Published in final edited form as:

Addict Behav. 2007 February ; 32(2): 248–264.

Profiles of current disruptive behavior: Association with recent drug consumption among adolescents

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Abstract

Instead of using scale thresholds and standard diagnostic criteria, latent class analysis was used to elucidate distinct subgroups of adolescents based on symptom profiles of the 24 Youth Self-Report items assessing attention-deficit hyperactivity, oppositional and conduct problem behaviors. We then investigated the extent to which being classified into different classes of disruptive behavior was associated with drug consumption in the month prior to the survey assessment. Three latent classes of disruptive behavior emerged along a continuum of severity. Youth classified into a class representing multiple and more serious behavior problems were found to have the highest rates of drug use, particularly involving inhalants and marijuana. Contrary to our hypotheses, younger adolescent females in this class reported a higher rate of past month drug use than similarly aged males. Drug use also was found to be common among youth in a class with a greater proportion of subclinical levels of behavior problems. Adolescents evidencing multiple behavior problems, particularly emerging conduct problems, need to be thoroughly assessed for recent drug involvement.

Keywords

Adolescence; Disruptive behavior; Conduct; Oppositional defiant; Attention-deficit/hyperactivity; Drug abuse

1. Introduction

During adolescence, the prodromes for many disturbances in health, behaviors, and social adaptation start to emerge, including those associated with drug use (Brook, Cohen, & Brook, 1998; Costello & Angold, 2000; Federman, Costello, Angold, Farmer, & Erkanli, 1997; Weinberg & Glantz, 1999). The expression of susceptibility in the form of disturbances in the

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mental life, behavior and social adaptation of adolescents is consistent with the psychobiological framework proposed by Adolph Meyer in the early 20th century (Neill, 1980) and also consistent with developmental models of psychopathology that have been advanced in more recent years (Costello & Angold, 2000; Institute of Medicine, 1994; Kellam & Ensminger, 1980; Patterson, Reid, & Dishion, 1992).

Data suggest that the onset of the first symptoms of American Psychiatric Association Diagnostic and Statistical Manual (DSM) behavior disorders in most cases precedes drug use (Costello, Erkanli, Federman, & Angold, 1999). However, treatment-based samples have shown that many of the delinquent behaviors associated with specific conditions, such as DSM-defined conduct disorder, may be attributed to drug use (Brown, Gleghorn, Schuckit, Myers, & Mott, 1996). The shared liabilities of dependence symptoms with conduct disorder may be due to genetic as well as environmental influences (Rose, Dick, Viken, Pulkkinen, & Kaprio, 2004; True et al., 1999). Substance use disorders, as well as subdiagnostic levels of drug-related problems, have both been shown to relate to disruptive diagnoses (Shrier, Harris, Kurland, & Knight, 2003).

Although standard psychiatric classifications describe Attention-Deficit/Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), and Conduct Disorder (CD) as three distinct syndromes, these conditions often exhibit very similar or related symptoms (Loeber & Keenan, 1994; Maughan, Rowe, Messer, Goodman, & Meltzer, 2004). Diagnostic assessments often fail to capture the behavioral heterogeneity and multiplicity of overlapping symptoms that emerge in youth. There is, therefore, a need for different approaches in research to examine the co-occurrence of adolescent disturbances in behavior and mental health. One alternative approach is: 1) to use assessments of psychological difficulties, such as the widely used instruments developed by Achenbach: the Child Behavior Checklist (CBCL) and the Youth Self-Report (YSR; Achenbach, 1991a,b,c), and 2) to use a statistical technique to identify patterns in the observed symptom response profiles, instead of classifying youth in terms of the presence or absence of clinically significant symptomatology based on predetermined cut off scores of separate syndromes. The response profiles or 'classes' are derived empirically using latent class analysis and the classes may indicate underlying subsyndromes or biopsychological similarities. Latent class analysis (LCA) has been useful in identifying several disruptive behavior symptom profiles from instruments developed by Achenbach based on teacher reports of young elementary children and among general population samples of preadolescents based on both parent- and self-report symptoms (Sondejker et al., 2005; van Lier, Verhulst, & Crijnen, 2003). In addition, other research groups have been exploring the class structure of behavioral symptoms derived from other instruments assessing DSM-IV diagnoses (e.g., Volk, Neuman, & Todd, 2005). Findings from these studies advocate that LCA may provide more precise characterization of comorbidity among the externalizing disorders.

