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Developmental Epidemiological Courses Leading to Antisocial Personality Disorder and Violent and Criminal Behavior: Effects by Young Adulthood of a Universal Preventive Intervention in First- and Second-Grade Classrooms

Hanno Petras,

University of Maryland College Park, Department of Criminology and Criminal Justice, College Park, MD 20742 USA, Phone: 301-405-4716, Email: hpetras@crim.umd.edu

Sheppard G. Kellam,

American Institutes for Research, Baltimore, MD 21230 USA

C. Hendricks Brown,

Department of Epidemiology and Biostatistics, College of Public Health, University of South Florida, Tampa, FL 33612 USA

Bengt O. Muthén,

Graduate School of Education and Information Studies, UCLA, Los Angeles CA 90095-1521 USA

Nicholas S. Ialongo, and

Johns Hopkins University, Bloomberg School of Public Health, Baltimore, MD 21205 USA

Jeanne M. Poduska

American Institutes for Research, Baltimore, MD 21230 USA

Abstract

Background—Antisocial personality disorder (ASPD), violent and criminal behavior, and drug abuse disorders share the common antecedent of early aggressive, disruptive behavior. In the 1985–1986 school year teachers implemented the Good Behavior Game (GBG), a classroom behavior management strategy targeting aggressive, disruptive behavior and socializing children to the student role. From first grade through middle school the developmental trajectories of 2,311 students from 19 Baltimore City Public Schools were examined. This article reports the GBG impact on these trajectories and ASPD and violent and criminal behavior by age 19–21 among the selected 768 students.

Methods—In five urban poor to lower-middle class predominately African American areas, three to four schools were matched and within each set randomly assigned to one of three conditions: 1) the GBG, 2) a program directed at reading achievement, or 3) the standard program. Classrooms and teachers were randomly assigned to intervention or control. Measures at 19–21 included self reports and juvenile court and adult incarceration records. Intervention impact was assessed via General Growth Mixture Modeling based on repeated measures of aggressive, disruptive behavior.

Correspondence to: Hanno Petras.

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Results—Three trajectories of aggressive, disruptive behavior were identified. By young adulthood, there was significant reduction in rates of ASPD and violent and criminal behavior among GBG males in the high aggressive, disruptive trajectory.

Replication—A replication was implemented with the next cohort of first-grade children using the same teachers during the following school year, but with diminished mentoring and monitoring of teachers. The results showed generally non-significant effects in the same direction.

Keywords

Good Behavior Game; developmental epidemiology; growth mixture modeling; universal prevention; classroom behavior management; aggressive; disruptive behavior; Antisocial Personality Disorder; violence and criminal behavior

1. INTRODUCTION

Antisocial personality disorder (ASPD) is one of the more common serious mental health problems presently faced in the U.S. (Kessler et al., 1994; Moran, 1999; Turner and Gil, 2002). It is associated with both economic costs and great suffering for individuals (e.g., involvement with the legal system, co-occurring substance use and other mental health problems) families (e.g., broken homes, non-support), the community (e.g., victims, crime and aggression) and the state (e.g., welfare, imprisonment) (Britt, 2000; Capaldi and Stoolmiller, 1999; Cohen and Miller, 1998; Krueger et al., 1998; Lambert et al., 2001; Loeber et al., 2000; New and Berliner, 2000; Robinson and Keithley, 2000). ASPD is frequently comorbid with virtually every drug abuse disorder (Compton et al., 2005), and it increases the morbidity and complicates the treatment for substance use disorders (Westermeyer and Thuras, 2005). Both ASPD and drug abuse disorders are also commonly associated with serious violent and criminal behavior. Importantly, heavy use of alcohol and other drugs appears to increase risk for both commission and victimization of violent acts (Chaiken and Chaiken, 1990). In addition, Fazel and Danesh (2002) report in a review of serious mental disorders in special populations that close to half (47%) of imprisoned individuals qualify for an Antisocial Personality Disorder diagnosis. Importantly, all of the above mentioned outcomes associated with ASPD, drug abuse, and violence require high levels of service use (Poduska et al., in press, this issue; Webster-Stratton and Taylor, 2001).

Given these adverse effects and the difficulty in treating ASPD and its co-occurring antisocial outcomes once they are established (Reid and Thorne, 2006), there has been a growing consensus among social scientists and policy makers that early preventive interventions targeting the antecedents of antisocial behavior are preferable to treatment approaches (Bennett et al., 1998; Bennett et al., 1999; Mrazek and Haggerty, 1994; Offord and Bennett, 1997; Reiss and Price, 1996). In light of this strong evidence regarding the continuity between childhood and adult antisocial behavior, this preventive approach is especially pertinent (Farrington, 1995; Robins, 1966). Indeed, decades of research suggest that prevention is the most effective strategy available for reducing youth antisocial and violent behavior (Dodge, 1999; Hawkins et al., 2000b; Satcher, 2001).

Early aggressive, disruptive behavior is widely recognized as an antecedent of later ASPD and violent and criminal behavior as well as drug abuse and school dropout (Dishion et al., 1996; Ensminger et al., 1983; Ensminger and Slusarcick, 1992; Farrington and Gunn, 1985; Hawkins et al., 2000a; Kellam et al., 1983; Kellam et al., 1991; Kellam et al., 1994; Kellam et al., in press, this issue; Kershaw, 1992; McCord and Ensminger, 1997; Robins, 1978; Sameroff, 1994; Schwartzman et al., 1985). Given the importance of early aggressive, disruptive behavior as a precursor for an array of later problems, a number of universal (i.e., directed at the entire

population) classroom preventive intervention trials have targeted this antecedent as a means of preventing later antisocial behavior and drug abuse. Examples of rigorous trials incorporating random assignment include The Seattle Social Development Project (Hawkins and Weiss, 1985), Linking the Interests of Families and Teachers (Eddy et al., 2000; Reid et al., 1999), Promoting Alternative Thinking Strategies (Greenberg and Kusche, 1998), Second Step (Grossman et al., 1997), Bullying Prevention (Olweus, 1991; Olweus, 1992; Olweus and Alsaker, 1991; Smith and Sharp, 1994), and the three generations of developmental epidemiology-based field trials involving the Good Behavior Game (GBG) in the Baltimore City Public School System (BCPSS) (Kellam et al, in press, this issue). These randomized trials are particularly important and powerful in determining the efficacy of interventions such as the GBG and in testing the etiologic model upon which the GBG is based (Brown and Liao, 1999; Brown et al., in press, this issue; Farrington and Welsh, 2005; Kellam and Langevin, 2003; Kellam and Rebok, 1992; Kellam et al., 1999).

