of boosters during the first semester did not appear to provide any added benefit. One limitation of this study was that it did not account for variability among parents. It is plausible that different versions of the PBI might be more or less effective for different types of parents. For example, Mallett and colleagues (2011) found a PBI delivered prior to college matriculation was more effective at reducing student drinking during the first year among students with parents with higher-risk styles (e.g., authoritarian or permissive parenting styles). Thus, the goal of the present study was to evaluate whether parent type moderated the effects of the three PBI conditions examined by Turrissi and colleagues (2012).

Recent research has identified unique parent types associated with patterns of college student drinking that may affect the efficacy of PBIs. For example, Abar (2012) used latent profile analysis (LPA) to identify four parent types that were associated with five student drinker profiles (ranging from *abstainers* to *extreme risk drinkers*). Analyses revealed students with *pro-alcohol* parents (characterized by higher approval of student drinking and modeling of alcohol use) were most likely to be in the highest-risk drinker profiles. Varvil-Weld and colleagues (2012) extended this research by examining distinct maternal and paternal overall parenting (monitoring, positive and negative communication) and alcohol-specific parenting (modeling of drinking, approval of student drinking), also using LPA. Two of the four parent types identified had consistent mother and father influences, characterized by high-quality overall parenting (positive communication, high monitoring), but different alcohol-specific parenting such as *pro-alcohol* (higher approval of student drinking and parental alcohol use) or *anti-alcohol* (low approval of student drinking, low parental alcohol use) orientations. Of the two parent types that had inconsistent mother and father influences, one revealed high levels of maternal negative communication, whereas the other had higher paternal negative communication and higher paternal modeling of drinking. Students whose parents fit either the *high-quality, pro-alcohol* or the *negative father* parent types were at increased risk of experiencing greater alcohol-related consequences. Therefore, relative to the lower-risk *high-quality, anti-alcohol* and *negative mother* parent types, the *high-quality, pro-alcohol* and the *negative father* parent types were identified as highest-risk with respect to student drinking-related outcomes. Taken together, the findings of these studies underscore the distinction between types of parents, characterized by both overall (e.g., negative communication), and alcohol-specific parenting (e.g., approval of alcohol use). Further, they suggest there are consistent associations between parent types and college student drinking patterns, which may affect the efficacy of PBIs.

Present study

The objective of the present study was to examine whether parent type moderated the efficacy of three PBI conditions with varied dosage and timing of delivery (PCM, PMC+B, and ACM) as previously described (Turrissi et al., 2012). The moderator, parent type, was

classified using LPA assessing mother and father parenting constructs identical to those used in Varvil-Weld et al. (2012). The main outcome variable was high-risk (*weekend heavy episodic drinker* or *heavy drinker*) versus low-risk (*non-drinker*, or *weekend light drinker*) drinking pattern at follow up (i.e., winter of the first year of college) using the multidimensional classification approach described in Turrissi, et al. (2012). Briefly, using latent classification analysis (LCA) of diverse drinking behaviors (e.g., typical weekly drinking, heavy episodic drinking, peak drinking) students were classified into drinking patterns at baseline and again at follow-up. These analyses resulted in four types of drinkers at each time point: non-drinker, weekend light drinker, weekend heavy episodic drinker, and *heavy drinker*. Because we were interested in determining whether parent type moderated the effects of the PBI on reducing high-risk drinking patterns at follow up, we classified high- versus low-risk drinkers dichotomously at the follow-up assessment (i.e., high-risk comprised *weekend heavy episodic drinker* or *heavy drinker* patterns and low-risk comprised *non-drinker* or *weekend light drinker* patterns). We assessed this interaction effect first for the entire sample and then separately for each of the four baseline drinking patterns.

