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Family Check Up effects on adolescent arrest trajectories: Variation by developmental subtype

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Abstract

This study examines the effect of the Family Check Up intervention on the probability of arrests from ages 12 to 17 years for youth following heterogeneous developmental trajectories of antisocial behavior. Latent Growth Mixture Modeling results supported the presence of three developmental trajectories of arrests, including a large group of youth with few police contacts, a smaller group of youth showing early onset and chronic arrests, and a group with adolescent-onset arrests. In line with hypotheses, effects of intervention were seen within the adolescent-onset group, but not in the early onset chronic arrest trajectory group, or those youth with little police contact. The trajectory groups were differentiated by peer, family, behavioral and academic risk variables at age 11.

Keywords

Family prevention; conduct problems; delinquency; arrests; latent growth mixture modeling

The widespread occurrence of criminal behavior and serious conduct problems by youth is a major public health concern (i.e. U.S. Surgeon General, 2001), and improved understanding of the effects of prevention programs on such behavior is needed. The current paper examines the effects of a family-focused prevention program delivered in early adolescence, the Family Check-Up (Dishion & Kavanagh, 2003), on reducing the likelihood of arrests across adolescence. Early adolescence is a time of heightened risk for the development of a variety of forms of problematic behaviors, including conduct problems and arrests, as well as substance use behaviors (Biglan, Brennen et al, 2004). The prevalence of conduct disorders nearly doubles between childhood and adolescence, reaching a lifetime prevalence rate of approximately 9.5% (i.e. Nock, Kazdin, Hiripi, & Kessler, 2006; Offord, Boyle, & Racine, 1991). In addition, findings have suggested that drinking onset occurs between the seventh and tenth grades, and the use and abuse of illegal drugs increases dramatically between the eighth and twelfth grades, from 8.1% to 23.3% (Johnston et al., 2010). The reasons for such increases are complex, with multiple contributing domains of risk and protective factors, including child-level influences (i.e. neurobiological and self-regulatory factors), peer influences (i.e. peer rejection, peer deviance), and social or cultural risks (i.e. poverty, neighborhood and school influences; see Dishion & Patterson, 2006).

Family risk factors have been the subject of particular research attention in part because such risk factors may be readily translated into targets for intervention and prevention efforts. Broad family risk factors include high levels of conflict in families and poor parent management skills, such as poor parental limit setting and monitoring of youth behavior. DiClemente et al (2001) found that less parental monitoring was associated with sexually risky behavior, drug and alcohol use, and arrest frequency among adolescent females. Further, high family conflict has been associated with substance abuse (Skeer et al, 2009) and with externalizing behaviors in adolescents (Chung et al, 2009; Rhoades, 2008). Research on family interaction patterns related to conduct problems has also consistently underscored the importance of coercive family processes, which are escape conditioning sequences in families that may inadvertently promote escalating conduct problems (Patterson, Reid & Dishion, 1992). Additionally, adolescents in high risk families often experience premature autonomy, as parents disengage from their youth in the face of escalating behavior problems (Dishion, Nelson, & Bullock, 2004; Dishion, Poulin, & Medici-Skaggs, 2000). Such premature autonomy may promote further gravitation of high-risk youth into deviant peer groups, which may exacerbate youth conduct problems. Taken together, it is clear that family risk processes are central to development of conduct problems in adolescence.

While many theories have been formulated to account for individual differences in problem behavior development, there has been growing recognition in recent years that there may be heterogeneous subgroups of youth following distinct developmental trajectories of conduct problems, predicted by differing clusters of risk factors (for a review see Dishion & Patterson, 2006). In particular, two prominent theories of conduct problem development across childhood and adolescence both posit the existence of two high-risk subgroups of youth. First, Patterson and colleagues defined the ‘early versus late starter’ model of antisocial behavior (Patterson, Capaldi & Bank, 1991; Patterson & Yoeger, 1993), with the two groups distinguished primarily by the timing of exposure to family risk processes. The early starting youth were found to be exposed to coercive parenting practices in childhood, prompting the development of an antisocial pattern that results in a cascade of effects including poor academic skills, peer rejection, peer deviance and amplification of problem behavior during adolescence (Patterson, Reid & Dishion, 1992; Dishion, Patterson et al, 1991). The late starters, in contrast, showed disruptions in parenting in adolescence, and more importantly, were vulnerable to the influence of the deviant peer group in adolescence (Patterson et al, 1998). A second perspective was introduced by Moffitt (1993) in the differentiation of adolescent-limited and life-course persistent trajectories of conduct problems, discriminated by the age of onset and chronicity of offending. Moffitt hypothesized that the life-course persistent pathway was predicted by the combination of early individual vulnerability (i.e. executive control deficits of self regulation) and disrupted early parenting processes, while the adolescent-limited profile was predicted primarily by disrupted later family processes and peer relationship risks, including adopting the problem behavior of peers. While Moffitt’s model posits that many youth in the adolescent-limited trajectory are likely to desist from antisocial behavior in early adulthood, Patterson highlighted that many of these youth will continue to offend at an elevated rate over time.

These typological theories are consistent in pointing to two high-risk patterns of antisocial behavioral development, and studies that have relied upon a priori classification rules to group youth according to age of onset have generally yielded supportive evidence (e.g. Moffitt, 1993; Moffitt, Caspi, Harrington, & Milne, 2002; Patterson, Forgatch, Yoeger, & Stoolmiller, 1998). However, studies that have employed group-based modeling techniques (i.e., finite-mixture modeling) have yielded more diverse findings with respect to the number and nature of subgroups, with the number and types of trajectory groups largely dependent upon methodological factors, regardless of the number and type of “true” underlying

trajectory types. Indeed, in a systematic review of the literature on trajectories of antisocial behavior across adolescence and early adulthood, van Dulmen and colleagues (2009) found that studies using arrest records as the measure of problem behavior generally identified between three and five trajectories. However, differences across studies in terms of the number and types of trajectories identified appeared largely due to methodological factors, including the manner in which antisocial behavior was defined, the number of assessments, the developmental span covered, gender of participants, and use of single vs. multiple informants (van Dulmen et al, 2009).

Adaptive, family-focused intervention

Although hypotheses regarding the nature of the subgroups differ somewhat across these theories, one consistent theme from this literature is that there are multiple pathways into the initiation and maintenance of conduct problems over childhood and adolescence. Such developmental heterogeneity presents a challenge for prevention research, as children with different developmental profiles may have different intervention needs with respect to either the timing or targets of intervention. As such, there has been growing interest in “adaptive interventions,” in which specific intervention targets and doses may be tailored to the individual needs of families. Advantages include more efficient use of resources, increased treatment compliance and intervention potency, greater resemblance to real-world clinical practice, and decreased chances of negative effects of intervention components that are inappropriate for a given individual (e.g. Collins, Murphy, & Bierman, 2004).