The Baltimore trials have a study design with two unique features that make it well suited for the study of long-term outcomes. First, study participants were followed into young adulthood, which gives these trials the capacity to inform the field about the long-term impact of the GBG on a range of outcomes including antisocial and violent and criminal behavior as the subjects move into adulthood. Although a number of the intervention programs targeting early aggressive, disruptive behavior cited above have demonstrated short-term impact, the Baltimore prevention intervention research is part of only a small set of programs that followed study participants into the young adult years (for a comprehensive review of school based violence prevention programs, see Gottfredson, 2001; Gottfredson et al., 2002). Second, the Baltimore trials are part of only a few to employ a randomized block design to disentangle the effects of the school from the effects of the intervention itself (for more detail, see Kellam et al., in press, this issue).

The GBG is a team-based behavior management strategy that promotes appropriate classroom behavior by rewarding teams of students that do not exceed maladaptive behavior standards (Barrish et al., 1969; Dolan et al., 1993; Kellam et al., 1994). The goal is to encourage students to manage their behavior through group reinforcement and mutual self-interest. Previous research has documented the effectiveness of the GBG in reducing the level and development of aggressive, disruptive behavior, particularly among aggressive, disruptive males (Brown, 1993; Dolan et al., 1993; Kellam and Anthony, 1998; Kellam et al., 1994; Kellam et al., 1998; Muthén et al., 2002; Rebok et al., 1996).

1.1 The Life Course/Social Field Theory and Developmental Epidemiology

Life course/social field theory has guided the use of preventive interventions aimed at early antecedent of later problem outcomes as well as the conceptualization of normal and pathologic development in the Baltimore trials (Kellam et al., 1975; Kellam and Rebok, 1992). Central to life course/social field theory is the concept that individuals face specific social task demands in various social fields over the major stages of the life course. The specific social task demands the individual confronts through each stage of life are defined by individuals in each social field, whom we have termed the *natural rater(s)*. The natural rater not only defines the tasks but also rates the adequacy of performance of the individual in that social field. Parents function as natural raters in the family, peers in the peer group, teachers in the classroom, and supervisors in the workplace. This interactive process of demand and response is termed *social adaptation*, and the judgment of adequacy of the individual's performance by natural raters is labeled *social adaptational status* (Kellam et al., 1975).

In line with the organizational approach to development (Cicchetti and Schneider-Rosen, 1984), normal development is viewed within the life course/social field theory as marked by the integration of earlier competencies into later modes of function, with the earlier

competencies remaining accessible, ready to be activated and utilized during times of stress, crisis, novelty, and creativity. It follows then that early successful social adaptation in the face of prominent developmental challenges tends to promote later adaptation as the individual traverses the life course and encounters new and different social task demands across the main social fields (Cicchetti and Schneider-Rosen, 1984).

A critical developmental challenge early in the life course is entrance into the classroom social field, where the child is confronted with the teacher's demands for academic achievement, compliance, attention, and participation in classroom and peer activities. The transition into middle school and early adolescence provides another set of developmental tasks and challenges, which center on separation and individuation from parents and the growing demands of the family, classroom, and peer group social fields. Life course/social field theory posits that success in meeting these evolving and new task demands in middle school will depend, in part, on successful adaptation to the earlier developmental challenges encountered during the transition to elementary school. This key developmental principle, supported by a growing empirical literature, forms the basis for the focus in the Baltimore trials on successful adaptation to first grade as a means of improving social adaptational status over the life course.

1.2 Developmental Pathways of Aggressive, Disruptive Behavior

Several researchers have worked on theoretical and empirical modeling of aggressive, disruptive behavior development (Loeber et al., 1998; Moffitt, 1993; Moffitt et al., 1996, Moffitt et al., 2002; Nagin and Tremblay, 1999; Nagin et al., 1995; Patterson et al., 1992; Patterson et al., 1998). Despite differences in terminology and emphasis, each model identifies two to five distinct groups of antisocial youth with different behavioral patterns, risk factors, and prognoses for desistance from antisocial behavior as adults. Each model proposes one to two chronic groups whose early and persistent aggressive, disruptive behavior is likely to be related to a biological or genetic vulnerability that is exacerbated by poor parenting and early school failure (i.e., the *early starters* [Patterson, 1982], and *life course persistent groups* [Loeber and Stouthamer-Loeber, 1998; Moffitt, 1993]). Each model also identifies one to two less severe groups whose antisocial behavior starts later, is less aggressive, disruptive, more sporadic, and stems from later socialization experiences such as deviant peer affiliations in early adolescence (i.e., the *late starters* [Patterson et al., 1992], *adolescent-limited* [Moffitt, 1993], and *limited duration pathways* [Loeber and Stouthamer-Loeber, 1998]). Also implicit in each model is the assumption that there is at least one other group of youth who do not exhibit problems with antisocial behaviors. These models have helped to shift the study of youth antisocial behavior away from a variable-centered focus on describing broad predictors of behavior toward a more person-centered focus emphasizing individual differences in development (Magnusson, 1998). However, the empirical literature has focused primarily on the development of boys' aggression and has given little attention to the role of early aggression and other disruptive behaviors in the development of girls' later antisocial behavior (Keenan and Shaw, 1997; Silverthorn and Frick, 1999). Although some empirical studies examining pathways of antisocial behavior development among girls are starting to emerge in the literature (e.g., Broidy et al., 2003; Cote et al., 2001; Schaeffer et al., 2006), research regarding gender differences in these pathways is limited.

1.3 Intervention Theory

The mechanisms by which the GBG intervention is hypothesized to reduce the risk for later antisocial behavior is consistent with the integration of the life course/social field theory and the *early starter* and *late starter* models of the development of antisocial behavior identified by Patterson et al. (1992). The *early starter* models of antisocial behavior build upon the theory of coercive family process developed by Patterson in 1982. In the toddler years, parents' failure to effectively punish noncompliant and aggressive, disruptive behavior comprises the first step

in a process which serves to train the child to become progressively more coercive and antisocial. In the classroom setting, such children prove difficult for teachers, peers, or other natural raters to teach appropriate forms of social interaction and problem solving. Moreover, their coercive style may be further reinforced in the presence of inconsistent and punitive teacher disciplinary practices. Ultimately parents, teachers, and well-adjusted peers reject the coercive child, which results in the child's failure to develop academic, social, and occupational survival skills. Patterson et al. (1992) argues that a lack of adequate monitoring by parents in early adolescence and rejection by teachers and mainstream peers precipitates a child to drift into a deviant peer group, wherein a wide array of antisocial and delinquent behavior, including alcohol and drug use, may be reinforced, along with a rejection of mainstream norms and mores (Brook et al., 1989; Jessor and Jessor, 1978; Patterson et al., 1992).