Our hypotheses with regard to the effects of parent type and PBI were fourfold and based on timing and dosage of the PBI, level of parental risk, and level of student risk. First, based on previous research indicating the pre-college version of the PBI was effective for higher-risk parents (Mallett et al., 2011), we expected that students of higher-risk parent types would benefit from their parents receiving the PCM, with or without the booster (early intervention hypothesis). Second, regarding dosage of the PBI, we hypothesized that students of higher-risk parents would benefit more from their parents receiving the PBI plus boosters (PCM+B condition) relative to students of lower-risk parents (increased dosage hypothesis). Third, we hypothesized that the effects of the different versions of the PBI would vary the least for students with protective parents, considering they typically convey consistent anti-alcohol messages (invariant hypothesis). Finally, we expected the benefits of early intervention plus the highest dosage (PCM+B) would be greatest for the highest-risk students (e.g., *weekend heavy episodic drinker*) with the highest-risk parents (treatment matching risk hypothesis).

Method

Participants

A random sample of 2907 first-time, incoming students was invited to participate in the summer prior to college matriculation over three cohorts at a large, public, northeastern university. Of the 2907 participants initially contacted, 1900 consented to participate in the study and completed the web-based baseline assessment, yielding a 65% overall response rate, which is consistent with other studies using web-based approaches (Larimer et al., 2007; McCabe, Boyd, Couper, Crawford, & D'Arcy, 2002; McCabe, Hughes, Bostwick, & Boyd, 2005; Thombs, Ray-Tomasek, Osborn, & Olds, 2005). Participant demographics were as follows: 52% female, 87% Caucasian, 5% Asian, 3% African American, and 5% multi-racial or other. Roughly 5% of participants identified as Hispanic, and the mean age was 17.94 years ($SD = .32$). In addition, 23% of the sample intended to join a fraternity or sorority upon arrival on campus and 81% intended to participate in some level of athletics (i.e., intramural, club, varsity). These demographics are representative of the larger campus community from which the sample was drawn. This sample is identical to that used by Turrissi, et al. (2012), and includes the subsample ($n=370$) used by Varvil-Weld, et al., (2012), which consisted of two cohorts of the control condition only.

Selection and Recruitment Procedures

Student Recruitment—Participants were randomly selected from the university registrar's database of incoming first-year students. Prior to recruitment, participants were

randomized to one of four conditions, which varied in timing and dosage of the intervention (1 = pre-college matriculation PBI [PCM], 2 = pre-college matriculation PBI with boosters [PCM+B], 3 = after-college matriculation PBI [ACM], and 4 = control), using a computerized algorithm. The algorithm used simple randomization, drawing one of four numbers corresponding to the four conditions on a random basis and assigning them to participants' data as it was pulled from the university's database.

Invitation letters explaining the study, procedures, and compensation were mailed to all 2907 potential participants. Participants also received an e-mailed invitation to their university e-mail, which is assigned at summer orientation prior to college matriculation and the start of the study, as well as e-mail and postcard reminders. All recruitment materials included a URL and Personal Identification Number (PIN) for accessing the survey. After logging in to the survey, students provided informed consent electronically by reading the online consent form, providing their consent, and indicating either that they had printed a copy of the informed consent form for their records or that they would like one mailed to them. Participants received \$25 for completing the baseline survey and \$30 for the follow-up survey. Each survey took approximately 35 minutes to complete. The follow-up assessment was conducted at approximately 5 months post-baseline. There was an 84.4% retention rate at follow up. Attrition analyses indicated students who did not complete follow up were more likely to report alcohol use at baseline compared to those with complete data ($p < 0.05$). No other differences in alcohol use behaviors were found between the attrition groups. In addition, individuals with missing data were more likely to be male ($p < 0.05$). There was no evidence of differential attrition by treatment condition or by parent profile.