In our work, we designed an adaptive intervention model that targeted parenting practices, motivated key family management skills, and could be delivered in community contexts that involved children and families on a daily basis: The public school setting. At the core of the intervention model is the Family Check Up (FCU; see Dishion & Stormshak, 2007), a brief, three session intervention delivered in early adolescence and designed to support parent’s motivation to engage in effective family management practices, and to provide more intensive support for parents and youth in need (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). The intervention follows an adaptive and tailored design (Collins, Murphy and Bierman, 2004), based on systematic assessments, resources available, and motivation and skills of the parents. In prior research with the current sample, the intervention predicted significant declines in youth-reported antisocial behavior over adolescence and a decreased total number of arrests over adolescence for youth whose families engaged with the FCU (Connell, Dishion, Yasui, & Kavanagh, 2007). However, those analyses only examined changes in youth-reported antisocial behavior over time, including the number of arrests as a distal outcome, and the impact of the intervention on trajectories of arrests over adolescence has not yet been examined in detail.

Documenting an effect of intervention on arrests would offer independent corroboration of the importance of this family-focused program for producing effects of personal and community importance. Official arrest records may offer alternative and complementary strengths as an index of antisocial behavior, relative to self-report or other informant reports (see Thornberry & Krohn, 2000). For instance, the validity of self- or other-reports of antisocial behavior may be affected by reporting or memory biases, while arrest records have the advantage of high validity (e.g. Farrington, Joliffe, Hawkins, Catalano, Hill, & Kosterman, 2003). Conversely, arrest records may under-represent the extent of engagement in antisocial behavior, as many youth committing antisocial acts do not come to the attention of the criminal justice system (Elliott and Voss, 1974), and there may be neighborhood, community, or demographic factors, such as ethnicity and socioeconomic status, that are related to the likelihood of a youth being arrested for committing a criminal offense. It is

important, therefore, for prevention studies to examine intervention effects both on youth and other informant reports, and on official records of arrests, when possible.

The current study

The goal of the current study was to examine the effect of the FCU intervention on the likelihood of experiencing arrests over adolescence. In particular, we sought to examine whether the effects of intervention on arrests differed across youth following different developmental trajectories of antisocial behavior. We used Latent Growth Mixture Modeling to examine possible differences in intervention effects across groups of youth following heterogeneous developmental trajectories (see Muthen et al., 2002). In line with current theories regarding typologies of adolescent antisocial behavioral development, we predict that latent growth mixture modeling analyses will yield the following three trajectory groups: 1) a large group of youth exhibiting consistently-low likelihood of arrest across adolescence, 2) a group of adolescents exhibiting consistently elevated arrest likelihood across adolescence, and 3) a group of teens exhibiting initially-low but increasing likelihood of arrest over adolescence.

We considered three competing hypotheses regarding the effects of intervention on trajectories of arrests across subgroups of youth identified by mixture modeling. First, a *severity effect hypothesis* holds that the intervention may be most effective for the most severely antisocial youth, which at baseline would be those following an early-onset trajectory. This hypothesis stems from the finding from prior prevention trials that youth exhibiting the most severe early antisocial behavior have shown the greatest improvements in behavior in response to prevention efforts (Muthen et al., 2002; Segawa et al., 2005; Van Lier et al., 2005). Second, a *developmental specificity hypothesis* holds that the match between the timing and content of intervention and the needs of youth in different trajectory groups will predict differences in the magnitude of intervention effects across subgroups of youth. In the current study, this hypothesis leads to the prediction that the FCU program will be most effective at reducing the likelihood of arrests in the adolescent-onset group. It is possible that the timing of the intervention in early adolescence may be most appropriate for youth at-risk for adolescent escalation in problem behaviors, and the family-focused intervention seeks, in part, to disrupt peer-deviancy that might be particularly potent for the escalating problems within this group. Third, a *generalized effects hypothesis* holds that the effects of the intervention will be stable across heterogeneous groups of youth, as family processes that are at the heart of the FCU may be generally important despite differences in the age of onset or other etiological factors that may differentiate trajectory classes identified via mixture modeling techniques.

Method

Participants

Participants included 998 adolescents and their families, recruited in sixth grade from three middle schools within an ethnically diverse metropolitan community in the Northwest region of the United States. Parents of all sixth grade students in two cohorts were approached for participation, and 90% consented to participate. The sample included 526 males (52.7%) and 472 females (47.3%). By youth self-report, there were 423 Caucasians (42.3%), 291 African Americans (29.1%), 68 Latinos (6.8%), 52 Asian Americans (5.2%), and 164 (16.4%) youth of other ethnicities (including biracial). Biological fathers were present in 585 families (58.6%). Youth were randomly assigned at the individual level to either control (498 youth) or intervention classrooms (500 youth) in the spring of sixth grade. Public schools agreed to individual-level randomization of students because it reduced the need for services at the school wide level. Approximately 80% of youth were

retained across the longitudinal span of the current study (wave 2, $n = 857$; wave 3, $n = 829$; wave 4, $n = 820$; wave 6, $n = 794$).

Intervention Protocol

The FCU is part of the multilevel intervention program that includes universal, selected, and indicated levels of services (see Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). All intervention services were delivered by Parent Consultants, including two Master's-level therapists and one with a Bachelor of Science. Parent consultants were trained using a combination of didactic instruction, role-playing, and videotaped supervision throughout the study. Parent consultants received ongoing supervision (generally weekly) by a licensed clinical psychologist, and followed a written manual, a prepublication version of Dishion and Kavanagh (2003).

The goal of the universal intervention was to support positive parenting practices while engaging parents of high-risk youth into the selected intervention. The universal intervention included the establishment of a Family Resource Center (FRC) in each of the participating schools. The FRC services were available for the entire intervention group, but not for individuals in the control group, and included brief in-person or telephone consultations with parents, feedback to parents on their student's behavior at school, and access to parenting books and videotapes. In addition, the FRC parent consultant delivered six in-class lessons to students, based on the Life Skills Training (LST) program (Botvin, Baker et al, 1990), including the following topics: 1) School success; 2) Health Decisions; 3) Building Positive Peer Groups; 4) The Cycle of Respect; 5) Coping with Stress and Anger; 6) Solving Problems Peacefully. Lessons included brief parent-student home-activities designed to motivate family management.

The Family Check-Up (FCU) was the selected intervention. The FCU is a brief, three-session intervention based on motivational interviewing principles (Miller & Rollnick, 2002). While all families in the intervention condition could receive the FCU, families of high-risk youth, rated by teachers as being in the top 1/3 on a 16-item screening measure, were specifically contacted by parent consultants and offered the FCU in 7th and 8th grades. The three sessions consist of an initial interview, where the therapist explores parent concerns and stage of change and motivates involvement in a family assessment. The second session is primarily assessment, where the family engages in a variety of assessment tasks, including an in-home videotaped assessment of a parent-child interaction. The third session involves a feedback session, where the therapist systematically summarizes the results of the assessment using motivational interviewing strategies. An essential objective of the feedback session is to explore potential intervention services that support family management practices. An outcome of the FCU was a collaborative decision between the parent and parent consultant on the indicated services most appropriate for their family. These indicated services included empirically validated interventions, including a behaviorally oriented parent group intervention (Dishion & Andrews, 1995; Forgatch & DeGarmo, 1999), individually based behavior family therapy (Patterson, 1975; Patterson, Reid, Jones, & Conger, 1975), and multisystemic family therapy (Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 1998). Students who left the targeted schools were offered services if they remained in the county.

