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Frequency of heavy drinking and perceived peer alcohol involvement: Comparison of influence and selection mechanisms from a developmental perspective*

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Abstract

The present study investigated social influence and selection explanations for the association between frequency of heavy drinking and perceived peer alcohol involvement in emerging and early adulthood. Participants were 489 young adults recruited from a university setting who were taking part in an 11-year longitudinal study, which includes 6 waves of data. Piecewise latent growth curve analyses indicated that patterns of change from ages 18 to 30 for both frequency of heavy drinking and perceived peer alcohol involvement are best represented by two distinct developmental periods (i.e., college and post-college years). Several models were compared to identify a framework that yielded the best estimates of influence and selection effects. Evidence suggests that selection mechanisms may best account for the relation between frequency of heavy drinking and perceived peer alcohol involvement especially during the post-college years. Published by Elsevier Ltd.

Keywords

Heavy drinking; Peer; Latent growth curve analysis

1. Introduction

Perceptions of peers' involvement with alcohol are among the strongest and most consistent correlates of individual drinking behavior (e.g., Curran, Stice, & Chassin, 1997). From a social norms perspective, perceptions of peers' alcohol use (descriptive norms) and approval of drinking (injunctive norms) are two key components of peer alcohol involvement (Borsari & Carey, 2001). Despite the large body of evidence documenting an association between perceived peer alcohol involvement and patterns of alcohol consumption, mechanisms underlying this relation are not particularly well understood (Curran et al., 1997). Researchers generally have relied on social influence explanations to account for the link between individual and perceived peer alcohol use (for discussion, see Bullers, Cooper, & Russell, 2001). From this perspective, peers tend to affect an individual's drinking behavior through processes such

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as creating norms and expectations regarding alcohol involvement (Sieving, Perry, & Williams, 2000). Conversely, there is growing recognition that similarities between individual and peer drinking can exist because people seek out social groups whose behavior and beliefs are consistent with their own (Bullers et al., 2001). This mechanism has been termed social selection.

A limitation of research examining linkages between individual alcohol use and perceived peer alcohol involvement is that relatively few studies make direct comparisons between social influence and selection mechanisms (Bullers et al., 2001). Consequently, there is only a small, albeit growing, number of investigations capable of distinguishing between the two processes (see literature reviews in Bullers et al., 2001; Curran et al., 1997; Wills & Cleary, 1999). A notable strength of this literature is that longitudinal designs have typically been used. Some findings from longitudinal studies directly comparing social influence and selection processes suggest that social influence is the primary mechanism explaining similarities between individual and peer drinking behaviors (e.g., Sieving et al., 2000). Other work indicates that social selection is the key process (e.g., Schulenberg et al., 1999). Perhaps most intriguing among the results from this line of inquiry, however, is evidence that supports a reciprocal, bidirectional process whereby the two mechanisms operate simultaneously (i.e., individuals' patterns of drinking are influenced by their perceptions of peers' alcohol use and attitudes toward alcohol and, at the same time, individuals tend to select peers with similar levels of alcohol involvement; e.g., Bullers et al., 2001; Curran et al., 1997). Taken together, research that compares influence and selection explanations within the same analysis has yielded inconsistent results, which suggests findings should be viewed with caution.

The purpose of the present study was to compare social influence and selection explanations for the association between frequency of heavy drinking and perceived peer alcohol involvement in emerging and young adulthood. To examine these two processes from a developmental perspective, data from an 11-year longitudinal study were used. The latent growth curve framework outlined by Curran et al. (1997) guided the current research (see below for details). Consistent with previous work (e.g., Bullers et al., 2001), we hypothesized a reciprocal, bidirectional model whereby influence and selection mechanisms would operate simultaneously.

2. Methods

Data for the present research were drawn from an 11-year longitudinal study examining the development and persistence of alcohol and other related problems in a high-risk sample. A detailed description of participant ascertainment and recruitment for this project is presented elsewhere (see Sher, Walitzer, Wood, & Brent, 1991). Thus, only a brief summary of these procedures is provided here.

2.1. Participants and procedures

Participants were recruited from an initial screening sample of 3156 (80% of the total class of 3944) first-time freshmen entering a large, Midwestern university. Based on responses to well-established family history of alcoholism screening measures, participants were classified as either family history positive (FH+) or negative (FH-) for alcoholism. The screening procedures yielded a baseline (Year 1) sample of 489 individuals. The sample was predominately White (93%) and included 124 FH+ men, 113 FH- men, 132 FH+ women, and 118 FH- women.¹ Participants completed a diagnostic interview and paper-and-pencil

¹The number of participants reported equals 487 instead of 489 because it was discovered during the course of the study that 2 participants (1 man and 1 woman) were initially misclassified on family history of alcoholism status. These 2 individuals were retained in primary study analyses.

questionnaire battery at baseline (Year 1; occurring during freshman year of college) and on 5 subsequent occasions over the next 10 years (Years 2, 3, 4, 7, 11). At Year 11, 410 individuals were assessed, mean age was 29.0 (SD=1.03), and 82% of participants had completed at least a bachelor's degree.

2.2. Measures

2.2.1. Frequency of heavy drinking—A single item assessed frequency of heavy drinking at each of the 6 measurement periods. The question was worded as follows: “In the past 30 days, how many times have you had five or more drinks at a single sitting, either of beer, wine, wine coolers, liquor, or some combination of these?” This item was transformed to be expressed as number of heavy drinking occasions per week.

2.2.2. Perceived peer alcohol involvement—Perceived peer alcohol involvement was assessed at each measurement occasion using a 6-item scale. The content of this scale reflected both peer alcohol use (descriptive norms; e.g., “When your close friends drink, how much [on the average] does each person drink?”) and peer attitudes toward use (injunctive norms; e.g., “How do most of your friends feel about drinking?”). Participants rated on a 5-point Likert scale the extent to which they endorsed each question. Scores on this measure were the sum of ratings on the 6 items and ranged from 0 to 24. Coefficient alpha for the index ranged from .87 to .90 over the study period.