Parent Intervention—Parents were recruited based on the timing of the intervention conditions to which their teens were assigned. There were no significant differences in alcohol use by treatment condition for any of the seven alcohol use indicators used in the LCA (all $ps > .10$). Parents randomized to one of the intervention conditions (PCM, PCM+B, or ACM) were mailed a handbook, parent survey, and informed consent form, while parents randomized to the control group received only the parent survey and informed consent form (the same handbook utilized by Turrissi et al., 2001). Parents were asked to (1) read the handbook, (2) evaluate the materials and (3) discuss the material with their teen. The handbook is described in depth in Turrissi et al., (2001). Parents were asked to evaluate the handbook by filling out a brief questionnaire as well as making notes directly on the handbook itself, and to return both (Turrissi et al., 2001). Parents received \$10 with the initial mailing, and an additional \$10 for returning their study materials. All parent materials were paper rather than web-based. Parents of teens randomized to the control group were mailed a handbook after the final teen follow-up assessment. Of the 1430 parents invited to participate across the three treatment conditions (470 were assigned to control), 940 (65.7%) mailed at least one of the survey materials back (consent forms, survey, handbook and/or handbook evaluations). The proportion was similar in the control group. No differences were observed on teen baseline drinking outcomes, or in the latent model used in the present study, between the full sample and the proportion of the sample that returned study materials. For a full description of intervention procedures and fidelity, see Turrissi et al. (2012).

Measures

Parenting was assessed at baseline, and drinking patterns were assessed at baseline and at the 5-month follow-up.

Parenting—All measures of parenting were student-reported. All parenting items were assessed separately for mothers and fathers and included items adapted from previous work (see Varvil-Weld et al., 2012). Specific indicators included perceived positive communication (mother $\alpha=.85$; father $\alpha=.81$; Abar, 2012), perceived negative communication (mother $\alpha=.88$; father $\alpha=.90$; Abar, 2012), perceived parental monitoring (mother $\alpha=.67$; father $\alpha=.75$; Wood, Read, Mitchell, & Brand, 2004), perceived parental approval of alcohol use (mother $\alpha=.81$; father $\alpha=.80$; Abar & Turrissi, 2008), and perceived parental alcohol use (mother $r = .52$ [$p < .01$]; father $r = .51$ [$p < .01$]; Varvil-Weld et al., 2012).

Drinking Patterns at Baseline—Each participant was classified according to four drinking patterns found in Turrissi et al. (2012): (1) *non-drinkers (ND)*; 51%; unlikely to report any drinking behaviors); (2) *weekend light drinkers (WLD)*; 15%; likely to use alcohol in the previous month and to report drinking only on Fridays and Saturdays); (3) *weekend heavy episodic drinkers (WHED)*; 30%; likely to report being drunk in the past month, engage in HED, and have a BAC greater than 0.08 on their recent peak drinking occasion); and (4) *heavy drinkers (HDs)*; 4%; likely to endorse all drinking indicators, including weekday drinking and drinking on Thursdays). Assignment was based on a latent classification analysis (LCA; Lanza, Collins, Lemmon, & Schafer, 2007) of seven dichotomous drinking indicators: (1) any alcohol use in the past 30 days; (2) any reported drunkenness in the past 30 days; (3) any weekday – Sunday, Monday, Tuesday, Wednesday – drinking in the past 30 days; (4) any Thursday drinking in the past 30 days; (5) any weekend – Friday and Saturday – drinking in the past 30 days; (6) any HED in the past two weeks; and (7) peak blood alcohol concentration (BAC) greater than 0.08 on last drinking occasion. For more details see Turrissi et al. (2012).

High-Risk Drinking at Follow Up—Participants were first assigned to one of the four drinking patterns at baseline (e.g., *ND*, *WLD*, *WHED*, and *HD*). At follow up, each participant was assigned to a dichotomous classification of high or low risk drinking. Individuals in the *WHED* or *HD* groups at follow up were classified as high-risk, whereas individuals in the *ND* or *WLD* groups at follow up were classified as low-risk.