Using nationally representative samples of adolescents collected as part of the 1994–1996 United States National Household Survey on Drug Abuse (NHSDA), we first sought to classify adolescents into groups with distinct disruptive behavior profiles using latent class analyses of self-reported responses to items consistent with behavioral features of conduct disorder (CD), oppositional defiant disorder (ODD), and attention-deficit/hyperactivity disorder (ADHD). In this group of adolescents, we explored whether latent class analysis might reveal meaningful summary patterns that reflected a qualitative difference (e.g., overt antisocial behaviors versus covert behaviors) in addition to or instead of only a severity gradation. A qualitative difference might be of significance since specific behavioral features (e.g., aggressive behavior and covert conduct problems) have been found to relate more strongly to substance use than other behavioral features (Moss & Kirisci, 1995; Rey, Sawyer, Raphael, Patton, & Lynskey, 2002; Pedersen, Mastekaasa, & Wichstrom, 2001). In addition, different types of subclinical

conduct problems have been found to relate to the initiation of specific substances. Serious delinquent acts have been found to have a moderate effect for cannabis initiation among boys, while aggressive and covert dimensions have had stronger effects among girls (Pedersen et al., 2001). Externalizing and delinquent behaviors have also been associated with the progression of drug use, whether progression in stage of use within a particular drug (van den Bree & Pickworth, 2005) or becoming involved with other drugs, in particular illicit drugs, such as marijuana and inhalants (Mackesy-Amiti & Fendrich, 1999; King, Iacono, & McGue, 2004). While it is established that disruptive behaviors are found in a majority of adolescents with substance use disorders, little is known about the recent drug consumption of youth classified empirically into distinct disruptive behavior subgroups.

In this report we investigate the extent to which being classified into different classes of disruptive behavior is associated with drug consumption in the month prior to the survey assessment. Under problem behavior theory, disruptive behavior that deviates from societal norms would be part of the same pattern of behavior where the use of drugs (e.g., alcohol, tobacco cigarettes, inhalants, or marijuana) is also more common (Jessor & Jessor, 1977). We hypothesized that classes characterized by a greater number or reflective of more serious behavioral problems would be associated with greater risk for drug use overall and that the strength of the association would be stronger for inhalant and marijuana use than alcohol or tobacco cigarette use. A differential risk by age, as well as gender, for drug use, disruptive behavior, and their potential co-occurrence has been suggested by others (Clark & Cornelius, 2004; Cote, Tremblay, Nagin, Zoccolillo, & Vitaro 2002; Maughan, Rowe, Messer, Goodman, & Meltzer, 2004; Miles, van den Bree, & Pickens, 2002; Moss & Lynch, 2001; Pineda, Lopera, Palacio, Ramirez, & Henao, 2003; Sung, Erkanli, Angold, & Costello, 2004). So, in order to present a more complete picture of these relationships, we also 1) explored the use of each drug type individually as they might be associated with disruptive behavior classes and 2) explored possible age and gender variations. The association between disruptive behavior and drug use was hypothesized to be stronger for males and older youth.

2. Methods

2.1. Sample

Data for this study came from the public use files of the 1994b–1996 National Household Surveys on Drug Abuse (NHSDA) (<http://www.oas.samhsa.gov>). During each of those years, independent nationally representative samples of non-institutionalized civilians aged 12 or older were identified, via stratified, multi-stage area probability sampling. Details of the research protocols and sampling procedures can be found in NHSDA publications (Substance Abuse and Mental Health Service Administration, 1996, 1997, 1998). Each year, the NHSDA participation rates at the household level were close to 90%. The study sample used in these analyses include the 13,831 youth who participated in these years. Data from these three years (1994b, 1995b, 1996) were aggregated to increase the statistical power and improve the precision of the estimates. Other survey years were not used because they did not include the same mental health checklist. A total of 50.0% of the sample was female; 47.3% were non-Hispanic White, 23.3% non-Hispanic Black, 26.4% Hispanic, and 3.0% of another self-designated race–ethnicity category (Asian, Native American, Native Alaskan, Hawaiian, or Pacific Islander). Over 4500 youth were in each of three age groups: early (12–13 years, 33.3%), middle (14–15 years, 34.1%), or late (16–17 years, 32.6%) adolescence.

2.2. Procedures and measures

Interviews were conditional on parental or legal guardian permission and participant consent was secured. The one-hour assessment was interviewer-administered with self-administered answer sheets used for the mental health and drug modules. The NHSDA assessment format

is standardized and structured with almost exclusively pre-specified and pre-coded response categories allowing virtually no allowance for probing questions. In 1994, two versions of the NHSDA questionnaire were fielded. These analyses included data from the 1994b file, which included similar questions and editing procedures to those used in 1995 and 1996.

Adolescents were asked to complete a comprehensive mental health checklist, an adaptation of the Youth Self-Report (YSR) developed by Achenbach (1991a). Designed to identify syndromes and problems, the YSR requires the youth rate their own behavior during the preceding six-month period, indicating for each item whether the behavior is 'not true', 'somewhat or sometimes true', or 'very true or often true'. The standardized assessment is written at a fifth grade reading level and takes about 15 min to complete. For the current report, we used the 24 items that correspond to features of DSM-IV criteria for conduct disorder (CD), oppositional defiant disorder (ODD), and attention-deficit/hyperactivity disorder (ADHD; Achenbach, 1991c; Achenbach, Dumenci, & Rescorla, 2001). The mapping of YSR items to diagnostic categories was based on the methodology used in the construction of the Achenbach DSM-Orientated Scales, included as part of the scoring system for the most recent version of the YSR (Achenbach & Rescorla, 2001). The NHSDA version of the YSR did not contain three items that have since been added or modified.