3. Results

3.1. Latent growth curve analysis

Zero-order correlations among indices of frequency of heavy drinking, perceived peer alcohol involvement, biological sex, and family history of alcoholism are presented in Table 1. Latent growth curve analysis (LGCA) was used to examine social influence and social selection explanations for the association between frequency of heavy drinking and perceived peer alcohol involvement. LGCAs were fit using the statistical package Mplus Version 3.14 (Muthén & Muthén, 1998–2004). Maximum likelihood estimation with robust standard errors was employed given findings that suggest its appropriateness for variables with skewed distributions (e.g., Satorra & Bentler, 1994). Latent growth curve models were estimated using full information maximum likelihood in Mplus which assumes that data are missing at random. To both increase interpretability of parameters in the LGCAs and ease comparison of different models, measures of both frequency of heavy drinking and perceived peer alcohol involvement at each assessment period were centered around their respective Year 1 means.

3.2. Univariate models

3.2.1. Frequency of heavy drinking—To identify the best way of modeling change in frequency of heavy drinking, 4 unconditional latent growth curve models were examined: Intercept only, linear (intercept and slope), quadratic (intercept as well as slope and quadratic trends), and piecewise (intercept and separate slopes for the college years [Years 1–4] and post-college years [after Year 4]). The piecewise model was selected as the best fitting model because it provided the best overall fit to the data and conceptually best represented the observed pattern of means (see Table 2).² As shown in Table 3, findings from the piecewise model indicated that there was a slight decrease in frequency of heavy drinking during the

²As noted previously, maximum likelihood estimation with robust standard errors was employed. This estimation method cannot be used for chi-square difference testing of nested models (Muthén & Muthén, 1998–2004). Recent work, however, suggests that the Satorra–Bentler scaled chi-square difference test is appropriate for comparing nested models with this estimator (Muthén & Muthén, 1998–2004). Procedures outlined by Muthén and Muthén, (1998–2004) were followed to compute the Satorra–Bentler scaled chi-square difference tests reported in the paper.

college years (Years 1–4; $M=-.15, p<.10$) and a substantial decrease in post college (Years 4–11; $M=-.65, p<.001$). Results also revealed a strong negative relation between the intercept and post-college slope ($r=-.64, p<.001$). Thus, individuals with high initial levels of frequency of heavy drinking tended to decline at steeper rates (i.e., have more negative slopes) following the college years compared to those with lower initial levels.

3.2.2. Peer alcohol involvement—The piecewise latent growth curve model also provided the best overall fit to the data when considering perceived peer alcohol involvement (see Table 2).³ As shown in Table 3, findings from the piecewise model indicated there was a moderate decrease in perceived peer alcohol involvement during the college years ($M=-.25, p<.001$) and a substantial decrease post college ($M=-.66, p<.001$). With regard to associations among the latent factors, there was a significant negative covariance between the intercept and college slope, suggesting that individuals with high initial levels of perceived peer alcohol involvement tended to exhibit the largest decreases on perceived peer alcohol involvement during the college years. There was a similar negative association between initial level of perceived peer alcohol involvement and the post-college slope. Finally, an inverse relation also was found between the college and post-college slopes indicating that those who tended to have larger rates of decrease during the college years had smaller declines post college (and vice versa).

3.3. Multivariate models

To examine the primary study aim, a multivariate latent growth curve model was conducted by simultaneously estimating the piecewise models for frequency of heavy drinking and perceived peer alcohol involvement (depicted in Fig. 1). Based on recommendations for examining possible influence and selection mechanisms within an LGCA framework (Curran, 2000), both college and post-college slopes for frequency of heavy drinking were regressed on the perceived peer alcohol involvement intercept. These parameters have been hypothesized to represent influence processes (Curran et al., 1997). Similarly, college and post-college slopes for perceived peer alcohol involvement were regressed on the frequency of heavy drinking intercept. These parameters have been hypothesized to represent selection processes. In addition to parameters examined in the two univariate models (e.g., covariances among latent factors), covariances were estimated between the (1) frequency of heavy drinking intercept and perceived peer alcohol involvement intercept, (2) frequency of heavy drinking college slope and perceived peer alcohol involvement college slope, and (3) frequency of heavy drinking post-college slope and perceived peer alcohol involvement post-college slope.

Findings indicated that the multivariate latent growth curve model provided a reasonable fit to the data ($\chi^2[54, n=489]=112.36, p<.001$; CFI=.97; RMSEA=.05; SRMR=.04). Findings related to specific parameters are presented in Table 4 (top panel). Most notably, the frequency of heavy drinking intercept was a significant negative predictor of the perceived peer alcohol involvement post-college slope ($\beta=-.17, p<.05$), but not the perceived peer alcohol involvement slope during the college years ($\beta=-.08, n.s.$). Thus, higher initial (i.e., freshman year) levels of frequency of heavy drinking were associated with greater *decreases* in peer alcohol involvement post college. Similarly, initial level of perceived peer alcohol involvement was a negative predictor of the frequency of heavy drinking post-college slope ($\beta=-.51, p<.001$), but not the frequency of heavy drinking slope during the college years ($\beta=-.08, n.s.$). Higher initial levels of perceived peer alcohol involvement, therefore, were linked to greater *decreases* in frequency of heavy drinking post college. Taken together, these findings provide evidence for a reciprocal, bidirectional process whereby influence and selection mechanisms operate simultaneously.⁴

³For models to converge on proper solutions, the variance of the measure of perceived peer alcohol involvement at Wave 6, which was negative when freely estimated, was fixed to 0 in all LGCAs.

Following recommendations (Curran, Bauer, & Willoughby, 2004), we created two figures to better illustrate relations between initial level (intercept) of one construct and patterns of change over time (slopes) of the other. These figures depict each individual's model-estimated trajectories for frequency of heavy drinking (Fig. 2) and perceived peer alcohol involvement (Fig. 3) as a function of initial (Year 1) level of the other construct. Each intercept was first separated into low, medium, and high levels based on a tertile split. The bold lines represent the average trajectory for each tertile. As Fig. 2 shows, the largest *decrease* in frequency of heavy drinking post college (i.e., from Year 4 to Year 11) occurred for those individuals who reported a high initial level of perceived peer alcohol involvement; conversely, the *smallest* decrease in frequency of heavy drinking post college occurred for those individuals who reported a low initial level of perceived peer alcohol involvement. The same pattern was also found for change in perceived peer alcohol involvement post college at high and low initial levels of frequency of heavy drinking (see Fig. 3). These figures illustrate the negative relations observed between intercepts and post-college slopes.

