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Association with Deviant Peers across Adolescence: Subtypes, Developmental Patterns, and Long-term Outcomes

Julia Price,

Nemours Children's Health System, 1600 Rockland Rd, Wilmington, DE 19808, Sidney Kimmel Medical School of Thomas Jefferson University

Deborah A.G. Drabick, and

Temple University, Weiss Hall 1701 N 13th S, Philadelphia, PA 19122

Ty A. Ridenour

Research Triangle Institute, Research Triangle Park, NC 27709

Abstract

Objective: Indices of deviant peer group involvement are inconsistent and confound type, frequency, and severity of deviant peer behaviors. These measurement approaches thus obfuscate potential meaningful differences in deviant peer involvement in terms of subtypes, developmental patterns, and long-term outcomes. The current study employed latent class analysis to derive subtypes of deviant peer involvement and examined relations to substance use disorder in adulthood, a common outcome of deviant peer involvement.

Method: Youth (76% Caucasian) completed assessments across four time points: ages 10–12 years (Time 1; N=775, 71% male); 12–14 years (Time 2; n=649, 72% male); 16 years (Time 3; n=613, 73% male); and 22 years (Time 4; n=425, 71% male). At Times 1 to 3, participants completed an interview assessing deviant peer involvement. At Time 4, participants completed a structured interview assessing substance use disorder. Classes of youth with different profiles of deviant peer associations were derived at Times 1, 2, and 3.

Results: Classes varied by type (conduct problems vs. substance use) and severity of deviant peer behavior. Youth reported higher levels of involvement with deviant peers across adolescence, suggesting some of these deviant peer behaviors may be normative. Earlier involvement with deviant peers and involvement with groups defined by severe conduct problems and substance use were related to the greatest risk for substance use disorder at Time 4.

Conclusions: Type and severity of peer deviant behavior differentially relate to long-term risk for substance use disorder and should be included in screening and assessment for risk across adolescence.

Keywords

deviant peers; conduct problems; substance use; adolescence; latent class analysis

Correspondence concerning this article should be addressed to Julia Price, Center for Healthcare Delivery Science, Nemours Children's Health System, Wilmington, DE 19803. julia.price@nemours.org, ddrabick@temple.edu, tridenour@rti.org.

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Association with deviant peers, or engagement with peers who exhibit aggressive behaviors, are truant, steal, cheat, and/or use substances, is associated with a wide range of negative outcomes, including employment difficulties (Shook, Vaughn, Litschge, Kolivoski, & Schelbe, 2009), antisocial behavior (Eddy & Chamberlain, 2000; Gardner, Dishion, & Connell, 2008), and violent and non-violent criminal offending (Gatti, Tremblay, Vitaro, & McDuff, 2005). In addition, affiliation with such peers confers particular risk for adolescent conduct problems (Lacourse et al., 2006) and substance use (Kirisci, Tarter, Mezzich, & Vanyukov, 2007; Piehler & Dishion, 2013). Risk related to deviant peer involvement occurs through two processes, selection (i.e., choosing deviant peers as friends) and socialization (i.e., being influenced by deviant friends; Mercken, Candel, Willems, & de Vries, 2009). Although these relations generally hold when considering patterns of deviant peer affiliation, conduct problems, and substance use within a sample, not all youth who associate with deviant peers exhibit these negative outcomes and some of these peer behaviors may be normative. Further confounding these issues are inconsistent measurement approaches to deviant peer affiliation, which limit current understanding of these risk processes. Thus, there may be distinct patterns of deviant peer affiliation that confer differential risk, but research is wanting.

There is little consensus regarding the “gold” standard for measurement or conceptualization of deviant peer involvement. Many measures include multiple types of deviant peer behavior, namely, conduct problems and substance use, as well as a wide range of severity levels of these behaviors. For instance, peer conduct problems and substance use behaviors included on most measures range from illegal acts such as selling drugs to less severe forms of conduct problems such as fighting, as well as from use of tobacco products to use of hard drugs (Gardner et al., 2008; Kirisci et al., 2007). Typical scoring practices include summing or averaging self-report responses about peer behaviors to reflect the number of deviant behaviors in which youths’ friends engage (Gardner et al., 2008; Kirisci et al., 2007). This approach limits understanding of selection and socialization processes. For example, it is unclear whether youth select peers based on similarity in type (substance use versus conduct problems) and/or severity of deviant behavior or if peer influence leads to engaging in more severe or different deviant behaviors over time. Indicators that reflect a range of types and severity of deviant peer behaviors could identify potential subgroups of deviant peer behavior, as well as elucidate developmental patterns of co-occurring conduct problems and substance use among deviant peers.

There is variability in longitudinal patterns of substance use and conduct problems across adolescent development (Moss & Lynch, 2001; Odgers et al., 2008) and, similarly, deviant peers likely exhibit variation in these behaviors. Given high rates of co-occurrence between conduct disorder and substance use disorder among adolescents (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003), some individuals who affiliate with deviant peer groups likely engage in both conduct problems and substance use. Multiple pathways result in co-occurring conduct problems and substance use, with one pathway marked by early onset conduct problems (m, Caspi, Harrington, & Milne, 2002; Silberg, Rutter, D’Onofrio, & Eaves, 2003) and another without early onset conduct problems (Odgers et al., 2008). Comparable developmental patterns of co-occurring conduct problems and substance use likely exist among deviant peers, such that some deviant peer groups may exhibit early onset

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conduct problems without substance use. However, no studies have evaluated differences in type of deviant peer behavior across adolescence.