The NHSDA includes standardized questions to assess the use of several drug types. We focused on substances more commonly used in adolescence: alcohol, tobacco, inhalants, and marijuana (Kandel & Yamaguchi, 1993). Information on the most recent time period of drug use was utilized in these analyses—use within the 30-days preceding the interview. We did not quantify the amount used, only that the use had occurred within the 30-day period. For example, any drug use was defined as use of any of the four drug types in any quantity or combination. Each drug was weighted equally. Other covariates were included based on the availability of the data in the survey and were limited to age and gender.

2.3. Statistical analyses

Rather than determining behavioral syndromes by predetermined scores, latent class analysis (LCA) was used to identify relatively homogeneous classes of disruptive behavior different from one another, based on the 24 YSR items consistent with ADHD, ODD, and CD. Not to be confused with factor analysis, which is concerned with the structure of variables and considers a continuous dimension or trait, LCA identifies the underlying structure of cases and treats item responses as imperfect indicators of an otherwise unobserved discrete and categorical latent variable (Magidson & Vermunt, 2000; McCutcheon, 1987). The *Latent Gold* software (Vermunt & Magidson, 2000) made it possible to fit latent class models and to estimate two sets of parameters, which include class membership probabilities and item endorsement probabilities for each class. Item responses were dichotomized as 0 = not true and 1 = somewhat/sometimes or often true.

The goal of LCA is to identify the smallest number of latent classes that adequately describes the associations among the observed symptoms. The number of classes assuming a single underlying latent variable can be determined via several criteria (Bandeem-Roche, Huang, Munoz, & Rubin, 1999; McCutcheon, 1987; Magidson & Vermunt, 2000). We started by seeking a parsimonious model based upon a comparison of a solution with n classes versus solutions with $n + m$ classes, where the integer m ranges upward from 1. We examined a set of model fit statistics, including the Bayesian Information Criterion (BIC), to compare the fit of alternative models. The BIC is a global measure that weights the fit and parsimony of the model and the lower the BIC, the better the model. Once the discrete latent class variables are modeled, the manifest variables may be assumed to be locally independent (in the statistical sense of independence), but advanced latent class analyses allow for residual interdependence of pairs of indicators. Information on bivariate residuals can be used to improve the fit of alternative

models—for example by introducing local dependencies between indicators that are found to have high residuals, rather than mistakenly creating another latent class (Magidson & Vermunt, 2000). Alternative approaches, such as deleting one in a pair of indicators or combining them into a single ‘and/or’ item, yielded similar results in terms of the number and size of classes and response probabilities, but less adequate model fit.

After elucidating the underlying latent class structures, we used regression models to probe questions pertinent to the co-occurrence of adolescent drug use and behavioral disturbances. Regression-based estimates of co-occurrence were derived for the sample as a whole and for subgroups devised to illuminate possible age and male–female differences.

3. Results

3.1. Classes of disruptive behavior

An overview of the occurrence of each clinical feature within the study sample is presented in Table 1. Features often characteristic of adolescence – being argumentative, talking too much, “swearing” – were the most commonly reported behavioral features. Being stubborn and having trouble concentrating were expressed by half of the sample. Behaviors reflecting features of ADHD and ODD were more commonly reported than those of CD. More severely deviant behaviors such as stealing, destroying, and physically attacking others were not as prevalent.

Four alternative latent class models were fit sequentially to the data, starting with the most parsimonious 1-class model. The results suggested a best-fitting latent class structure based on three classes. A specification of two classes gave a substantially worse fit to the data [Likelihood-ratio (chi square) $L^2=70,646$, 49 parameters, $BIC(L^2)=-158,290,180$], as compared to a 3-class model [$L^2=63,758$, 74 parameters, $BIC(L^2)=-158,296,822$]. Diagnostic information on bivariate residuals indicated that the local independence assumption was not holding. The fit of a 3-class model improved when the local independence criterion was relaxed, as compared to the 4-class model. By allowing local dependency between indicators that were found to have high residuals (ADHD1 and ADHD2, ADHD4 and ADHD5, as well as ODD1 and ODD5), the fit index for the 3-class model was further improved (3-class model with bivariate interdependence $L^2=61,421$, 77 parameters, $BIC(L^2)=-158,299,131$; relative to the 4-class model $L^2=61,820$, 99 parameters, $BIC(L^2)=-158,298,523$).

Three profiles of the 24 clinical features for disruptive behavior emerge among youth in this sample (Fig. 1). Classes differed mainly on a severity dimension (increase in endorsement probabilities from class to class), but also in content as indicated by different features endorsed more frequently (Table 1). Descriptively, these classes can be characterized as follows. Class 1 represented a group of adolescents yet to develop much in the way of clinical features consistent with disruptive behavior (the average number of clinical features endorsed was 2.7 (standard deviation=1.6)). The estimated prevalence of Class 1 overall is 37%, with slightly more males (52.4%) than females (47.6%) in this class. Youth in Class 2 (46%), endorsed a mean of 8.5 (2.1) behavioral features, and the profile of this class contained a number of clinical features that emphasized behaviors common to ADHD and ODD with only low levels of behavioral features aligned with CD. A greater percentage of this class was female (55%). Approximately 17% of the youth were classified into a third Class and the majority of them were male (58.4%). The profile for Class 3 is characterized by a high probability of expressing features of ADHD and ODD with intermediate levels of CD behaviors. Youth in Class 3 endorsed on average 15.3 (2.7) of the clinical features.