3.3.1. Within-construct directional framework—Consistent with existing literature (e.g., Curran, 2000), certain assumptions were made about parameters estimated in the LGCA discussed previously. Notably, covariances were modeled among latent factors within each construct (e.g., covariance between the heavy drinking intercept and heavy drinking college slope). Relations between intercept and slope latent factors within each construct can also be represented by directional paths from the former to the latter. Modeling associations among latent factors within a construct in this manner may provide a more conservative estimate of hypothesized influence and selection mechanisms because an underlying component of the data is statistically controlled. Specifically, findings from the two univariate LGCAs for both heavy drinking and peer alcohol involvement indicated that the higher an individual's initial level the further he/she tends to fall. By modeling the relations between intercept and both college and post-college slopes within a construct as *directional* paths, this feature of the data is statistically controlled, potentially providing a less confounded estimate of possible influence and selection effects.

To investigate the within-construct directional framework, the multivariate piecewise model was respecified, substituting directional paths for covariances between the intercept and college years slope and between the intercept and post-college years slope within each construct (χ^2 [54, $n=489$]=110.22, $p<.001$; CFI=.97; RMSEA=.05; SRMR=.04). Findings indicated that there were substantial differences in the cross-construct parameter estimates between the within-construct covariance (original model) and within-construct directional models (see Table 4, bottom panel). Of particular importance, the directional path representing the relation between frequency of heavy drinking intercept and perceived peer alcohol involvement slope during the college years (selection mechanism) changed from $-.08$ in the within-construct covariance model to $.36$ in the within-construct directional model. Although the standardized estimate for the within-construct directional model ($.36$, $p=.23$, between heavy drinking intercept and peer alcohol involvement college slope) is not statistically significant, it represents a modest effect in terms of effect size. The directional path representing the relation between frequency of heavy drinking intercept and perceived peer alcohol involvement post-college slope (selection mechanism) changed from $-.17$ and statistically significant in the within-construct covariance model to $-.03$ and non-significant in the within-construct directional model (see Table 4). Similarly, the parameter representing the relation between perceived peer alcohol involvement intercept and frequency of heavy drinking slope post

⁴Given that sex differences have been found in terms of alcohol use/misuse and FH status were part of the study design, these background characteristics could influence results of the LGCAs. The LGCAs were reexamined controlling for biological sex and FH. Specifically, the two variables were included as predictors of frequency of heavy drinking and perceived peer alcohol involvement intercepts and slopes. Inclusion of sex and FH as covariates did not change the substantive interpretation of the latent growth models.

college (social influence mechanism) went from a statistically significant negative value (standardized estimate = $-.51$, $p < .001$) in the within-construct covariance model to $.01$ in the within-construct directional model. Thus, no statistically significant cross-construct parameters emerged in the within-construct directional model.

These findings indicate that within the multivariate latent growth curve framework statistically controlling for initial level (intercept) of frequency of heavy drinking and perceived peer alcohol involvement when predicting trajectories of the other construct has a substantial impact on parameter estimates hypothesized to represent influence and selection mechanisms. It is important to note that significant residual variance was found for both college and post-college perceived peer alcohol involvement slopes, but not for either college or post-college heavy drinking slopes in the within-construct directional model (see Table 4, bottom panel). It is possible that the relatively limited variability associated with the college and post-college heavy drinking slopes contributed to the lack of significant findings related to influence processes.

3.3.2. Year 4 intercept model—As discussed previously, the univariate LGCA for both frequency of heavy drinking and perceived peer alcohol involvement indicate that there are two distinct developmental periods in the data. Year 1 is the beginning of the first development period and Year 4 is the beginning of the second. It is possible that cross-construct directional paths from Year 4 level to post-college slopes may represent a stronger test of influence and selection mechanisms after the college years compared to directional paths from Year 1 level to post-college slopes.

To examine this Year 4 intercept framework, factor loadings for the within-construct directional model were recoded such that initial level began at Year 4. This was done by setting the factor loadings for the college slopes to -3 , -2 , -1 , 0 , 0 , and 0 . Parameters representing the paths from frequency of heavy drinking and perceived peer alcohol involvement intercepts to college slopes are not clearly interpretable using this coding scheme, but those to post-college slopes are. The Year 4 intercept model provided a reasonable fit to the data ($\chi^2 [54, n=489] = 96.14$, $p < .001$; CFI = $.98$; RMSEA = $.04$; SRMR = $.04$). Findings indicated a significant positive relation between frequency of heavy drinking intercept (level at Year 4) and perceived peer alcohol involvement slope post college (standardized estimate = $.36$, $p < .01$; selection mechanism). This suggests that individuals with high Year 4 levels of heavy drinking tended to exhibit the smallest decreases in perceived peer alcohol involvement post college. A significant association was not found between the perceived peer alcohol involvement intercept (level at Year 4) and frequency of heavy drinking slope post-college (standardized estimate = $-.03$, n.s.; influence mechanism). It is important to note (see Discussion below) that there was significant residual variance for the perceived peer alcohol involvement post-college slope (unstandardized estimate = $.24$, $p < .001$), but not for the frequency of heavy drinking post-college slope (unstandardized estimate = $.002$, n.s.).

4. Discussion

The present research examined social influence and selection explanations for the association between frequency of heavy drinking and perceived peer alcohol involvement in emerging and early adulthood. This study extends prior work in two important ways: (1) distinct developmental periods related to trajectories of both frequency of heavy drinking and perceived peer alcohol involvement over an 11-year period were considered and (2) direct comparisons were made between influence and selection mechanisms using a young adult sample. Additionally, from a methodological perspective, findings indicate that parameters estimated in a latent growth curve framework can change considerably depending on how within-construct parameters are modeled.