In the intervention condition, 115 families (23%) elected to receive the FCU, and 88 of these received further intervention services after the FCU. For Cohort 1, 46% of FCUs were completed following the seventh grade family assessment, 53% following the eighth grade family assessment, and 1% following the ninth grade family assessment. For Cohort 2, 93% of FCUs were completed following the seventh grade family assessment, and 7% were completed following the eighth grade family assessment. These families had an average of

8.9 hours of direct contact with the intervention staff over the course of the study ($SD = 9.42$; median = 5.00).

Assessment Procedures

Parents were asked to provide permission for a search of Juvenile court records in every county in which the family had lived during the youth's life, and county courts were contacted to obtain court records for each participant in the study. If parents declined to provide permission for a search of court records, the offspring were asked directly for permission when they reached age 18 (due to the long-term longitudinal nature of the current study, youth were still in contact with the study team at that age). Baseline covariates were gathered from youth self-report. In the spring semester of 6th grade, prior to the initiation of intervention services, student surveys were conducted using an instrument developed and reported by colleagues at the Oregon Research Institute (Metzler, Biglan, Rusby, & Sprague, 2001). Assessments were conducted primarily in the schools. Youth were paid \$20 for completing each assessment.

Measures

Arrest Records—With parental permission, court records were searched for every county where youth reported having resided from birth to age 18. Arrest records included a range of potential offenses, including status violations, misdemeanors, and felony offenses. *Arrest* was defined as a police contact for problem behavior regardless of the type of violation or adjudication. At individual years of the study, arrest records were available for between 891 and 894 participants (89.3% – 89.6%), and for 890 participants across all study waves (89.2%). Over the course of the study, 291 youth (29.2%) were arrested 1 or more times (range = 1 to 50 arrests total). For this study, we included a binary categorical variable summarized across each wave of data-collection, indicating whether the youth had been arrested for any offense during a given year (0 = no, 1 = yes).

Intervention Status—Randomization was coded as 0 = “control,” and 1 = “intervention.”

Child Gender—Child gender was coded as 0 = “male,” and 1 = “female.”

Child Ethnicity—Ethnicity was coded as 0 = “Caucasian,” and 1 = “ethnic minority.”

Father Presence—Youth reports of biological father presence in their primary residence in sixth grade were coded as 0 = “biological father not present,” and 1 = “biological father present.”

Adolescent Problem Behavior in 6th grade—Youth reports of problem behavior at baseline were measured averaging across 6 items, measuring the number of times in the past month teens engaged in the following behaviors: (a) lying to parents, (b) skipping school, (c) staying out all night without permission, (d) stealing, (e) panhandling, and (f) carrying a weapon. Responses were given on a 6-point scale, ranging from 1 (*never*) to 6 (*more than 20 times*), with a mean of 1.41 ($SD = .59$). Good internal reliability was found for this scale (alpha reliability = .74).

Deviant Peer Involvement in 6th Grade—Youth reports of deviant peer involvement in sixth grade were measured averaging across 4 items. Items assessed children's reports of the number of times in the past week they had spent time with peers who (a) get into trouble, (b) fight a lot, (c) take things that don't belong to them, and (d) smoke cigarettes or chew tobacco. Responses ranged from 0 (*never*) to 7 (*more than seven times*). The sample mean = .76 ($SD = 1.11$). Good internal reliability was found for this scale (alpha reliability = .79).

Substance use in 6th grade—The frequency of past month substance use was assessed as the sum of two items from the 6th grade survey. Children reported the number of cigarettes they had smoked in the past month, and the number of drinks of alcohol they had in the past month. Responses to these two items were significantly correlated ($r = .51, p < .05$; Mean = 1.05, SD = 3.45).

Parental monitoring in 6th grade—Youth reports of parental monitoring in sixth grade were measured averaging across 5 items. Children reported how often at least one parent knows: (1) what they are doing when not at home, (2) what they are doing after school, (3) their plans for the coming day, (4) about their interests, activities, and whereabouts, and (5) where they were and what they were doing in the last two days. Response options ranged from (1) “never or almost never,” to (5) “always or almost always” (Mean = 3.99, SD = .96). Good internal consistency was found for this scale (alpha reliability = .86).

Academic records in 6th grade—Analyses included baseline Grade Point Average (GPA) and the number of school absences for 6th grade. GPA was calculated on a scale ranging from 0 to 4, with higher scores reflecting better grades (F = 0, D = 1, C = 2, B = 3, A = 4). When possible, cumulative GPA for the entire academic year was provided by the school district and reflected the average grade across the child’s academic courses. When youth attended multiple schools during the academic year, the cumulative GPA was calculated as the average of the available GPAs, weighted by the proportion of the school year they represented (Mean = 2.69, SD = .89). The total number of school absences across 6th grade was provided by the school district when possible. When youth attended multiple schools during the school year, the number of absences was summed across schools (Mean = 12.50, SD = 11.56).

Analytic Strategy

A latent growth mixture model (Muthen, 2004) was used to examine intervention effects. The goal of the LGMM analysis was to examine hypotheses regarding whether the effect of intervention varied across developmentally-heterogeneous subgroups of youth. Core hypothesis-testing analyses were conducted using a General Growth Mixture Modeling (GGMM) framework, using M-plus 5.01 (Muthen & Muthen, 2008) to examine heterogeneity in developmental trajectories of arrests. All analyses used full information maximum likelihood estimation (Muthen & Muthen, 2008), which provides a method for accommodating missing data by estimating each parameter using all available data for that specific parameter. All models were run with 500 randomly-generated start values, run for 10 iterations, and the best fitting 100 random-start values were run to convergence. Across all models, excellent replication across random start-values was found.