3.2. Classes of disruptive behavior and past month drug use

Next, we wanted to evaluate the latent classes of disruptive behavior as they relate to current drug use behaviors. Overall in this sample, 20.1% reported using alcohol, 17.4% tobacco, 1.7% inhalants, and 7.2% marijuana in the past month; in all, 28.4% reported using at least one of these four drugs in the past month. We found that the distribution of drug use in the prior 30-days varied by class membership in the anticipated direction (Table 2). Over half of those in Class 3 used drugs, with drug specific rates nearly double the rate of their peers in Class 2. One in three youths in Class 2 and 15% of youth in Class 1 used drugs—mainly alcohol and tobacco. Youth who had been classified with intermediate levels of disruptive behavior (Class 2) were twice as likely to have used drugs and youth with high levels of disruptive behavior (Class 3) were nearly seven times as likely to have used a drug, as compared to their counterparts who had been classified as being in Class 1 with low levels of disruptive behavior (estimated $OR=2.4$, 95% $CI=2.2, 2.7$ and $OR=6.8$, 95% $CI=6.1, 7.7$, respectively). Similar results emerged when we explored the association between disruptive behavior and the use of different drug types and as hypothesized, the associations were strongest for inhalants and marijuana.

3.3. Gender and age differences

Within each class of disruptive behavior, comparison of past month drug use for males and females did not reveal striking gender differences; however girls in Class 3 (higher levels of disruptive behavior) tended to use more drugs than boys in the same class (Table 2). A strong age difference was revealed. Within every disruptive behavior class, compared to the immediately preceding age group, a doubling of the odds for using drugs in the past month occurred with increasing age (Table 2; e.g., within the class with high levels of disruptive behaviors [Class 3] $OR=10.2$ for 12/13 year olds, $OR=23.0$ for 14/15 year olds, and $OR=53.3$ for 16/17 year olds).

Anticipating possible male–female developmental differences in disruptive behavior, we explored beyond the simple subgroup analyses (Table 3). We collapsed the age categories to simplify the assessment of possible interaction across age, sex, and disruptive behavior strata. The data provide evidence that higher levels of disruptive behavior were associated with greater risk for drug use particularly among young adolescent females.

4. Discussion

Using LCA, we found evidence to support a three class latent structure of disruptive behavior. None of the classes identified youth displaying problems of only one type of disruptive behavior; instead, the behavior syndromes tended to co-occur. Nearly half of the youth in this sample expressed intermediate levels of disruptive behavior (Class 2) common with features of ADHD and ODD, while just under one in five were more likely to experience high levels of disruptive behavior with CD symptoms of antisocial and norm-violating behaviors. We found that the distribution of drug use in the prior 30-days varied by class membership in the anticipated direction—increasing disruptive behavior was associated with greater odds of using drugs, and the associations were strongest for inhalant and marijuana use. Females with high levels of disruptive behavior tended to have a greater likelihood of reporting past month use of drugs than males with high levels of disruptive behavior, especially in early adolescence.

Our findings are consistent with a previous report on the NHSDA data where approximately 17% of the youth reported subclinical or clinical levels of behavioral problems (aggressive or delinquent behavior) based on standard YSR cut-points (Substance Abuse and Mental Health Services Administration, 1999). This is comparable to the proportion of youth represented by Class 3 (characterized by many features of ADHD, ODD, and CD) in the current study. In the SAMHSA report, logistic regression identified three specific YSR scales as being associated

with substance use (Delinquent Behavior, Social Problems, and Attention Problems; Substance Abuse and Mental Health Services Administration, 1999). Several of the items used in our analysis of disruptive behavior were from the Delinquent Behavior and Attention subscales. However, items also came from other subscales, such as Aggressive Behavior, in which no association with drug use was found in the SAMHSA analyses.

In this reanalysis of the same data, we wanted to incorporate complimentary conceptual models that often link early aggression, rule-breaking, and other socially maladaptive behaviors with drug-taking (Dishion, 2000; Fergusson & Horwood, 2002; Fergusson, Horwood, & Lynskey, 1994; Nagin & Tremblay, 1999) or advocate an underlying trait of general delinquency or problem behavior syndrome (Crowley, MacDonald, Whitmore, & Mikulich, 1998; Donovan, Jessor, & Costa, 1999; Jessor & Jessor, 1977). Epidemiological studies suggest that the co-occurrence among disruptive behavior disorders in population samples of adolescents is quite high (August, Realmuto, MacDonald, Nugent, & Crosby, 1996; Maughan et al., 2004; Willcutt, Pennington, Chhabildas, Friedman, & Alexander, 1999). The strength of our latent class analysis was to model empirically the co-occurrence of problems from several DSM disorders. If we describe the average profiles of the three empirically derived classes, they are largely distinguished by a gradation of aggressive opposition, bullying, and hyperactivity with one class in particular including a greater array of serious delinquent acts such as vandalism.