4.1. Developmental considerations

Results from the univariate latent growth curve analyses suggest that frequency of heavy drinking and perceived peer alcohol involvement follow similar developmental trajectories from ages 18 to 30. Specifically, for both constructs, it appears that patterns of change during this time period are best represented by two distinct developmental periods. The first stage, which in general spans the ages of 18 to 22–24, is characterized by high initial levels followed by relatively small linear declines.⁵ The second developmental period, which in general spans the ages of 25 to 30, is represented by sharper linear declines. Findings indicating two distinct patterns for both frequency of heavy drinking and perceived peer alcohol involvement at different life stages (i.e., college and post-college years) are consistent with developmental theory and research. Emerging adulthood (ages 18 to 25) has been relatively well established as a distinct developmental period (Arnett, 2000). Developmental tasks during this stage of life (e.g., identity exploration) afford the opportunity for relatively high levels of alcohol involvement. The sharp decreases in frequency of heavy drinking and peer alcohol involvement observed in the late 20s and early 30s (i.e., young adulthood) also are consistent with developmental challenges of this life stage. Specifically, individuals are beginning to assume adult roles and responsibilities (e.g., parenthood) which tend to be incompatible with heavy alcohol use or associating with heavy using peers (Sher & Gotham, 1999).

4.2. Comparison of within-construct covariance and within-construct directional frameworks

As noted, in traditional latent growth curve frameworks, the relation between intercept and slope latent factors within a construct is typically represented by a covariance. If the goal of a study is to predict a latent construct representing change over time (e.g., slope), it may be more appropriate to model this relation as a directional path instead of a covariance. The conceptual rationale for estimating the association between initial level and change function as a directional path is to account for the fact individuals with high initial values have the potential to decrease at the steepest rates (and vice versa). Possible implications of statistically controlling for this phenomenon (Law of Initial Values; e.g., Wilder, 1958) were considered in the present study.

If comparisons of influence and selection mechanisms are made using the within-construct covariance model, findings provide evidence for a bidirectional, reciprocal relation between frequency of heavy drinking and perceived peer alcohol involvement (Curran et al., 1997). An important limitation of the multivariate within-construct covariance model for investigating influence and selection processes, however, is that it does not control for relationships between the intercept and slopes. Because frequency of heavy drinking and perceived peer alcohol intercepts are highly correlated, this may result in misleading estimates. Specifically, estimates of influence and selection are potentially open to misinterpretation in the within-construct covariance model because they may reflect both patterns of change *within* the measures of heavy drinking and peer alcohol involvement *and* the processes of interest across the constructs.

To provide less confounded estimates of influence and selection mechanisms, an additional multivariate latent growth curve model was investigated. In this within-construct directional framework, directional paths instead of covariances were modeled between intercepts and both college and post-college slopes within the two constructs. Paths hypothesized to represent influence and selection mechanisms in the within-construct directional model are thus interpreted as the expected change in slopes for a construct for each unit change on the intercept of the other construct *controlling for initial level of the original construct*. Although no statistically significant cross-construct parameters were found in this model, a moderate effect

⁵Because of the study design (i.e., assessments were not conducted between Year 4 and Year 7), it is not possible to determine the exact age at which one developmental period ends and the other begins.

size was evident for the parameter representing the relation between frequency of heavy drinking intercept and perceived peer alcohol involvement college slope. Results thus provide some, albeit limited, evidence that selection processes may best account for linkages between frequency of heavy drinking and perceived peer alcohol involvement during the college years, but not post college.

It is possible that neither influence or selection effects were found post college in the within-construct directional model because Year 1 levels of heavy drinking and perceived peer alcohol involvement did not represent the beginning of their respective post-college developmental periods. To address this concern, an analysis was conducted in which intercepts for frequency of heavy drinking and perceived peer alcohol involvement were modeled as the level for each construct at Year 4 (i.e., level at the start of the second developmental period). Results from this model provided evidence for selection but not influence effects post college.

Based on findings concerning these various multivariate analyses, several conclusions related to the structure of these models for examining influence and selection mechanisms seem warranted. First, it appears that modeling directional paths instead of covariances between intercepts and slopes within a construct provides less confounded estimates of influence and selection processes. The primary reason for this is that the within-construct directional model controls statistically for patterns of change *within* a construct. Second, when multiple developmental periods (e.g., college and post-college years) are present, separate multivariate models should be examined for each stage of life so that stage-specific processes can be resolved.

4.3. Influence and selection mechanisms

The within-construct directional Year 4 intercept model suggests that selection processes may best account for the relation between frequency of heavy drinking and perceived peer alcohol involvement following the college years. Specifically, results indicate a significant positive relation between the frequency of heavy drinking intercept and the peer alcohol involvement post-college slope. This finding suggests that individuals with high initial levels of heavy drinking tend to select peers who have the smallest decreases in alcohol involvement following the college years. This finding is consistent with previous work that suggests selection mechanisms are stronger than influence mechanisms in explaining the association between heavy drinking and peer alcohol involvement among adults (Bullers et al., 2001). As individuals transition into adulthood, they appear to be more active in selecting interpersonal relationships with others who drink at similar levels.

Caution should be used, however, in interpreting the current results to indicate that influence processes do not help explain the relation between heavy drinking and perceived peer alcohol involvement. Findings indicated that the frequency of heavy drinking college and post-college slopes had limited variability. The relatively small amount of variation associated with these constructs could explain at least partially why influence effects were not found during either the college or post-college years. Additional research that includes both college and non-college attending individuals may show increased variability on measures of heavy drinking, thus enabling stronger conclusions related to influence processes to be drawn.

4.4. Limitations and future directions

Several limitations of the current study along with promising directions for future research should be noted. First, from a psychometric perspective, participants were asked to report on their perceptions of their peers' alcohol involvement. It has been shown that the association between individual and peer drinking often is either overestimated or underestimated (depending on the reporter's level of drinking) when a measure of perceived peer alcohol

involvement is used (Prinstein & Wang, 2005). Few studies in adult literatures, however, have included measures obtained from participants' peers (for a notable exception, see Leonard & Mudar, 2003). Although the logistics of this type of assessment procedure pose a significant challenge, peer report measures have the potential to make a substantial contribution to knowledge of relations between individual functioning and peer-related factors in adulthood (Bauman & Ennett, 1996). In this type of study, information related to changes in peer group membership over time also could be assessed. A second limitation of the study in the sample was initially selected from first-time college freshman entering a large university. Caution thus should be taken in generalizing these findings to non-college attending populations. Third, the sample is predominately White (93%) which limits generalizability of findings to other racial/ethnic groups. Fourth, sample size was not large enough to conduct separate latent growth curve models for men/women or family history positive/negative individuals.