Analytic Strategy

Deriving Parent Types—Latent profile analysis (LPA) was used to assess parent types, using the ten baseline parenting indicators described above (positive communication, negative communication, monitoring, approval, and parental alcohol use; each separately for mothers and fathers). Procedures for LPA were conducted according to the recommendations of Lanza and colleagues (2007) using Mplus (Muthen & Muthen, 2007). First, a restricted one-profile solution was fit to the data. Additional profiles were added iteratively until the best-fitting solution was determined, according to the Akaike Information Criteria (AIC; Akaike, 1974), the Bayesian Information Criteria (BIC; Schwartz, 1978), and log likelihood values. For each of these indices, relatively lower values suggested better fit. In addition, the Lo, Mendell, and Rubin Likelihood Ratio Test (LMR-LRT; Lo, Mendell, & Rubin, 2001) was used to determine if each additional profile significantly improved model fit. A significant LMR-LRT indicates that the model with $k + 1$ profiles is preferred, relative to a model with k profiles. After determining the number of latent profiles, means on each indicator for each profile were used to characterize the profiles. Finally, posterior probabilities were used to assign students to their most likely baseline parenting profile. The LPA solution provides posterior probabilities of membership in each profile for each individual in the sample (posterior probabilities range from 0 to 1). When the LPA solution fits the data well, most individuals will have a posterior probability of close to 1 for one profile (the “most likely” profile to which they are assigned) and

probabilities of close to 0 for the other profiles. This “classify and analyze” approach has been used successfully in previous studies (Agrawal, Lynskey, Madden, Bucholz, & Heath, 2007).

Moderation of Intervention Effects by Parent Type—Moderation is defined as when the effects of a predictor (i.e., intervention) on an outcome (i.e., student drinking) change across levels of a third variable (i.e., parent profile; Jaccard, Wan, & Turrise, 1990). Moderation was tested by regressing high-risk drinking at follow-up onto intervention condition, parent type, and an intervention condition by parent type product term, using binomial logistic regression. Moderation effects were first examined for the entire sample to assess the early intervention, increased dosage, and invariant hypotheses. To assess the treatment matching risk hypothesis, moderation effects for each baseline drinker pattern were examined separately. A regression coefficient associated with the product term that was significant at the 0.05 level was considered to be sufficient evidence of an interaction. If the interaction was significant, a contingency table was created to compare the distribution of the expected versus observed likelihood of being in a higher-risk drinker status at follow-up by intervention condition and parent type.

Results

Descriptives: Distribution of Drinking Patterns at Baseline and Follow Up

Examination of drinking patterns at baseline and follow-up revealed a high degree of consistency. A majority of baseline *ND* and *WLD* remained in a lower-risk drinking pattern at follow up (81% and 53%, respectively), and a majority of *WHED* and *HD* remained in higher-risk patterns at follow-up (88% and 95%, respectively). Table 1 shows the distribution of risk level at follow up by baseline drinker pattern.

Identification of Parent Types

Latent profile analysis indicated four parenting types, consistent with Varvil-Weld, et al. (2012). While model fit indices (AIC, BIC, and log likelihood) continued to decrease up to the 5-profile model, the profiles within the 5-group solution were not well separated. Therefore, the 4-profile solution was retained as the best fitting model. The LMR-LRT confirmed that the 4-profile solution provided a better fit for the data relative to the 3-profile solution ($\Delta LRT=622.15, p = .002$). All models converged normally and the final 4-profile solution had adequate classification quality (entropy = .76). Fit indices for all tested solutions are presented in Table 2.

Table 3 lists the means of the indicators for each of the parenting types identified in the 4-profile solution. The *positive, pro-alcohol* type ($n = 724$; 38.2%) reported high levels of positive communication and monitoring and low levels of negative communication with both parents. Students with this parent type also indicated both their parents had more positive orientations toward alcohol (i.e., higher approval of alcohol and higher parental alcohol use.) The *positive, anti-alcohol* type ($n = 662$; 34.9%) was similar to the *positive, pro-alcohol* type with respect to protective overall parenting characteristics (high positive communication, low negative communication, and high monitoring) for both mothers and fathers, but described both their parents as having more negative orientations toward alcohol. The *negative mother* type ($n = 314$; 16.5%) was characterized by high levels of maternal conflict (i.e., higher negative communication), and lower levels of maternal and paternal monitoring. Maternal and paternal approval of alcohol and alcohol use were moderate in this parent type. Finally, the smallest type ($n = 198$; 10.4%) was labeled *negative father*. Students with this parent type reported high levels of paternal conflict (i.e.,

lower positive, and higher negative communication), lower maternal and paternal monitoring, and heavier paternal alcohol use compared to the other profiles.

