

A Randomized Trial of a Parent-Based Intervention on Drinking Behavior Among Incoming College Freshmen*

MICHAEL A. ICHIYAMA, PH.D.,[†] ANNE M. FAIRLIE, B.A.,[†] MARK D. WOOD, PH.D.,[†] ROB TURRISI, PH.D.,[†]
DIANE P. FRANCIS, M.P.H., ANNE E. RAY, B.S.,[†] AND LOUISE A. STANGER, ED.D.[†]

Department of Psychology, University of San Diego, 5998 Alcalá Park, San Diego, California 92110-2492

ABSTRACT. Objective: Despite research suggesting that parental involvement can affect alcohol involvement among adolescents, few studies have focused on parent-based alcohol prevention strategies among college undergraduates. We report the results of a randomized trial of a parent-based intervention (PBI) in a sample of college freshmen. **Method:** Across two cohorts, 724 incoming freshman–parent dyads completed baseline assessments and were randomly assigned to PBI or intervention as usual (an alcohol fact sheet for parents). Student follow-up assessments were completed at 4 and 8 months. **Results:** Two-part latent growth curve modeling was used to test hypothesized intervention effects. Outcome variables were drinks per week (past month), heavy episodic drinking (past 2 weeks), and alcohol-related problems (past 3 months). Over the 8-month follow-up period, PBI had a significant effect

on drinks per week but not heavy episodic drinking or alcohol-related problems. Specifically, compared with students in the intervention-as-usual condition, students receiving the PBI were significantly less likely to transition from nondrinker to drinker status and showed less growth in drinking over the freshman year. However, the direct PBI effect on growth was qualified by a PBI \times Gender interaction, with probes indicating that the effect applied to women but not men in the PBI condition. **Conclusions:** This study extends previous research by demonstrating the potential utility for PBIs to decrease the likelihood of transitioning into drinker status and, at least for women, for slowing growth in drinking over the freshman year. (*J. Stud. Alcohol Drugs*, Supplement No. 16: 67-76, 2009)

PROBLEM DRINKING AMONG college undergraduates is widely recognized as one of the major public health concerns on university campuses nationwide (see O'Malley and Johnston, 2002; Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism, 2002a; Wechsler et al., 2000). The wide array of adverse consequences resulting from alcohol misuse among college students has been well documented (Hingson et al., 2005; Jackson et al., 2005; Perkins, 2002). These findings point to the need for the development of interventions designed to prevent or reduce heavy drinking and alcohol-related problems among college undergraduates. The present study reports on the efficacy of a parent-based intervention (PBI) conducted on a randomized sample of matriculating college freshmen.

Parental influences on adolescent and young adult drinking

The relative impact of parental versus peer influences on the drinking behavior of high school and college age teenag-

ers has been a matter of some debate. Presumably, the impact of socialization agents over the course of adolescence is hypothesized to shift with parental influences weakening and peer influences strengthening over the course of this developmental transition (Harris, 1998; Kandel and Andrews, 1987; Windle, 2000). However, a growing body of research has provided evidence of reductions in adolescent drinking associated with parental influences, including greater parental monitoring (Barnes et al., 2006; Beck et al., 2004; van der Vorst et al., 2006), lower levels of parental substance use and drinking (Chassin et al., 1993, 1996; White et al., 2000), less favorable parental attitudes and beliefs about drinking (Ary et al., 1993; Hawkins et al., 1992), greater support and family cohesiveness (Duncan et al., 1994; Marshal and Chassin, 2000; Urberg et al., 2005), and more positive quality of the parent–child relationship and communication (Andrews et al., 1997; Kafka and London, 1991; Walden et al., 2004).

The prevailing view of receding parental influence during adolescence (e.g., Harris, 1998) may have also contributed to the relative neglect of alcohol prevention efforts focusing on parental involvement strategies among college students. However, findings from several recent studies provide evidence of the continuing influence of parents on college student drinking. Among a sample of college freshmen, parent and peer approval of drinking were linked to increased levels of heavy drinking (Turrisi et al., 2001). Wood and colleagues (2004) showed that, cross-sectionally, parental monitoring and permissiveness toward drinking moderated robust peer influences on drinking behavior among high

*This research was supported by National Institute on Alcohol Abuse and Alcoholism grants U18AA015631 (Michael A. Ichiyama, Principal Investigator) and U01AA014749 (Mark D. Wood, Principal Investigator). Louise A. Stanger is the former principal investigator on grant U18AA015631.

[†]Correspondence may be sent to Michael A. Ichiyama at the above address or via email at: ichiyama@sandiego.edu. Anne M. Fairlie and Mark D. Wood are with the Department of Psychology, University of Rhode Island, Kingston, RI. Rob Turrisi and Anne E. Ray are with Biobehavioral Health and the Prevention Research Center, The Pennsylvania State University, University Park, PA. Louise A. Stanger is a private consultant in La Jolla, CA.

school graduates before matriculation. Patock-Peckham and colleagues (2001) found that the parenting style of the same-gender parent exerted the strongest influence on college student alcohol use and consequences (as compared with the influence of the opposite gender parent) and showed that the effects are partly the result of the influence of parenting on students' self-regulation. Same-gender parenting style was also found to influence college student drinking and consequences through the mediating effects of students' impulsiveness and behavioral undercontrol (Patock-Peckham and Morgan-Lopez, 2006). Thus, the findings of recent studies suggest that parents continue to influence the drinking behavior of their children even in emerging adulthood (Chassin and Handley, 2006; Fromme, 2006; see also Arnett, 2000).

Transition to college

The transition from high school graduation to college matriculation is a period accompanied by significant changes in drinking behavior that occur over a relatively short period (Sher and Rutledge, 2007). The college transition has been recognized as an important period for identifying risk factors for the development of problem drinking patterns that become more firmly established in college (see Baer et al., 1995). Immediately before matriculation, most college-bound students are still living at home, and parental guidance and support may be especially salient for the emerging adult about to enter a more autonomous lifestyle. The PBI in the present study was timed to occur just before students' entrance into college, with the goal of disrupting the expansion of heavy drinking over the subsequent transition to college.