An additional limitation of the current investigation is that parameters representing developmental trajectories for both frequency of heavy drinking and perceived peer alcohol involvement were assumed to be drawn from a single, normally distributed population. Recent findings, however, suggest that there may be subgroups of individuals with distinct heavy drinking trajectories, at least from adolescence to emerging adulthood (Chassin, Pitts, & Prost, 2002). Given that a primary focus of the paper was comparing within construct covariance and within-construct directional latent growth curve models, investigation of possible subgroups was not undertaken. Future research examining influence and selection processes will undoubtedly benefit from an integrated variable- and person-centered approach such as growth mixture modeling (Muthén & Muthén, 1998–2004).

References

- Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist* 2000;55:469–480. [PubMed: 10842426]
- Bauman KE, Ennett ST. On the importance of peer influence for adolescent drug use: Commonly neglected considerations. *Addiction* 1996;91:185–198. [PubMed: 8835276]
- Borsari B, Carey KB. Peer influences on college drinking: A review of the research. *Journal of Substance Abuse* 2001;13:391–424. [PubMed: 11775073]
- Bullers S, Cooper ML, Russell M. Social networks drinking and adult alcohol involvement: A longitudinal exploration of the direction of influence. *Addictive Behaviors* 2001;26:181–199. [PubMed: 11316376]
- Chassin L, Pitts SC, Prost J. Binge drinking trajectories from adolescence to emerging adulthood in a high-risk sample: Predictors and substance abuse outcomes. *Journal of Consulting and Clinical Psychology* 2002;70:67–78. [PubMed: 11860058]
- Curran, PJ. A latent curve framework for the study of developmental trajectories in adolescent substance use. In: Rose, JS.; Chassin, L.; Presson, CC.; Sherman, SJ., editors. *Multivariate applications in substance abuse research: New methods for new questions*. Mahwah, NJ: Lawrence Erlbaum; 2000. p. 1-42.
- Curran PJ, Bauer DJ, Willoughby MT. Testing main effects and interactions in latent curve analysis. *Psychological Methods* 2004;9:220–237. [PubMed: 15137890]
- Curran PJ, Stice E, Chassin L. The relation between adolescent alcohol use and peer alcohol use: A longitudinal random coefficients model. *Journal of Consulting and Clinical Psychology* 1997;65:130–140. [PubMed: 9103742]
- Leonard KE, Mudar P. Peer and partner drinking and the transition to marriage: A longitudinal examination of selection and influence processes. *Psychology of Addictive Behaviors* 2003;17:115–125. [PubMed: 12814275]
- Muthén, LK.; Muthén, BO. *Mplus User's Guide*. Los Angeles, CA: Muthén and Muthén; 1998–2004.
- Prinstein MJ, Wang SS. False consensus and adolescent peer contagion: Examining discrepancies between perceptions and actual reported levels of friends' deviant and health risk behaviors. *Journal of Abnormal Child Psychology* 2005;33:293–306. [PubMed: 15957558]

- Satorra, A.; Bentler, PM. Corrections to test statistics and standard errors in covariance structure analysis. In: Von Eye, A.; Clogg, CC., editors. *Latent variables analysis: Applications for developmental research*. Thousand Oaks, CA: Sage; 1994. p. 399-419.
- Schulenberg J, Maggs JL, Dielman TE, Leech SL, Kloska DD, Shope JT, et al. On peer influences to get drunk: A panel study of young adolescents. *Merrill-Palmer Quarterly* 1999;45:108-142.
- Sher KJ, Gotham HJ. Pathological alcohol involvement: A developmental disorder of young adulthood. *Development and Psychopathology* 1999;11:933-956. [PubMed: 10624733]
- Sher KJ, Walitzer KS, Wood PK, Brent EE. Characteristics of children of alcoholics: Putative risk factors, substance use and abuse, and psychopathology. *Journal of Abnormal Psychology* 1991;100:427-448. [PubMed: 1757657]
- Sieving RE, Perry CL, Williams CL. Do friendships change behaviors, or do behaviors change friendships? Examining paths of influence in young adolescents' alcohol use. *Journal of Adolescent Health* 2000;26:27-35. [PubMed: 10638715]
- Wilder J. Modern psychophysiology and the law of initial value. *American Journal of Psychotherapy* 1958;12:199-211. [PubMed: 13521047]
- Wills TA, Cleary SD. Peer and adolescent substance use among 6th-9th graders: Latent growth analyses of influence versus selection mechanisms. *Health Psychology* 1999;18:453-463. [PubMed: 10519461]