A second commonly identified trajectory of aggressive, disruptive behavior involves late onset (i.e., in the pre- or early adolescent years) antisocial behavior and substance use. Patterson et al. (1992) argues that *late starters* typically exhibit marginal levels of social adaptation in the elementary school years in terms of aggressive, disruptive behavior, and their caregivers' discipline and monitoring skills may be marginal at best. Consequently, these children are quite vulnerable to disruptions in parental monitoring and supervision, which may lead to rapid escalation of behavior and/or academic achievement problems. More specifically, Patterson et al. (1992) hypothesizes that the escalation in antisocial behavior seen in these *late starters* in early adolescence is the product of perturbations in parental monitoring and supervision brought on by serious family adversities that first surface in the middle school years. The disruptors may include a divorce, serious financial distress associated with the loss of a job, and/or the late onset of parental psychiatric distress or substance use, abuse, and/or dependence. Like the *early starters*, *late starters* may be rejected by their mainstream natural raters, as a result of their coercive and antisocial behavior. Their limited social skills and the rejection by their mainstream natural raters can precipitate an individual to drift into a deviant peer group, where antisocial behavior, substance use, and rejection of mainstream social values, mores, and institutions is reinforced.

In keeping with life course/social field theory and its integration with Patterson et al.'s (1992) *early starter* developmental model, the Baltimore GBG intervention is hypothesized to reduce the early aggressive, disruptive behavior and its distal correlates by improving teachers' disciplinary practices. This improved classroom management will then result in a reduction of early aggressive, disruptive and coercive behavior at the individual and the classroom level, and as a result there will be fewer opportunities for youth to learn inappropriate behavior through modeling of their classmates' aggressive, disruptive behavior. The youth will then be at decreased risk of being rejected by parents/caregivers, teachers, peers, and other natural raters and thus less likely to drift into a deviant peer group, where antisocial behavior and substance use may be reinforced and mainstream norms and mores rejected. Consequently, the youth will then be at reduced risk of serious antisocial behavior, violent and criminal behavior, and drug abuse in adolescence and adulthood.

With respect to the *late starter* model and mechanisms of GBG intervention impact, it is hypothesized that youth in the GBG classrooms will maintain higher levels of social adaptation in the face of disruptions in parent supervision, discipline, and reinforcement in the pre- to early adolescent years than their standard setting counterparts. As a result, these youth will be less likely to drift into a deviant peer group and engage in serious antisocial behavior and substance abuse in adolescence and adulthood. Finally, those youth who continually exhibited minimal aggressive, disruptive behavior have shown successful social adaptation and therefore are hypothesized not to be influenced by other students' aggressive, disruptive behavior.

1.4 The Present Paper

In this paper, we report on the impact of the GBG on the course of aggressive, disruptive behavior from first to seventh grade and on the distal outcomes of ASPD and violent and criminal behavior in young adulthood (age 19–21) for both males and females from the first generation of the Baltimore trials. This is an extension of previously published reports (Dolan et al., 1993; Kellam et al., 1994), which documented the more proximal or shorter term, impact of the intervention. In Kellam et al. (in press, this issue) the impact of the GBG is briefly reported, taking into account baseline aggressive, disruptive behavior in the fall of first grade. In this paper we examine the developmental trajectories and variation in impact of the GBG along with extending the young adult outcomes to include violent and criminal behavior. Importantly, we compare the results obtained using the data from the effectiveness trial (i.e., Cohort 1) to the data from the sustainability trial (i.e., Cohort 2).

In accord with the existing evidence regarding the development of aggressive, disruptive behavior, we hypothesize that there will be three developmental trajectories of aggressive, disruptive behavior with varying risk for later antisocial and violent and criminal behavior (Muthén et al., 2002; Petras et al., 2004; Schaeffer et al., 2003; Schaeffer et al., 2006). We hypothesize that children, especially males who are highly aggressive, disruptive early in elementary school and who remain aggressive, disruptive over elementary and middle school years (i.e., a *persistent high* class), will be at greater risk for later ASPD and violent and criminal behavior than their less aggressive, disruptive counterparts. We also hypothesize a second group of children who enter school with lower levels of aggressive, disruptive behavior and then escalate by the end of elementary school/early middle school to a higher level of aggressive, disruptive behavior (i.e., an *escalating medium* class). We hypothesize this group will also be at an elevated risk for later ASPD and violent and criminal behavior compared with their less aggressive, disruptive counterparts. Lastly, we hypothesize a third group of children who display a consistent low level of aggressive, disruptive behavior from first to seventh grade (i.e., a *stable low* group) and who will show the lowest level of risk for later ASPD and violent and criminal behavior. In addition, we hypothesize a lesser GBG impact for females given their overall lower levels of aggressive, disruptive behavior (Ensminger et al., 1983; Kellam et al., 1983; Schaeffer et al., 2006; Wilcox et al., in press, this issue).

2. METHODS

2.1 Study Design

Study participants were first grade students from 19 Baltimore City Public Schools who were initially assessed in the fall of first grade as part of a randomized field trial of two classroom-based interventions targeting either early learning with Mastery Learning (ML) or aggressive, disruptive behavior with the GBG. The schools were drawn from five geographic areas within the eastern half of the city that were defined by census tract data and vital statistics obtained from the Baltimore City Planning Office. The areas varied by ethnicity, type of housing, family structure, and income, unemployment, violent crime, suicide, and school drop out rates. Three or four schools were matched within each of the five areas.

Special education and gifted classrooms were excluded from the pool of potential classrooms in light of the fact that the preventive interventions targeted regular or mainstream classrooms. In schools with three or fewer regular first grade classrooms, all classrooms participated, and in larger schools, three first grade classrooms were randomly selected for inclusion in the study.

Of the three or four matched schools selected in each of the five urban areas, we randomly assigned schools to serve as 1) schools in which the GBG would be tested independently of ML, 2) schools in which ML would be tested independently of the GBG, or 3) schools that

would serve as external control schools in which neither of these interventions would be implemented, rather the standard program would be in place. These external control schools offered protection against the possibility of between-classroom contagion that might occur between intervention classroom and internal control classrooms within the same school. Following the school assignment, children were assigned to classrooms in a manner designed to create comparability across classrooms within each school. Then, first grade classrooms within the GBG and ML schools were randomly assigned to either the intervention or internal control condition. Internal control classrooms were used to hold constant school building, family, and/or community differences such as the effect of the principal on the school environment, for example. Internal control classrooms composed the control group for the present study (for more detail see Kellam et al., in press, this issue).