Present study

In this study, we implemented a PBI approach developed by Turrisi and colleagues (2001) that consists of disseminating an informational handbook to the parents of students who are about to enter college. The theoretical background of the PBI is founded on a series of published studies examining decision-making tendencies of college students and parent-teen communication (Turrisi and Wiersma, 1999; Turrisi et al., 2000a,b). The handbook aims to assist parents in addressing several relevant factors with their children, including skill building (e.g., assertiveness training, improving parent-teen communication), choosing behavioral alternatives to drinking, and avoiding high-risk situations (see Turrisi et al., 2001). Turrisi and colleagues (2001) demonstrated the short-term efficacy of the PBI handbook approach in reducing heavy drinking and alcohol-related consequences among 154 incoming freshmen attending two medium-sized public universities.

The present study extends the intervention study conducted by Turrisi and colleagues (2001) in a number of

important ways. First, our study includes a larger sample ($n = 724$) of incoming freshmen. Second, as opposed to a posttest-only comparison group, we tested the PBI against an active comparison condition designated as the intervention-as-usual (IAU) condition, which consisted of an alcohol information fact sheet sent to parents as part of the summer orientation materials. Third, we collected data at three time points for both PBI and IAU groups (summer prematriculation and the fall and spring semesters of the freshman year), which allowed us to assess the longer term efficacy of the intervention. Fourth, we used two-part growth-curve-modeling techniques, enabling us to simultaneously examine the effects of the PBI on both the initiation of alcohol use and growth in drinking over time (Brown et al., 2005). Finally, we examined whether any observed intervention effects would vary by gender.

Accordingly, the following hypotheses are rendered. Hypotheses 1a and 1b: Compared with IAU individuals, students assigned to the PBI condition will (1) be significantly less likely to transition from nondrinker to drinker status and (2) exhibit less growth in weekly drinking over the freshman year. Hypotheses 2a and 2b: Compared with IAU individuals, students assigned to the PBI condition will (1) be significantly less likely to transition to heavy episodic drinker status and (2) show less growth in heavy episodic drinking over the freshman year. Hypotheses 3a and 3b: Compared with IAU individuals, students assigned to the PBI condition will (1) be less likely to begin experiencing alcohol-related problems and (2) exhibit less growth in alcohol-related problems over the freshman year.

Method

Procedure

Participant recruitment. Study recruitment began by obtaining the contact information of the 2005 and 2006 incoming freshman classes ($N = 2,373$) from the university's admissions office. Student participants were screened based on inclusion criteria (i.e., 18 or 19 years of age, first-time freshman, never married), resulting in 1,688 eligible students. Our sampling goal was to successfully recruit at least 750 student participants (375 PBIs and 375 IAUs). Based on an estimated recruitment rate of approximately 60%, 1,255 students were randomly selected from the eligible participant pool for initial recruitment and randomly assigned to the handbook intervention condition (PBI, $n = 628$) or nonhandbook condition (IAU, $n = 627$). In the summer months before university matriculation, these students were phoned by project staff and were invited to participate in the study. Students who agreed to participate were also asked to provide the name of the parent whom the student believed would be most likely to participate in the study. During recruitment, 77 students were deemed ineligible to

participate because they were no longer intending to attend the university or their birth date was incorrectly listed. Of the remaining 1,178 students, 1,134 students (96.3%) agreed to participate. Among these students, 882 baseline surveys were completed (77.8%). Student surveys with excessive missing data (i.e., missing 50% or more of the items making up any of the measures used in this study) were excluded from subsequent analyses ($n = 19$), resulting in the initial baseline sample of 863 participants (418 in the PBI condition and 445 in the IAU condition). Two follow-up surveys were administered to students approximately 4 months and 8 months from the baseline survey, during the middle of the fall and spring semesters. The fall and spring surveys were administered only to students who had completed the summer baseline survey.

Parents whose teen completed the summer baseline survey were recruited for study participation. Of the 863 parents targeted for recruitment, 18 (2.1%) refused to participate and 121 (14.0%) could not be contacted (after 10 follow-up phone calls), resulting in 724 successfully recruited parents (347 in the PBI condition and 377 in the IAU condition). The large majority of the recruited parents were mothers (76.5% in the PBI condition and 77.1% in the IAU condition). Parent participants completed a brief survey in the summer asking them to rate how often they talked to their college-bound child about a range of topics (e.g., academics, sports, relationships, alcohol/drug use, life plans). All parents were also administered a fall survey. The fall survey given to the parents assigned to the PBI condition contained an additional set of items to evaluate the handbook. The 4-month follow-up surveys were administered to parents and students concurrently during the fall semester. Because of budgetary constraints, only students were administered a subsequent spring survey.

Of the 724 students in the final sample, 608 students (84.0%) completed the fall survey and 566 students (78.2%) completed the spring survey. Seventy-two percent of the final sample completed all three assessments. Students received \$25 for their participation at the fall survey and \$20 for the spring survey. Of the 724 parents in the final sample, the summer baseline survey was completed by 534 parents (73.8%), and the fall survey was completed by 542 parents (74.9%). Parents who completed the surveys were entered into random drawings for gift certificates to the campus bookstore or dinner tickets to the university Parent Weekend festivities.

All study participants gave formal informed consent by indicating in the online survey that they had read and agreed with the content of the informed consent page (the small number of participants who requested hard-copy versions signed and mailed in their informed consent form). At each data collection point, students and parents were sent an email with a link to the survey and a unique five-digit personal

identification number required for access. Follow-up contacts included at least two email reminders, up to 10 phone contacts, and the resending of the survey link (see Dillman, 2007).

Participant characteristics. The initial sample consisted of 863 incoming freshmen enrolled in a medium-sized private university in California (see prior section on *Participant recruitment*). This institution has an annual enrollment of approximately 4,800 undergraduates, of whom 96% are full-time students. The majority of student participants were women (63%), and 79.1% ($n = 573$) self-reported their ethnicity as white, followed by Latina/o (9.9%), Asian/Pacific Islander (7.2%), black/African American (1.5%), American Indian/Alaska Native (0.4%), and "other" (1.8%). In terms of religious affiliation, 51.2% of the participants self-identified as Catholic, followed by Christian (any denomination; 31.4%), no religious affiliation (14.4%), and "other" (3.0%). The large majority of students (94.5%) reported living in on-campus housing.

Intervention materials

Parents assigned to the PBI condition were mailed the intervention materials during the summer months (ranging from mid-July to mid-August) between their teen's high school graduation and the beginning of college. Parents were asked to read all of the materials, discuss the contents of the handbook, and implement the suggested activities with their teen before college matriculation.