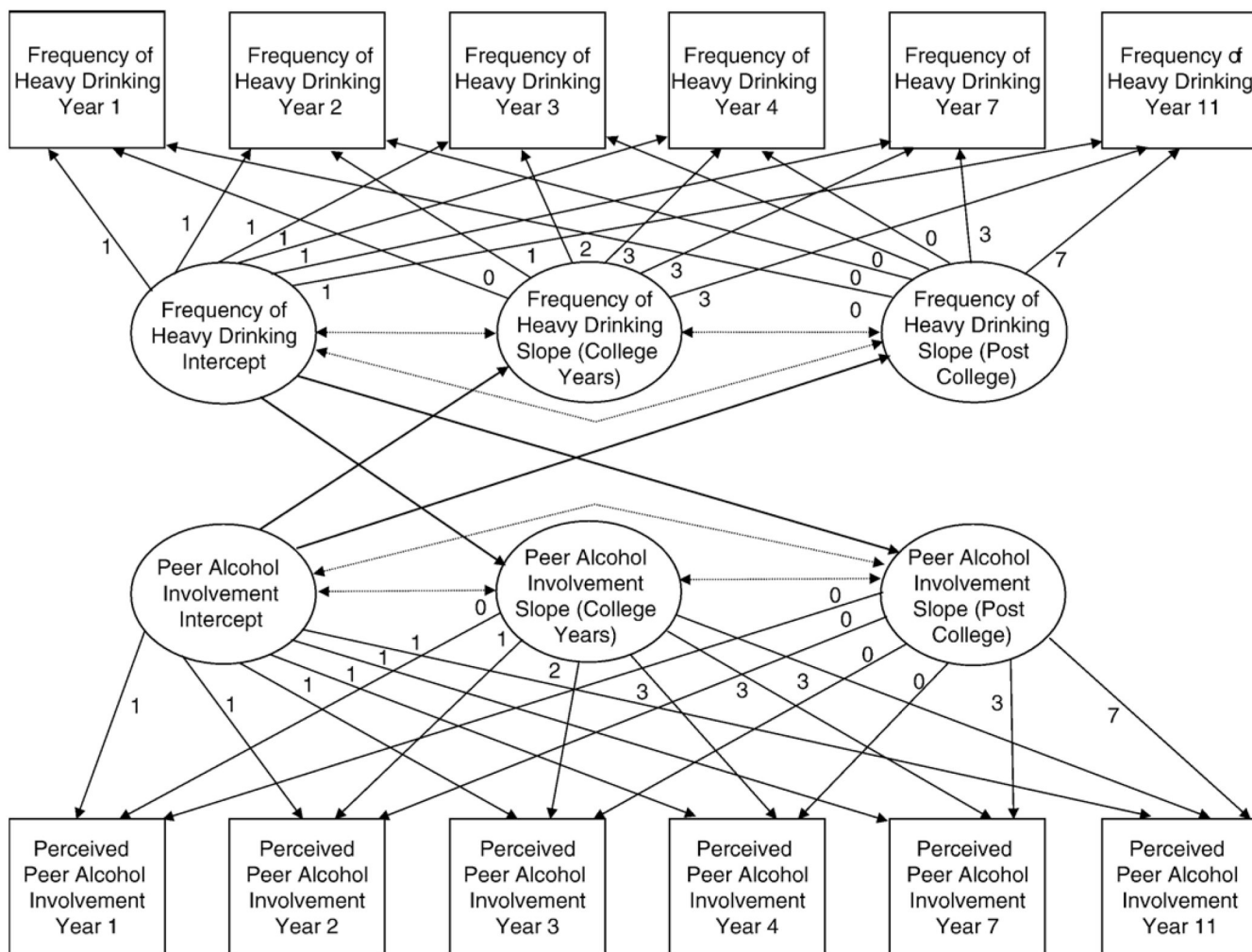


Fig. 1. The figure depicts a piecewise latent growth curve model in which frequency of heavy drinking and perceived peer alcohol involvement are modeled simultaneously.

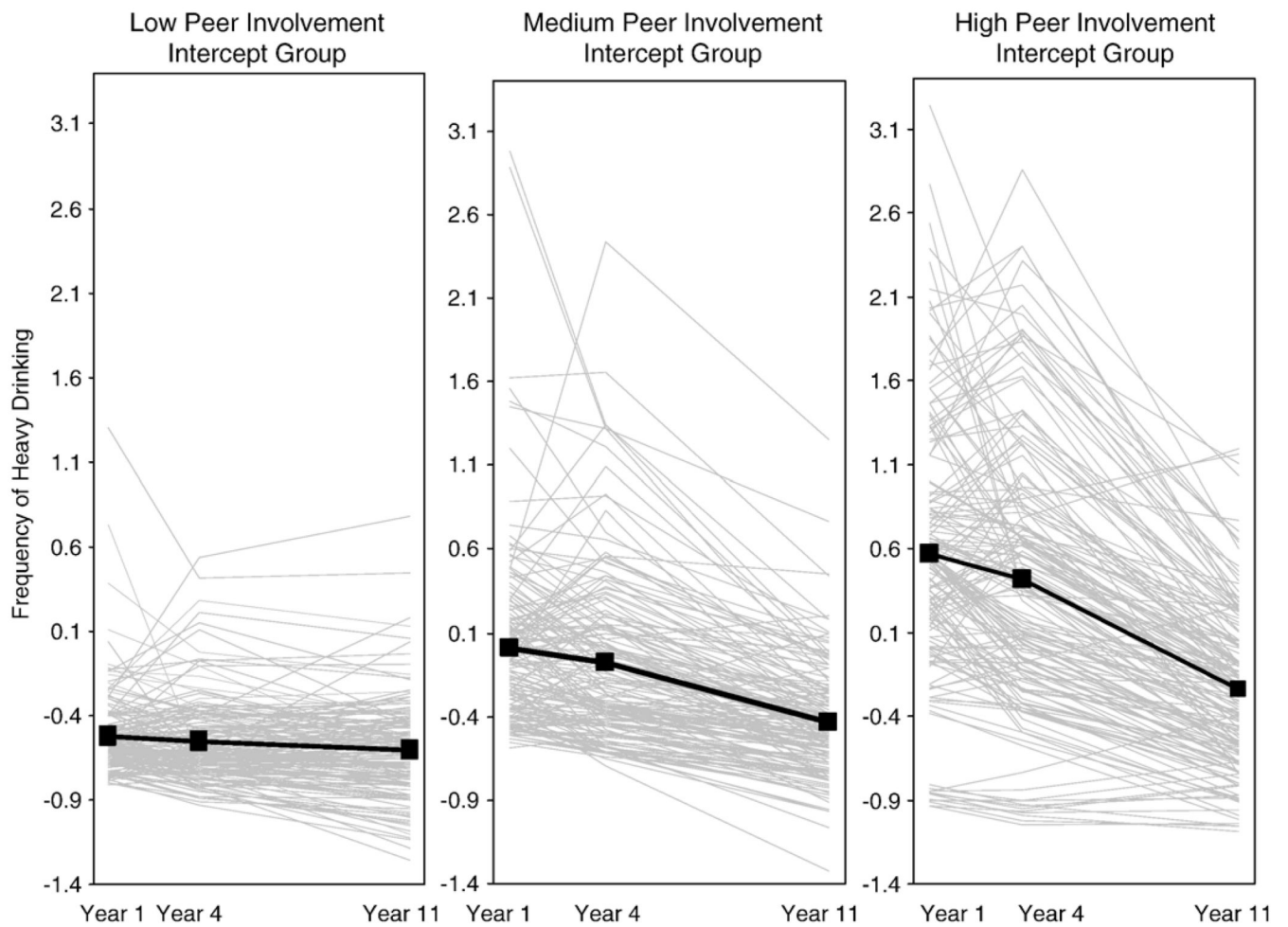


Fig. 2. Each individual's model-estimated trajectory for frequency of heavy drinking as a function of initial (Year 1) level (low, medium, high) of perceived peer alcohol involvement.