2.2 The Population Samples

Two cohorts with a total of 2,311 students were originally available within the 19 participating Baltimore City Public Schools in first grade from recruitment in the 1985–1986 and 1986–1987 school years. We describe the two populations together here but remind the reader that the effectiveness trial involved the first cohort, while the second cohort was a replication with less mentoring and monitoring, thus considered to be a sustainability trial (see Kellam et al., in press, this issue). Of the population, 1,531 (66.2%) were assigned to intervention conditions not pertinent to this paper (i.e., external control, internal ML control, and ML classrooms) and were not included in this analyses. In addition, twelve students did not have valid teacher ratings of aggressive, disruptive behavior and were consequently excluded from the analysis.

Of the remaining 768 participants, 403 (52.5%) were in the first cohort and 365 (47.5%) in the second cohort (see Table 1). Gender was equally distributed in both cohorts and the majority of the sample was African American (see Table 1). There was a significant difference between the cohorts on participation in the free or reduced-price lunch program, a proxy for family income; the percentage of students in Cohort 1 receiving a free or reduced-price lunch was 51.9%, while in Cohort 2 it was 73.2% ($\chi^2=18.855$, $df=1$, $p<0.001$). Upon entrance into first grade, youth in the first cohort ranged in age from 5.08 years to 9.42 years with a mean age of 6.4 years, while youth in the second cohort were significantly younger with ages ranging from 5.56 years to 7.93 years with a mean age of 6.3 ($p<0.011$). Teacher ratings of aggressive, disruptive behavior in the fall of first grade were slightly lower for Cohort 2 than they were for Cohort 1 ($p<0.01$). Overall, no significant cohort differences were found in respect to the students' ethnic background and intervention condition. For the age 19–21 young adult follow-up, 76.2 % of the Cohort 1 and 77.3% of the Cohort 2 youth contributed to the data used in this report.

2.2.1 Assessment Design—For Cohort 1, teacher reports of child aggressive, disruptive behavior were gathered twice a year in first and second grades, once a year during third through seventh grade, and at the age 19–21 follow-up assessments. The assessments in the fall of first grade were carried out prior to the initiation of the interventions. Data gathered in the first grade assessments consisted of teacher reports of child aggressive, disruptive behavior and intervention assignment. At ages 19–21, a follow-up structured clinical interview was used to ascertain whether the participant met criteria for Antisocial Personality Disorder. In addition, records of violent and criminal behavior were obtained at the time of the young adult follow-up interview and repeated yearly searches were conducted thereafter. The assessment design was identical for Cohort 2 except data was not gathered in the fall of second grade because of funding issues.

2.3 Measures

2.3.1 Aggressive, Disruptive Behavior—Teacher ratings of aggressive, disruptive behavior were obtained using the Teacher Observation of Classroom Adaptation-Revised (TOCA-R; Werthamer-Larsson et al., 1991). The TOCA-R is a structured interview with the teacher administered by a trained assessor. Teachers respond to 36 items pertaining to each child's adaptation to classroom task demands over the last three weeks. The level of adaptation is rated by teachers on a six-point frequency scale (1=almost never through 6=almost always). We used the authority acceptance subscale which includes the following items: (1) breaks rules, (2) harms others and property, (3) breaks things, (4) takes others property, (5) fights, (6) lies, (7) trouble accepting authority, (8) yells at others, (9) stubborn, and (10) teases classmates. The internal consistency reliability coefficients for the aggressive, disruptive behaviors subscale ranged from 0.92 to 0.94 over grades one through seven, or ages eight to thirteen. The one-year test-retest intraclass reliability coefficients ranged from 0.65 to 0.79 over grades two to three, three to four, four to five, five to six, and six to seven. Teacher reports of aggressive, disruptive behavior have also been found to have the highest level of agreement with students' self reports, and have been shown to be equivalent or superior in the level of agreement between parent and student self reports of problem behavior (Lochman et al., 1995; Loeber et al., 1984). Scores on the aggressive, disruptive behavior subscale were significantly related to the incidence of school suspensions within each year from grades one to seven, i.e., the higher the score of aggressive, disruptive behavior, the greater likelihood of being suspended from school that year.

2.3.2 Antisocial Personality Disorder Diagnoses—As part of a larger follow-up telephone interview at age 19–21, a scale was developed and administered to determine whether the participant met Diagnostic and Statistical Manual-IV (American Psychiatric Association, 1994) criteria for Antisocial Personality Disorder (ASPD) including a history of Conduct Disorder. The questions comprising the scale were keyed to DSM-IV criteria and the diagnoses derived in accord with those criteria (Turner and Gil, 2002). To reduce the likelihood of socially desirable responses, participants were asked to maintain their own count of “yes” responses as opposed to responding “yes” or “no” to the interviewer's questions, and to insure against respondents losing track of the count, they were asked to have a pencil and sheet of paper available to mark down the number of “yes” responses. In addition, the questions were divided into three sections and the count of “yes” responses was obtained by the interviewer at the end of each section.

2.3.3 Violent and Criminal Behavior—Juvenile court and adult incarceration records were obtained at the time of the young adult follow-up interview (i.e., between age 19 and 21) and repeated yearly searches were conducted thereafter. For this paper we use information from the search in February of 2006. A juvenile court record for a violent crime (e.g., assault, rape) was obtained from local records in Baltimore City and the five municipalities surrounding the city because 90% of the sample lived in one of these jurisdictions at the time of the follow-up. The use of the juvenile data was supported in writing by the Chief Judge of the Baltimore Juvenile Court and was included in the Hopkins JHSPH IRB.

Records of incarceration for an offense classified as a felony in the Uniform Crime Reports system (i.e., murder, non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, and motor vehicle theft) was used as an indicator of violent and criminal behavior as an adult. These data were obtained from the Maryland Department of Correction and are considered public record. The juvenile court records and adult incarceration records were used to characterize an individual as having a record of violent and criminal behavior.