Person-centered latent variable approaches, such as latent class analysis (LCA), empirically define groups based on response patterns. Rather than summing minor and severe peer conduct problem and substance use behaviors, LCA derives subgroups, or classes, of deviant peer involvement while allowing deviant peer classes to vary across type and severity of peer behavior. Some adolescents may be involved primarily with youth engaging in minor conduct problems and others may engage with peers exhibiting severe conduct problems and substance use. Although it is likely that peer deviant behavior differs in terms of quality and frequency, there is a paucity of research using such methods in this literature.

In one study of 17-year-old foster youth using latent profile analysis, Shook et al. (2009) identified three subgroups of youth who differed in terms of their level of involvement with deviant peers: low, moderate, and high. Many differences were evidenced between the moderate and high subgroups, which generally indicated poorer overall functioning in the high deviant peer subgroup. For example, this group showed a higher prevalence of clinically significant conduct problems, Antisocial Personality Disorder, and narcissism, as well as a higher likelihood of having friends who engage in more severe forms of deviant behavior (i.e., use drugs, have police contact). However, those in the moderate subgroup were more likely to be in college and less likely to be fired than those in the high subgroup. These findings suggest moderate levels of involvement with deviant peers are likely normative and that the type of deviant peer behavior may indicate elevated risk for poor outcomes. It is unclear whether similar deviant peer subgroups would emerge during early and mid-adolescence or if deviant peer subgroups would be similar among youth not involved in foster care.

There is a dearth of research investigating deviant peer associations in the context of typical adolescent development. Given normative increases in risk taking, reward dominance, conduct problems, and substance use, combined with poorer self-regulatory skills in early and mid-adolescence (Steinberg, 2008) and normative increases in conduct and substance use behaviors during mid- to late adolescence (Moffitt, 1993), some levels of engagement with deviant peers are likely typical. Indeed, as noted, youth with moderate levels of deviant peer involvement exhibit more positive outcomes than those with high levels (Shook et al., 2009). At-risk and typically developing youth may differ in the onset and stability of associations with deviant peers, as well as type and severity of deviant peer behavior. A growing literature indicates that high levels and continuity of deviant peer involvement and transitioning into deviant peer groups are associated with increased risk for both conduct problems and substance use, compared to youth who do not associate with deviant peers, associate with moderately deviant peers, or change from deviant to nondeviant peer groups (Brendgen, Vitaro, & Bukowski, 2000; Dishion and Medici, 2000; Warr, 1993). In addition, youth exhibiting earlier onset (i.e., ages 10–13) of involvement with deviant peers exhibit higher levels of conduct problems and substance use disorder (SUD; Lacourse et al., 2006; Moffit, 1993). In sum, age of onset and continuity of deviant peer involvement, as well as severity of deviant peer behavior, likely distinguish those most at-risk for poor outcomes, such as SUD.

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In the present study, we used LCA to identify groups of youth that potentially could be distinguished based on whether they endorsed having friends who engaged in conduct problems and/or substance use in a large, longitudinal sample. We employed LCA using youth reports that at least one friend exhibited deviant behavior, considering peer behaviors that vary by type and/or severity and whether the features of these classes change from early to mid-adolescence and differentially predict SUD in early adulthood. Because multiple demographic factors, such as socioeconomic status, family psychiatric history, sex, and age (Kirisci et al., 2007; Lacourse et al., 2006) are often related to youth conduct problems, substance use, and deviant peer involvement, we explored potential differences in these background variables across subgroups of deviant peer behaviors. We expected to find an overall increase in reported involvement with deviant peers across adolescence, as having some friends who engage in relatively minor conduct problems and substance use is normative during this developmental period. Consistent with findings related to early-onset conduct problems and substance use (Moffitt, 1993) and variability in developmental pathways to these co-occurring problems, we also hypothesized that a subgroup of associations with deviant peers with more severe co-occurring conduct problems and substance use would emerge across early and mid-adolescence and membership in this group would be associated with SUD in early adulthood. In contrast, involvement with peers exhibiting less severe conduct problems and substance use would not substantially increase risk for later SUD, as these behaviors may be typical among adolescents. Finally, we hypothesized that earlier involvement with peers engaging in conduct problems and substance use would confer risk for later SUD.

Method

Participants

The present study involved secondary analyses of data collected for a National Institute on Drug Abuse (NIDA)-funded longitudinal study conducted at the Center for Education and Drug Abuse Research at the University of Pittsburgh. Recruitment and baseline assessments began in 1990 when index children were aged 10–12 years (Time 1). Three of the follow-up assessments occurred when index children were 12–14 (Time 2), 16 (Time 3), and 22 (Time 4) years old. The primary objective of the parent project was to use a prospective design to understand etiological pathways to SUD. Sampling methods were designed to recruit youth at high and low risk for SUD based on the presence or absence of a lifetime diagnosis of SUD or other psychiatric disorder in the biological father. Biological fathers were recruited through substance dependence treatment programs and other venues. Fathers who had a child aged 10–12 years (index youth) were eligible to participate. Index youth were classified into one of three groups: (a) paternal history of SUD (n = 344, 44.4%); (b) paternal history of other psychiatric diagnosis not including SUD (n = 81, 10.5%); or (c) no lifetime paternal history of psychiatric diagnosis (n = 350, 45.1%). Fathers were considered to have a SUD if they met lifetime *DSM-III-R* criteria (American Psychiatric Association, 1987), the most recent edition when the study was initiated, for any substance abuse or dependence. Index children were included in the present study if they completed assessments at Time 1 (10–12 years old; N=775, 71% male) and at least one subsequent time point, namely, Time 2 (12–14 years old; n=649, 72% male); Time 3 (16 years old; n=613,

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73% male); and/or Time 4 (22 years old; *n*=425, 71% male). The sample contains more males than females because recruitment of females began four years after the parent project was underway. The sample is predominantly Caucasian (76%; 22% African American, 2% other ethnicities). Recruitment sources and procedures, as well as inclusion and exclusion criteria, are described in detail elsewhere (Clark et al., 1997; Tarter & Vanyukov, 2001).

