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Observed Family and Friendship Dynamics in Adolescence: A Latent Profile Approach to Identifying “Mesosystem” Adaptation for Intervention Tailoring

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Abstract

Nuanced understanding of adolescents' interpersonal relationships with family and peers is important for developing more personalized interventions that prevent problem behaviors and adjustment issues. We used latent profile analysis (LPA) to classify a community sample of 784 adolescents with respect to their observed relationship dynamics with friends and family using videotaped observations and five-minute audiotaped speech samples collected at age 16-17. The resulting latent classes served to predict behavioral and emotional health in early adulthood. The LPA of the video- and audio-coded observational variables revealed a three-class model: (1) the *Healthy Relationship* group ($n = 587$), representing low levels of deviant and drug use talk with friends and positive, non-coercive relationship with parents; (2) the *Disaffected* group ($n = 90$), representing high levels of drug use talk with friends and negativity about their parent(s) in the five-minute speech sample; and (3) the *Antisocial* group ($n = 107$), representing high levels of deviant talk, drug use talk, coercive joining with friends, and coerciveness in family interactions. In contrast to the *Healthy Relationship* group, the *Disaffected* group showed elevated risk for substance use problems and depression and the *Antisocial* group showed higher risk for substance use problems and committing violent crimes in early adulthood. Outcome differences between *Disaffected* and *Antisocial* groups were mostly non-significant. We discuss the viability of applying these findings to tailoring and personalizing family-based interventions with adolescents to address key dynamics in the family and friendship relationships to prevent adult substance use problems, depression, and violence.

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^bConflicts of Interest

Dr. Dishion was a developer of the Family Check-Up model, which was key to this research. However, the impact of intervention was not the topic of this study and therefore there is no conflict of interest. All authors declare they have no conflict of interest.

^cEthical Approval

The Institutional Review Boards at the University of Oregon and the Oregon Research Institute approved all research procedures. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

^dInformed Consent

Participants learned of the research procedures and all individual participants included in the study provided informed consent.

Keywords

intervention tailoring; relationship dynamics; drug use; depression; antisocial behaviors; observation

Introduction

Conceptualizing Psychopathology

Central to intervention science is developing an empirical taxonomy of individuals that guides prevention and treatment strategies (Lahey, Krueger, Rathouz, Waldman, & Zald, 2017). The conventional strategy is to use expert clinical consensus to define mutually exclusive diagnostic groups of youths who display symptoms of a disorder. For example, the Diagnostic and Statistical Manual of Mental Disorders (DSM) and the International Statistical Classification of Diseases and Related Health Problems (ICD) systems describe adolescent psychopathology along the lines in which adults are classified. The approach arises from medical science, in which the first step is to carefully define a nomenclature for disease processes and the second is to understand etiology and treatment. However, various disorders such as depression, anxiety, addiction, and conduct disorder often share etiologies and even common elements in treatment. Hence, many argue that the current diagnostic system focusing on symptoms of individuals is not sufficient or particularly helpful in guiding the design and selection of the most effective interventions.

As a result, the scientific community is moving away from research on individually oriented diagnostic categories to multifaceted patterns of mental health. The National Institute of Mental Health, for example, encourages research on the pathophysiology of mental health disorders using a research domain criteria (RDoC) framework (Insel et al., 2010). This research focuses on genomics and neuroscience in search of underlying biosocial mechanisms. The focus on biological mechanisms will likely translate to improvements in psychopharmacological approaches to treatment (McGowan, Fishman, & Lambrix, 2010).

A complimentary and equally important need is to study the functional dynamics in close relationships underlying long-term variation in behavioral and emotional health. There is strong evidence that interventions that improve adolescents' close interpersonal environments significantly enhance their behavioral and emotional health (Biglan, 2015; Sandler et al, 2011). Understanding how youths adapt to their interpersonal environment is critical to the design and tailoring of family-based interventions (Dishion & Patterson, 1999). In particular, direct observation of relationship processes among youth can provide a robust, measurable, and pragmatic classification system that could directly link to potential intervention targets (Beauchaine, Gatzke-Kopp, & Mead, 2007).

Relationship Systems

A unique insight of ecological systems theory is that multiple relationships serve to socialize children and adolescents (Bronfenbrenner, 1979; 1986). An especially useful conceptual advantage of ecological theory is the concept of a "mesosystem." A mesosystem is a supraordinate system consisting of two or more relationship dynamics. For example, an

adolescent who has conflicts with a parent *and* spends time with drug-using peers is potentially more likely to escalate to problem behavior. In comparison, an adolescent who is academically engaged and has primarily prosocial peers, but has conflict with parents, may be less at risk for the development of serious problem behavior (Van Ryzin & Dishion, 2012; Véronneau & Dishion, 2010). Thus, the friendship and family dynamics considered together may uniquely influence socialization. In essence, functional dynamics with parents and peers are functional in that relationships adjust and can present primary risks in which pathology emerges and worsens.

A particularly useful method for understanding relationship dynamics between parents and peers is direct observation. A little over 10 years ago, it was suggested that observed interpersonal dynamics are not only important for predicting adolescents' behavioral and emotional adjustment issues, but also for further improving diagnostic systems such as DSM (e.g., Beach, Wamboldt, Kaslow, Heyman, & Reiss, 2006; Piehler & Dishion, 2007). Indeed, direct observation of relationship dynamics has some empirical advantages when attempting to identify salient functional adaptation patterns as intervention targets. First, observations directly measure specific relationship patterns and are less susceptible to global report biases (Dishion, Burraston & Li, 2006; Fiske, 1987). Second, the computation of inter-observer reliability assures that the measurement will be more objective (Reid, 1978). This aspect of direct observation measurement is especially relevant to intervention research, allowing coding of videotapes of social interaction without observers' knowledge of the participants' intervention status. Third, the social interactions can serve as putative mediators of change (Patterson & Reid, 1984), which is at the core of translational research in the development of effective treatment and prevention intervention (MacKinnon, 2008).