By integrating information about the ASPD diagnosis as well as records of violent and criminal behavior, four categories were established: both an ASPD diagnosis and a record of violent and criminal behavior, only a diagnosis of ASPD, only a record of violent and criminal behavior, or neither outcome by young adulthood. Among the 269 males with data on this outcome, 15.6% had both outcomes, 17.5% met criteria for ASPD only, 11.2% had a record of violent and criminal behavior only, and the remaining 55.8% had neither outcome. Among females with data, 2.5% had both outcomes, 8.4% had a diagnosis of ASPD, 3.8% had a record of violent and criminal behavior only, and 85.3% had neither outcome.

In terms of construct validity, males with an ASPD diagnosis were three times more likely than those who did not to have a record of violent and criminal behavior (ASPD, odds ratio (OR): 3.40, 95% CI: 2.38–4.83). In comparison, females diagnosed with ASPD were four times more likely to have a record of violent and criminal behavior (OR=4.08; 95% CI=2.32/7.19).

2.4 Analytic Plan

We used general growth mixture modeling (GGMM) as described in Muthén et al. (2002) and Muthén (2004) to identify distinct developmental trajectories of aggressive, disruptive behavior. GGMM clusters growth curves into a small number of classes, each of which can be examined independently for intervention impact. GGMM additionally offers the opportunity to examine how the probability of a distal outcome (e.g., ASPD and violent and criminal behavior) depends on class and intervention. Each class of curves in GGMM provides an interpretable pattern of growth based on its mean growth curve.

We first fit growth mixture models to the nine time points (eight time points in Cohort 2) at which teachers rated students' level of aggressive, disruptive behavior, refining the fit using BIC (Bayesian Information Criterion) to compare alternative models. We then evaluated the relationship between class membership and the distal outcomes as well as the impact of the intervention on the class specific slopes and on the distal outcomes for females and males in Cohort 1 separately. The analysis was replicated for Cohort 2. In the models we report log likelihoods and numbers of parameters. Because these models fit both continuous and discrete data, the log likelihoods themselves are not meaningful, but differences in log likelihoods from nested models (i.e., likelihood ratio test) do result in appropriate chi-square tests, which we report as χ^2 along with their degrees of freedom. We also tested for the class-specific impact of the GBG using Wald-type tests that compared the appropriate coefficient to its standard error. In the few cases where these tests functioned poorly—for example, a log odds ratio with a cell probability of zero—we used the above mentioned likelihood ratio tests. Testing classes for intervention impact is similar to the process of examining mediation (Baron and Kenny, 1986); however, a straightforward test for mediation in the growth mixture-modeling framework is not readily available nor is the procedure appropriately documented in the published literature. The goal in growth mixture modeling is to derive classes with limited within-class variance in terms of the growth parameters (intercept and slope); therefore, if one wished to test for mediation using the within-class slope as a mediator, intervention condition as the independent variable, and antisocial personality disorder as the outcome, for example, slope variance would be too small to provide an adequately powered test of mediation. In the absence of an established method to test for mediation, we use a parallel procedure; the distal outcome in growth mixture modeling is regressed on the categorical variable representing class membership and not the within class growth parameters (intercept and slope). The use of the likelihood ratio test to compare competing models can be best described as having comparability to the Baron and Kenny (1986) method.

The proximal impact of the GBG intervention on growth of aggressive, disruptive behavior was assessed by examining the effect of the GBG intervention on the linear and nonlinear slope parameters within each of the trajectory classes as well as conducting an overall likelihood

ratio test on two degrees of freedom. For the models we have tested here, these two approaches all lead to the same conclusions of significant intervention effect over time, so we only present results using the former approach. Given a significant intervention impact in a particular class we further investigated the length of time for which this effect was sustained. For this purpose, we constructed a test statistic which related the time specific estimated mean differences between the two conditions (i.e., GBG versus control) and to the time specific variance and covariance components. This statistic approximates a z-distribution, and the corresponding p-value can then be computed to test the hypothesis that the two means are not significantly different from zero. We report these results where significant from a univariate perspective. We also report those grade levels where the GBG impact reached significance after controlling for the multiple testing through the use of Bonferroni's or Scheffé's method, which produce virtually identical confidence intervals in this particular case. The added conservativeness of these procedures helps clarify which time points provide the strongest information about the benefit on one intervention condition over another.

All models were run in Mplus Version 4.1 (Muthén and Muthén, 1998–2006) with a minimum of 100 sets of start values. The number of starting values was increased if the best log likelihood was not replicated at least three times. In addition, a common finding in mixture analyses is the “label switching” of classes in the estimation process (Chung et al., 2004). Previous analyses had found that the three developmental classes differ in their starting point in fall of first grade, such as the *persistent high* class started at a higher intercept than the *escalating medium* class which started at a higher intercept than the *stable low* class (Muthén et al., 2002; Petras et al., 2004). We incorporated this knowledge in defining the inequality constraints so that label switching was avoided.

2.5 Missing Data

The estimates of parameters in the models were adjusted for attrition. Mplus uses full information maximum likelihood estimation under the assumption that the data were missing at random. Missing at random assumes that the reason for the missing data is either random or random after incorporating other variables measured in the study (Arbuckle, 1996; Little, 1995). Full information maximum likelihood, used in the present study, is widely accepted as an appropriate way of handling missing data (Muthén and Shedden, 1999; Schafer and Graham, 2002).

Overall, the percentage of the sample who had missing data at a given time point was similar for Cohort 1 and Cohort 2 (see Table 1). Mplus bases its estimates on all available time points for a given case. To assess the extent of missing data in the dataset, Mplus provides a bivariate covariance “coverage” matrix that gives the proportion of available observations for each indicator variable and pairs of variables, respectively. The minimum coverage necessary for models to converge is 0.10 (Muthén and Muthén, 1998–2006). In the present study, coverage for males ranged from 0.437–0.925 in Cohort 1 and 0.381–0.923 in Cohort 2, and for females, 0.451–0.961 in Cohort 1 and 0.397–0.924 in Cohort 2, more than adequate for unbiased estimation.

3. RESULTS

In this section, we present the results by cohort status separately by gender. In each instance we describe the proximal intervention effect on the course of aggressive, disruptive behavior as well as the distal impact of the intervention, the effect on ASPD diagnosis and incidence of violent and criminal behavior.