With respect to qualitative characteristics, these parenting types are nearly identical to those identified in Varvil-Weld et al. (2012) and were labeled to be consistent. In addition, the proportions of the sample that fit each parent type were equivalent (in the Varvil-Weld et al. [2012] sample, profile distributions were *positive, pro-alcohol*: 37.8%, *positive, anti-alcohol*: 34.6%, *negative mother*: 19.5%, and *negative father*: 8.1%). Taken together, this suggests the four parent types identified by Varvil-Weld and colleagues (2012) are consistent in this larger sample.

Assessment of the early intervention, increased dosage, and invariant hypotheses

The first objective of the present study was to evaluate whether parent type moderated the effect of intervention condition on the likelihood of being in a higher-risk drinker status at the 5-month follow-up to assess the benefits of early intervention (PCM) and higher dosage (PCM+B) for high-risk parent types. The results of the moderated logistic regression with the entire sample revealed no significant interaction effect ($p > .05$). Therefore, the effects of the various versions of the PBI, and the benefits of early intervention (PCM) and increased dosage (PCM+B), were invariant for both higher- and lower-risk parent types.

Assessment of the treatment matching risk hypothesis

The second focus of the analyses was to examine whether the benefits of early intervention plus increased dosage (PCM+B) would be greatest for the highest-risk students (i.e., *HD* or *WHED*) with the highest-risk parents (i.e., *positive, pro-alcohol, negative father*; treatment matching risk hypothesis). As expected, the results of the moderated logistic regression conducted separately for each baseline drinker type revealed no significant interaction effects for the low-risk student drinking groups (*ND* and *WLD*). For the two high-risk drinking patterns (*WHED* and *HD*), there was a marginally significant interaction effect only for students in the baseline *WHED* pattern ($B = -.17, p = .056$). To examine the nature of this interaction, means for likelihood of being in one of the higher-risk drinker patterns at follow up for students in the *WHED* pattern at baseline are presented in Figure 1. For *WHED* students assigned to the PCM or PCM+B conditions, discernible differences in likelihood of membership in the higher-risk drinker patterns among the parent types were evident. For students with the *positive, anti-alcohol* parent type, likelihood of belonging to a higher-risk drinking pattern at follow up was considerably lower if they received the PCM or PCM+B conditions (.76 and .80, respectively) relative to the ACM or control conditions (.89, and .91, respectively). For students with the *negative father* parent type, likelihood of belonging to a higher-risk drinking pattern at follow up was considerably lower if they received the PCM or PCM+B conditions (.71 and .71, respectively) relative to the ACM or control conditions (.91, and .89, respectively). Overall, among baseline *WHED* drinkers, students in the *negative father* and *positive, anti-alcohol* groups seem to benefit most from receiving the PCM and PCM+B interventions.

Discussion

The present study examined the extent to which parenting types moderated the efficacy of a PBI with varying conditions among four types of student drinkers. Four specific hypotheses were evaluated (early intervention, increased dosage, invariant, and treatment matching risk). Findings supported our invariant hypothesis, which expected the effects of the different versions of the PBI would not vary for protective parent types. Parents who maintain positive relationships with their students and hold more conservative orientations toward alcohol (e.g., *positive, anti-alcohol*) may benefit from the PBI delivered as usual:

prior to college, without boosters. In contrast, our early intervention and increased dosage hypotheses that assumed higher-risk parent types (e.g. *negative father*, *positive*, *pro-alcohol*) would benefit most from early intervention and increased dosage was not supported. The content of the boosters were developed as universal prevention materials, and not with respect to specific higher-risk parent types. It may be that higher-risk parent types would benefit from early intervention or increased dosage if the content of the boosters were tailored to address risky parenting behaviors, such as pro-alcohol orientations.