Procedure

All procedures were approved by the Institutional Review Board of the University of Pittsburgh. The present project was determined to be exempt by the Temple University Institutional Review Board. In terms of informed consent, the goals, procedures, risks, and benefits of the research protocol were explained in detail to all adult participants. Of fathers meeting criteria to participate, 87% consented. All minor children provided assent. A Certificate of Confidentiality from NIDA was obtained. Association with deviant peers was measured via a structured interview with a research associate at Times 1, 2, and 3. Index youths' SUD was measured via structured clinical interview with the index individual at Time 4. Each of these measures is presented in greater detail below.

Association with deviant peers.

At Times 1, 2, and 3, youth reported on the proportion of their friends who engaged in delinquent and antisocial behaviors over the previous six months (e.g., hit someone with the idea of hurting that person, used alcohol) using 15 items from the Peer Delinquency Scale (PDS) of the Pittsburgh Youth Study Interview (Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998). Items were rated on a scale from 0 (*none of my friends*) to 4 (*all of my friends*). Of the 15 PDS items indexed at Times 1, 2, and 3 (i.e., total of 45 deviant peer items across time), 32 items had skewness coefficients above 2.0. In addition to this skewness, there were low base rates of endorsing higher proportions of friends engaging in deviant behaviors. Given the focus of the current study on examining a range of types of deviant peer behavior rather than proportion of friends or size of youth's deviant peer networks, all items were dichotomized such that endorsement of an item indicated that one or more friends engaged in that particular deviant behavior. By dichotomizing the class indicators, we also aimed to attenuate the potential impact of outliers to maximize generalizability of findings and to minimize the chance of overfitting the model to the data. Peer deviant behavior items on the PDS (see Table 1) included a combination of peer conduct problems (12 items; e.g., skip school, lie, disobey, damage property, steal, joyride, engage in aggressive behavior, sell drugs) and peer substance use (3 items; peer use of alcohol, marijuana, and/or hard drugs). Each PDS item was used as a class indicator for deviant peer class membership at Times 1, 2, and 3 so that classes were allowed to vary in type, frequency, and severity of deviant peer behavior. Previous research among the current sample indicates that higher summary scores on the PDS are related to neurobehavioral disinhibition (which includes indices of conduct problems, temperament, and neuropsychological functioning; Feske et al., 2008), and to increased risk for youth conduct problems and substance use (Moss et al., 2002, 2003).

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Socioeconomic status.

Household socioeconomic status (SES) was indexed using Hollingshead ratings (Hollingshead, 1990). Given that SES is related to recruitment group status (i.e., paternal history of substance use diagnosis; Moss et al., 2002) and risk for SUD and deviant peer involvement among the sample (Moss et al., 2003), SES was examined as a covariate of class membership.

Paternal psychiatric diagnoses.

Lifetime paternal psychiatric diagnoses were made according to *DSM-III-R* criteria. Given that associations with deviant peers and SUD are related to paternal psychiatry history among the current sample (Aytaclar et al., 1999; Moss et al., 2003), recruitment group was examined as a covariate of class membership.

Substance use disorder.

At Time 4 (age 22), SUD status was assessed using an expanded version of the Structured Clinical Interview for *DSM-III-R* (Spitzer, Williams, & Gibbon, 1987), which included extensive detail of substance use behavior. A committee of a board-certified psychiatrist, another psychiatrist or clinical psychologist, and the research associate who conducted the interview used methods recommended by Leckman, Sholomaskas, and Thompson (1982) to derive diagnoses. Among the current sample, there are prospective relations between associations with deviant peers and illegal substance use (Kirisci, Mezzich, Reynolds, Tarter, & Aytaclar, 2009).

Analysis Plan

Missing data.

Mplus employs Full Information Maximum Likelihood (FIML) estimation, which includes all available data to estimate model parameters but does not impute values (Enders, 2001; Graham, 2009). FIML assumes that data are either missing completely at random or missing at random; given the study design and our ability to predict missing values based on the variables assessed, the requirements for missing at random were met for these data (Enders, 2001; Graham, 2009). FIML thus maintains participants with missing data in the model estimation and produces smaller errors in parameter estimates and standard errors relative to other techniques for managing missing data (Enders, 2001; Graham, 2009).

Latent class analysis.

LCA (Muthén & Muthén, 2000) empirically derives groups of individuals based on the aggregation of observed categorical items. We employed LCA to identify classes or subgroups of youth who reported that at least one friend engaged in different types and levels of conduct problem and substance use behaviors at Times 1, 2, and 3.

LCA is an iterative model building process that seeks to identify the best fitting model using statistical indices and conceptual and practical implications (Nylund, Muthén, & Asparouhov, 2007). First, the unconditional model is specified (i.e., 1-class model) and the number of classes is increased one at a time until the models specified no longer converge or

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the results are no longer useful for application. Two types of model parameters are evaluated to assess model fit, item probability parameters and class probability parameters. Item probabilities are class-specific and refer to the probability of endorsing an item for an individual in a given latent class. For example, an item probability of .80 for Class 1 indicates that for those classified in Class 1, there is an 80% chance of endorsing that particular item. Class probabilities describe the relative size of classes, or the percentage of the sample that the latent class represents. In addition, posterior class probabilities, the individual's probabilities of being in each of the latent classes depending on the response pattern for the observed items, were considered. Posterior class probabilities are based on both of the model parameters (i.e., item and class probabilities).