3.1 Cohort 1 Males

3.1.1 Model—A three-class solution fit the data the best, separating a *persistent high* class, an *escalating medium* class, and a *stable low* class based on aggressive, disruptive behavior from first through seventh grade. The *persistent high* class began with the highest rates of aggressive, disruptive behavior that rose through third or fourth grade, then decreased into middle school, but remained consistently higher throughout. The *escalating medium* class showed medium ratings in first grade and increasing aggressive, disruptive behavior into middle school which did not reach the high levels seen initially in the *persistent high* group. The *stable low* group began and continued with low ratings of aggressive, disruptive behavior. Both linear and quadratic slopes were needed to model the course of aggressive, disruptive behavior. The quadratic slope was treated as a fixed effect and intercept and slope were allowed to co-vary. The residual variances of the teacher ratings in first and second grade, when teachers rated students in both fall and spring each year, were free to correlate. The *stable low* group showed a smaller intercept and residual variance compared to the other classes.

3.1.2 Proximal Impact—Figure 1 shows that among the 199 Cohort 1 males, 14.3% belonged to the *persistent high* class, 50.2% to the *escalating medium* class, and 35.5% to the *stable low* class of aggressive, disruptive behavior (LL=-1603.831, # of parameters=40). Among the *persistent high* group, GBG males displayed a lower slope compared to control males indicating that the GBG had an impact in lowering the growth of aggressive, disruptive behavior (β_{GBG} on slope = -0.440, $p=0.041$). This positive GBG intervention effect was sustained until fourth grade with p -values ranging from 0.007–0.031. In fifth grade the mean difference between the two conditions was marginally significant (i.e., $p<0.077$) and reached non-significance in sixth ($p<0.315$) and seventh grade ($p<0.615$). These significance values at each time point are based on univariate comparisons; when we corrected for the multiple comparisons across time, we found that there remained significant benefits of the GBG at third and fourth grade.

We did not find a significant GBG impact in the other two classes; compared to control males, GBG males in the *escalating medium* or *stable low* classes had a lower slope of aggressive, disruptive behavior (*escalating medium* class: β_{GBG} on slope = -0.047, $p=0.7106$; *stable low* class: β_{GBG} on slope = -0.002, $p=0.9705$). In addition, GBG males compared to control males showed a non-significantly higher nonlinear slope. The effect reached from 0.053 ($p=0.3281$) in the *persistent high* group to 0.006 ($p=0.7505$) in the *escalating medium* and 0.001 ($p=0.9116$) in the *stable low* class. Similar results were previously reported in Muthén et al. (2002).

3.1.3 Distal Impact—The distal outcomes of ASPD and violent and criminal behavior were modeled as a function of class membership (see Figure 2). In the *persistent high* class of control males all qualified for an ASPD diagnosis (LL=-1676.416, # of parameters=46). Overall, males in the GBG condition showed a lower prevalence of ASPD across all three classes; however, the reduction in the prevalence was only significant in the *persistent high* class where 100% of the controls but only 40.1% of the GBG males had a diagnosis of ASPD. A likelihood ratio test confirmed this differences as being significant ($\chi^2 = 17.18$, $df=1$, $p<0.001$). In the *escalating medium* class, GBG males were 15% less likely to be diagnosed with ASPD than control males (37.1% in GBG males, 41% in control males, OR=0.851), and in the *stable low* class, GBG males were 32% less likely to be diagnosed with ASPD compared to the control males (17.8% in GBG males, 17.8% in control males, OR=0.678). Neither of the latter two OR's were significantly different from one.

We found similar results for violent and criminal behavior (see Figure 3). Thirty-four percent of GBG males in the *persistent high* class had both ASPD and a record of violent and criminal behavior and 9% had ASPD alone compared with 50% of *persistent high* control males who

had both outcomes and 50% who had ASPD alone ($\chi^2 = 25.062$, $df=3$, $p<0.001$). For the other less aggressive, disruptive classes the GBG impact was again not significant in reducing ASPD or violent and criminal behavior combined or individually.

3.2 Cohort 1 Females

3.2.1 Model—The model set-up used for Cohort 1 females was very similar to the one used for Cohort 1 males, with the exception that the slope variance in the *stable low* class was nonsignificantly different from zero and was therefore set to zero. In addition, the middle class for Cohort 1 females was not an escalating group as for Cohort 1 males, rather the medium ratings of aggressive, disruptive behavior persisted through middle school lending the name of *persistent medium* to this class. It is also noteworthy that the intercept for the *persistent high* class was lower than that for the *persistent high* males.

3.2.2 Proximal Impact—Figure 4 shows the three-class solution that best fit the data ($LL = -1167.886$, # of par=41). Of the 204 females, 8.4% belonged to the *persistent high* class, 55.4% belonged to a *persistent medium* class, and 36.3% were in the *stable low* class. GBG *persistent high* females showed a significantly lower slope than the *persistent high* control females, indicating a GBG impact (β_{GBG} on slope = -0.0498 , $p=0.0356$). However, for these *persistent high* females the GBG impact was not sustained through seventh grade; unlike Cohort 1 males, GBG females showed a similar level of aggressive, disruptive behavior when compared to controls by seventh grade. The positive intervention effect was sustained until the end of elementary school (i.e., fifth grade) with p-values ranging from 0.020 to 0.034, with the most significant effects in the third through fifth grades. The mean difference between the two conditions was not significantly different from zero in sixth ($p<0.136$) and seventh grade ($p<0.953$). When we corrected for multiple comparisons, none of the differences at these time points reached significance.

We did not find a significant GBG impact in the *persistent medium* ($p=0.8173$) or the *stable low* class ($p=0.9585$). In addition, GBG females in the *persistent high* class showed a non-significantly higher nonlinear slope ($p=0.0685$) and GBG females in the *persistent medium* ($p=0.8220$) and *stable low* class ($p=0.7879$) showed a non-significantly lower nonlinear slope.

3.2.3 Distal Impact—To explore the distal GBG impact among Cohort 1 females we used the same model set up used for males (Data not shown). This model ($LL = -1211.892$, # of par=46) revealed a nonsignificant reduction in prevalence of ASPD in the *persistent high* and the *persistent medium* class. Among the *persistent high* females, 50.6% of the controls compared to 38.7% of the GBG group received a diagnosis for ASPD ($p=0.7064$), and among the *persistent medium* females 14.1% of the controls compared to 4.2% of the GBG group had the outcome ($p=0.1493$). In the *stable low* group 0% of the control females and 2.3% of the GBG females met criteria for the diagnosis of ASPD ($p=0.3871$). To further explore this finding we conducted a series of likelihood ratio tests by comparing the current model to a model where the GBG impact was constrained to be equal across classes and to a model where the impact was set to zero. Ultimately, the zero impact model fit the data the best ($\chi^2 = 3.298$, $df=3$, $p=0.3479$), indicating that the GBG intervention did not significantly reduce the risk for later ASPD for females compared to controls in any of the three classes.