Similar profiles of disruptive behavior based on items taken from Achenbach instruments, as were found in our current report, have been identified among younger children in the Netherlands (Sondejker et al., 2005; van Lier, Verhulst, van der Ende, & Crijnen, 2003). The latent class work done by Neuman and Todd's group (Volk, Henderson, Neuman, & Todd, 2006; Volk et al., 2005) using the 18 ADHD items in the Missouri Assessment for Genetic studies of Children (MAGIC) interview appears to be able to distinguish inattentive, combined, and hyperactive/impulsive ADHD subtypes. They have established seven ADHD classes, but the comorbid disorder latent class patterns for ODD and CD without the depression items, appear to have a similar class structure as our findings. Their prevalence of 14.1% in ADHD groups with comorbid ODD and CD with or without depression is comparable to the 17% found in our class that contain high levels of ADHD, ODD, and CD. ADHD combined type group is the most common form occurring in nearly two-thirds of children and children with the ADHD combined subtype have been found to have more ODD and CD comorbid diagnoses than children with ADHD inattentive subtype (Morgan, Hynd, Riccio, & Hall, 1996). Thus it may not be too surprising that we can only distinguish three distinct classes with the limited ADHD items on the YSR.

Other research has also supported associations between disruptive behavior syndromes and drug use in population-based and clinical settings. Many of them use DSM-based assessments (Boys et al., 2003; Kandel et al., 1999; Sawyer et al., 2001; Shrier et al., 2003), but several international researchers have also found associations between behavioral scales, such as the Achenbach assessments, and substance use in their survey and longitudinal studies (Rey et al., 2002; Pedersen et al., 2001; Ferdinand, Blum, & Verhulst, 2001). In this report, rather than classifying youth by predetermined scores on separate subscales which would potentially miss the naturally co-occurring subgroups of disruptive behavior that might otherwise be overlooked in general linear models, latent class analysis was used to explore patterns in responses across several features of three disruptive behavior disorders (attention-deficit/hyperactivity disorder, oppositional defiant disorder, and conduct disorder).

In addition to our findings regarding the overall association of disruptive behavior classes with drug use, we also found a strong age effect (increasing drug use with older age) similar to prior reports (Bauman & Phongsavan, 1999). Consistent with the findings of Costello et al. (1999) and Pedersen et al. (2001), we also found hints of a stronger effect of conduct problems on

drug use in girls than in boys (albeit in our study it was Class 3 which is characterized by high levels of disruptive behavior that included many conduct problems). That is, although Class 3 was over-represented by males, females in this same class tended to show higher rates of recent drug use than males, and this was particularly true for young girls with high disruptive behavior patterns. This finding has been described in terms of a 'gender paradox', whereby the gender exhibiting the lowest prevalence of a disorder shows more pervasive problems and poorer outcomes (Loeber & Keenan, 1994; Taylor & Ounsted, 1972; Tiet, Wasserman, Loeber, McReynolds, & Miller, 2001). As discussed by others, disruptive behavior trajectories and familial influences may differ by sex (Maughan et al., 2004; Smalley et al., 2000), which may account for differential outcomes. Other theories behind the gender paradox include moderating effects of sex at different levels of risk and sex differences in the risk threshold or genetic variability (Tiet et al., 2001).

Although our findings build on previous work, several limitations should be mentioned. First, the cross-sectional nature of the data may be the most important limitation of this paper as it precludes making conclusions regarding the temporal relationship of disruptive behavioral symptoms and drug use. Others may consider the retrospective self-report of mental and behavioral health and drug use to be a concern, albeit the reference interval occurred within a relatively short interval of time prior to assessment. Reliance upon self-report can be a problem due to social desirability bias or a lack of sensitivity of YSR-type assessments (e.g., when the adolescent has concentration or attention problems recognized by teachers and parents but fails to self-recognize or acknowledge them). However, this lack of sensitivity is not pervasive; for some disturbances, such as covert antisocial, the youth self-report tends to be more sensitive than the parent or teacher report (Burke, Loeber, Mutchka, & Lahey, 2002; Frank, Van Egeren, Fortier, & Chase, 2000; Loeber, Green, Lahey, & Stouthamer-Loeber, 1991).

Not all of the behavioral criteria formulated by the DSM-IV (American Psychiatric Association, 1994) are covered by the YSR. However, assessment of adolescent mental health and behavioral problems via the YSR approach is useful because of its wide appeal and comparability across studies, including international behavior studies (Broberg et al., 2001; Sondejker et al., 2005; Hofstra, van der Ende, & Verhulst, 2001; van Lier et al., 2003). In addition, potential confounding due to additional risk factors for drug use could not be addressed in the analyses because the information was not available. For example, SES and a family history of drug abuse or dependence may be associated with the participants' drug use patterns as well as with clinical symptoms of disruptive behavior.