Link to psychopathology

One example that suggests that dysfunctional interpersonal dynamics can amplify psychopathology is the coercion theory. Coercion describes the function of aversive behavior in resolving conflict in marital relationships and families (Patterson, 1982). Parent-child coercion is central to the etiology of the early onset of antisocial behavior in childhood (Patterson, Reid, & Dishion, 1992; Smith et al., 2014). The cornerstone of coercion is family conflict, when two members of a family become angry and negative, and escalate insults and negative behavior (Snyder, Edwards, McGraw, Kilgore, & Holton, 1994). Most recently, a dynamic systems framework was developed to more reliably measure coercive dynamics (Granic & Patterson, 2006; Hollenstein, 2012). Using state space grids, one can summarize interactions over the course of an observation session in terms of the 'dyadic states' of the participants. For example, the duration in which the parent and youth remain mutually aversive defines levels of family coercion. The duration in which the youth and parent(s) remain mutually calm, neutral, and positive during a problem-solving discussion reflects positive engagement, which predicts healthy adjustment (Dishion, Forgatch, Van Ryzin, & Winter, 2012).

A unique feature of the human relationship experience is that narratives can summarize the quality of the relationship. The narrative that emerges about a specific relationship purportedly affects the probabilities of future positive and negative interactions with that

person. From relational frame theory (Hayes, Barnes-Holmes, & Roche, 2001), we can conceptualize the relationship narratives as relationship schemas that efficiently summarize overlearned and often unconscious expectancies regarding reinforcement and punishment within a specific relationship. For example, resenting a parent for favoring a sibling over oneself can translate to a negative schema about that parent. This increases the likelihood of conflict and disengagement from the family. Similarly, a youth's violation of parent trust through salient misdeed can create a parent's negative schema, which reduces the likelihood of affectionate or shared pleasant activities. Contrarily, a positive schema can emerge from experiences suggesting trustworthiness or validation within a relationship. The audiotaped five-minute speech sample (Magaña et al., 1986) is a useful method for capturing both parent and youth positive and negative relational schema. Systematically coding audiotaped speech samples of adolescents and their parents showed that low positive and high negative schema differentiated between families with typically developing adolescents from those with antisocial adolescents. Negative schema of adolescents and parents correlated moderately with observations of parent-youth coercion (Bullock & Dishion, 2007).

Social interaction patterns with friends contribute to peer influence on problem behavior in children and adolescents. In observational studies within adolescent friendships, a process of deviancy training (Dishion, Spracklen, Andrews, & Patterson, 1996) emerged as an important predictor for individual differences in drug use (Patterson, Dishion, & Yoerger, 2000; Piehler, Véronneau, & Dishion, 2012) and antisocial behavior in adulthood (Dishion, Nelson, Winter, & Bullock, 2004). More recently, deviancy training has expanded to include 'coercive joining' among adolescent friends. Coercive joining describes a dynamic in which youth connect with friends by making denigrating statements towards others, suggesting and promoting aggressive behavior towards others, and making efforts to dominate each other. Gang membership was significantly associated with coercive joining in adolescent friendships and coercive joining uniquely predicted future violence over and above antisocial behavior and gang membership (Van Ryzin & Dishion, 2013).

Much of the observational research on families and friends focuses on the development of problem behaviors such as antisocial behavior, violence, and drug use. However, a recent comprehensive review suggests that social interaction patterns in general, and coercive processes in particular, predict a variety of emotional adjustment problems and psychopathology in youth and adults (Dishion & Snyder, 2016). For example, conflict and coerciveness in families underlie adolescent depression (e.g., Sheeber, Davis, Leve, Hops, & Tildesley, 2007) and anxiety (Crowley & Silverman, 2016). When considering friendships, momentary assessments of conflicts in adolescent friendships also covary with increases in depressed mood (Connell & Dishion, 2006; Silk et al., 2013).

Heterogeneity

It is likely that there is developmental variation in how friendship and family dynamics define etiological pathways to adult emotional and behavioral health (Cicchetti, 1984). A person-centered framework is particularly useful for identifying subgroups of individuals who share similar family and friend observable dynamic patterns with unique developmental pathways. There have been various person-centered approaches to understanding

psychopathology in prevention science. One of the most popular approaches is to define classes of individuals based on their developmental trajectories of symptoms. In the study of antisocial behavior, this approach results in the identification of early-starting, childhood-persistent, and adolescent-onset trajectories (e.g., Moffitt, 1993; Patterson & Yoerger, 1993; Odgers et al., 2008). Another approach is to apply a person-centered strategy to the analysis of heterogeneous symptoms. Fergusson, Horwood, and Lynskey (1994) used the reports of various mental health symptoms to classify adolescents. The authors identified a subgroup who presented both mood and problem behaviors. Searching back to the adolescents' childhoods, they found that the comorbid group had experienced severely disrupted family environments, both in the affective family climate and in material disadvantage. Expectedly, individuals in the comorbid group showed more mental health problems, criminality, and substance use as adults.

To our knowledge, however, there has been no person-centered analysis of observed relationship patterns in friendships and families during adolescence. This may be a promising approach to identify meaningful classes of adolescents who share distinct functional dynamics with friends, parents, and across the family-peer mesosystem. Such an approach would potentially be informative for the translational goal of identifying which environmental interventions would prove most effective for each adolescent subgroup.