Content and evaluation of the parent-based intervention. The intervention materials consisted of a parent handbook titled "A Parent Handbook for Talking with College Students About Alcohol," that is approximately 45 pages in length. The intervention materials used in this study were provided by the handbook author (Turrisi) and administered to parents in its unmodified form (see Turrisi et al., 2001, for a detailed description of the handbook's content and evaluation). The fall survey for parents included items that asked parents to rate the amount of the handbook they had read on a 4-point scale ranging from 1 (none) to 4 (all) and to rate their overall satisfaction with the handbook on a 5-point scale ranging from 1 (not sure) to 5 (very satisfied).

Content of the intervention-as-usual materials. The university administration mails two brochures to all parents of incoming freshmen during the summer before the beginning of college. One brochure contains a section detailing alcohol policies and consequences of alcohol-policy violations. The other brochure contains information on health and wellness topics and includes a section on college drinking that provides unreferenced statistics regarding heavy drinking among college students. In this brochure, parents are explicitly encouraged to be actively involved in conversations with their teen about responsible alcohol use.

Measures

The outcome measures described below were collected at each of the three time points (summer, fall, and spring). We defined a *drink* as a 12-oz can or bottle of beer, one 5-oz glass of wine, or one 1.5-oz shot of distilled spirits (see National Institute on Alcohol Abuse and Alcoholism, 2004).

Typical number of weekly drinks. Derived from the Daily Drinking Questionnaire (Collins et al., 1985), students estimated, over the past month, the typical number of drinks they had consumed on each day of the week, which were then summed.

Heavy episodic drinking. Heavy episodic drinking was assessed as the number of times students consumed five or more drinks (four or more for women) in a 2-hour period (National Institute on Alcohol Abuse and Alcoholism, 2004). The imposed timeframe on this item was over the past 2 weeks, and the response options ranged from 0 (zero times) to 8 (eight or more times).

Alcohol-related problems. Alcohol-related problems were assessed with an abbreviated version (17 items) of the Young Adult Alcohol Problems Screening Test (Hurlbut and Sher, 1992). We assessed the frequency of alcohol-related problems (e.g., drinking and driving, hangover/nausea, academic problems) over the past 3 months to maintain consistency across the follow-up administrations. Students responded on a continuous scale ranging from 0 (never) to 4 (10 or more times). The 17 items were summed for subsequent analyses. Coefficient α ranged from .85 to .88 across the three assessment waves.

Overview of statistical analyses

Using Mplus Version 5 (Muthén and Muthén, 1998-2007), we fit three two-part latent growth models to determine the efficacy of the PBI in reducing alcohol use (typical number of weekly drinks; heavy episodic drinking) and consequences (alcohol-related problems) among undergraduates (Brown et al., 2005; Olsen and Schafer, 2001). Full-information maximum-likelihood estimation, with robust standard errors, was used for missing data in both parts of the models. To address the efficacy of the intervention for delaying the transition to alcohol use or problems, Part 1 of the two-part growth model examines alcohol use/problem status (e.g., 0 = nondrinker and 1 = drinker) as a random-effects logistic growth model using the log odds of the outcome. To examine the efficacy of the intervention among those already consuming alcohol or experiencing consequences, Part 2 of the model examines the frequency of the nonzero responses using traditional latent growth curve modeling and a log transformation of the outcome. Responses for participants who did not engage in alcohol use or experience problems at a given time point were treated as missing in Part 2 of the model.

Our analytic approach follows that of Brown and colleagues (2005). For each of the outcomes, the two parts of the models were first fit separately as unconditional models. Part 1 (use vs nonuse) was evaluated using a chi-square difference test for the log likelihood values, comparing an intercept-only model to a model with both the intercept and slope. Part 2 (continuous portion with nonzero values) was evaluated using the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). Unconditional two-part models were then examined, in which Parts 1 and 2 were estimated simultaneously. Lastly, conditional models were estimated for each of the three outcomes. Gender, intervention, and the interaction between gender and intervention were included as predictors in both Parts 1 and 2 of the conditional models.

Results

Preliminary analyses

Descriptive data and student attrition. Table 1 displays Pearson product-moment correlations, means, and standard deviations of the outcome measures. We compared the students in the final sample who completed all three assessments ($n = 521$) with students who completed the baseline survey but did not complete at least one of the follow-up surveys ($n = 203$) on demographic (i.e., intervention group, gender, ethnic group, drinker-nondrinker status) and baseline outcome (typical number of weekly drinks, heavy episodic drinking, alcohol-related problems) variables. No significant differences between these groups were found on any assessed variable.

Parent-based intervention handbook evaluation. Of the 347 parents in the PBI condition, we received 251 (72.3%) evaluations of the PBI handbook. Two-hundred and seven (82.5%) of the parents indicated that they read “most” or “all” of the handbook, whereas only three parents indicated that they read “none” of the handbook. Two-hundred and eighteen (86.9%) parents were “mostly” or “very” satisfied with the handbook, whereas only three parents indicated “little” satisfaction.

Two-part growth model for typical number of drinks per week

Unconditional model. Part 1 exhibited significantly better fit when the intercept and linear slope were included rather than the intercept only ($\Delta\chi^2 = 102.34$, 3 df, $p < .001$; $n = 723$). For Part 2 (the continuous portion of the model), a negative residual variance for the Time 3 measure of drinks per week was observed. Because the negative residual variance was small and nonsignificant, it was fixed at zero in the subsequent models. Part 2 was fit using an intercept and

TABLE 1. Correlations, means, and standard deviations of model variables across time waves

Variable	Wave	1.	2.	3.	4.	5.	6.	7.	8.	9.	Mean (SD)
Typical no. of weekly drinks	1. Summer		.497	.487	.705	.504	.397	.625	.398	.485	2.98 (4.48)
	2. Fall	.613		.643	.472	.755	.486	.508	.585	.564	4.04 (5.33)
	3. Spring	.477	.673		.428	.580	.674	.490	.413	.585	5.31 (5.21)
Heavy drinking episodes	4. Summer	.679	.548	.467		.533	.423	.573	.353	.475	0.74 (1.40)
	5. Fall	.547	.837	.622	.578		.517	.585	.623	.617	0.88 (1.36)
	6. Spring	.338	.445	.686	.398	.501		.406	.331	.487	1.32 (1.59)
Alcohol-related problems	7. Summer	.622	.428	.332	.539	.409	.265		.527	.632	3.57 (4.69)
	8. Fall	.322	.457	.369	.347	.432	.298	.428		.545	2.77 (3.83)
	9. Spring	.249	.158	.383	.280	.211*	.372	.255	.363		3.42 (3.86)
Mean (SD)		5.42 (7.34)	8.74 (9.69)	9.76 (9.09)	1.24 (1.77)	1.57 (1.84)	1.75 (1.84)	4.24 (4.75)	4.14 (4.72)	4.77 (6.24)	

Note: Values for women are shown above the diagonal, values for men below.