It also should be noted that, like other latent structure approaches, LCA is uninformative with respect to validity, specifically, whether the classes of disruptive behavior identify discrete pathological entities and whether the entities are distinct. LCA is a model-based approach that estimates the probability of belonging to one class versus another class and borderline cases may be forced into one class or the other arbitrarily. However, this sophisticated statistical analysis provided an opportunity to explore an alternative interpretation of the meaning of behavioral disturbances. Instead of relying solely on an underlying metric based on the number of clinically significant symptoms present, we explored patterns among clinically relevant symptoms.

This study also had a number of other strengths. The sample size obtained by pooling across three survey years of the NHSDA was quite large and provides an opportunity to explore gender, age, and drug specific differences. In addition, these nationally representative surveys of household-dwelling adolescents may include youths who have become disengaged from school (i.e., chronic absentees) and dropouts, making its sample frame more complete than sampling frames commonly used in school-based surveys.

This study contributes to our understanding of the structure of disruptive behavior disorders, extending previous work examining the dimensionality of disruptive behavior among younger children in the Netherlands (Sondejker et al., 2005; van Lier et al., 2003). Findings further support the common co-occurrence of symptoms across ADHD, ODD, and CD and bolster previous reports of the association between serious disruptive behavior and concurrent drug use. In light of such findings, clinicians should recognize that adolescents presenting with one disruptive behavior disorder will likely exhibit symptoms of other disruptive behavior disorders as well, possibly at subclinical levels that may not exceed predetermined cut-points on behavioral rating scales or qualify for a DSM diagnosis. This is meaningful since subclinical levels of disruptive behavior have been linked with other problems such as drug use and academic deficits (Pedersen et al., 2001; Todd et al., 2002). Assessments should be conducted accordingly, addressing multiple behavior problems at all levels and incorporating both empirically based and clinical-diagnostic approaches, with consideration of patterns of behavior across diagnostic categories. Additionally, adolescents evidencing multiple behavior problems, particularly emerging conduct problems, need to be thoroughly assessed for co-occurring drug use. The rate of coexisting drug consumption needs to be taken into account in efforts directed towards prevention and treatment as earlier identification may prevent the sequelae of later substance abuse and dependence.

As others have also indicated, more attention should be given to young adolescent girls showing early signs of behavior problems. Although girls exhibiting behavior problems may be at increased risk for drug use and other negative outcomes, research suggests that conduct problems often go undiagnosed in girls, possibly due to a bias in diagnostic criteria or identification and referral patterns or because of variations in symptom expression (Delligatti, Akin-Little, & Little, 2003). Clinicians, physicians, and teachers and other school personnel should work to identify this subgroup of at-risk girls as early as possible so that intervention may be applied before more pervasive and serious problems develop.

In conclusion, the results of this study provide evidence consistent with three classes of disruptive behavior which vary with drug use. Future research can explore classes or clusters of prodromal symptoms as well as explore different behavioral and drug use trajectories as exemplified by the work of Costello et al. (1999), Loeber, Stouthamer-Loeber, and White (1999), and White, Xie, Thompson, Loeber, and Stouthamer-Loeber (2001). In particular, the exploration of patterns of behavior that include internalizing behaviors might be relevant (Volk et al., 2006). By longitudinally tracking individual clinical features and drug use across several time points it will be possible to establish stable and transitional states, as well as subtypes of drug users, including polydrug use patterns (Boys et al., 2003). The developmental relationship between clinical features of behavioral disorders and drug use may provide insights into whether the co-occurrence may relate to a common vulnerability or neurobiological etiology. It is also plausible that these relationships are temporally bi-directional, so that the presence of one may alter the course and prognosis of the other.

Acknowledgements

This work was supported by NIDA R01DA016323 (CLS) and K01DA16720 (VHA). The data reported herein come from the National Household Survey of Drug Abuse 1994–1996 collected under the auspices of the Office of Applied Studies, Substance Abuse and Mental Health Services Administration.

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Fig. 1.

Latent class profiles of disruptive behavior. Note: ADHD1—trouble concentrating, ADHD2—trouble sitting still, ADHD3—Acts impulsively, ADHD4—talks too much, ADHD5—louder than other kids; ODD1—disobey at school, ODD2—temper, ODD3—stubborn, ODD4—argues, ODD5—disobey at home; CD1—physically attack people, CD2—hang around with kids who get in trouble, CD3—destroy things belonging to others, CD4—mean to others, CD5—No guilt, CD6—fights, CD7—swear or use dirty language, CD8—lie or cheat, CD9—run away from home, CD10—set fires, CD11—steals from home, CD12—steals from places other than home, CD13—cut classes or skip school, CD14—threaten to hurt people.