To examine possible differences in intervention effects across groups of youth following heterogeneous developmental trajectories of antisocial behavior, LGMM analyses followed the framework proposed by Muthen and colleagues (2002). The first goal of the growth mixture analysis was to determine the optimal number of classes that best describe the population of developmental trajectories. All models included intercept, slope, and quadratic slope parameters. Intervention effects and other potential covariates were not included in the process of determining the optimal number of classes (see Marsh et al., 2009). Fit indices were obtained for unconditional models with 1 – 6 classes (see Muthen et al., 2002). Models with different numbers of latent classes are not nested, and so a number of model fit-indices were examined to determine the optimal number of latent classes. Relative model-fit indices included the Bayesian Information Criteria (BIC), and the sample-sized adjusted Bayesian Information Criteria (Adj BIC), with lower scores representing better-fitting models. Additionally, two newer statistical tests, the Lo-Mendell-Rubin Likelihood Ratio Test

(LMR-LRT; Lo, Mendell, & Rubin, 2001), and the Bootstrapped Likelihood Ratio Test (BLRT; McLachlan & Peel, 2000), provide statistical comparisons of the fit of a given model with a model of one fewer classes. The LMR-LRT uses an approximation to the likelihood-ratio test distribution, while the BLRT uses a bootstrap approach to estimate the distribution of the likelihood-ratio test. Additional criteria for determining the optimal number of classes are primarily informal, and serve to refine the model-selection process used to assist in the process of determining the number of classes. Among these more informal indices, entropy is a summary measure of the probability of membership in the most-likely class for each individual. There are no specific guidelines for interpreting entropy, but possible values range from 0 to 1.0, and values closer to 1.0 represent better classification. Additionally, the usefulness and interpretability of latent trajectory classes should be considered, with the optimal model yielding a small number of distinct trajectory classes that are large enough to permit further testing, and that yield meaningful results.

To examine the effect of intervention, the best-fitting model was run as a multiple-groups mixture model, with intervention status used as a known-class variable. Intercepts were held equal across intervention and control groups, while slope and quadratic slope parameters were freely estimated. Intercept, slope, and quadratic slope parameters were allowed to vary across estimated classes, although residual variances were equal across classes. Estimated class membership was regressed on the intervention-status grouping variable to examine whether the size of the estimated classes varied across intervention and control groups. A series of nested-model comparisons were conducted using the Wald test to examine the impact of allowing the slope and quadratic slope parameters to vary across intervention and control groups. Following the logic of random assignment, this approach assumes that trajectories observed in the control condition are unaffected by treatment status, and that any differences between trajectories across the control and intervention conditions are attributable to the intervention (see Muthen and colleagues, 2002). The three hypotheses were evaluated against the pattern of mixture-modeling results, in a competing-hypotheses approach. The *severity effect hypothesis* would be supported by finding the strongest intervention effects in the early-onset trajectory class, while the *developmental specificity hypothesis* would be supported by finding the strongest intervention effects in the adolescent-onset class, and the *generalized effects hypothesis* would be supported by finding consistent intervention effects across trajectory groups.

Finally, baseline covariates were examined in relation to latent class membership. Covariates were included as auxiliary variables in Mplus, an approach that avoids the widespread challenge of model misspecification when attempting to incorporate covariates into mixture models, which often results in changing class membership results (see Marsh et al., 2009). In Mplus, auxiliary variables do not directly affect class membership results, and the equality of covariate means across latent classes are tested with a nested modeling approach (equal means versus freely estimated means) using posterior-based multiple imputations with degrees of freedom equal to the number of latent classes minus one.

Results

Descriptive analyses

Baseline covariates and arrest frequencies by youth age are presented in Table 1, separately for control and intervention youth. Correlations between all study variables are shown in Table 2.

LGMM analyses

Determining the optimal number of latent classes—Fit indices used to determine the optimal number of trajectory classes are shown in Table 3. All four fit indices were consistent in leading to the selection of a 3-class model, and the model had reasonable entropy (entropy = .75). The 3-classes from the final unconditional model are shown in Figure 1A. As shown, the classes were consistent with the hypothesized presence of a large group of youth with consistently low probability of arrest across adolescence (77% of sample), and two smaller high-risk groups, including a group of youth exhibiting consistently high likelihood of arrest across adolescence (9.5% of sample), and a group of youth exhibiting an increasing likelihood of arrest across adolescence (13.2% of sample). For simplicity, these three groups are referred to as “Stable-Low,” “Stable-High,” and “Adolescent-Onset” throughout the remainder of the paper.

The Stable-Low group had a non-significant intercept (estimate = 2.69, SE = 2.40), a non-significant slope (estimate = $-.51$, SE = .36), and a non-significant quadratic slope (estimate = .10, SE = .06). In contrast, the Stable-High group had a significant intercept (estimate = 6.06, SE = 2.25), a non-significant slope (estimate = .42, SE = .25), and a significantly negative quadratic slope (estimate = $-.09$, SE = .05), indicating that while this group was at consistently high-risk for arrest, the level of risk attenuated slightly from middle to late adolescence. Finally, the Adolescent-Onset group had a non-significant intercept (estimate = 0.0, SE = 0.0), but a significant linear slope (estimate = 3.05, SE = 1.50), and a significantly negative quadratic slope (estimate = $-.41$, SE = .20), indicating that while this group exhibited an initial increase in the rate of arrest beginning in early adolescence, the growth in risk attenuated in later adolescence.

Examining the effect of intervention within trajectory classes—To examine the effect of intervention on the likelihood of being arrested over time, the three-class model was extended to include intervention assignment as a grouping variable. Latent class membership was regressed on intervention status, testing the difference in class size as a function of intervention status. The linear and quadratic slope parameters in the three latent-classes were also allowed to vary across the intervention and control groups. The significance of the difference in linear and quadratic slope parameters across intervention and control conditions was tested using a nested-model Wald test, which compares the fit of a model allowing the linear and quadratic slopes to vary across intervention and control groups, versus one that constrains these two parameters to be equal. All models permitted the three growth parameters to vary across the three latent-classes. However, the intercepts were held equal across the intervention and control groups within the three classes, as the intercept reflects the baseline arrest likelihood, prior to intervention.

Results from this 2-group (control and intervention) by 3-class (Stable-Low, Stable-High, Adolescent-Onset) model are shown in Figure 1B. The Stable-high class served as the reference class for logistic regression analyses examining whether the size of the three classes varied across the control versus intervention groups. Results indicated that neither the stable-low class (estimate = .39, SE = .37) nor the adolescent-onset group (estimate = -1.00 , SE = .54) varied in size across the intervention and control conditions. To further verify that these class sizes were not significantly different across the intervention and control conditions, Wald-tests compared the fit of models allowing class sizes to vary across intervention and control groups with the fit of models constraining class sizes to be equal across conditions. Both Wald tests were consistent with the regression results, indicating that neither the stable-low class (Wald test [df = 2] = 1.13, n.s.) nor the adolescent onset-class (Wald-test [df = 2] = 3.43, n.s.) were significantly different in size across the intervention and control conditions.

Intercept, slope, and quadratic slope parameters are shown across classes in Table 4. Three nested model comparisons were used to test the effect of intervention on the rate of change in the likelihood of arrest across the three trajectory classes. Nested model tests compared the fit of a model with the linear and quadratic slopes allowed to vary across intervention and control groups with the fit of a model constraining these parameters to be equal across the groups. Wald-tests did not reject the hypotheses that the linear and quadratic slopes in the stable-low (Wald test [$df = 2$] = 2.31, n.s.) and the stable-high classes (Wald test [$df = 2$] = 2.13, n.s.) were equal across the intervention and control groups. However, the nested model comparison for the adolescent-onset group indicated that the linear and quadratic slopes were significantly different across the intervention and control groups (Wald test [$df = 2$] = 7.04, $p < .05$), with the probability of arrests in the intervention group lower than that of the control group.