The Present Study

The current study is a person-centered analysis of direct observations of family and peer environments that followed a large community sample of adolescents into early adulthood. Specifically, we employed latent profile analysis (LPA) to empirically identify homogenous subgroups of adolescents with respect to their observed relationship dynamics with friends and parents using videotaped observations and audiotaped five-minute speech samples. We then evaluated the predictive validity of the empirically identified subgroups on emotional adjustment, drug abuse and dependence, and violent offenses in early adulthood.

Although LPA is inherently an exploratory data analysis strategy, the literature suggests some expectations. First, an antisocial group will emerge that coercively engages with parents and displays high rates of deviancy training and coercive joining with friends. Based on previous findings linking comorbidity with the pathogenic family and friendship interactions (e.g., Moffitt, 1993), we expect this group will be vulnerable to future problem behaviors and mood problems. Second, we can expect a group akin to the late (adolescent) onset, with relatively healthy family environments, with the exception of low monitoring and engagement with peers who use substances and engage in minor delinquency. Lastly, we hypothesize a relatively large group of adolescents who will maintain healthy interactions with both friends and parents.

Method

Participants

We approached all parents of sixth-grade students from three public middle schools in an urban community in the Northwest region of the United States. A sample of 999 consented

to participate for a school-based assessment (see Dishion & Kavanagh, 2003), with an average age of 12.2 years ($SD = .37$) at baseline. Approximately 80% of youth were retained across the longitudinal span of the study (age 13, $n = 857$; age 14, $n = 829$; age 15, $n = 820$; ages 16-17, $n = 794$; ages 18-19, $n = 735$; ages 21-22, $n = 818$; ages 23-24, $n = 839$; and ages 26-27, $n = 799$). After one youth and family removed themselves from the study, the final sample included 472 females (47.3%) and 527 males (52.7%). The sample was racially diverse (43.4% European Americans, 30.4% African Americans, 4.1% Asian Americans, 2% Native American, 0.6% Pacific Islander, and 19.5% either bi-racial or other races). Six percent of the participants reported to be Hispanic origin. Additionally, 58.6% lived with their biological fathers. The median gross annual household income was \$30,000 to \$39,999. Primary caregivers' education ranged from "no formal schooling" to "graduate degree," with a median value corresponding to "partial college." Although attrition accounted for some lost participants, the demographic composition of the remaining sample stayed essentially the same. The present study included a sample of 784 who participated in observation tasks at ages 16-17. We conducted attrition analyses on key baseline demographic, child, and family variables. None of these baseline variables was significantly associated with the missingness at ages 16-17. Hence, it is less likely that there is systematic bias in the present sample of 784.

Intervention Protocol—After the initial assessment, youth and their families were randomly assigned to a family-centered intervention. Using an encouragement design, we offered families the Family Check-Up (FCU) when the youth were in the seventh and eighth grades of middle school and again when in high school. The intervention effects were not central to the study hypotheses, but intervention status was a covariate in the model. Dishion and Kavanagh (2003) describe in detail about the intervention procedures, and several other papers examined intervention effects (e.g., Dishion, Nelson, & Kavanagh, 2003; Veronneau, Dishion, Connell, & Kavanagh, 2016).

Procedures

This study received approval from the University of Oregon's Institutional Review Board. Youth and their parents or guardians provided assent and consent forms, respectively. There were no exclusion criteria; the project recruited all youth in the participating public schools in regular education classes and their families for participation in this prevention trial. Most assessments took place in the schools from grades 6 through 11. If students moved out of their original schools, we followed up with them at their new locations. For assessments conducted at ages 18-19 and after, project staff mailed questionnaires to the participants. Participants received small monetary compensation for each completed assessment. Completion and retention rates were similar for the intervention and the control groups.

Procedure for Video and Audio Observation Tasks

At ages 16-17, participants received invitations to take part in the full assessment, including videotaped observations of peer-youth interactions, parent-youth interactions, and a parent and youth five-minute speech task. Participants could decline participation in any specific data collection activity; thus, the completion rates vary by tasks. Trained research assistants who were blind to experimental condition coded all observation data with both a macro

rating scale and a micro observation coding system. The bases for a *macro rating scale* are the impressions of an interaction after viewing the entire episode, while the basis of a *micro coding scale* is real-time coding of each participant's behavior for each second of the observation. In the case of assessing the target adolescent and two-parent families, we combined the two parents into a 'parent system.' Thus, our dyadic scores essentially reflect the interaction between the adolescent and the parent system. We used the Noldus Observer XT version 11 (Noldus Information Technology, 2012) to code the interactions continuously in real time. We coded the five-minute audiotaped speech sample with the Family Affective Attitude Rating System (FAARS) to measure negative and positive relational schema (Bullock & Dishion, 2004). We briefly describe each observation task and general coding dimensions below. More specific details on each coding items are available as supplemental material (available online; see supplemental table 1).

Measures

Video and audio observed indicator variables for latent profile analysis

Peer Interaction Task (PIT)—Seven hundred twenty-one participants completed a videotaped interaction task with a self-nominated, same sex friend between 14 and 21 years of age who had no familial relationship to the participants. Informed consent was given by the friends who were 18 or older and by the parents if the friend was younger than 18. The interaction task with the friend lasted 45 minutes. Participants and their friends discussed eight different topics with for five minutes each. Topics included (1) planning an activity, (2) discussing a current problem of the participant, (3) discussing a current problem of the peer, (4) talking about drug and alcohol use, (5) discussing goals for the next year, (6) talking about friends and peer groups, (7) talking about dating, and (8) planning a party (Dishion et al., 1996). The first topic, planning an activity, was a practice discussion and was not included in the analyses.