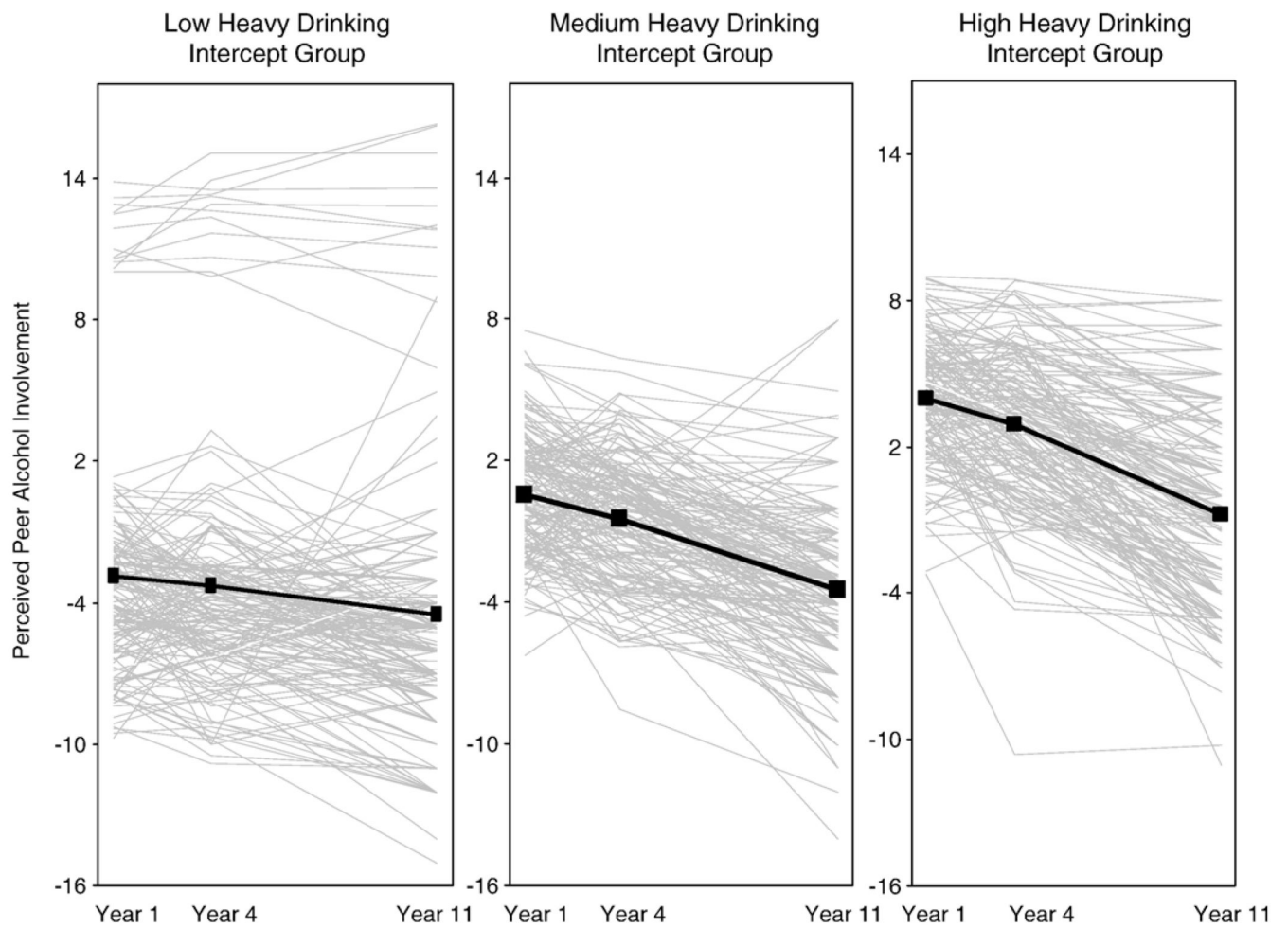


Fig. 3. Each individual's model-estimated trajectory for perceived peer alcohol involvement as a function of initial (Year 1) level (low, medium, high) of frequency of heavy drinking.

Table 1
Zero-order correlations between indices of frequency of heavy drinking, perceived peer alcohol involvement, sex, and family history of alcoholism

Measure	Frequency of heavy drinking							Peer alcohol involvement						
	1	2	3	4	7	11	1	2	3	4	7	11		
Frequency of heavy drinking														
Year 1														
Year 2	.49													
Year 3	.41	.43												
Year 4	.43	.47	.51											
Year 7	.33	.32	.36	.41										
Year 11	.28	.18	.23	.41	.31									
Peer alcohol involvement														
Year 1	.47	.36	.33	.42	.29	.24								
Year 2	.41	.39	.37	.43	.27	.28	.76							
Year 3	.44	.42	.42	.51	.33	.31	.71	.77						
Year 4	.43	.43	.41	.57	.33	.29	.63	.71	.79					
Year 7	.34	.41	.36	.48	.50	.35	.52	.57	.63	.68				
Year 11	.35	.37	.39	.49	.42	.48	.52	.54	.56	.58	.71			
Sex ^b	-.19	-.25	-.26	-.29	-.31	-.27	-.22	-.21	-.26	-.31	-.29	-.33		
Family history ^b	.08 ^a	.05 ^a	-.02 ^a	.09	.07 ^a	.07 ^a	.14	.08 ^a	.02 ^a	.05 ^a	.07 ^a	.13		
Mean	.72	.74	.74	.64	.46	.30	15.06	14.63	14.53	14.29	12.58	11.46		
SD	1.03	1.19	1.20	.98	.92	.74	5.25	5.33	5.13	5.09	4.78	4.58		

Note. *N*s range from 391 to 487. 0 = men, 1 = women. Scores on the measure of frequency of heavy drinking ranged from 0 to 7. Scores on the measure of perceived peer alcohol involvement ranged from 0 to 24.