Probing between-class differences—Baseline correlates were examined in relation to latent class membership. When the overall equality of means test was significant, follow-up paired comparison tests were conducted to examine differences in means across specific classes. Results are shown in Table 5. Ethnicity differed across classes, with youth in the stable-high class disproportionately likely to be of ethnic minority status, relative to youth in the stable-low class. Youth in the stable-high class also differed significantly from youth in either the stable-low or adolescent-onset classes with respect to parental monitoring, peer deviance, antisocial behavior, and school absences. As expected, youth in the stable-high class were at elevated risk in 6th grade on all variables relative to youth in the stable-low or adolescent-onset classes. Finally, 6th grade GPA differed across all classes, with youth in the stable-low class exhibiting the highest GPA, followed by youth in the adolescent-onset class, then youth in the stable-high class. A final model included all of these correlates as predictors of class membership in a multivariate logistic regression framework. In this final model, only 6th grade GPA significantly predicted class membership, controlling for other baseline correlates. Lower GPA significantly predicted membership in the stable-high class (estimate = $-.95$, $SE = .21$, $p < .05$), and the adolescent-onset class (estimate = $-.36$, $SE = .18$, $p < .05$), relative to the stable-low class.

Discussion

The goal of the current study was to examine the effect of the FCU intervention on the likelihood of experiencing arrests from ages 11 to 18 years, and in particular, to examine differences in intervention effects across groups of youth exhibiting distinct developmental trajectories of arrests over adolescence. Consistent with the typological theories of Moffitt (1993) and Patterson (Patterson, Capaldi & Bank, 1991; Patterson & Yoeger, 1993) three classes of youth were identified, exhibiting distinct profiles of changes in the likelihood of being arrested from age 11 through age 18. Most youth in the current sample (approximately 77%) followed a trajectory marked by a consistently low likelihood of arrest across adolescence. A smaller group of youth (approximately 13% of the sample) was at low-risk for arrest in early adolescence, but exhibited escalating risk for arrest from ages 11 to 18. Finally, a small group of youth, consisting of approximately 10% of the sample, was at consistently elevated risk for arrest from early to late adolescence.

A number of demographic and risk factors discriminated these three groups, with most of the differences emerging across the chronically-elevated class relative to either the adolescent-onset or the stable-low classes, particularly with respect to risk factors in sixth grade. Youth following the chronically-elevated trajectory reported significantly less parental monitoring, greater peer deviance, and greater engagement in antisocial behavior in sixth grade relative to youth in either of the other trajectory classes. Chronically-elevated youth also had significantly lower grade point averages and more school absences in 6th

grade relative to youth in the other trajectory classes. Of note, youth in the chronically-elevated class were significantly more likely to be of ethnic minority status than youth in the stable-low class, but not youth in the adolescent-onset class. Taken together, the chronically-elevated class appeared to be marked by a generally-greater severity of risk exposure in 6th grade, compared to youth in the adolescent-onset or chronically-low trajectory classes. It is possible, and indeed likely, that these risk factors were evident prior to 6th grade, and future research following youth from earlier childhood would be helpful to more fully characterize the temporal nature of risk exposure.

There were fewer differences between youth in the adolescent-onset versus stable-low trajectory classes. Youth in the adolescent-onset class exhibited significantly lower grade point averages in 6th grade compared to youth in the stable-low trajectory class. Such academic problems may serve as an early indicator of emerging difficulties for these youth, highlighting the onset of processes associated with engaging in increasingly problematic behavior. It is important to highlight that the current study focused on baseline risk indicators gathered in 6th grade as predictors of class membership, although these risk factors likely reflect processes that evolve over adolescence. As such, the adolescent-onset class may show growing problems in either school performance, family functioning, and peer relationship factors that may drive the increases in arrest-likelihood over time, and these evolving risk processes are not well-captured by the focus on baseline risk exposure. Future research examining evolving risk processes in more detail is needed to better characterize these trajectory classes.

Differences in Intervention Effects across subgroups

As indicated, the core goal of the current analyses was to test three competing hypotheses (i.e. the developmental specificity, severity effect, and general effects hypotheses) regarding the effects of intervention across the three heterogeneous subgroups of youth. The results were consistent with the developmental specificity hypothesis, as the family-focused prevention program in early adolescence reduced arrests specifically for youth following the adolescent-onset trajectory. It is possible that the timing and content of the intervention in the current study, with services initiated in early-adolescence, were best matched to youth prone to developing escalating antisocial behavior across adolescence. Improvements in parenting skills in early adolescence may serve to disrupt the cascade of developmental processes, including reductions in parental knowledge and monitoring of youth behavior, and gravitation into deviant peer groups, that are associated with escalating engagement in antisocial behavior for such youth. Delivery of prevention services in early adolescence, just prior to the entry of these youth into the age of greatest risk for the development of adolescent-onset antisocial behavior, may therefore be particularly important for youth who have not yet fully developed the pattern of risky family and peer relationships that may promote the development of antisocial behavior in early adolescence.

While the FCU was found to reduce the likelihood of arrest for youth exhibiting an adolescent-onset pattern of antisocial behavior, it is important to acknowledge that significant intervention effects were not found for youth in the chronically-elevated or in the stable-low trajectory classes. The lack of significant intervention effects for youth in the stable-low class may simply reflect the generally low likelihood of arrest for such youth, which may make it quite difficult to achieve further reductions due to intervention. In line with the view guiding the multilevel intervention design of the current study, most youth in the current study appeared to be at generally low-risk for antisocial behavior, and may therefore not be in need of concerted prevention efforts in order to avoid juvenile arrest. One benefit of delivering the FCU in the context of a multilevel prevention approach is that such youth are likely to receive only minimal services, thus preserving limited intervention resources for youth in greater need of intervention.

There are two potential explanations for the lack of effects in the chronically-elevated trajectory. First, it is possible that significant intervention effects on antisocial behavior may be found with longer-term follow-up of the current sample into early adulthood. This possibility is supported by the apparent curvilinear trajectory of arrests shown by youth in the chronically-elevated trajectory who were assigned to intervention, with modest increases in arrest likelihood followed by declining arrest likelihood in later adolescence. If these declines persist into early adulthood, it is possible that the effect of intervention may achieve significance at a later point in development than was observed for the effect of intervention in the adolescent-onset trajectory. As we continue to collect data on the current sample, future work will test this possibility.