One challenge of LCA is identifying the number of latent classes that best describes the heterogeneity in observed items (e.g., 3-class vs. 4-class model). Although there is no single method of assessing model fit, Nylund and colleagues (2007) recommend examining a combination of indices in determining the optimal number of classes. The Bayesian Information Criterion (BIC; Schwartz, 1978), sample size adjusted BIC (ABIC; Sclove, 1987), and the Akaike Information Criterion (AIC; Akaike, 1987) often are used to determine model fit (Nylund et al., 2007). Smaller values on these indices indicate the best-fitting model. In addition, the Bootstrap Likelihood Ratio Test (BLRT; Nylund et al., 2007) estimates the log likelihood differences in comparing the fit of the model with *k* classes to the fit of the model with *k-1* classes. A significant BLRT indicates that the *k* class model is a significantly better fit to the data than the *k-1* class model. Given that simulation studies suggest that the BLRT and BIC indices provide the most reliable indicators of true number of classes (Nylund et al., 2007), these indices primarily are considered in the model evaluation process. Entropy, a measure of separation among classes, is also considered when determining number of classes. Entropy values approaching one indicate clearer delineation of classes (Celeux & Soromenho, 1996), or suggest classes represent distinct subgroups of individuals. Substantive theory and class size are also used to determine the number of latent classes. For example, reasonable smallest class size was considered within the context of prevalence rates of conduct problems and substance use across adolescence (Costello et al., 2003); small class sizes may suggest overfitting of the data and can limit replicability of the solution in other samples (Masyn, 2013). Finally, interpretability of the classes and practical considerations are used to determine the optimal number of classes.

Covariates of latent classes.

To examine potential differences across deviant peer classes, demographic variables (i.e., age, sex, paternal SUD history, other paternal psychiatric history, and SES) were included as covariates in each set of LCAs. Because the model and classes can change when including covariates, posterior item probabilities, class size, and posterior class membership probabilities were examined to ensure that the classes derived with and without each covariate were similar. We conducted a series of logistic regressions, run separately for each deviant peer class at Times 1, 2, and 3, where the categorical latent class variable was regressed on each covariate.

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Distal outcome.

Following identification of the best-fitting model, Time 4 SUD outcomes were included in each LCA at Times 1, 2, and 3 (Nylund et al., 2007). By including the distal outcome in the LCAs, we derived probabilities of SUD at Time 4 separately for each deviant peer class.

Results

Descriptive Statistics

Examination of the percentage of youth who endorsed peer deviant behaviors (Table 1) indicates that higher levels were endorsed across Times 1, 2, and 3. For example, at Time 1, 27.3% of the sample endorsed having a friend who skipped school, and at Time 3, 69.5% endorsed this same item. Similarly, endorsement of having a friend who used alcohol or a friend who stole something worth between $5 and $100 increased from 9.4% to 72.9% and from 11.3% to 31.8% from Times 1 to 3, respectively. Only 0.9% of the sample reported having a friend who used hard drugs at Time 1 whereas 14.6% endorsed this item at Time 3.

LCA at Time 1 (ages 10–12).

Examining results for the deviant peer LCA model at Time 1 (Table 2), the BIC is minimized in the three-class model and thus this index suggests that the three-class model fits the data best. Other indices continue to indicate a better fitting model with each additional class (i.e., AIC, ABIC, BLRT); however, the four- and five-class models did not reveal substantively distinct or meaningful classes. The three-class model had adequate delineation of classes as indicated by the entropy (.786). Posterior class probabilities ranged from .887 to .931. The smallest class size (9.2%, $n = 68$) was both reasonable in size and conceptually meaningful, as this finding is consistent with prevalence rates of these deviant behaviors (Costello et al., 2003). In sum, multiple fit indices and parameters indicate that the three-class model best fits the data at Time 1.

Given the conditional item probabilities for each deviant peer class at Time 1 (see Figure 1), the three classes were distinguished by (1) low levels of peer deviant behavior (Low DP), (2) predominantly peer conduct problem behaviors (DP-Conduct Problems), and (3) both peer conduct problems and substance use behaviors (DP-Combined). The Low DP class (56.0%) included youth with a low probability of endorsing having at least one friend who engaged in conduct problems or substance use behaviors. Although youth in this Low DP class exhibited a roughly 50% chance of endorsing peers “lie, disobey,” this peer conduct problem item did not distinguish among classes. The DP-Conduct Problems class (34.7%) was comprised of youth who had a moderate probability of endorsing having at least one friend who engaged in conduct problem behavior, particularly hitting others, skipping school, property damage, and petty theft (<$5). In contrast, the DP-Combined class (9.2%) was characterized by moderate to high probability of endorsing having at least one friend who engaged in both conduct problems and substance use, including peer conduct problem behaviors seen among the DP-Conduct Problems class, as well as at least one friend who engaged in alcohol use and qualitatively more serious forms of conduct problems (e.g., attacking someone with a weapon and stealing from a building).

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LCA at Time 2 (ages 12–14).

Different from the LCA model of deviant peer classes at Time 1, results for the deviant peer LCA model at Time 2 (see Table 2) indicated a four-class model best fit the data. Although other fit indices continued to indicate a better fitting model with each additional class, the BIC is minimized in the four-class model. The four-class model also had good delineation of classes (entropy = .873) and most youth were assigned to classes that were highly related to their levels of endorsing peer conduct problems and substance use (posterior class probabilities range =.881 to .948). The smallest class size (11.0%, n = 72) represented a reasonable percentage of the sample and was substantively meaningful.