Bolded correlation coefficient not significant ($p > .05$). * $p < .05$; all other coefficients are significant at $p < .01$.

linear slope and demonstrated good model fit ($\chi^2 = 3.28$, 2 df, $p > .05$; $n = 542$; CFI = .995; RMSEA = .034).

In the unconditional two-part model, there was significant variation in the intercept growth factors in both Part 1 (variance [SE] = 9.26 [2.89], $p = .001$) and Part 2 (variance = 0.94 [0.10], $p < .001$), indicating individual variability in the mean levels of use versus nonuse and the frequency of weekly drinks at baseline. The variances of the linear growth factors were significant in both Part 1 (variance = 77.74 [28.58], $p < .01$) and Part 2 (variance = 2.93 [0.35], $p < .001$), indicating individual variability in the likelihood of transitioning to drinker status and the rate of change for alcohol use. There was a significant positive correlation between the intercept growth factors for Parts 1 and 2 ($r = .83$, $p < .001$), suggesting that students with a lower propensity to use alcohol in a typical week also had less use in a typical week. There was a significant, negative correlation between the intercept and linear growth factors for Part 2 ($r = -.45$, $p < .001$), suggesting that a lower mean frequency of use at baseline corresponds to more growth over time. The linear growth factor in Part 1 was significantly and positively correlated with the intercept growth factors in both Part 1 ($r = .46$, $p < .05$) and Part 2 ($r = .37$, $p < .05$), suggesting a greater likelihood of transitioning to regular drinking was related to a higher intercept in both parts of the model. Lastly, the linear growth factor for Part 2 was not significantly related to either the intercept or linear growth factors in Part 1.

Conditional model. Table 2 shows the results of the conditional model for typical weekly drinks. The use-versus-nonuse portion of the model revealed a significant gender effect on the intercept (at baseline, men were more likely to drink in a typical week than women). There was a significant overall intervention effect, indicating that participants in the PBI condition were significantly less likely to transition into drinking status than participants in the IAU condition ($b = -2.67$ [1.53], $p < .05$, one tailed).

The results of the frequency of use portion of the model revealed that men had significantly greater baseline alcohol use than women. There was a significant intervention effect, indicating that participants in the PBI condition showed less growth over the freshman year in typical number of drinks per week compared with the participants in the IAU condition ($b = -0.62$ [0.23], $p < .01$; $\beta = -.37$). The single degree-of-freedom interaction terms for gender and intervention were significant for both the intercept ($b = -0.46$ [0.18], $p < .05$; $\beta = -.50$) and slope ($b = 1.46$ [0.40], $p < .001$; $\beta = .87$) of the frequency portion of the model. To probe the interaction effects, models were run separately by gender. When men and women were examined separately, there was not a significant intervention effect on the intercept of the frequency portion of the model for either men or women. For the slope of the frequency portion of the model, intervention had a significant effect for both women ($b = -0.61$ [0.23], $p < .01$; $\beta = -.35$) and men ($b = 0.89$ [0.32], $p < .01$; $\beta = .55$). As depicted in Figure 1, women in the PBI condition

TABLE 2. Results of two-part latent growth model for typical number of drinks per week

Variable	Intercept		Slope	
	b (SE)	β	b (SE)	β
Part 1, use versus nonuse				
Growth factor mean	0.31 (0.28)		7.51 (1.38)‡	
Gender, males	1.31 (0.49)†		-1.13 (1.91)	
Intervention	0.54 (0.40)		-2.67 (1.53)§	
Gender × Intervention	-0.71 (0.67)		1.20 (2.65)	
Part 2, frequency of nonzero values				
Growth factor mean	0.68 (0.10)‡		1.61 (0.21)‡	
Gender, males	0.71 (0.13)‡	.76	-0.47 (0.27)	-.28
Intervention	0.18 (0.11)	.20	-0.62 (0.23)†	-.37
Gender × Intervention	-0.46 (0.18)*	-.50	1.46 (0.40)‡	.87

Note: For ease of interpretability, standardized estimates are reported for the continuous portion (Part 2).

‡ $p < .05$ (one tailed); * $p < .05$; † $p < .01$; ‡ $p < .001$.