Second, the current intervention was delivered in early adolescence, and it is possible that youth exhibiting early-onset antisocial behavior may benefit from earlier intervention services. By early adolescence, such youth are likely to have experienced a number of years of disruption, including familial problems, peer relationship difficulties (including rejection and gravitation into deviant peer groups), and academic problems (e.g. Loeber, & Stouthamer-Loeber, 1998; Gottfredson & Hirschi, 1990). As a result of these disruptions, their antisocial behavior may become relatively more intransigent to parents' efforts to change, and therefore more difficult to prevent and treat in early adolescence. It may be important to intervene earlier in the course of development to prevent the accumulation of problems in familial, social, and academic domains. Indeed, research on an early childhood version of the FCU intervention model (see Dishion, Shaw, Connell, Wilson, & Gardner, 2008) has shown that early parenting intervention leads to reduced growth in early behavior problems from ages 2 to 4. Similarly, Olds and colleagues (1998) reported results from a nurse home visitation intervention in early childhood suggesting that the intervention predicted strongest improvements (including decreased likelihood of arrest in adolescence) for youth exhibiting early-onset antisocial behavior.

Future Directions

The current results present a novel evidence that the effects of a family-focused prevention program delivered in early adolescence that is designed to disrupt the development of conduct problems may differ depending upon the developmental profile of the youth. While a number of other prevention or intervention programs for early conduct problems have demonstrated effects on reducing arrest rates (for reviews, see Hahn et al., 2007; Welsh & Farrington, 2007), few other studies have examined the relation between developmental typologies of antisocial behavior and intervention effectiveness. In light of the current results, such work with other prevention programs for adolescent conduct problems appears warranted. While we found evidence supporting the developmental specificity hypothesis, it is important to note that stronger or weaker effects may be found in other prevention programs, depending upon the design features of the interventions. For instance, earlier interventions may exert stronger effects on youth with early-onset problems.

Additionally, several strengths and limitations are important to consider.

One strength of the current study is that the results regarding intervention effects on arrest trajectories are generally in accord with prior results supporting the effect of the FCU on youth reports of substance use over time (Connell, Dishion, & Deater-Deckard, 2006), and of youth-reported antisocial behavior (Connell, Dishion, Yasui, & Kavanagh, 2007). As indicated, self-reports of antisocial behavior and official arrest records have complementary strengths and weaknesses. Because the results of the FCU are supported across both measurement methods, confidence in the overall impact of the intervention approach on reducing youth antisocial behavior is enhanced.

A limitation related to the use of arrest records as an outcome, however, is that there may be substantial variability in the nature of the offenses for which youth were arrested. The current study focused only on a categorical index of whether or not the youth was arrested within a given year, but the arrest records included a variety of offenses, ranging from misdemeanors to felonies. Unfortunately, the numbers of youths with different types of arrests were too small across the years to permit more detailed trajectory-analyses by the nature of the arrests. Future studies would do well to attend to possible differences in intervention effects across types of arrests, although large sample sizes are likely to be necessary.

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References

- Biglan, A.; Brennan, P.A.; Foster, S.L.; Holder, H.D.; Miller, T.L.; Cunningham, P.B., et al. Helping adolescents at risk: Prevention of problem behaviors. New York: Guilford; 2004.
- Botvin GJ, Baker E, Dusenbury L, Tortu S, Botvin EM. Preventing adolescent drug abuse through a multimodal cognitive-behavioral approach: Results of a 3-year study. *Journal of Consulting and Clinical Psychology*. 1990; 58:437–446. [PubMed: 2212181]
- Collins L, Murphy S, Bierman K. A conceptual framework for adaptive preventive interventions. *Prevention Science*. 2004; 5:185–196. [PubMed: 15470938]
- Connell AM, Dishion TJ, Deater-Deckard K. Variable-and person-centered approaches to the analysis of early adolescence substance use: Linking peer, family, and intervention effects with developmental trajectories. *Merrill-Palmer Quarterly*. 2006; 52:421–448.
- Connell A, Dishion TJ, Yasui M, Kavanagh K. An adaptive approach to family intervention: Linking engagement in family-centered intervention to reductions in adolescent problem behavior. *Journal of Consulting and Clinical Psychology*. 2007; 75:568–579. [PubMed: 17663611]
- Chung GH, Flook L, Fuligni AJ. Daily family conflict and emotional distress among adolescents from Latin American, Asian, and European backgrounds. *Developmental Psychology*. 2009; 45:1406–1415. [PubMed: 19702401]
- DiClemente RJ, Windgood GM, Crosby R, Sionean C, Cobb BK, Harrington K, Davies S, Hook EW, Oh MK. Parental monitoring: Association with adolescents' risk behaviors. *Pediatrics*. 2001; 107:1363–1368. [PubMed: 11389258]
- Dishion TJ, Andrews D. Preventing escalations in problem behaviors with high-risk young adolescents: Immediate and 1-year outcomes. *Journal of Consulting and Clinical Psychology*. 1995; 63:538–548. [PubMed: 7673531]
- Dishion, T.J.; Kavanagh, K. Intervening in adolescent problem behavior: A family-centered approach. New York: Guilford; 2003.
- Dishion, T.J.; Patterson, G.R. The development and ecology of antisocial behavior. In: Cicchetti, D.; Cohen, D.J., editors. *Developmental psychopathology*, Vol. 3: Risk, disorder, and adaptation. New York: Wiley; 2006. p. 503-541.
- Dishion TJ, Patterson GR, Stoolmiller M, Skinner ML. Family, school, and behavioral antecedents to early adolescent involvement with antisocial peers. *Developmental Psychology*. 1991; 27:172–180.
- Dishion, T.J.; Stormshak, E. Intervening in children's lives: An ecological, family-centered approach to mental health care. Washington, DC: APA Books; 2007.
- Dishion TJ, Nelson SN, Bullock BM, Kiesner J, Kerr K. Premature adolescent autonomy: Parent disengagement and deviant peer process in amplification of problem behavior. *Journal of Adolescence*. 2004; 27:515–530. Peer and family processes in the development of antisocial and aggressive behavior [Special Issue]. [PubMed: 15475044]