Macro ratings of friendship interaction: The Peer Interaction Task Coder Impressions Inventory (Piehler & Dishion, 2005) measures general impressions of friendship interactions. Three dimensions were used as indicators for the LPA analyses; (1) *Drug Use Talk*, which measures a tendency to discuss drug use, (2) *Prosocial Talk*, which measures a tendency to offer prosocial solutions to problems discussed, (3) *Coercive Joining*, which measures a tendency to denigrate others, talk aggressively about third parties, and domineering and aggression within the friendship (Van Ryzin & Dishion, 2013). To assess coding reliability, two separate coders randomly sampled and coded 15% of the data. Interrater agreement was 86%.

Micro ratings of friendship interactions: We used a modified Topic Code (Poe, Dishion, Griesler, & Andrews, 1990) to measure *Rule Breaking Talk*. This is the average rate per minute of discussing any topic that is considered as breaking the rules, violating conventional norms, or as deviant. Reliability was good with interrater agreement of 82%.

Family Assessment Task (FAST)—Six-hundred forty-nine participants took part in the FAST (Dishion & Kavanagh, 1997), a structured videotaped observation task in which the

target youth and parents discuss eight different topics. Topics included (1) parent discussion regarding areas of growth for their child, (2) teen-led discussion of an area in which they would like to grow, (3) parental monitoring and listening task, (4) a discussion about a disagreement between the parents and youth and how it was solved, (5) a family problem-solving activity, (6) individual beliefs regarding substance use, (7) planning a fun family activity, and (8) positive recognition of family members. Each interaction task lasted five minutes except for the substance use section, which lasted for eight minutes.

Macro ratings of family interaction: The Coder Impressions Questionnaire (Dishion & Kavanagh, 2003) was developed to measure various aspects of family management process and problem-solving skills between parents and adolescents. Four scales were computed and included as indicators of LPA: (1) *Family Monitoring*, which reflects adolescents not being well monitored, (2) *Parent Deviant Talk*, which measures parent's engagement in rule breaking or drug use talk (3) *Parent-Child Positive Interaction*, which measures how much the child and parents engage in positive interactions and (4) *Parent-Child Negative Interaction*, which measures how much the child and parent engage in negative interactions. Interrater agreement was calculated on 15% of the tapes and it was 84%.

Micro ratings of family interactions: The Relationship Affect Coding System (RACS) was used to code youth and parents' behavior and affect in real time (Peterson, Winter, Jabson, & Dishion, 2008). Two dyadic measures from RACS were included as indicators of LPA: (1) *Dyadic Positive Engagement*, which represents positive and neutral behavior engagement between the parent and the youth across all observation task, (2) *Dyadic Coercion*, which represents 'Negative' or 'Directive' behaviors, while the reactant was coded as either no talk, ignore, negative, or directive. Inter-rater reliability, based on the duration and sequencing of coded behavior, were computed on 15% of all videotapes and was found to be high, with coder agreement of 94%.

Five-Minute Speech Samples (FMSS)—The audiotaped FMSS task (Magana et al., 1986) involved 773 target children and parents. This was a brief assessment of a respondent's attitude and expressed emotions toward a family member. Each parent would describe his or her relationship with the target adolescent during a 5-minute period; each target youth would also describe his or her relationship with their parent. Interviewers provided the task instructions and left the parent or target youth alone in the room to minimize distractions during the audiotaping.

Family Affective Attitudes Rating Scale (FAARS; Bullock & Dishion, 2004): The FAARS was used to measure parent-youth negative and positive relational schema. The parent-youth *Negative Relational Schema* assesses a tendency for either the parent or adolescent to discuss negative features of their relationship. The parent-youth *Positive Relational Schema* measures positive and loving aspects of the relationship. Inter-rater agreement was computed for 15% of the audiotapes across all items and found to be 88%.

Predictors of Classes

Gender: The codes for child gender were 0 for male and 1 for female.

Race.: We created two dummy codes to compare (1) ‘European American’ to ‘African American’; and (2) ‘European American’ to ‘Other Races’ that include Asian American, Native American, Pacific Islanders, and other racial minorities.

Intervention status.: We coded random assignment to control group as “0” and to FCU intervention group as “1.”

Distal Outcome Variables

Early adulthood depression and anxiety.: Depressive and anxiety symptoms were assessed four times (i.e., at ages 18-19, 21-22, 23-24, and 26-27). At ages 18-19, Adult Self-Report (ASR; Achenbach & Rescorla, 2003) measured depressive and anxiety symptoms that are consistent with the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). Cronbach’s alphas for ASR depressive and anxiety symptoms were .86 and .79, respectively. Assessments of depressive and anxiety symptoms at ages 21-22, 23-24, and 26-27 utilized the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983). The reliability of this scale ranged from Cronbach’s alphas of .70 to .87. Depression and anxiety symptoms measured by the BSI at ages 16-17 were used as covariates in the model.

Early adulthood substance abuse and dependence.: Participants answered questions about their tobacco, alcohol, and marijuana abuse and dependent behaviors that was adapted from the Composite International Diagnostic Interview (CIDI 2.1; Robins et al., 1988), four times between ages 18-19 and 26-27, except tobacco (not measured at ages 26-27). Piehler, Véronneau, and Dishion (2012) previously used and validated these measures. Frequency of tobacco, alcohol, and marijuana use over the past three months at ages 16-17 was a covariate for each substance abuse and dependence outcome.

Violent offenses.: Juvenile and court records of criminal contact provided a range of legal offenses for each youth at ages 16-17, 18-19, 21-22, and 23-24. Consistent with other studies of late adolescent and adult arrests (e.g., Shulman, Steinberg, & Piquero, 2013), we created a *number of violent offenses* variable (0 = no violations, 1 = one violation, and 2 = two or more violations). Violent offenses included menacing, intimidating, stalking, assaulting (or attempting to do so), kidnapping, committing manslaughter, murdering (or attempting to do so), committing negligent homicide, committing negligent wounding, committing domestic violence, sexually abusing someone, and committing other violent crimes. At each assessment point, the number of individuals charged with one or more than one violent offense are as follows: ages 16-17 (n = 15); ages 18-19 (n = 88); ages 21-22 (n = 38); and ages 23-24 (n = 65). The number of violent offenses at ages 16-17 served as a covariate in the model. However, due to a very low base rate of violent offenses committed at ages 16-17, we also included self-report of antisocial behavior¹ as an additional control variable.