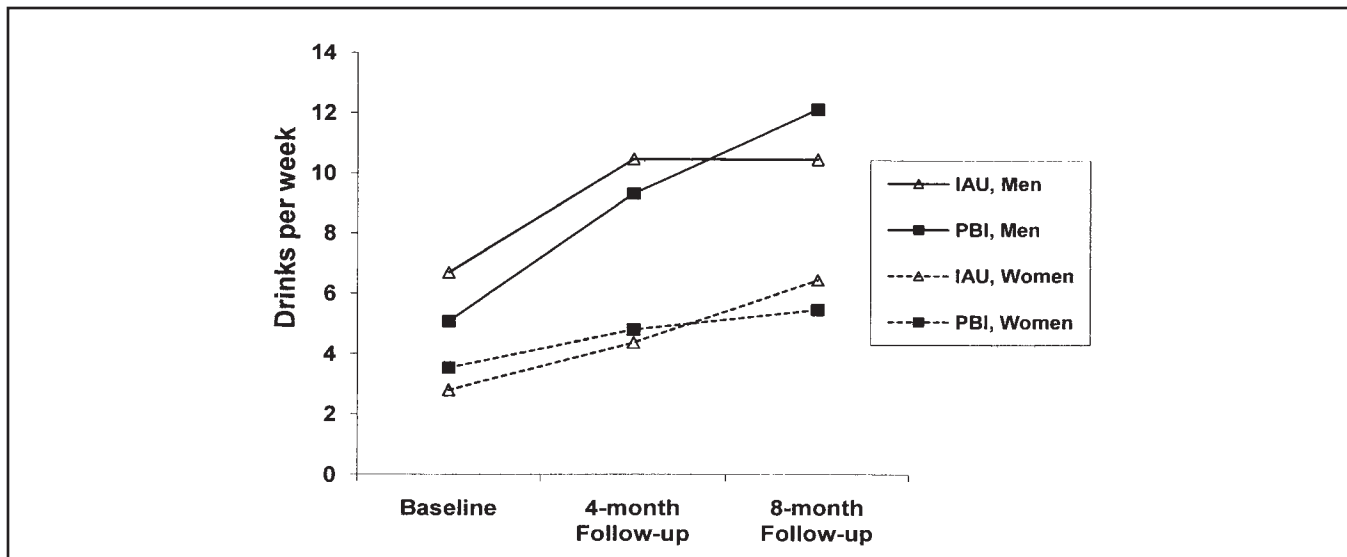


FIGURE 1. Plot of the Gender \times Intervention interaction effect for typical number of drinks per week. The sample means for the participants included in the continuous portion of the model for weekly drinking ($n = 521$) are plotted separately by gender and treatment. IAU = intervention as usual; PBI = parent-based intervention.

exhibited somewhat lower levels of growth in drinks per week compared with the women in the IAU condition. Alternatively, men in the IAU condition exhibited lower levels of growth in drinks per week compared with the men in the PBI condition.

Two-part growth model for heavy episodic drinking

Unconditional model. Part 1 exhibited significantly better fit when the intercept and linear slope were included rather than the intercept only ($\Delta\chi^2 = 90.04$, 3 df, $p < .001$; $n = 723$). Part 2 was fit using an intercept and linear slope with good model fit observed ($\chi^2 = 2.81$, 1 df, $p > .05$; $n = 434$; CFI = .977; RMSEA = .065).

In the unconditional two-part model, there was significant variation in the intercept growth factors in both Part 1 (variance = 10.93 [2.88], $p < .001$) and Part 2 (variance = 0.42 [0.08], $p < .001$), indicating individual variability in the mean levels of use versus nonuse and the frequency of heavy episodic drinking at baseline. The variance of the linear growth factor for Part 1 was not significant (variance = 11.07 [7.57], $p = .14$). We did, however, retain this parameter for use in the conditional model. The variance of the linear growth factor for Part 2 was significant (variance = 1.03 [0.34], $p < .01$), indicating individual variability in the rate of change for heavy episodic drinking. There was a significant, positive correlation between the intercept growth factors for Part 1 and Part 2 ($r = .99$, $p < .001$), indicating that students with a lower propensity to engage in heavy episodic drinking also had a lower frequency of heavy episodic drinking at baseline. The linear growth factor for Part 2 exhibited a significant negative correlation with the intercept growth factors for

both Part 1 ($r = -.49$, $p < .05$) and Part 2 ($r = -.54$, $p < .05$), indicating that a higher rate of change was associated with lower baseline propensities toward heavy episodic drinking. All other growth factor correlations were nonsignificant.

Conditional model. The use versus nonuse portion of the model revealed significant gender effects on the intercept ($b = 1.60$ [0.51], $p < .01$) and slope ($b = -2.44$ [1.19], $p < .05$). At baseline, men were more likely to engage in heavy episodic drinking than women; over the course of the freshman year, however, women exhibited a proportionately greater transition into heavy episodic drinking. The results of the frequency portion of the model revealed that, at baseline, men engaged in heavy episodic drinking significantly more than women ($b = 0.44$ [0.10], $p < .001$; $\beta = .71$). There were no significant intervention effects for Part 1 or Part 2 of this model.

Two-part growth model for alcohol-related problems

Unconditional model. Part 1 exhibited significantly better fit when the intercept and linear slope were included rather than the intercept only ($\Delta\chi^2 = 12.00$, 3 df, $p < .01$; $n = 724$). A negative variance was observed for the latent slope of the continuous portion of the model. Because the negative variance of the latent slope was small and nonsignificant, it was fixed at zero in the subsequent models. Part 2 was fit using an intercept and linear slope with modest model fit ($\chi^2 = 14.19$, 3 df, $p < .01$; $n = 518$; CFI = .917; RMSEA = .085).

In the unconditional two-part model, there was significant variation in the intercept growth factors in both Part 1 (variance = 12.91 [3.66], $p < .001$) and Part 2 (variance = 0.49 [0.05], $p < .001$), indicating individual variability in the

mean levels of problems versus no problems and the frequency of alcohol-related problems at baseline. The variance of the linear growth factor for Part 1 was not significant (variance = 16.27 [8.84], $p = .07$). We did, however, retain this parameter for use in the conditional model. The variance of the linear growth factor for Part 2 was set at zero because of the nonsignificant negative variance. There was a significant positive correlation between the intercept growth factors for Part 1 and Part 2 ($r = .80$, $p < .001$), suggesting that students with a lower propensity to experience alcohol-related problems also experienced a lower frequency of problems. The linear growth factor for Part 1 was not significantly related to the intercept growth factors for either Part 1 or Part 2. All other growth factor correlations were inestimable because the variance of the linear growth factor for Part 2 was fixed at zero.

Conditional model. The only significant finding for alcohol-related consequences was for gender on the intercept of the frequency portion of the model ($b = 0.39$ [0.11], $p < .001$; $\beta = .56$). At baseline, men had significantly more alcohol-related consequences than women.

Discussion

The current study was a replication and extension of a systematic, theory-driven intervention approach (Turrisi et al., 2001) that used parents in the prevention of the onset and growth of alcohol use, heavy episodic drinking, and alcohol-related problems that typify the transition into college (Sher and Rutledge, 2007; Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism, 2002b). Specifically, the intervention was targeted at a crucial juncture just before entry into college, when the adoption or escalation of problematic drinking behaviors frequently occurs.

In support of Hypothesis 1a, for the first time and with the largest sample and longest follow-up period reported to date in a college population using the PBI approach, we found that individuals in the PBI condition were less likely to transition into drinking status during their freshman year, compared with individuals in an active comparison condition. Although the effect of the PBI on the likelihood of transitioning to drinker status was modest, it is encouraging. The PBI is designed to reduce student alcohol use by enhancing parental support and communication, the parent-child relationship, and specific parent-teen dialogue regarding the risks of college student drinking. Because of space limitations here, we were unable to examine explicitly these potential mechanisms of the PBI but will do so using mediation analysis approaches described by MacKinnon (2008) in a forthcoming article.