Table 1
Overall prevalence and probability of endorsement of behavioral features consistent with ADHD, ODD, and CD by latent class

Adapted Youth Self-Report item	Prevalence (%) ^a	Class 1 conditional probability (se)		Class 2 conditional probability (se)		Class 3 conditional probability (se)	
		0.370	(0.007)	0.461	(0.006)	0.169	(0.005)
Overall							
Attention-deficit/hyperactivity disorder (ADHD)							
1 Trouble concentrating	50.7	0.228	0.007	0.609	0.008	0.833	0.009
2 Trouble sitting still	39.4	0.173	0.007	0.462	0.008	0.689	0.011
3 Acts impulsively	43.0	0.113	0.006	0.540	0.008	0.829	0.009
4 Talks too much	62.1	0.402	0.008	0.731	0.007	0.803	0.010
5 Louder than other kids	33.1	0.106	0.006	0.400	0.008	0.634	0.012
Oppositional defiant disorder (ODD)							
1 Disobey at school	28.7	0.042	0.004	0.291	0.008	0.792	0.010
2 Temper	46.9	0.163	0.007	0.581	0.008	0.833	0.009
3 Stubborn	50.4	0.232	0.008	0.626	0.008	0.783	0.010
4 Argues	72.0	0.458	0.009	0.862	0.006	0.924	0.007
5 Disobey at home	43.8	0.109	0.006	0.556	0.009	0.849	0.009
Conduct disorder (CD)							
1 Physically attack people	8.6	0.013	0.002	0.038	0.003	0.358	0.012
2 Hang around with kids who get in trouble	36.5	0.101	0.005	0.405	0.008	0.827	0.010
3 Destroy things belonging to others	8.5	0.005	0.001	0.045	0.003	0.349	0.012
4 Mean to others	32.1	0.078	0.005	0.356	0.008	0.728	0.011
5 No guilt	35.6	0.189	0.007	0.369	0.007	0.663	0.012
6 Fights	16.4	0.030	0.003	0.126	0.005	0.527	0.013
7 Swear or use dirty language	58.6	0.274	0.008	0.717	0.008	0.931	0.006
8 Lie or cheat	29.4	0.047	0.004	0.318	0.008	0.757	0.011
9 Run away from home	5.3	0.006	0.001	0.027	0.002	0.212	0.010
10 Set fires	5.9	0.014	0.002	0.031	0.003	0.215	0.010
11 Steals from home	5.5	0.011	0.002	0.030	0.003	0.202	0.009
12 Steals from places other than home	8.3	0.006	0.001	0.042	0.003	0.352	0.012
13 Cut classes or skip school	16.7	0.030	0.003	0.160	0.006	0.478	0.012
14 Threaten to hurt people	15.1	0.016	0.002	0.093	0.005	0.575	0.013

^aItem scored by youth as 'somewhat true' or 'often true'.

Table 2

Co-occurrence of disruptive behaviors (DB) and past month drug use: Adolescents participating in the United States National Household Survey on Drug Abuse, 1994b–1996