- Dishion, TJ.; Poulin, F.; Skaggs-Medici, N. The ecology of premature autonomy in adolescence: Biological and social influences. In: Kearns, KA.; Contreras, JM.; Neal-Barnett, AM., editors. *Family and peers: Linking two social worlds*. Westport, CT: Praeger Publishers/ Greenwood Publishing Group; 2000. p. 27-45.
- Dishion T, Shaw D, Connell A, Wilson M, Gardner F. Early intervention effects on problem behavior development mediated through improved positive parenting. *Child Development*. 2008; 79:1395–1414. [PubMed: 18826532]
- Elliott, D.; Voss, H. *Delinquency and Dropout*. Lexington, MA: Lexington Books; 1974.
- Farrington D, Jolliffe D, Hawkins J, Catalano R, Hill K, Kosterman R. Comparing delinquency careers in court records and self-reports. *Criminology*. 2003; 41:933–958.
- Forgatch MS, DeGarmo DS. Parenting through change: An effective prevention program for single mothers. *Journal of Consulting and Clinical Psychology*. 1999; 67:711–724. [PubMed: 10535238]
- Gottfredson, MR.; Hirschi, T. *A general theory of crime*. Stanford, CA: Stanford University Press; 1990.
- Hahn R, Fuqua-Whitley D, Wethington H, Lowy J, Crosby A, Fullilove M, et al. Effectiveness of universal school-based programs to prevent violent and aggressive behavior: A systematic review. *American Journal of Preventive Medicine*. 2007; 33:S114–S 219. [PubMed: 17675013]
- Henggeler, SW.; Schoenwald, SK.; Borduin, CM.; Rowland, MD.; Cunningham, PB. *Multisystemic treatment of antisocial behavior in children and adolescents*. New York, NY: Guilford Press; 1998.
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Bethesda, MD: National Institute on Drug Abuse; 2010. *Monitoring the Future national results on adolescent drug use: Overview of key findings, 2009*; p. 77(NIH Publication No. 10-7583)
- Lo Y, Mendell N, Rubin D. Testing the number of components in a normal mixture. *Biometrika*. 2001; 88:767–778.
- Loeber R, Stouthamer-Loeber M. Development of Juvenile Aggression and Violence: Some Common Misconceptions and Controversies. *American Psychologist*. 1998; 53:242–259. [PubMed: 9491750]
- Marsh H, Ludtke O, Robitzsch A, Trautwein U. Latent. Profile analysis of academic self-concept dimensions: Synergy of person- and variable-centered approaches to the internal/external frame of reference models. *Structural Equation Modeling*. 2009; 16:191–225. 2009.
- McLachlan, G.; Peel, D. *Finite mixture models*. New York: John Wiley & Sons; 2000.
- Metzler CW, Biglan A, Rusby JC, Sprague JR. Evaluation of a comprehensive behavior management program to improve school-wide positive behavior support. *Education and Treatment of Children*. 2001; 24:448–479.
- Miller, WR.; Rollnick, S. *Motivational interviewing: Preparing people for change* (2nd ed.). New York, NY: Guilford Press; 2002.
- Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*. 1993; 100:674–701. [PubMed: 8255953]
- Moffitt TE, Caspi A, Harrington H, Milne BJ. Males on the life-course-persistent and adolescence-limited antisocial pathways: Follow-up at age 26 years. *Development and Psychopathology*. 2002; 14:179–207. [PubMed: 11893092]
- Muthén, B. Latent variable analysis: Growth mixture modeling and related techniques for longitudinal data. In: Kaplan, D., editor. *Handbook of quantitative methodology for the social sciences*. Newbury Park, CA: Sage; 2004. p. 345-368.
- Muthén B, Brown CH, Masyn K, Jo B, Khoo ST, Yang CC, Wang CP, Kellam S, Carlin J, Liao J. General growth mixture modeling for randomized preventive interventions. *Biostatistics*. 2002; 3:459–475. [PubMed: 12933592]
- Muthén, LK.; Muthén, BO. *Mplus user's guide*, 5th ed. Los Angeles, CA: Muthén & Muthén; 2008.
- Nock M, Kazdin A, Hiripi E, Kessler R. Prevalence, subtypes, and correlates of DSM-IV conduct disorder in the National Comorbidity Survey Replication. *Psychological Medicine*. 2006; 36:699–710. [PubMed: 16438742]
- Offord, DR.; Boyle, MH.; Racine, YA. The epidemiology of antisocial behavior. In: Pepler, DJ.; Rubin, KH., editors. *The development and treatment of childhood aggression*. Hillsdale, NJ: Erlbaum; 1991. p. 31-45.

- Olds D, Henderson C, Cole R, Eckenrode J, Kitzman H, Luckey D, et al. Long-term effects of nurse home visitation on children's criminal and antisocial behavior: 15-year follow up of a randomized controlled trial. *JAMA*. 1998; 280:1238–1244. [PubMed: 9786373]
- Patterson, GR. A guide for the professional for use with "living with children and families.". Champaign, IL: Research Press; 1975.
- Patterson, GR.; Capaldi, D.; Bank, L. An early starter model for predicting delinquency. In: Pepler, DJ.; Rubin, KH., editors. The development and treatment of childhood aggression. Hillsdale, NJ: Erlbaum; 1991. p. 139-168.
- Patterson GR, Forgatch MS, Yoerger KL, Stoolmiller M. Variables that initiate and maintain an early-onset trajectory for juvenile offending. *Development and Psychopathology*. 1998; 10:531–547. [PubMed: 9741681]
- Patterson, GR.; Reid, JB.; Jones, RR.; Conger, RW. A social learning approach to family intervention. Eugene, OR: Castalia Publishing Co; 1975.
- Patterson, GR.; Reid, JB.; Dishion, TJ. A social learning approach: IV. Antisocial boys. Eugene, OR: Castalia Publishing Co; 1992.
- Patterson, GR.; Yoeger. A developmental model for late-onset delinquency. In: Osgood, DW., editor. Motivation and delinquency. Lincoln: University of Nebraska Press; 1993. p. 119-177.
- Rhoades K. Children's responses to interparental conflict: A meta-analysis of their associations with child adjustment. *Child Development*. 2008; 79:1942–1956. [PubMed: 19037959]
- Segawa E, Ngwe JE, Li Y, Flay BR. Evaluation of the effects of the Aban Aya Youth Project in reducing violence among African American adolescent males using latent class growth mixture modeling techniques. *Evaluation Review*. 2005; 29:128–148. [PubMed: 15731509]
- Skeer M, McCormick MC, Normand ST, Buka SL, Gilman SE. A prospective study of familial conflict, psychological stress, and the development of substance use disorders in adolescence. *Drug and Alcohol Dependence*. 2009; 104:65–72. [PubMed: 19446409]
- Thornberry T, Krohn M. The self-report method for measuring delinquency and crime. *Criminal Justice*. 2000; 4:33–83.
- U.S. Surgeon General. Washington, DC: U.S. Department of Health and Human Services; 2001. Youth violence: A report of the surgeon general.
- Van Dulmen, MHM.; Goney, EA.; Vest, A.; Flannery, DJ. Group based trajectory modeling of externalizing behavior problems from childhood through adulthood: Exploring discrepancies in the empirical findings. In: Savage, J., editor. The Development of Persistent Criminality. Oxford: Oxford University Press; 2009.
- Van Lier PAC, Vuijk P, Crijnen AAM. Understanding mechanisms of change in the development of antisocial behavior: The impact of a universal intervention. *Journal of Abnormal Child Psychology*. 2005; 33:521–535. [PubMed: 16195948]
- Welsh B, Farrington D. Scientific support for early prevention of delinquency and later offending. *Victims and Offenders*. 2007; 2:125–140.