Given the small prevalence of ASPD and reports of violent and criminal behavior among females and the smaller prevalence of *persistent high* aggressive, disruptive females in our sample, models using reports of violent and criminal behavior were very unstable and are therefore omitted from this manuscript. Among the Cohort 1 females, the majority qualified for neither ASPD nor violent and criminal behavior (86%). Of the remaining females, 2.3%

had both outcomes, while 4.1% qualified for violent and criminal behavior only and 7.6% for ASPD only.

3.3 Cohort 2 Males

3.3.1 Model—Two candidate models were identified as potentially appropriate for examining the GBG impact among Cohort 2 males. The first model used the same specifications as the best fitting model in Cohort 1, but since no assessment took place in fall of second grade the residual correlation between fall and spring of second grade was omitted. Additionally, the mean quadratic slope was set to zero in the *stable low* class. Fitting this model for Cohort 2 (LL=−1169.796, # of par=38) yielded similar trajectories as in the previous models; however, the *persistent high* group was very small (4.9%) and consisted of males who started as highly aggressive, disruptive (intercept=4.608) and then decreased to a level in seventh grade that was below the *escalating medium* class. An alternative and better fitting model ($\chi^2=37.4$, df=1, $p<0.001$) freed the residual variance in spring of first grade in the *escalating medium* class and was used for subsequent analysis. This model (LL=−1151.087, # of par=39) yielded three trajectories similar to those of Cohort 1: a *persistent high* class which began with high aggressive, disruptive behavior that increased until third or fourth grade, then decreased into middle school yet still remained high; an *escalating medium* class that showed initial mid-level aggressive, disruptive behavior which increased into middle school; and a *stable low* class that exhibited low levels of aggressive, disruptive behavior from beginning of first grade through seventh grade.

3.3.2 Proximal Impact—Among Cohort 2 males, 18% belonging to the *persistent high* class, 56.2% to the *escalating medium* class, and 25.8% to the *stable low* class (see Figure 5). In terms of the proximal impact, the GBG *persistent high* and *escalating medium* classes showed a lower slope than the controls (β_{GBG} on slope = −0.390, $p=0.1465$; β_{GBG} on slope = −0.073, $p=0.9418$, respectively). In the *stable low* class we found a significant impact with GBG males showing a significantly lower slope compared to control males (β_{GBG} on slope = −0.122, $p=0.0312$). While the GBG did have the listed significant effects on trajectory slopes, males in the GBG classrooms had nonsignificantly higher levels of aggressive, disruptive behavior in seventh grade than their controls in the *escalating medium* and *stable low* classes. In addition, as was found for males in the first cohort, GBG males showed a higher nonlinear slope which reached significance among males in the *stable low* class (β_{GBG} on quadratic slope = 0.028, $p=0.0063$), but not in any of the other two classes.

3.3.3 Distal Impact—As in Cohort 1, we examined impact on distal outcomes for each class. This model (LL=−1234.017, # of parameters=45; see Figure 6) yielded a nonsignificant distal impact in all of the classes. Compared to their controls, GBG males in the *persistent high* class were slightly less likely to be diagnosed with ASPD (OR=0.993) while GBG males in the *escalating medium* and in the *stable low* classes showed an increase in the prevalence of the diagnosis (OR=1.102; OR=3.138, respectively). To further investigate this finding, we tested the results against a model of zero impact (LL=−1234.606, # of parameters=42) to find that the increase in ASPD among the GBG group in the *escalating medium* and *stable low* classes was not significantly different than no effect at all ($\chi^2=1.178$, df=3, $p=0.7583$).

When testing the impact of the intervention on the violent and criminal behavior (see Figure 7), GBG males in the *persistent high* class were nonsignificantly less likely than controls to have the combination of both ASPD and a record of violent and criminal behavior (35% of GBG vs. 50% of controls) as well as ASPD by itself (12.3% of GBG vs. 50% of controls). None of the control males compared to 23.0% of the *persistent high* GBG males had the violent and criminal behavior outcome only, but a zero impact model for the *persistent high* class could not be rejected ($\chi^2=13.16$, df=3, $p=0.004$). The impact of the GBG on reducing ASPD and

violent and criminal behavior alone and combined was not significant for the *escalating medium* or *stable low* classes.

3.4 Cohort 2 Females

3.4.1 Model—The model set up used for Cohort 2 females was identical to the one used for Cohort 2 males, except that the covariance between the intercept and slope was set to zero due to a very small and nonsignificant estimate. A three-trajectory solution fit the data the best ($LL=-993.486$, # of par. =37), consisting of a *persistent high* class which showed the highest levels of aggressive, disruptive behavior that subsequently decreased into middle school, a *persistent medium* group with medium aggressive, disruptive behavior, and a *stable low* class that had consistently low levels of aggressive, disruptive behavior from first grade through seventh grade. The impact on the nonlinear slope in the *persistent medium* class was also set to zero to avoid model instability.

3.4.2 Proximal Impact—Figure 8 shows the three-class model for Cohort 2 females. A small *persistent high* group (8.6%) was distinguished from a *persistent medium* (56.3%) and a *stable low* class (35.1%). GBG females in the *persistent medium* and *stable low* classes showed a nonsignificantly lower slope in aggressive, disruptive behavior when compared to their controls (β_{GBG} on slope -0.008 , $p=0.9936$; β_{GBG} on slope -0.051 , $p=0.9593$, respectively). The GBG intervention had an opposite effect in the *persistent high* group (β_{GBG} on slope $=0.424$, $p=0.2793$). Further model testing revealed that a hypothesis of no GBG impact in any of the classes could not be rejected ($\chi^2 = 3.562$, $df=2$, $p=0.1715$).

3.4.3 Distal Impact—Only 11.8% of the Cohort 2 females qualified for an ASPD diagnosis ($LL=-1038.624$, # of par. =39) and all were in the *persistent medium* group. There was a nonsignificant increase in ASPD prevalence among the *persistent medium* GBG group; 16.4% of controls and 22.5% of GBG females received the diagnosis ($p=0.4959$). Further testing revealed that a hypothesis of zero impact compared to class unspecific impact could not be rejected ($\chi^2 = 0.653$, $df=1$, $p=0.4190$).

As stated before, given the small prevalence of ASPD and violent and criminal behavior among females and the overall smaller prevalence of *persistent high* aggressive, disruptive females in this sample, models using reports of violent and criminal behavior became very unstable and were therefore dropped. Among Cohort 2 females, 84.5% qualified for neither outcome. Of the 15.5% with an outcome, 2.7% had ASPD as well as violent and criminal behavior, 9.5% had ASPD only, and 3.4% had violent and criminal behavior only.