We found support for our treatment matching risk hypothesis. Students with a pre-college *WHED* pattern of drinking and either the *positive*, *anti-alcohol* or *negative father* parent types had a greater likelihood of membership in the lower-risk drinking pattern at follow-up if they were randomized to the PCM or PCM+B conditions. The benefits of early intervention and higher dosage were greater for high-risk students (*WHED*) with one of the higher-risk parent types (*negative father*). Future intervention efforts would benefit from considering both students' risk and parent type when selecting parent intervention methods to reduce subsequent high-risk drinking when at college.

Our findings are consistent with previous work suggesting the PCM condition may be most effective for higher-risk students (Turrise et al., 2012). The present findings suggest both the PCM and PCM+B conditions were most effective for students exhibiting the baseline *WHED* pattern and whose parents were characterized by one of two parent types (*positive*, *anti-alcohol* and *negative father*). This effect was marginally significant, possibly due to the complex nature of the analyses (i.e., parenting was assessed using latent profile analysis, student drinking was assessed using latent transition analysis and students were classified dichotomously at follow up to characterize their level of risk). In addition, cell sizes were small for certain combinations of parent profiles and student drinking patterns. It is possible that the present analyses did not detect an interaction within the baseline *HD* pattern due to smaller cell sizes in this highest-risk group. Future studies should explore these issues with larger sample sizes.

With regard to differential benefits of the PBI for specific parent types, our findings are partially consistent with our proposed hypotheses and previous research. Mallett and colleagues (2011) found the PBI delivered in the summer prior to college entrance was associated with reductions in drinking for students whose parents had higher-risk parenting styles (authoritarian or permissive). The current study also found the PCM and PCM+B conditions appeared to be effective for *WHED* students who also were affiliated with the *negative father* parent type, which was found to be the highest-risk parent group with respect to students' risk for experiencing alcohol-related consequences (Varvil-Weld et al., 2012). Interestingly, the PCM and PCM+B conditions also appeared to be effective for baseline *WHED* students whose parents fit the *positive*, *anti-alcohol* profile, which is considered a protective parent type (Varvil-Weld et al., 2012). Although previous work suggests the PBI has smaller effects for lower-risk parent types (Mallett et al., 2011), the present finding is promising considering the highest proportion of college students are affiliated with this parent type. Future studies should examine whether early delivery of the handbook (as in both the PCM and PCM+B conditions) serves to strengthen existing positive parenting qualities for some parents (e.g., *positive*, *anti-alcohol*) but addresses more negative parenting qualities for other parents (e.g., *negative father*).

Notably, while the PCM and PCM+B conditions had beneficial effects for one of the more common parent types (*positive*, *anti-alcohol*), they did not appear to have an effect within the other common parent type (*positive*, *pro-alcohol*). One possible explanation for this finding is that the PBI emphasizes a non-confrontational communication style and accurate information about college student drinking. Parents who have more pro-alcohol orientations

(as in the *positive, pro-alcohol* type) may adapt their communication styles as a result of the PBI, but may continue to convey pro-alcohol messages based on their own attitudes and behavior. To date, research in this area has focused primarily on identifying risky parenting practices (e.g., permissiveness) and conveying this information to parents. While this may motivate change for some parents, it may not be effective for others. Future research should explore motivating factors and processes that serve to change parents' pro-alcohol attitudes and behaviors and would improve parent-based intervention materials. Finally, parents may choose to discuss specific topics in the handbook they believe to be relevant rather than discussing the full content. This highlights the need for tailored messages appropriate for different types of parents as well as a more detailed assessment of parents' alcohol-related attitudes and parents' decision-making related to conveying information from the handbook to their teens.

Limitations and Future Directions

Despite its contributions, the present study is not without limitations. First, the sample was derived from one university and may not generalize to other more heterogeneous college populations. Future directions include expanding these findings to other college settings.

Second, explanatory mechanisms (e.g., increased parent-student communication, changes in parental communication style) that might account for the effects of the PBI were not explored. It is possible that the mechanisms underlying the effects of the PBI might be different for different types of parents. For example, for *negative father* parent types, it may be that reducing confrontational communication will result in the greatest reductions in drinking, whereas for *positive, pro-alcohol* parent types, the PBI may increase the frequency of constructive communication. These hypotheses would be consistent with our present findings, although mediators of intervention efficacy were not assessed in the present study. Therefore, future work should identify explanatory mechanisms that account for intervention effects among different types of parents.