Patterns of conditional item probabilities for each deviant peer class at Time 2 (see Figure 1) indicated that three deviant peer classes at Time 2 were similar to the deviant peer classes identified at Time 1 (i.e., Low DP, DP-Conduct Problems, DP-Combined). At Time 2, the Low DP (57.1%) and DP-Conduct Problems (19.3%) classes were defined by similar types and levels of peer deviant behavior as at Time 1. However, different from the Time 1, the Time 2 DP-Combined class (12.6%) was characterized by a low probability of qualitatively more severe peer conduct problem behaviors (e.g., attacking someone with a weapon, stealing from a building) and a high probability of peer alcohol and peer cannabis use. In addition, a fourth class distinguished by more severe levels of both peer conduct problem and substance use behaviors emerged (DP-Severe Combined, 11.0%), characterized by a high probability of qualitatively moderate peer conduct problem behaviors (e.g., skipping school, property damage); moderate to high probability of more serious peer conduct problem behaviors (e.g., stealing something worth >$100, attacking someone with a weapon, selling hard drugs); and a high probability of peer alcohol and cannabis use.

LCA at Time 3 (age 16).

Results for the deviant peer LCA model at Time 3 (see Table 2) indicated a four-class model best fit the data, similar to Time 2. The four-class model minimized the BIC, had good separation of classes (entropy = .811), and evidenced a high association between response patterns and class assignment (posterior class probabilities range =.847 to .926). The smallest class size (11.3%, n = 67) was both reasonable in size and conceptually important.

Evaluation of the conditional item probabilities at Time 3 (see Figure 1) suggested classes for Low DP (29.3%), DP-Combined (28.6%), and DP-Severe Combined (11.3%), were similar to Time 2 deviant peer classes. However, compared to Time 2, the DP-Severe Combined class at Time 3 was characterized by increased probability of qualitatively more severe peer conduct problems (e.g., steal something worth >$100, attacking someone with a weapon, sell hard drugs) and peer substance use (e.g., hard drug use) behaviors. In contrast to deviant peer classes at Times 1 and 2, a class defined predominantly by peer substance use (i.e., DP-Substance Use, 30.8%), with particularly high probability of alcohol and cannabis use, emerged at Time 3.

Covariate Analyses

At Time 1, logistic regressions (Table 3) suggested that compared to youth in the Low DP class, youth in the DP-Conduct Problems and the DP-Combined classes were more likely to

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be male, have a paternal history of substance dependence, and be from a lower SES background. In addition, compared to youth in the Low DP class, youth in the DP-Combined class were more likely to be older.

At Time 2, logistic regressions (Table 3) suggested that compared to youth in the Low DP class, youth in the DP-Conduct Problems and DP-Combined classes were significantly more likely to have a paternal history of substance dependence and were more likely to be male. Youth in the DP-Conduct Problems and DP-Severe Combined classes were more likely to be from a lower SES background compared to youth in the Low DP class. In addition, compared to youth in the Low DP class, youth in the DP-Combined and DP-Severe Combined classes were more likely to be older.

Finally, at Time 3, a series of logistic regressions (Table 3) revealed that youth in the higher risk DP classes were from more at-risk backgrounds. Compared to youth in the Low DP class, youth in the DP-Substance Use, DP-Combined, and DP-Severe Combined classes were more likely to have a paternal history of substance dependence and to be male, although these differences only reached marginal significance for some DP classes. In addition, compared to youth in the Low DP class, youth in the DP-Severe Combined class were more likely to be from lower SES backgrounds.

Prediction of SUD in Early Adulthood from Deviant Peer Classes across Adolescence

The probability of SUD at age 22 years was highest among youth involved with peers exhibiting severe levels of conduct problems and substance use at Time 3 (DP-Severe Combined, 79.8%; Table 4). High probability of SUD at age 22 also was evidenced among youth engaged with peers exhibiting both conduct problems and substance use at Time 1 (DP-Combined, 68.1%) and among youth engaged with peers exhibiting severe levels of conduct problems and substance use at Time 2 (DP-Severe Combined, 67.9%).

In sum, youth at highest risk for SUD in early adulthood exhibited early or proximal involvement with deviant peers with multiple types of and qualitatively severe peer deviant behaviors. Youth who reported low levels of friends' deviant behavior at the most proximal time point (i.e., age 16) were at relatively lowest risk for SUD at age 22 (14.2%). Of note, 33.2% of youth in the DP-Substance Use class at age 16 met criteria for SUD at age 22, a percentage comparable to youth with non-deviant friends at age 10–12 (30.0%).

Discussion

Inconsistent measurement approaches plague the deviant peer literature. By employing LCA to examine potential subtypes of peer deviant behaviors, the current findings suggest that adolescent involvement with deviant peers varies by type and qualitative severity of peer behavior. Moreover, the proportion of youth who endorsed having at least one friend who engaged in different deviant behaviors changed across early to mid-adolescence, with substance use, particularly alcohol and marijuana use, becoming relatively more prevalent in mid-compared to early adolescence. Indeed, by age 16, a subtype of deviant peer involvement predominantly defined by this peer substance use emerged, whereas in early adolescence (10–14 years), peer conduct problems primarily defined a subtype of deviant

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peer involvement. These findings are consistent with normative increases in substance use across adolescence (Reboussin, Hubbard, & Ialongo, 2007) and highlight the importance of nuanced assessment of deviant peer behaviors that differ in terms of type and qualitative severity.

Subtypes of deviant peer behaviors were differentially associated with risk for SUD in early adulthood, similar to findings of Shook et al. (2009), who reported that compared to Low and Moderate levels, High levels of deviant peer involvement were associated with higher risk for negative outcomes (i.e., conduct problems, substance use, narcissism, fired from a job, less likely to be in college). In the current study, those in classes defined by peers exhibiting more varied and qualitatively severe forms of deviant behavior had higher rates of SUD in early adulthood than did those in classes defined by peers with only one type and relatively minor deviant behavior. Taken together, these results expand the deviant peer literature to include both type and severity of deviant peer behavior as risk factors that distinguish typically from atypically developing youth (Shook et al., 2009).