^a $p < .05$ for all parameters except those with superscript a.

^b Point-biserial correlations.

Table 2
Comparison of model fit between unconditional latent growth curve models for frequency of heavy drinking and perceived peer alcohol involvement

Model	Model χ^2	df	Correction factor ^c	χ^2 difference	df difference
<i>Frequency of heavy drinking</i>					
Intercept only	97.04	19	2.602	—	
Linear ^a	24.90	16	2.074	37.06 ^{***}	3
Quadratic ^b	20.01	12	2.035	59.22 ^{***} /4.98	7/4
Piecewise ^b	14.12	12	1.914	59.68 ^{***} /9.63 [*]	7/4
<i>Peer alcohol involvement</i>					
Intercept only	1663.89	20	1.184	—	
Linear ^a	109.74	17	1.176	1497.93 ^{***}	3
Quadratic ^b	57.59	13	1.133	1489.22 ^{***} /48.44 ^{***}	7/4
Piecewise ^b	25.29	13	1.179	1626.30 ^{***} /85.01 ^{***}	7/4

Note. N=489.

^a Comparison for χ^2 difference test is between intercept and linear models.

^b Comparison between specified model and intercept only/linear models.

^c Correction factor was used to conduct the Satorra–Bentler scaled chi-square difference tests.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Univariate latent growth curve model parameters fit separately for frequency of heavy drinking and perceived peer alcohol involvement

	Intercept	College slope	Post-college slope
<i>Frequency of heavy drinking</i>			
Intercept	<u>.03 (.67)</u> ***		
College slope	-.40 (-.07)	<u>-.15[†] (.04)</u> *	
Post-college slope	-.64 (-.04)***	-.28 (.00)	<u>-.65*** (.01)</u> *
<i>Perceived peer alcohol involvement</i>			
Intercept	<u>.00 (23.18)</u> ***		
College slope	-.40 (-2.09)***	<u>-.25*** (1.20)***</u>	
Post-college slope	-.26 (-.71)***	-.28 (-.17)**	<u>-.66*** (.33)***</u>

Note. $N=498$. Standardized estimates of means and unstandardized estimates of (variances) of the latent factors appear on the diagonal and are underlined. Model-estimated correlations (covariances) are presented on the off-diagonal.

[†]
 $p < .10$.

*
 $p < .05$.

**
 $p < .01$.

 $p < .001$.

Table 4
Parameter estimates for within-construct covariance (top panel) and directional (bottom panel) latent growth curve models

Latent variable	(1)	(2)	(3)	(4)	(5)	(6)
<i>Within-construct covariance model</i>						
1. HD—intercept	<u>-.003 (.22.61)</u> ***					
2. HD—college slope	<i>-.41 (-.07)</i>	<u>-.15[†](.04)</u> *				
3. HD—post-college slope	<i>-.21 (-.02)[†]</i>	<i>-.28 (-.01)</i>	<i>-.62</i> *** (.01)*			
4. PAI—intercept	<i>.62 (2.43)</i> ***	<i>-.08 (-.003)</i> **	<i>-.51 (-.01)</i> *	<u>.03 (.67)</u> ***		
5. PAI—college slope	<i>-.08 (-.10)</i>	<i>.15 (.03)[†]</i>	—	<i>-.31 (-1.55)</i> ***	<i>-.27</i> *** (1.08)	
6. PAI—post-college slope	<i>-.17 (-.12)</i> *	—	<i>-.12 (.01)</i>	<i>-.18 (-.47)</i> ***	<i>-.25 (-.15)</i> **	<i>-.66</i> *** (.32)
<i>Within-construct directional model</i>						
1. HD—intercept	<u>-.003 (.23.29)</u> ***					
2. HD—college slope	<i>-.39 (-.08)</i>	<u>-.19[*](.02)</u>				
3. HD—post-college slope	<i>-.78 (-.08)</i>	<i>-.29 (-.003)</i>	<i>-.63</i> *** (.003)			
4. PAI—intercept	<i>.65 (2.45)</i> ***	<i>.12 (.004)</i> *	<i>.01 (.00)</i>	<u>.03 (.61)</u> **		
5. PAI—college slope	<i>.36 (.50)</i>	<i>.37 (.06)</i> *	—	<i>-.63 (-.14)</i> **	<i>-.27</i> *** (.94)	
6. PAI—post-college slope	<i>-.03 (-.02)</i>	—	<i>.26 (.01)</i> ***	<i>-.24 (-.03)</i> *	<i>-.35 (-.22)</i> ***	<i>-.67</i> *** (.30)

Note. $N=489$. HD = frequency of heavy drinking. PAI=perceived peer alcohol involvement. Standardized estimates of means and unstandardized estimates of (variances) of the latent factors appear on the diagonal and are underlined. Variances for HD—college slope, HD—post-college slope, PAI—college slope, and PAI—post-college slope are residualized variances (i.e., disturbances). Model-estimated correlations (covariances) are presented on the off-diagonal. Bold indicates directional path representing hypothesized influence or selection processes. Italics indicate within-construct parameters that were differently specified in the within-construct covariance and directional models (i.e., as unconditional parameters [covariances] in the upper panel, and as conditional parameters dependent on the series intercept [initial level] in the bottom panel).

Because the frequency of heavy drinking and perceived peer alcohol involvement slopes were regressed on the peer alcohol involvement and frequency of heavy drinking intercepts, respectively, the mean of each slope factor is no longer the mean trajectory of that factor. Instead, each mean is the expected value of the slope factor when the intercept predicting it is equal to 0.

[†] $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.