Figure 1.
(A) 3-Class unconditional model; (B) 3-class model across intervention and control groups

Table 1

Descriptives

	Intervention	Control	Comparison
Wave 1 arrested (N (%))	36 (8.2%)	37 (8.1%)	χ^2 (df = 1) = .19, n.s.
Wave 2 arrested (N (%))	38 (8.7%)	37 (8.1%)	χ^2 (df = 1) = .49, n.s.
Wave 3 arrested (N (%))	39 (8.9%)	37 (8.1%)	χ^2 (df = 1) = .20, n.s.
Wave 4 arrested (N (%))	62 (14.1%)	57 (12.5%)	χ^2 (df = 1) = .49, n.s.
Wave 5 arrested (N (%))	61 (14.0%)	60 (13.2%)	χ^2 (df = 1) = .11, n.s.
Wave 6 arrested (N (%))	43 (9.9%)	48 (10.5%)	χ^2 (df = 1) = .12, n.s.
Ethnic minority status (N (%))	289 (58.0%)	286 (57.2%)	χ^2 (df = 1) = .07, n.s.
Female gender (N (%))	232 (48.2%)	240 (46.4%)	χ^2 (df = 1) = .32, n.s.
Biological father in the home (N (%))	278 (55.6%)	307 (61.6%)	χ^2 (df = 1) = 3.76, n.s.
Parental Monitoring (Mean (SD))	3.97 (1.00)	4.03 (.92)	F (1, 978) = .93, n.s.
Deviant Peer Association (Mean (SD))	.74 (1.11)	.77 (1.12)	F (1, 980) = .13, n.s.
Substance Use (Mean (SD))	1.20 (3.69)	.90 (3.19)	F (1, 980) = 1.90, n.s.
Antisocial Behavior (Mean (SD))	1.43 (.63)	1.38 (.55)	F (1, 981) = 2.03, n.s.
Family Conflict (Mean (SD))	.94 (1.04)	.89 (1.01)	F (1, 979) = .58, n.s.
Wave 1 GPA (Mean (SD))	2.74 (.89)	2.65 (.89)	F (1, 989) = 2.51, n.s.
Wave 1 school absences (Mean (SD))	11.86 (11.11)	13.14 (11.97)	F (1, 894) = 2.73, n.s.

Table 2

Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Wave 1 arrested	--																
2. Wave 2 arrested	.34*	--															
3. Wave 3 arrested	.26*	.33*	--														
4. Wave 4 arrested	.25*	.31*	.33*	--													
5. Wave 5 arrested	.26*	.29*	.34*	.40*	--												
6. Wave 6 arrested	.17*	.15*	.21*	.32*	.26*	--											
7. Intervention status	.00	.01	.02	.02	.01	-.01	--										
8. Ethnic minority status	.11*	.11*	.12*	.12*	.07*	.10*	-.01	--									
9. Female gender	-.06	.00	-.02	-.04	-.10*	-.10*	-.02	.02	--								
10. Biological father in the home	-.10*	-.06	-.05	-.05	-.05	-.08*	-.06	-.17*	-.06	--							
11. Parental Monitoring	-.17*	-.11*	-.12*	-.15*	-.17*	-.12*	-.03	-.14*	.10*	.12*	--						
12. Deviant Peer Association	.25*	.14*	.12*	.15*	.15*	.13*	-.01	.15*	-.10*	-.04	-.31*	--					
13. Substance Use	.17*	.08*	.02	.06	.05	.03	.04	.11*	.00	.00	-.26*	.36*	--				
14. Antisocial Behavior	.29*	.14*	.14*	.21*	.21*	.12*	.05	.21*	-.13*	-.10*	-.47*	.61*	.55*	--			
15. Family Conflict	.12*	.06	.11*	.08*	.04	.05	.02	.16*	.01	-.08*	-.24*	.46*	.28*	.41*	--		
16. Wave 1 GPA	-.21*	-.25*	-.22*	-.25*	-.21*	-.20*	.05	-.32*	.19*	.26*	.33*	-.29*	-.18*	-.37*	-.24*	--	
17. Wave 1 school absences	.23*	.20*	.17*	.13*	.16*	.12*	-.06	.14*	-.01	-.19*	-.18*	.23*	.16*	.24*	.14*	-.48*	--

* $p < .05$

Table 3

Fit indices for determining optimal number of latent classes (unconditional model)

Number of Classes	# of Free parameters	BIC	Adj BIC	LMR-LRT	B-LRT
1	3	3570.20	3560.67	N/A	N/A
2	7	3137.16	3114.93	443.93, $p < .05$	460.25, $p < .05$
3	11	3133.63	3098.69	29.66, $p < .05$	30.75, $p < .05$
4	15	3155.95	3108.31	4.27, $n.s.$	4.89, $n.s.$
5	19	3176.46	3116.12	5.29, $n.s.$	, $n.s.$
6	23	3201.54	3128.50	2.06, $n.s.$	, $n.s.$

Notes: BIC = Bayesian Information Criteria; Adj BIC = Sample size adjusted Bayesian Information Criteria; LMR-LRT = Lo Mendel Rubin Likelihood Ratio Test; B-LRT = Bootstrapped Likelihood Ratio Test. Bolded numbers denote best fitting model according to that criteria.

Table 4

Results for 3-class model with intervention status as grouping variable

Class (N, % of group)	Intercept	Linear Slope	Quadratic Slope
Stable-Low			
• Control (376, 41.7%)	−1.62 (.42) *	−.55 (.31)	.12 (.06)
• Intervention (277, 30.7%)	−1.62 (.42) *	−.91 (.83)	.11 (.12)
Adolescent Onset			
• Control (41, 4.6%)	−4.13 (2.17)	3.46 (1.52) *	−.50 (.21) *
• Intervention (123, 13.6%)	−4.13 (2.17)	2.42 (1.43)	−3.12 (.19)
Stable-High			
• Control (40, 4.5%)	1.73 (.00)	.07 (.37)	−.02 (.08)
• Intervention (44, 4.9%)	1.73 (.00)	.62 (.28) *	−.14 (.06) *

*
 $p < .05$

Table 5

Univariate differences in covariate status across 3-classes.

Covariate	Equality of Means test (Chi-square, df = 2)	Adolescent Onset	Stable-low	Stable-High Mean (SE)
Ethnicity (% Minority)	11.05, $p < .05$	.63 (.05)	.55 (.02) _a	.71 (.05) _a
Gender (% Female)	4.21, n.s.	.42 (.05)	.49 (.02)	.41 (.06)
Biological Father presence in home	2.99, n.s.	.55 (.06)	.60 (.02)	.52 (.06)
Parental monitoring (6 th grade)	20.92, $p < .05$	3.92 (.11) _a	4.07 (.04) _b	3.53 (.13) _{a, b}
Peer deviance (6 th grade)	23.89, $p < .05$	.79 (.12) _a	.66 (.04) _b	1.50 (.18) _{a, b}
Substance use (6 th grade)	5.24, n.s.	.00 (.07)	.00 (.03)	.33 (.16)
Antisocial Behavior (6 th grade)	23.62, $p < .05$	1.39 (.06) _a	1.31 (.02) _b	1.71 (.09) _{a, b}
Grade Point Average (6 th grade)	75.88, $p < .05$	2.54 (.09) _{a, b}	2.81 (.03) _{a, c}	1.98 (.10) _{b, c}
School Absences (6 th grade)	23.59, $p < .05$	12.29 (1.23) _a	11.54 (.42) _b	20.96 (1.99) _{a, b}

Note: Matching subscripts denote significant differences.