Finally, parent type was assessed according to both maternal and paternal influences, while the PBI was delivered at the level of the family (that is, it was mailed to the home rather than to one parent specifically). While the consideration of maternal and paternal influences when assessing parent types is a unique strength of the present study, the intervention delivery was not specific to either parent. Future work should explore how PBI efficacy changes based on whether one or both parents receive the intervention.

Conclusions

In sum, the present results suggest the pre-college delivery of the PBI is an effective intervention strategy for certain types of high- (*negative father*) and low- (*positive, anti-alcohol*) risk parents of students who have established a *WHED* pattern prior to college. Findings highlight the continued need for intervention materials that are targeted to specific types of students and parents, suggesting materials may need to be further refined to reach other types of parents (e.g., parents with positive relationships with their teens but who hold pro-alcohol beliefs and attitudes).

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Figure 1.

Average probabilities of students' transitioning from baseline WHED to higher-risk drinker status (WHED or HD) at follow up, by intervention condition and parent types.

Table 1

Distribution of baseline drinker pattern class membership by follow-up risk level.

Baseline drinker status	Drinker status at follow up		
	Lower-risk (ND + WLD)	Higher-risk (WHED + HD)	
Non-drinker	810 (81%)	194 (19%)	1004
Weekend light drinker	126 (53%)	112 (47%)	238
Weekend heavy episodic drinker	73 (12%)	520 (88%)	593
Heavy drinker	3 (5%)	63 (95%)	66
	1012	889	

Note. Values indicate the number of participants who belonged to each possible transition pattern. ND = Non-drinker, WLD = Weekend light drinker, WHED = Weekend heavy episodic drinker, HD = Heavy drinker.

Table 2

Parent profile fit indices for the one- through five-profile solutions.

Number of profiles	AIC	BIC	Log likelihood	Entropy
1	74126.95	74237.93	−37043.47	
2	72493.54	72665.56	−36215.77	.80
3	71588.80	71821.86	−35752.40	.72
4	70981.16	71275.26	−35437.58	.76
5	70693.02	71048.16	−35282.51	.72

Table 3

Model-based means, variances, and ranges for each of the 10 parenting indicators by parent type (4-profile solution)

	Positive, anti- alcohol (n = 662) 34.9%	Negative father (n=198) 10.4%	Negative mother (n = 314) 16.5%	Positive, pro- alcohol (n = 724) 38.2%
Maternal positive communication ($\sigma^2=3.65$; range: 4–16)	14.33	12.28	9.07	14.25
Maternal negative communication ($\sigma^2=1.88$; range: 2–8)	3.13	4.51	5.91	3.28
Maternal monitoring ($\sigma^2=3.09$; range: 4–12)	10.28	9.23	8.51	9.90
Maternal approval of alcohol use ($\sigma^2=6.96$; range: 3–15)	4.74	7.72	6.57	10.24
Maternal alcohol use ($\sigma^2=2.25$; range: –2.45–5.40)	–0.69	–0.35	0.18	0.58
Paternal positive communication ($\sigma^2=4.33$; 4–16)	14.20	9.03	12.05	14.18
Paternal negative communication ($\sigma^2=1.47$; range: 2–8)	2.86	6.39	3.31	2.99
Paternal monitoring ($\sigma^2=4.22$; range: 4–12)	9.19	6.85	7.25	8.52
Paternal approval of alcohol use ($\sigma^2=6.30$; range: 3–15)	5.05	7.11	7.52	10.65
Paternal alcohol use ($\sigma^2=2.52$; range: –2.81–6.14)	–0.74	–0.02	0.09	0.65

Note: see Varvil-Weld, et al. (2012), for profile means and variances for the original LPA.

σ^2 = variance (assumed to be constant across the profiles).