Subgroups ^a	n	Any drug use ^b			Alcohol use			Tobacco cigarette use			Inhalant use			Marijuana use		
		%	OR (95% CI)		%	OR (95% CI)		%	OR (95% CI)		%	OR (95% CI)		%	OR (95% CI)	
DB Class 1	4632	14.9	1.0		10.1	1.0		8.2	1.0		0.4	1.0		2.5	1.0	
DB Class 2	5810	29.7	2.4 (2.2, 2.7)		21.0	2.4 (2.1, 2.7)		17.4	2.3 (2.1, 2.7)		1.2	3.4 (2.0, 5.8)		6.5	2.7 (2.2, 3.3)	
DB Class 3	2128	54.4	6.8 (6.1, 7.7)		39.6	5.8 (5.1, 6.7)		37.4	6.7 (5.8, 7.7)		6.2	17.8 (10.7, 29.6)		18.7	8.9 (7.2, 11.0)	
Missing	1261	28.2	2.2 (1.9, 2.6)		20.2	2.3 (1.9, 2.7)		17.4	2.3 (2.0, 2.8)		1.4	3.7 (1.9, 7.3)		7.8	3.2 (2.5, 4.3)	
Gender																
DB Class 1	2206	13.2	1.0		9.2	1.0		6.9	1.0		0.1	1.0		1.9	1.0	
DB Class 1	2426	16.4	1.3 (1.1, 1.5)		10.9	1.2 (1.0, 1.5)		9.4	1.4 (1.1, 1.7)		0.6	4.3 (1.2, 14.8)		3.1	1.7 (1.2, 2.5)	
DB Class 2	3193	28.2	2.6 (2.2, 3.0)		19.8	2.4 (2.1, 2.9)		16.7	2.7 (2.2, 3.2)		1.2	8.6 (2.6, 27.9)		5.6	3.2 (2.2, 4.4)	
DB Class 2	2617	31.4	3.0 (2.6, 3.5)		22.5	2.9 (2.4, 3.4)		18.2	3.0 (2.5, 3.6)		1.3	9.9 (3.0, 32.4)		7.6	4.3 (3.1, 6.1)	
DB Class 3	886	58.1	9.1 (7.6, 10.9)		42.0	7.2 (5.9, 8.7)		40.4	9.1 (7.4, 11.2)		7.3	58.1 (18.2, 185.5)		20.2	13.4 (9.4, 19.0)	
DB Class 3	1242	51.8	7.0 (6.0, 8.3)		37.8	6.0 (5.0, 7.3)		35.3	7.3 (6.0, 8.9)		5.3	41.2 (12.9, 131.3)		17.6	11.3 (8.0, 15.9)	
Age																
DB Class 1	1794	4.8	1.0		2.7	1.0		2.8	1.0		0.4	1.0		0.6	1.0	
DB Class 1	1441	14.6	3.4 (2.6, 4.4)		10.0	3.9 (2.8, 5.5)		7.8	2.9 (2.1, 4.1)		0.1	0.4 (0.1, 1.7)		21.0	3.8 (1.8, 7.9)	
DB Class 1	1677	28.1	7.6 (6.0, 9.8)		19.5	8.6 (6.3, 11.8)		15.6	6.4 (4.7, 8.8)		0.6	1.5 (0.5, 4.1)		5.5	10.4 (5.4, 20.2)	
DB Class 2	1715	10.8	2.4 (1.8, 3.1)		6.0	2.3 (1.6, 3.2)		6.8	2.5 (1.8, 3.5)		0.8	1.9 (0.8, 4.9)		0.9	1.6 (0.7, 3.5)	
DB Class 2	2059	28.9	8.0 (6.3, 10.1)		19.2	8.5 (6.2, 11.5)		16.2	6.8 (5.0, 9.1)		1.1	2.9 (1.2, 6.7)		5.6	10.6 (5.5, 20.2)	
DB Class 2	2036	46.3	16.9 (13.4, 21.3)		35.4	19.5 (14.5, 26.3)		27.4	13.2 (9.8, 17.7)		1.8	4.6 (2.0, 10.3)		12.2	24.7 (13.1, 46.7)	
DB Class 3	616	34.3	10.2 (7.8, 13.4)		21.8	9.9 (7.0, 13.9)		23.4	10.6 (7.6, 14.9)		5.8	15.8 (7.0, 35.8)		7.3	14.0 (7.0, 28.1)	
DB Class 3	828	54.0	23.0 (17.8, 29.7)		38.4	22.2 (16.2, 30.5)		36.8	20.3 (14.8, 27.9)		6.5	17.8 (8.1, 39.3)		19.0	41.7 (21.9, 79.6)	
DB Class 3	684	73.1	53.3 (40.5, 70.1)		57.0	47.2 (34.2, 65.2)		50.7	35.9 (26.1, 49.4)		6.0	16.3 (7.3, 36.5)		28.6	71.6 (37.6, 136.3)	

Note: National Household Survey on Drug Abuse, now known as National Survey on Drug Use and Health. Gender: F = female, M = male.

^aClasses of disruptive behavior based on the 24 Youth Self-Report (YSR) items consistent with attention-deficit/hyperactivity disorder, oppositional defiant disorder, and conduct disorder. DB Class 1 = low disruptive behaviors, DB Class 2 = intermediate disruptive behaviors, and DB Class 3 = high disruptive behaviors.

^bAny use of alcohol, tobacco cigarettes, inhalants, or marijuana in the 30-days preceding the assessment.

Table 3

Exploratory look at more than simple subgroup differences of co-occurrence of disruptive behaviors (DB) and past month drug use, adolescents participating in NHSDA 1994b–1996

Subgroups ^a		<i>n</i>	Any drug use ^b	
			%	OR (95% CI)
<i>Younger, 12/14 year olds</i>				
DB Class 1	Female	1189	5.5	1.0
DB Class 1	Male	1350	8.2	1.5 (1.1, 2.1)
DB Class 2	Female	1499	14.1	2.8 (2.1, 3.7)
DB Class 2	Male	1225	16.7	3.4 (2.6, 4.6)
DB Class 3	Female	414	46.6	14.8 (10.8, 20.4)
DB Class 3	Male	610	35.4	9.3 (6.9, 12.5)
<i>Older, 15/17 year olds</i>				
DB Class 1	Female	1017	22.2	4.9 (3.6, 6.5)
DB Class 1	Male	1076	26.7	6.2 (4.7, 8.2)
DB Class 2	Female	1694	40.7	11.7 (8.9, 15.3)
DB Class 2	Male	1392	44.3	13.5 (10.3, 17.7)
DB Class 3	Female	472	68.2	36.5 (26.6, 50.0)
DB Class 3	Male	632	67.6	35.4 (26.3, 47.8)

Note: NHSDA: National Household Survey on Drug Abuse, now known as National Survey on Drug Use and Health.

^a Classes of disruptive behavior based on the 24 Youth Self-Report (YSR) items consistent with ODD, ADHD, and CD. DB Class 1 = low disruptive behaviors, DB Class 2 = intermediate disruptive behaviors, and DB Class 3 = high disruptive behaviors.

^b Any use of alcohol, tobacco cigarettes, inhalants, or marijuana in the 30-days preceding the assessment.