¹This is a youth report of antisocial behavior at ages 16-17 used in other published studies (e.g., Van Ryzin & Dishion, 2014). It is an average score of nine items that assess antisocial behaviors (e.g., frequency of lying to parents, hitting or threatening school peers, engaging in theft or vandalism, and having gang members as friends). The Cronbach’s alpha of this measure was 0.73.

Data Analysis Plan—Preliminary analyses included descriptive statistics and outlier analyses using Cook's distance and leverage statistics to identify influential data (Cook, 1977; Neter, Wasserman, & Kutner, 1989). We used LPA to identify potential subgroups representing the observed adolescent relationship dynamics with friends and parents. All the indicators were standardized (i.e., z-scored) before conducting LPA. To select the optimal number of classes, we used several fit indices, including the Bayesian information criteria (BIC; Schwarz, 1978), the sample-size adjusted BIC (Adj BIC; Sclove, 1987), the Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (VLMR; Lo, Mendell, & Rubin, 2001), the Bootstrap Likelihood Ratio Test (BLRT; McLachlan & Peel, 2000), entropy (Ramaswamy, DeSarbo, Reibstein, & Robinson, 1993), and average posterior classification probability (see Tein, Coxe, & Cham, 2013). In addition, we considered theoretical justification in interpreting latent classes, as well as sample proportions of each latent class (e.g., Grimm & Ram, 2009; Jung & Wickrama, 2008; Muthén, 2004).

After identifying the optimal number of classes, the most likely classification membership information was exported² from the statistical software (Asparouhov & Muthén, 2013; Clark & Muthén, 2009; Muthén & Muthén, 2012a) and used for the following: (1) covariates predicting class membership, and (2) class membership predicting distal outcomes (i.e., mean differences of the distal outcomes across the latent classes). For the former, we used multinomial logistic regression; for the latter, we employed path analysis. We created dummy variables for the contrast among the latent classes. Due to many outcome variables, we ran three separate models with different distal outcomes: (1) depressive and anxiety symptoms, (2) substance abuse and dependence, and (3) violent offenses. As Figures 2 to 4 show, we specified each outcome variable as a latent variable. We included the baseline (ages 16-17) self-report measures of substance use frequency, anxiety and depressive symptoms, and antisocial behavior, as well as court-documented violent offenses in each of the models respectively as control variables. This allowed for examining whether mean differences of the distal outcomes across latent classes are unique from the predictive effects of baseline control variables.

We used Mplus Version 7.3 (Muthén & Muthén, 2012b), with the full information maximum likelihood estimation to handle missing data, for all statistical analyses. We used the maximum likelihood estimation with robust standard errors (MLR) estimator for depression and anxiety as the outcome model, as we expected these outcome variables to be non-normally distributed. We employed the weighted least squares means and variances (WLSMV; Muthén, du Toit, & Spisic, 1997) estimator to analyze the substance abuse and dependence and the number of violent offenses as outcome models because both latent outcome variables included ordinal categorical indicators.

²We had to use the manual 3-step approach for LPA. The new 3-step approach (Asparouhov & Muthén, 2013) was not feasible in this study because the outcome variables were latent variables. It is not yet possible to specify a latent variable in this approach.

Results

Preliminary Findings

The descriptive statistics that include mean, standard deviation, skewness, and kurtosis for the indicators of LPA are summarized in supplemental table 2 (available online). Skewness and kurtosis of most LPA indicators fell within the acceptable range (Skewness cutoff = 2; Kurtosis cutoff = 7; West, Finch, & Curran, 1995) except Dyadic Coercive Engagement between parent and youth. Multivariate outlier analyses identified no influential cases.

Classification Findings

Table 1 presents the results of the systematic LPA model fitting processes. In considering multiple fit indices, interpretability, and sample proportions, the 3-class solution deemed the most parsimonious and optimal solution. Although the 4-class or 5-class models overall showed acceptable model fit without any improper solutions, the value of entropy and posterior classification probability significantly decreased compared to the 3-class model. The 5-class model's fit was overall acceptable, but the VLMR test indicated that this model was not a significantly better fitting model than the 4-class model. Furthermore, one of the classes that emerged from the 5-class solution was very small (< 3% of the sample; $n = 22$). Hence, based on various fit indices, interpretability, and model parsimony, we chose the 3-class model as the optimally fitting model.

Figure 1 shows the estimated pattern of these three classes. The first class was the largest ($n=587$; 74.9%), labeled 'Healthy Relationship,' with low deviant talk with friends and positive, non-coercive relationship with parents. The second class included 90 (11.5%) adolescents labeled 'Disaffected' and characterized by high negativity about parents in the five-minute speech sample. The third class ($n=107$; 13.6%), labeled as 'Antisocial,' demonstrated high levels of deviant talk and coercive joining with friends, and parents showed high negative schema towards their children.

Predictors³ of Class Membership

We tested whether gender, race, and intervention status related to class membership of observed adolescent relationship dynamics with friends and family. Males had higher odds of belonging to the Antisocial group ($B = 1.17$, $SE = 0.24$, $OR = 3.22$, $p < .001$) compared to the Healthy Relationship group. However, males were also less likely to belong to the Disaffected group ($B = -.42$, $SE = 0.23$, $OR = 0.66$, $p = .07$) compared to the Healthy Relationship group. Neither race nor intervention status predicted class membership.