Results are consistent with theoretical developmental pathways of antisocial behavior and the empirical literature. In Moffitt's dual pathways model, adolescence-limited antisocial behavior is posited to be less severe and primarily driven by involvement with deviant peers compared to the life-course-persistent pathway, which is marked by early onset and consistently elevated levels of conduct problems (Moffitt, 1993). Those with early or recent involvement with at least one friend engaging in multiple types of qualitatively severe deviant behavior may be following the life-course-persistent antisocial pathway delineated in Moffitt's dual pathways model (Moffitt, 1993). In contrast, those with some reported involvement with at least one friend exhibiting one type of relatively mild to moderate conduct problem and substance use behavior may represent youth following the adolescence-limited antisocial behavior.

Some involvement with deviant peers is likely normative during early and mid-adolescence (Steinberg, 2008). A large portion of the current sample reported at least one friend used alcohol and cannabis by mid-adolescence, consistent with literature indicating an overall increase in substance use across adolescence (Reboussin et al., 2007). In addition, nearly three-quarters of the present sample noted involvement with at least one friend who engaged in deviant behavior by mid-adolescence, similar to Shook and colleagues' (2009) finding that over 70% of the sample fit within the Moderate and High levels of deviant peer involvement. Findings are also consistent with existing knowledge that peers exhibit increased and more varied antisocial behavior across early to mid-adolescence (Clark & Winters, 2002; Johnston et al., 2007; Moffitt, 1993). However, relatively few individuals were in the most qualitatively severe classes of deviant peer behaviors (9%−12% of the sample across time), indicating the importance of distinguishing this small, at-risk group from those at lower risk. Indeed, some involvement with peers engaging in particular "deviant" behaviors may be common for a specific developmental stage, and may be associated with minimal long-term risk.

Methods of identifying associations with deviant peers through combining items assessing peer conduct problems and substance use preclude a nuanced characterization of deviant

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peer groups and specific risk associated with deviant peer involvement. Indeed, “gold standard” indices of deviant peer involvement (Kirisci et al., 2007) have not distinguished among typical and qualitatively more severe levels of peer deviant behaviors, including selling hard drugs and attacking someone with a weapon. Youth involved with at least one friend who engaged in severe deviant behaviors exhibited additional risks for continued conduct problems and substance use, such as lower SES and paternal history of SUD (Kirisci et al., 2007; Lacourse et al., 2006). Thus, there are important qualitative and quantitative differences across subtypes of deviant peer involvement, with some subtypes representing typically developing adolescents and others associated with long-term risks.

Among the strengths of this study were the size of the sample and the longitudinal data spanning early to mid-adolescence and early adulthood. The prospective nature of the sample afforded examination of differences in deviant peer behavior across time, and associations among deviant peer involvement across adolescence and SUD in early adulthood. Inclusion of both peer conduct problems and substance use, as well as use of a person-centered approach to identify classes of deviant peer behaviors, afforded an opportunity to consider typical and atypical behaviors and to evaluate the external and predictive validity of the classes identified.

The current study has a number of limitations. The sample was comprised of largely Caucasian males, which limits the generalizability of the findings. In addition, given outliers and the skewed item-level deviant peer data, we collapsed the class indicators of deviant peer involvement from a Likert to binary scale, such that endorsement of a deviant peer behavior item meant that an adolescent had at least one friend who exhibited that deviant behavior. Deviant peer behavior classes therefore could not vary by number of deviant peers engaging in a particular behavior. Deviant peer involvement, conduct problems, substance use, and SUD were indexed only by self-report measures and youth may have underreported these behaviors, some of which are illegal. This measurement approach also does not provide information about the level of closeness of the friendship(s) with a deviant peer. However, unlike parents and teachers, youth have access to knowledge about their peers’ behavior and youth perception of peer behavior represents one of the most proximal predictors of adolescents’ own behavior (Fromme & Ruela, 1994; Iannotti, Bush, & Weinfurt, 1992). In addition, data regarding deviant peer involvement in late adolescence were not available as no indices of associations with deviant peers were administered after age 16 in the parent project. Although involvement with deviant peers poses risk for myriad negative outcomes, SUD was the only long-term outcome included in the current study and earlier substance use behavior was not controlled in analyses. Future research could address these limitations by recruiting a more diverse sample and using person-centered approaches to examine deviant peer behaviors in late adolescence, as well as considering additional long-term outcomes (e.g., incarceration, employment status, and antisocial personality disorder).

In conclusion, a number of main findings emerged from the present study. First, classes defined by deviant peer behaviors are not equivalent in terms of qualitative severity and type of deviant behavior, demographic risk factors, or risk for SUD in early adulthood. In addition, some involvement with peers engaging in deviant behaviors is likely typical. Youth

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with early involvement with at least one peer who engaged in multiple types of and qualitatively severe deviant behaviors (e.g., stealing more expensive items, attacking someone with a weapon, use of hard drugs), as well as more proximal involvement with severely deviant peers, are at particular risk for later SUD. However, youth who reported having at least one friend who engaged in some minor conduct problems (skipping school, property damage, stealing items <$5) in early adolescence and substance use during mid-adolescence (i.e., alcohol and cannabis) may be at relatively lower risk for negative outcomes and consequently may not require intervention. There are also peer deviant behaviors that may not be useful in identifying youth most-at risk, such as lying, disobeying, and skipping school across early and mid-adolescence, as well as hitting others in mid-adolescence. Demographic factors associated with increased risk are also important to consider, such as familial history of psychiatric or substance use problems, lower SES, and older age. Taken together, findings can inform prevention and intervention efforts by increasing specificity in identification of at-risk youth through examination of reported deviant peer behaviors.