Consistent with Hypothesis 1b, we found a significant intervention effect, indicating that individuals in the PBI condition showed less growth over the freshman year in the number of drinks consumed per week, compared with

individuals in the IAU condition. Although our finding that the PBI resulted in less growth in drinking over the freshman year was limited to women, it is important to note that women constitute more than half of the current college population. In addition, we found that the women in our sample were more likely than the men to transition into a risky drinking pattern (heavy episodic drinking), a finding consistent with recent studies suggesting a trend of increasing risk among college women for alcohol abuse and related problems (Cole, 2006; LaBrie et al., 2008; Slutske, 2005).

The gender effect on the efficacy of the PBI in the present study is consistent with previous research suggesting that matriculating college women are more psychologically dependent on their parents than matriculating college men (Lapsley et al., 1989) and college undergraduates generally (see Gnauhati and Heine, 2001; Lucas, 1997). Noldon and Sedlacek (1998) also reported that college freshmen women were more likely than men to be concerned about their personal safety, which may have influenced the freshmen women in our study to be more receptive to parental advisement regarding the potential safety risks of alcohol misuse. In their study on parenting styles and alcohol use among college students, Patock-Peckham and Morgan-Lopez (2006) showed that the parenting style of the same-gender parent had the greatest relative influence on the student's drinking and alcohol-related problems. It is plausible, albeit speculative, that some of the PBI effect may have been moderated by parent-child gender match, because the finding of a positive intervention effect on reducing drinking continuity was specific to women, and the majority of participating parents in our study were mothers.

The finding that the men in our sample receiving the PBI showed *greater* growth in typical number of weekly drinks compared with men in the IAU condition is difficult to interpret. One potential explanation is that the men in our study were not as receptive to the PBI approach as the women and may have even experienced psychological reactance to the intervention (Brehm and Brehm, 1981). This finding is somewhat consistent with other research suggesting that college student men are more likely to show conflictual independence from their parents related to identity development (see Lucas, 1997). It should be noted here that gender moderation was not assessed in the original PBI study by Turrisi et al. (2001), and firm conclusions regarding gender differences in PBI efficacy among college students cannot be rendered based on the findings of one single-campus study. Important avenues for future research in this area include the potential moderating influences of parent-child gender matching (see Patock-Peckham and Morgan-Lopez, 2006; Patock-Peckham et al., 2001) on PBI efficacy and the examination of possible differences between mothers and fathers in their relative effectiveness in the "delivery" of the PBI to their college-bound teen. These issues were not examined

in the present study because of insufficient statistical power (i.e., the relatively small number of participating fathers).

We did not find evidence of efficacy for the PBI regarding either initiation or growth on heavy episodic drinking (Hypotheses 2a and 2b) or for alcohol-related problems (Hypotheses 3a and 3b). These findings diverge with those of Turrisi et al. (2001), who observed significantly lower levels of alcohol-related consequences for PBI recipients during the first semester of college, compared with participants in the control condition, with observed differences approaching a medium effect size ($d = 0.40$) (Cohen, 1988). Although the two studies used the same PBI handbook and participants reported similar levels of alcohol use and problems, several methodological differences may account for the divergent findings, most notably study design, sample size, and length of follow-up. The current study used a randomized pretest–posttest design, whereas, because of evidence of assessment reactivity among control group parents, Turrisi and colleagues used a posttest-only comparison design. The current study included 724 incoming students assessed pre-matriculation and at approximately 4 and 8 months into their first year in college, whereas Turrisi and colleagues examined 154 incoming freshmen (106 PBIs, 48 controls) 3 months into their freshman year. The lack of intervention effects for heavy episodic drinking and alcohol-related problems underscores the need for future intervention refinements.

Strengths and limitations

The present study is the largest randomized control trial of a PBI among college students to date, with multiple follow-up assessments over 8 months that enabled an analysis of longer term outcomes than have been reported previously. The study's design and sample, assessed during an important developmental transition, were well suited to test study hypotheses regarding PBI effects using two-part growth curve modeling techniques (Brown et al., 2005; Olsen and Schafer, 2001) that enable conjoint examination of binary (i.e., use vs nonuse) and continuous (i.e., growth in drinking over time) random effects.

The students receiving the PBI represented an enhanced intervention group, and the students in the comparison group represented an "active" IAU group. As previously described, there were statements in the orientation materials that explicitly encouraged parents to talk to their teen about responsible alcohol use. Although we would argue that such a comparison is more externally valid in that it more closely mirrors the types of activities in which universities are increasingly engaged, it may have also served to dampen the overall effect of the PBI. Given the study's two-group design, we could not systematically evaluate the potential impact of the orientation materials on parent–teen communication about alcohol.

Although the PBI administration of both the present study and the original study by Turrisi and colleagues (2001) oc-

curred during the summer months before college matriculation, parents of commuter students (those living at home) may have more opportunities to continue discussions and monitor their children, compared with parents of students residing on campus. Although speculative, to the extent that there was a relatively greater proportion of commuter students in the original study (Turrisi et al., 2001), compared with the present study (of which 94.5% of the freshmen lived on campus and away from home), this may have diminished the PBI effect. Specifically, it is possible that the strength of peer influences for students living on campus contributed to the dampening of the PBI effect. However, we were unable to examine the potential effects of residential context—including living on campus, living off campus with peers, or living off campus with parents—on PBI efficacy in the present study. Future research examining these factors as PBI moderators, as well as social influences more generally (Wood et al., 2001), is warranted.

Finally, the current study was conducted on a single campus of a private Catholic university in California. Due caution should be taken in generalizing the findings to other university contexts.

Implications for college-based preventive interventions

The PBI approach used in this study was effective in reducing the risk of incoming college freshmen to adopt drinking once they entered college and was associated with reduced growth in drinking, at least among women, across the freshman year. These findings suggest that PBIs can have effects that extend beyond the first semester of college. Future studies are needed to systematically test refined PBIs and delineate the mechanisms of effect through which PBIs exert their influence on reducing problem drinking among college students. Ultimately, PBIs are perhaps best viewed as an important component of a more comprehensive preventive intervention and policy approach to the problem of college student drinking (see DeJong and Langford, 2002; Larimer and Cronce, 2007). Despite the overall modest findings of this study, broader consideration, particularly with respect to the ease of dissemination, suggests that the PBI approach continues to show promise as an effective preventive intervention to help address the ongoing problem of college student alcohol misuse.