Baseline Covariates Difference by Latent Classes

We explored whether the three latent classes differed on baseline (ages 16-17) covariates (i.e., anxiety, depression, substance use frequency, and antisocial behavior). A series of one-way ANOVAs were conducted to compare the group mean differences. As none of the dependent variables met the homogeneity of variance assumption, for post-hoc testing we

³Predictors of class membership are variables that predict the class membership without influencing outcome of LPA whereas indicators of LPA are variables that are included to identify unknown clusters of individuals.

used the Games-Howell post-hoc test, which does not require homogeneity of assumption. Table 2 summarizes the findings of ANOVA. Overall, there were significant mean group differences among all age 16-17 covariates. The directions of the differences corresponded to the labels attached to each group (e.g., youth in the Disaffected group had the highest levels of depression and anxiety; youth in the Antisocial group had the highest levels of substance use and antisocial behavior).

Predicting Early Adult Adjustment

To test mean differences of the outcomes across the three latent classes, we first set the Healthy Relationship group as the reference group and created two dummy variables to compare that group with the two others. We also conducted an alternative model and set the Disaffected group as the reference group to enable a contrast between Antisocial and Disaffected groups.

Depression and anxiety.—The fit of the model linking relationship classifications to adult depressive and anxiety symptoms was adequate, $\chi^2(41) = 135.01$, $p < .001$, RMSEA = .05, CFI = 0.94, and SRMR = 0.06. Controlling for self-reported depressive and anxiety symptoms at baseline, compared to youths in the Healthy Relationship group (see Figure 2), the Disaffected group had higher depressive symptoms (Unstandardized $B = 0.79$, $SE = 0.36$, $p < .05$) but not higher anxiety symptoms ($B = 0.31$, $SE = 0.19$, $p = .11$) in early adulthood. There were no significant differences between the Antisocial group and the Healthy Relationship group on depression ($B = 0.28$, $SE = 0.33$, $p = .39$) and anxiety levels ($B = 0.30$, $SE = 0.19$, $p = .12$). Moreover, the mean differences between the Antisocial group and Disaffected group on both depression ($B = -0.49$, $SE = 0.44$, $p = .27$) and anxiety levels ($B = -0.02$, $SE = 0.27$, $p = .93$) were not significant.

Substance abuse and dependence.—The model with substance abuse and dependence as outcomes also showed acceptable model fit, $\chi^2(87) = 217.97$, $p < .001$, RMSEA = .04, and CFI = 0.94. As Figure 3 illustrates, the Disaffected group showed higher tobacco ($B = 1.51$, $SE = 0.40$, $p < .001$), alcohol ($B = 0.25$, $SE = 0.07$, $p < .01$), and marijuana ($B = 0.70$, $SE = 0.16$, $p < .001$) abuse and dependence when compared to the Healthy Relationship group in early adulthood while controlling for their self-reported tobacco, alcohol, and marijuana use frequency at baseline. Individuals in the Antisocial group were also more likely to report higher early adulthood tobacco ($B = 1.54$, $SE = 0.38$, $p < .001$), alcohol ($B = 0.24$, $SE = 0.07$, $p < .01$), and marijuana ($B = 0.70$, $SE = 0.15$, $p < .001$) abuse and dependence when compared to the Healthy Relationship group. Again, the mean group differences were not statistically significant between the Antisocial group and Disaffected group on tobacco dependence ($B = 0.10$, $SE = 0.14$, $p = .50$), alcohol abuse and dependence ($B = -0.02$, $SE = 0.02$, $p = .91$), and marijuana abuse and dependence ($B = -0.02$, $SE = 0.03$, $p = .48$).

Violent offenses.—There was a good overall fit in the model linking the latent classes of relationship dynamics to future violent offenses in late adolescence and early adulthood, $\chi^2(8) = 4.09$, $p = .85$, RMSEA < .001, and CFI = 1.00 (see Figure 4). Controlling for their self-reported antisocial behavior and court-documented violent offenses at baseline, youth in

the Disaffected group were not more likely to engage in violent criminal behaviors ($B = 0.01$, $SE = 0.36$, $p = .98$) in early adulthood compared to the Healthy Relationship group. As expected, individuals in the Antisocial group were more likely to be arrested for violent behavior during early adulthood ($B = 0.31$, $SE = 0.15$, $p < .05$) compared to those in the Healthy Relationship group. There was a marginal group mean difference between the Antisocial and Disaffected groups on the rates of violent criminal offenses ($B = 0.27$, $SE = 0.15$, $p = .08$); as expected, the Antisocial group showed slightly higher rates of violent criminal offenses compared to those from the Disaffected group.

Post-Hoc Analyses

From an ecological systems perspective, the social context of adolescence has an impact on the microsystem interactions with significant others. To explore this idea, we examined the marginal utility of class membership of relationship dynamics for predicting outcomes beyond demographic information. Gender (0 = Female, 1 = Male), family income (higher value indicates higher income), and race (0 = minority, 1 = European Whites) were included as additional covariates for each model. We found that even controlling for this demographic information, the results held. Interestingly however, after controlling for all demographic covariates, the significant mean difference between the Antisocial and Healthy Relationship groups in violent offenses became marginally significant ($B = 0.24$, $SE = 0.15$, $p < .10$). We found that gender ($B = 0.23$, $SE = 0.09$, $p < .05$), race ($B = -0.40$, $SE = 0.11$, $p < .001$), and family income ($B = -0.30$, $SE = 0.08$, $p < .001$) significantly predicted violent offenses. Specifically, male, low-income adolescents of color were generally more likely to be charged with violent offenses in early adulthood than those with more advantages.