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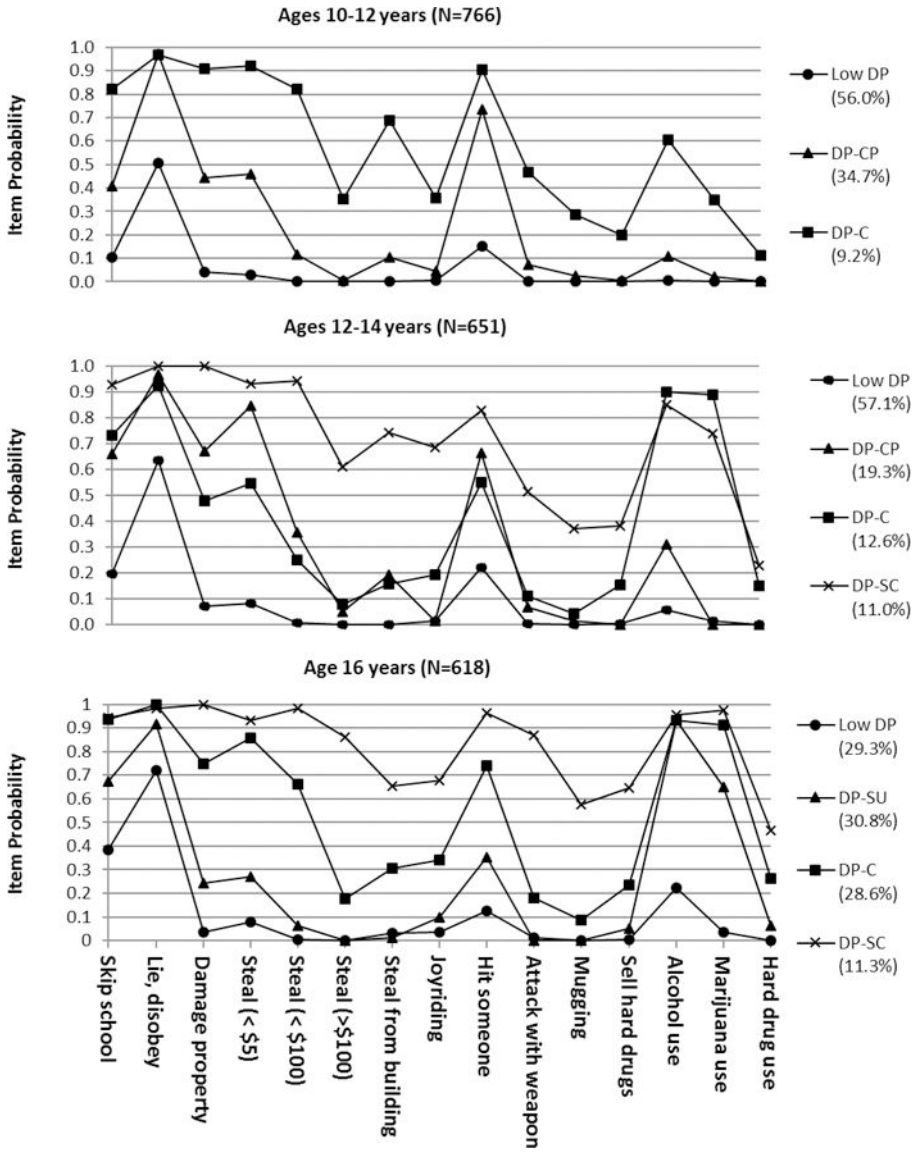

Figure 1.

Conditional item probability profile plots for the DP three- and four-class models for Times 1 to 3. Class size information is presented in the legend. Low DP = minimal association with deviant peers; DP-CP = deviant peers who primarily exhibit conduct problems; DP-SU= deviant peers who primarily exhibit substance use; DP-C = deviant peers who exhibit both conduct problems and substance use; DP-SC = deviant peers who exhibit qualitatively more severe levels of conduct problems and substance use.

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Table 1

Percentage of Youth Endorsing at Least One Friend Engaging in Deviant Peer Behavior Across Adolescence

Deviant Peer Behaviors	10–12 years (*N*=719–752)	12–14 years (*n*=617–643)	16 years (*n*=597–612)
Skip school	27.3	43.0	69.5
Lie, disobey, talk back	71.1	77.5	89.1
Purposefully damage or destroy property	26.0	33.7	41.0
Stole something worth less than $5	25.7	36.8	45.5
Stole something worth between $5 and $100	11.3	19.1	31.8
Stole something worth more than $100	3.2	8.0	14.5
Went or attempted to steal from building	9.8	13.0	17.1
Joyriding	5.0	10.5	21.4
Hit someone	42.1	41.5	46.3
Attacked someone with a weapon	6.5	8.2	14.9
Mugging with or without a weapon	3.2	4.7	8.7
Sold hard drugs	1.9	6.1	15.5
Used alcohol	9.4	29.4	72.9
Used marijuana or hashish	3.7	19.8	58.4
Used hard drugs	0.9	4.2	14.6