Acknowledgments

We express our appreciation to Roger Hartman, Ralph Hingson, Judith Arroyo, and Mariela Shirley for their valuable assistance on this project and the National Institute on Alcohol Abuse and Alcoholism Rapid Response Initiative. Special thanks to Stephanie Cox, Christine Webb, Alexa Buenrostro, Jennifer Johnston, Katie Erreca, Amanda Potoczak, Amanda Todd, Ashley Milhaud, Lian O'Neill, Andrew Scott, Jessica Levin, Stephanie Hartung, Carina Giachino, Lia Okun, Rochelle Greenhagen, Christina Schmitt, Libery Hebron, and Cvetanka Romanska for serving as phone recruiters and research assistants.

Copies of the intervention handbook are available from Rob Turrisi on request at Biobehavioral Health and Prevention Research Center, The Pennsylvania State University, 109 Henderson South Building, University Park, PA 16802, or via email at: rturrisi@psu.edu.

References

ANDREWS, J.A., HOPS, H., AND DUNCAN, S.C. Adolescent modeling of parent substance use: The moderating effect of the relationship with the parent. *J. Fam. Psychol.* **11**: 259-270, 1997.

ARNETT, J.J. Emerging Adulthood: A theory of development from the late teens through the twenties. *Amer. Psychol.* **55**: 469-480, 2000.

ARY, D.V., TILDESLEY, E., HOPS, H., AND ANDREWS, J. The influence of parent, sibling, and peer modeling and attitudes on adolescent use of alcohol. *Int. J. Addict.* **28**: 853-880, 1993.

BAER, J.S., KIVLAHAN, D.R., AND MARLATT, G.A. High-risk drinking across the transition from high school to college. *Alcsm Clin. Exp. Res.* **19**: 54-61, 1995.

BARNES, G.M., HOFFMAN, J.H., WELTE, J.W., FARRELL, M.P., AND DINTCHEFF, B.A. Effects of parental monitoring and peer deviance on substance use and delinquency. *J. Marr. Fam.* **68**: 1084-1104, 2006.

BECK, K.H., BOYLE, J.R., AND BOEKELOO, B.O. Parental monitoring and adolescent drinking: Results of a 12-month follow-up. *Amer. J. Hlth Behav.* **28**: 272-279, 2004.

BREHM, S.S. AND BREHM, J.W. *Psychological Reactance: A Theory of Freedom and Control*, San Diego, CA: Academic Press, 1981.

BROWN, E.C., CATALANO, R.F., FLEMING, C.B., HAGGERTY, K.P., AND ABBOTT, R.D. Adolescent substance use outcomes in the Raising Healthy Children Project: A two-part latent growth curve analysis. *J. Cons. Clin. Psychol.* **73**: 699-710, 2005.

CHASSIN, L., CURRAN, P.J., HUSSONG, A.M., AND COLDER, C.R. The relation of parent alcoholism to adolescent substance use: A longitudinal follow-up study. *J. Abnorm. Psychol.* **105**: 70-80, 1996.

CHASSIN, L. AND HANDLEY, E.D. Parents and families as contexts for the development of substance use and substance use disorders. *Psychol. Addict. Behav.* **20**: 135-137, 2006.

CHASSIN, L., PILLOW, D.R., CURRAN, P.J., MOLINA, B.S., AND BARRERA, M., JR. Relation of parental alcoholism to early adolescent substance use: A test of three mediating mechanisms. *J. Abnorm. Psychol.* **102**: 3-19, 1993.

COHEN, J. *Statistical Power Analysis for the Behavioral Sciences*, Mahwah, NJ: Lawrence Erlbaum, 1988.

COLE, T.B. Rape at US colleges often fueled by alcohol. *JAMA* **296**: 504-505, 2006.

COLLINS, R.L., PARKS, G.A., AND MARLATT, G.A. Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *J. Cons. Clin. Psychol.* **53**: 189-200, 1985.

DEJONG, W. AND LANGFORD, L.M. A typology for campus-based alcohol prevention: Moving toward environmental management strategies. *J. Stud. Alcohol, Supplement No. 14*, pp. 140-147, 2002.

DILLMAN, D.A. *Mail and Internet Surveys: The Tailored Design Method*, 2nd Edition, 2007 Update with New Internet, Visual, and Mixed-Mode Guide, Hoboken, NJ: John Wiley & Sons, 2007.

DUNCAN, T.E., DUNCAN, S.C., AND HOPS, H. The effects of family cohesiveness and peer encouragement on the development of adolescent alcohol use: A cohort-sequential approach to the analysis of longitudinal data. *J. Stud. Alcohol* **55**: 588-599, 1994.

FROMME, K. Parenting and other influences on the alcohol use and emotional adjustment of children, adolescents, and emerging adults. *Psychol. Addict. Behav.* **20**: 138-139, 2006.

GNAULATI, E. AND HEINE, B.J. Separation-individuation in late adolescence: An investigation of gender and ethnic differences. *J. Psychol.* **135**: 59-70, 2001.

HARRIS, J.R. *The Nurture Assumption: Why Children Turn Out the Way That They Do*, New York: Free Press, 1998.

HAWKINS, J.D., CATALANO, R.F., AND MILLER, J.Y. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. *Psychol. Bull.* **112**: 64-105, 1992.

HINGSON, R., HEEREN, T., WINTER, M., AND WECHSLER, H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24: Changes from 1998 to 2001. *Annual Rev. Publ. Hlth* **26**: 259-279, 2005.

HURLBUT, S.C. AND SHER, K.J. Assessing alcohol problems in college students. *J. Amer. Coll. Hlth* **41**: 49-58, 1992.

JACKSON, K.M., SHER, K.J., AND PARK, A. Drinking among college students: Consumption and consequences. In: GALANTER, M. (Ed.) *Recent Developments in Alcoholism, Vol. 17: Alcohol Problems in Adolescents and Young Adults*, New York: Kluwer Academic/Plenum, 2005, pp. 85-117.

KAFKA, R.R. AND LONDON, P. Communication in relationships and adolescent substance use: The influence of parents and friends. *Adolescence* **26**: 587-598, 1991.

KANDEL, D.B. AND ANDREWS, K. Processes of adolescent socialization by parents and peers. *Int. J. Addict.* **22**: 319-342, 1987.