Discussion

To our knowledge, this is the first study to conduct a person-centered analysis of direct observations of adolescents' relationship dynamics with both parents and friends, and to examine how subgroups differ in terms of various adjustment outcomes in early adulthood. Similar to previous literature, we found three adolescent groups (i.e., *Antisocial*, *Disaffected*, and *Healthy Relationship* groups) that indicate unique observed interpersonal dynamics with parents and friends. Compared to the *Healthy Relationship* group, the *Disaffected* group reported significantly higher substance use problems and depression and the *Antisocial* group reported significantly higher substance use problems and higher rates of committing violent crimes in early adulthood. Differences in distal outcomes between *Disaffected* and *Antisocial* groups were mostly non-significant, except for violent offenses. We believe that these findings have some important clinical and research implications, which are further discussed below.

Subgroups of adolescents and potential implications for intervention tailoring

As expected, the *Antisocial* adolescent group was more likely to be male, observed to connect with adolescent friends on themes of aggression (i.e., coercive joining), engaged in high levels of deviant and drug use talk with friends, and were observed to engage in coercive exchanges with parents. Interestingly, youth in this group did not have highly negative schema for their parents; however, their parents viewed the adolescents quite

negatively. Compared to adolescents in healthy relationships with friends and family, youth in the Antisocial group were more likely to have violent arrests during late adolescence and early adulthood, controlling for self-reports of antisocial behavior and court-documented violent offenses at ages 16-17. Moreover, they were more likely to have problems with using substances as young adults compared to those youths in healthy relationships, over and above self-reports of substance use at ages 16-17.

Families within this group may need pervasive and integrative environmental interventions that address both significant peer and family disruption, such as multi systemic therapy (Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009) or treatment foster care (Chamberlain, 2002; Smith & Chamberlain, 2010). However, one should use caution in aggregating this group of adolescents into group venues to deliver an intervention. It has been consistently demonstrated that aggregating high-risk youth with problem behavior can actually amplify problem behavior (see Dishion & Tipsord, 2011; Dodge, Dishion & Lansford, 2006). A recent study pointed out that even when interventions are highly supervised for fidelity, adolescents with antisocial problems do not benefit from a group format (Lochman, et al., 2015). In sum, as suggested previously, youths with multiple challenging behaviors could be optimally addressed by providing more intensive parent management training and intensive treatment foster care (Dishion, Forgatch & Chamberlain, & Pelham, 2016).

Especially poignant was the group of *Disaffected* youth in adolescence. Youth in this group engaged in relatively higher levels of drug talk with their friends than did adolescents in healthy relationships. However, they were not highly engaged in coercive joining with peers and were not likely to become violent offenders in adulthood. An interesting relationship feature of this group was both the lack of positive interactions with parents, and especially the adolescents' critical (i.e., negative relational schema) view of their parent(s). These groups of adolescents were more likely to experience high levels of depression and a tendency toward substance abuse and dependence as young adults, even controlling for these adjustment indices at ages 16-17. Furthermore, the difference in substance abuse and dependence between *Disaffected* and *Antisocial* groups was not statistically significant. These findings suggest that the *Disaffected* group is not merely a less problematic group than the *Antisocial* group. Furthermore, adolescents in the *Disaffected* group show fundamentally distinct family and peer dynamics compared to those in the *Antisocial* group. The *Disaffected* group would seemingly require different intervention approaches that are tailored to improve communication dynamics between adolescents and parents (e.g., Waldron, Brody, Robbins, & Alexander, 2010) and have emphasis on addressing their depression (e.g., Rohde, Waldron, Turner, Brody, & Jorgensen, 2014).

The good news is that a large percentage of this community sample showed healthy relationships with friends and families (N=580). This finding is generally consistent with research using a person-centered approach to analyze community samples of youth (see Broidy et al, 2003). This group seems to be relatively free of substance abuse and dependence issues, emotional distress, and antisocial behavior in early adulthood. However, the Healthy Relationship group showed similar levels of anxiety in comparison with the Disaffected and Antisocial groups. Transitions from adolescence through adulthood involve

navigating an array of interpersonal, educational, and vocational challenges, which might explain these results (Arnett, 2000).

Multiple gating assessment for intervention tailoring

From our findings, it becomes clear that one of the most important issues in personalizing or tailoring interventions is how to cost-effectively identify the *Healthy Relationship* group from the two pathogenic adolescent groups that are in need of intervention. The multiple gating assessment strategy was designed for this purpose, using a multistage assessment protocol (Cronbach & Gleser, 1965), beginning with the least aversive and expensive assessment to selectively screen out low-risk youth. Consistent with a multistage assessment perspective, we previously found the multiple gating approach useful (Dishion & Patterson, 1993; Loeber, Dishion, & Patterson, 1984), with the least expensive measures (e.g., self-, parent-, or teacher-reports) used to cull out individuals not needing preventive interventions, and direct observations used only in the final assessment to clarify what intervention is needed to prevent negative outcomes for those most at risk.

Once we screen those adolescents who may potentially benefit from an intervention, direct observations can be effectively incorporated during a clinical intake session for intervention tailoring. For instance, evidence-based family interventions such as the Family Check-Up (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007) uses direct observations during initial assessment that precedes the feedback session, in which a collaborative reflection on the assessment data involving the parent, therapist, and sometimes the adolescent leads to personalizing and tailoring follow-up interventions. Such assessment is also a useful motivational tool that taps into daily interpersonal patterns within families of which most are not consciously aware. In fact, in one study, we found that videotaped feedback on the parent-child interaction dynamics during early childhood significantly increased the effect size of the intervention (Smith, Dishion, Moore, Shaw, & Wilson, 2013).