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Table 2

Fit Indices for LCA Models with 1–5 Classes at Ages 10–12, 12–14, and 16 Years

No. of Classes	**1**	**2**	**3**	**4**	**5**
No. of free parameters	**15**	**31**	**47**	**63**	**79**
Ages 10–12 years (*N=766*)					
Log likelihood	−3679.482	−3019.085	−2881.753	−2848.131	−2828.516
AIC	7388.964	6100.169	5857.506	5822.263	5815.032 [a]
BIC	7458.582	6244.046	6075.641 [a]	6114.657	6181.686
ABIC	7410.95	6145.607	5926.395	5914.604 [a]	5930.825
BLRT	N/A [b]	0.000	0.000	0.000	0.013
Entropy	N/A [b]	.870	.786	.786	.821
Smallest Class Size *n*(%)	766 (100.0)	165 (22.0)	68 (9.2)	30 (4.0)	11 (1.5)
Ages 12–14 years (*n=651*)					
Log likelihood	−4212.578	−3349.968	−3203.179	−3140.314	−3112.721
AIC	8455.156	6761.936	6500.358	6406.629	6383.443 [a]
BIC	8522.334	6900.770	6710.848	6688.775 [a]	6737.245
ABIC	8474.709	6802.345	6561.624	6488.751	6486.421 [a]
BLRT	N/A [b]	0.000	0.000	0.000	0.000
Entropy	N/A [b]	.870	.845	.873	.889
Smallest Class Size *n*(%)	651 (100.0)	165 (33.1)	83 (13.2)	72 (11.0)	18 (2.8)
Age 16 years (*n=618*)					
Log likelihood	−4764.904	−3785.183	−3647.432	−3572.52	−3531.02
AIC	9559.808	7632.366	7388.864	7271.040	7220.039 [a]
BIC	9626.205	7769.587	7596.91	7549.909 [a]	7569.732
ABIC	9578.583	7671.167	7447.693	7349.895	7318.921 [a]
BLRT	N/A [b]	0.000	0.000	0.000	0.000
Entropy	N/A [b]	.911	.806	.811	.808
Smallest Class Size *n*(%)	618 (100.0)	246 (40.0)	149 (24.3)	67 (11.3)	40 (7.8)

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; ABIC = Adjusted BIC; BLRT = Bootstrap Likelihood Ratio Test.

[a]Best-fitting model according to that index.

[b]BLRT and Entropy not available for the one-class model.

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Table 3

Log Odds Coefficients and Odds Ratios for Three- and Four-Class Model with Demographic Covariates Using Low Association with Deviant Peers Class as the Comparison Group

Class	Effect	Logit	*SE*	*t*	Odds ratio
Ages 10–12 years					
DP-Conduct Problems	Age	.121	.111	1.090	1.129
	Male	1.121**	.235	4.775	3.068
	SES	−.022**	.008	−2.969	.978
	Paternal SUD	.557**	.196	2.837	1.745
	Paternal Dx	.052	2.93	.179	1.053
DP-Combined	Age	.742**	.233	3.185	2.100
	Male	.752*	.336	2.239	2.121
	SES	−.038**	.012	−3.044	.963
	Paternal SUD	.823**	.283	2.910	2.277
	Paternal Dx	−.928	.628	−1.478	.395
Ages 12–14 years					
DP-Conduct Problems	Age	−.164	.149	−1.098	.849
	Male	2.029**	.667	3.040	7.606
	SES	−.024*	.010	−2.404	.976
	Paternal SUD	1.013**	.264	3.831	2.754
	Paternal Dx	−.916	.614	−1.493	.400
DP-Combined	Age	1.291**	.195	6.619	3.636
	Male	−.629*	.283	−2.220	.533
	SES	−.017	.013	−1.322	.983
	Paternal SUD	.888**	.277	3.207	2.430
	Paternal Dx	−.006	.476	−.012	.994
DP-Severe Combined	Age	.977**	.204	4.793	2.656
	Male	.663^	.358	1.853	1.941
	SES	−.044**	.011	−4.007	.957
	Paternal SUD	.877**	.282	3.114	2.404
	Paternal Dx	−.818	.730	−1.120	.441
Age 16 years					
DP-Substance Use	Age	.156	.271	.578	1.169
	Male	−.577*	.276	−2.087	.562
	SES	.003	.011	.275	1.003
	Paternal SUD	.562^	.304	1.847	1.754
	Paternal Dx	−.902^	.472	−1.912	.406
DP-Combined	Age	−.052	.272	−.192	.949

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Class	Effect	Logit	*SE*	*t*	Odds ratio
	Male	1.013**	.322	3.142	2.754
	SES	.001	.009	.097	1.001
	Paternal SUD	.771**	.246	3.140	2.162
	Paternal Dx	−.413	.337	−1.227	.662
DP-Severe Combined	Age	.412	.328	1.255	1.510
	Male	.584^	.335	1.742	1.793
	SES	−.037**	.010	−3.771	.964
	Paternal SUD	1.581**	.346	4.573	4.860
	Paternal Dx	−1.087^	.641	−1.697	.337

Note. DP-Conduct Problems = deviant peers who primarily exhibit conduct problems; DP-Substance Use = deviant peers who exhibit substance use; DP-Combined = deviant peers who exhibit both conduct problems and substance use; DP-Severe Combined = deviant peers who exhibit severe levels of conduct problems and substance use; Male = sex (female = 0, male = 1); SES = socioeconomic status at Time 1 (ages 10–12); Paternal SUD = paternal history of substance use disorder (no history = 0, history =1); Paternal Dx = paternal history of other psychiatric disorder (no history = 0, history =1).

** $p < .01$

* $p < .05$

^ $p < .10$.

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Table 4

Proportion of Individuals Meeting Criteria for Substance Use Disorder at Age 22 by Class at Ages 10–12, 12–14, and 16 Years

Class	10–12 Years (*N*=772)	12–14 Years (*n*=689)	16 Years (*n*=661)
Low DP	.300	.255	.142
DP-Conduct Problems	.458	.538	--
DP-Substance Use	--	--	.332
DP-Combined	.681	.495	.555
DP-Severe Combined	--	.679	.798

Note. Low DP = minimal association with deviant peers; DP-Conduct Problems = deviant peers who primarily exhibit conduct problems; DP-Substance Use = deviant peers who exhibit substance use; DP-Combined = deviant peers who exhibit both conduct problems and substance use; DP-Severe Combined = deviant peers who exhibit severe levels of conduct problems and substance use; -- indicates that a specific class was not identified at a given time point.