LABRIE, J.W., HUTCHING, K., TAWALBEH, S., PEDERSON, E.R., THOMPSON, A.D., SHELESKY, K., LARIMER, M., AND NEIGHBORS, C. A randomized motivational enhancement prevention group reduces drinking and alcohol consequences in first-year college women. *Psychol. Addict. Behav.* **22**: 149-155, 2008.

LAPSLEY, D.K., RICE, K.G., AND SHADID, G.E. Psychological separation and adjustment to college. *J. Counsel. Psychol.* **36**: 286-294, 1989.

LARIMER, M.E. AND CRONCE, J.M. Identification, prevention, and treatment revisited: Individual-focused college drinking prevention 1999-2006. *Addict. Behav.* **32**: 2439-2468, 2007.

LUCAS, M. Identity development, career development, and psychological separation from parents: Similarities and differences between men and women. *J. Counsel. Psychol.* **44**: 123-132, 1997.

MACKINNON, D.P. *Introduction to Statistical Mediation Analysis*, Mahwah, NJ: Lawrence Erlbaum, 2008.

MARSHAL, M.P. AND CHASSIN, L. Peer influence on adolescent alcohol use: The moderating role of parental support and discipline. *Appl. Devel. Sci.* **4**: 80-88, 2000.

MUTHÉN, L.K. AND MUTHÉN, B.O. *Mplus User's Guide*, Version 5, Los Angeles, CA: Muthén and Muthén, 1998-2007.

NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM. NIAAA Council Approves Definition of Binge Drinking. NIAAA Newsletter, winter 3, p. 3, NIH Publication No. 04-5346, Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism, 2004.

NOLDON, D. AND SEDLACEK, W.E. Gender differences in attitudes, skills, and behaviors among academically talented university freshmen. *Roeper Rev.* **21**: 106-109, 1998.

OLSEN, M.K. AND SCHAFER, J.L. A two-part random-effects model for semi-continuous longitudinal data. *J. Amer. Stat. Assoc.* **96**: 730-745, 2001.

O'MALLEY, P.M. AND JOHNSTON, L.D. Epidemiology of alcohol and other drug use among American college students. *J. Stud. Alcohol, Supplement No. 14*, pp. 23-39, 2002.

PATOCK-PECKHAM, J.A., CHEONG, J., BALHORN, M.E., AND NAGOSHI, C.T. A social learning perspective: A model of parenting styles, self-regulation, perceived drinking control, and alcohol use and problems. *Alcsm Clin. Exp. Res.* **25**: 1284-1292, 2001.

PATOCK-PECKHAM, J.A. AND MORGAN-LOPEZ, A.A. College drinking behaviors: Mediation links between parenting styles, impulse control, and alcohol-related problems. *Psychol. Addict. Behav.* **20**: 117-125, 2006.

PERKINS, H.W. Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *J. Stud. Alcohol, Supplement No. 14*, pp. 91-100, 2002.

- SHER, K.J. AND RUTLEDGE, P.C. Heavy drinking across the transition to college: Predicting first-semester heavy drinking from precollege variables. *Addict. Behav.* **32**: 819-835, 2007.
- SLUTSKE, W.S. Alcohol use disorders among US college students and their non-college attending peers. *Arch. Gen. Psychiat.* **62**: 321-327, 2005.
- TASK FORCE OF THE NATIONAL ADVISORY COUNCIL ON ALCOHOL ABUSE AND ALCOHOLISM. High-Risk Drinking in College: What We Know and What We Need to Learn. Final Report of the Panel on Contexts and Consequences, Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism, 2002a (available at: www.collegedrinkingprevention.gov/NIAACollegeMaterials/panelReports.aspx).
- TASK FORCE OF THE NATIONAL ADVISORY COUNCIL ON ALCOHOL ABUSE AND ALCOHOLISM. How to Reduce High-Risk College Drinking: Use Proven Strategies, Fill Research Gaps. Final Report of the Panel on Prevention and Treatment, Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism, 2002b (available at: www.collegedrinkingprevention.gov/NIAACollegeMaterials/panelReports.aspx).
- TURRISI, R., JACCARD, J., TAKI, R., DUNNAM, H., AND GRIMES, J. Examination of the short-term efficacy of a parent intervention to reduce college student drinking tendencies. *Psychol. Addict. Behav.* **15**: 366-372, 2001.
- TURRISI, R., PADILLA, K.K., AND WIERSMA, K.A. College student drinking: An examination of theoretical models of drinking tendencies in freshmen and upperclassmen. *J. Stud. Alcohol* **61**: 598-602, 2000a.
- TURRISI, R. AND WIERSMA, K. Examination of judgments of drunkenness, binge drinking, and drunk driving tendencies in teens with and without a family history of alcohol abuse. *Alcsm Clin. Exp. Res.* **23**: 1-8, 1999.
- TURRISI, R., WIERSMA, K.A., AND HUGHES, K.K. Binge-drinking-related consequences in college students: Role of drinking beliefs and mother-teen communications. *Psychol. Addict. Behav.* **14**: 342-355, 2000b.
- URBERG, K., GOLDSTEIN, M.S., AND TORO, P.A. Supportive relationships as a moderator of the effects of parent and peer drinking on adolescent drinking. *J. Res. Adolesc.* **15**: 1-19, 2005.
- VAN DER VORST, H., ENGELS, R.C.M.E., MEEUS, W., DEKOV, M., AND VERMULST, A. Parental attachment, parental control, and early development of alcohol use: A longitudinal study. *Psychol. Addict. Behav.* **20**: 107-116, 2006.
- WALDEN, B., MCGUE, M., IACONO, W.G., BURT, S.A., AND ELKINS, I. Identifying shared environmental contributions to early substance use: The respective roles of peers and parents. *J. Abnorm. Psychol.* **113**: 440-450, 2004.
- WECHSLER, H., LEE, J.E., KUO, M., AND LEE, H. College binge drinking in the 1990s: A continuing problem. Results of the Harvard School of Public Health 1999 College Alcohol Study. *J. Amer. Coll. Hlth* **48**: 199-210, 2000.
- WHITE, H.R., JOHNSON, V., AND BUYSKE, S. Parental modeling and parenting behavior effects on offspring alcohol and cigarette use: A growth curve analysis. *J. Subst. Abuse* **12**: 287-310, 2000.