In sum, more research endeavors are warranted for efficiently screening adolescents who are in healthy or unhealthy relationships with family and friends. This would provide more resources (e.g., using direct observations) to effectively personalize interventions for youth and families who do need intervention.

Class memberships predicting outcomes over and above demographic information

Through post-hoc analyses, we further investigated the marginal utility of class membership of relationship dynamics for predicting adjustment outcomes while controlling for demographic information (i.e., gender, family income, and race). Although the majority of the results were held, interestingly, the difference between the *Antisocial* and *Healthy Relationship* groups in terms of violent offenses became marginally significant after controlling for these demographic variables. This finding concurs with an account of problem behavior that incorporates the role of marginalization into developmental theory (see Ellis, Del Giudice et al., 2012; Dishion, 2016). To be specific, it has been suggested that social marginalization can motivate implicit attention to immediate rewards, at the cost of inhibitory control and long-term planning (Dishion, Ha, & Véronneau, 2012). These findings collectively suggest the importance of prioritizing assessment of socio-demographic

information in treatment conceptualizations and plans for reducing problem behaviors. Furthermore, we further support the idea of systematically disseminating evidence-based interventions to prevent problem behaviors. This effort would not only promote improvements in parent and peer dynamics, but could potentially improve school and community functioning, which would result in a decrease in social marginalization.

Limitations

There are some limitations in the present study. First, assessment of depression, anxiety, and substance abuse and dependence were based on self-report. However, given that the groups were empirically based on direct observations of relationship dynamics with friends and parents at ages 16-17, the reliance on self-report for follow-up analyses alleviates the monomethod bias problem (Cook & Campbell, 1979). Second, we were unable to employ the new three-step approach for the LPA developed by Asparouhov and Muthén (2012) in predicting distal outcomes. Although this new approach has the advantage of reducing the uncertainty of classification, it does not yet allow inclusion of any covariates in the model when analyzing distal outcomes, or in specifying latent variables. As it was important for us to control for the level of outcome variables at ages 16-17 as covariates, we decided to use the most-likely class membership while acknowledging some possibility of ignoring the uncertainty of classification. Yet, previous studies reported that, when entropy is high (> 0.8) and the sample size is larger than 500, exporting the most likely class information does not significantly introduce bias of the latent class solution (Asparouhov & Muthén, 2013; Clark & Muthén, 2009; Muthén & Muthén, 2012a).

Conclusions

These findings suggest that adolescent interactions patterns with family and friends can identify groups of youth with identifiable strengths and needs. A vast majority of adolescents are in healthy relationships. However, some subgroups display pathogenic relationship dynamics, of which two groups appeared to be most salient (Disaffected and Antisocial). Although some evidence-based interventions exist in addressing those needs, there is a need for translational research that empowers service providers to effectively tailor and personalize interventions based on cost-efficient assessment strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Results of the Latent Profile Analysis of observed peer and family relationship dynamics

Figure 2.

Summary of depression and anxiety symptoms as outcomes

Note: Only significant unstandardized path estimates are shown here. Values in brackets are standard errors. 19 = Ages 18-19, 22 = Ages 21-22, 24 = Ages 23-24, 27 = Ages 26-27. Dep = Depression, Anx = Anxiety. Factor loadings of depression latent variable ranged from .37 to .68, anxiety from .49 to .72, and all were statistically significant. All predictors correlated to each other but we do not show paths here for visual parsimony.

Figure 3.

Summary of substance abuse and dependence as outcomes

Note: Only significant unstandardized path estimates are shown here. Values in brackets are standard errors. Tob = Tobacco dependence, Alc = Alcohol abuse and dependence, MJ = Marijuana abuse and dependence. Factor loadings of tobacco dependence latent variable ranged from .65 to .90, alcohol abuse and dependence from .51 to .75, and marijuana abuse and dependence from .70. to .81, and all were statistically significant.

Figure 4.

Summary of violent offenses as an outcome

Note: Only significant unstandardized path estimates are shown here. VO = Violent Offenses. Factor loadings of violent offenses latent variable ranged from .68 to .77 and all were statistically significant.

Table 1

Model fit information for LPA models with 1 to 5 latent classes

#of Classes	BIC	Adjusted BIC	VLMR	BLRT	Entropy	Average Posterior Classification Probability
1 Class	31056.324	30954.708	N/A	N/A	N/A	N/A
2 Class	30067.909	29912.309	$p < .05$	$p < .001$	0.846	0.93
3 Class	29762.798	29553.215	$p < .01$	$p < .001$	0.897	0.92
4 Class	29550.013	29286.446	$p < .05$	$p < .001$	0.771	0.86
5 Class	29391.739	29074.188	$p = 0.44$	$p < .001$	0.799	0.86

Table 2

Results of One Way ANOVA and means and standard deviations for each group

Dependent Variable	Healthy Relationship Group M (SD)	Disaffected Group M (SD)	Antisocial Group M (SD)	F-Test	Sig
Depression	0.41 (0.58)	0.66 (0.81)	0.37 (0.61)	F(2,773) = 20.15	$p < .01$
Anxiety	0.30 (0.44)	0.46 (0.63)	0.29 (0.50)	F(2,773) = 41.75	$p < .01$
Tobacco use frequency	0.88 (2.14)	1.59 (2.67)	2.17 (2.94)	F(2,767) = 51.07	$p < .001$
Alcohol use frequency	0.71 (1.25)	1.30 (1.57)	1.73 (1.86)	F(2,769) = 44.37	$p < .001$
Marijuana use frequency	0.60 (1.56)	1.36 (2.05)	1.75 (2.40)	F(2,768) = 29.32	$p < .001$
Antisocial behavior	0.02 (0.17)	0.02 (0.15)	0.09 (0.38)	F(2,754) = 53.48	$p < .001$