3.5 Summary of Results

Cohort 1 GBG males in the *persistent high* trajectory showed significantly lower slopes of aggressive, disruptive behavior sustained until fourth grade and lower rates of ASPD and violence and criminal behavior by young adulthood compared with controls. These results show the GBG appeared to be effective in lowering early aggressive, disruptive behavior development and later prevalence of ASPD as well as both ASPD and violent and criminal behavior. The positive GBG impact was also seen in males in the *escalating medium* and *stable low* classes, however, these results were not significant. *Persistent high* females showed a significantly lower slope of aggressive, disruptive behavior as well; however, time specific comparisons between control and GBG females showed that these differences were not significant. In addition, the reduction in later ASPD prevalence did not reach significance. In the second cohort, the GBG effect was similar in direction to that of Cohort 1 but generally not significant.

4. DISCUSSION

This paper reports on the developmental epidemiological trajectories from first grade through early adolescence of early aggressive, disruptive classroom behavior and the strength of the trajectories in predicting Antisocial Personality Disorder (ASPD) and violent and criminal behavior in young adulthood. We then report the impact of the GBG on each of the three developmental trajectories found to best typify the variation in courses leading to the young adulthood outcomes of ASPD and violent and criminal behavior. By following children from first grade through age 19–21, we investigated the effectiveness of using a universal preventive intervention like the GBG that is directed at early risk factors (e.g. aggressive, disruptive behavior) of later problem outcomes. This paper also is an important extension of the other work in this issue (Kellam et al., in press, this issue) and on sixth grade conduct disorder (Brown et al., in press, this issue) in two important ways. First, it investigates developmental trajectories of aggressive, disruptive behavior, not just initial first grade ratings of aggressive, disruptive behavior. Second, the paper analyzes ASPD as well as violent and criminal behavior, two problem outcomes which represent a major public health and public safety concern. Importantly, violent and criminal behaviors were measured by using records of incarceration by young adulthood and therefore are going beyond self reports of the participating youth.

The GGMM analyses revealed three distinct trajectories for males, as hypothesized. There was a group that started high, rose through third and fourth grade, and then decreased somewhat by middle school in aggressive, disruptive behavior over time (i.e., the *persistent high* group). There emerged another group with initial moderate levels of aggressive, disruptive behavior that increased over elementary school but not to the higher level of the *persistent high* group (i.e., the *escalating medium* group). Finally, there was a group that started and remained at a low level of aggressive, disruptive behavior (i.e., the *stable low* group). Similar trajectories were found for females in both cohorts, except the medium class did not display an increase in aggressive, disruptive behavior over time; rather it was a *persistent medium* group. Across the two cohorts the three trajectories were more similar than different, which lends additional support to the findings. Importantly, these growth trajectories were largely consistent with *early starter* and *later starter* models of antisocial behavior in keeping with the trajectories identified in the empirical literature (e.g., Broidy et al., 2003; Cote et al., 2001; Nagin and Tremblay, 1999; Petras et al., 2004; Schaeffer et al., 2003; Schaeffer et al., 2006).

In Cohort 1, the *persistent high* males and females showed a significant GBG impact on the slope of aggressive, disruptive behavior compared to controls indicating a significantly greater decline in the rate of growth of aggressive, disruptive behavior for the GBG groups. This impact was sustained until the end of elementary school. In Cohort 2, GBG males compared to control males in the *persistent high* class showed a more favorable development in aggressive, disruptive behavior; however, the impact did not reach the appropriate significance level. No proximal impact was detected for females in Cohort 2.

In both the *escalating medium* and *stable low* class, no GBG effect was found on the slope of aggressive, disruptive behavior for males in either cohort. The absence of impact in the *stable low* class was not surprising because these students continued to behave in a non aggressive, disruptive manner, leaving no room for improvement. With regard to the *escalating medium* class, it seems our hypothesis, that the GBG would protect youth from the effects of disruptions in parenting during late childhood and early adolescent years via improvement in social adaptation in the early elementary school years, was not supported. Of note, the growth of aggressive, disruptive behavior showed a precipitous rise after the completion of the GBG at the end of second grade and the beginning of third grade. Thus, it may be that the GBG suppressed the growth of aggressive, disruptive behavior during the period that it was in place, but once the systematic classroom behavior management practices associated with the GBG

were no longer in place, the individual, family, classroom, and/or peer group factors hypothesized by Patterson et al. (1992) to play a role in the *late starter* model may have overcome any benefits of the GBG for this group.

These findings provide strong support for the hypothesized link between early and later social adaptation consistent with life course/social field theory, but the question remains about whether the GBG had an impact on APSD and violent and criminal behavior at age 19–21 via the GBG's impact on the early growth of aggressive, disruptive behavior. As discussed above, in the absence of an established method to test for mediation, we employed a method that approximates the Baron and Kenny (1986) method. This approximation involved the use of the likelihood ratio test to compare competing models. More specifically, we constrained the path from the GBG intervention condition to the distal outcome within the high aggressive, disruptive behavior class to zero. A significant difference between GBG and control groups was found in Cohort 1 males, particularly for those males who met criteria for both ASPD and violent and criminal behavior. For males in Cohort 2 and females in both cohorts we report null findings.

The worsening in fit when the GBG distal outcome parameter was set to zero was consistent with the expectation that the impact of the GBG on the distal outcome of ASPD was through its impact on the growth of aggressive, disruptive behavior in elementary school. The beneficial mediating impact in the first cohort was replicated for the violent and criminal behavior outcome.

4.1 Reduction of Impact in Cohort 2

The most likely explanation for the lack of significant GBG effects for Cohort 2 relative to Cohort 1 males is the decreased level of mentoring and monitoring in the second cohort (Kellam et al., in press, this issue). While teachers in the effectiveness trial (i.e., Cohort 1) received 40 hours of training and support throughout the first year, during the following year those same teachers received no additional training and only minimal support for the replication/sustainability trial (i.e., Cohort 2). The reduced level of implementation is consistent with the beneficial but nonsignificant proximal impact seen among the *persistent high* males in the second cohort.

In addition, despite great similarities between the cohorts, it was also found that Cohort 2 males started at a lower level of first grade aggressive, disruptive behavior compared to Cohort 1 males ($p < 0.010$). Cohort 2 males were more likely to come from economically disadvantaged families (as indicated by their higher likelihood to receive free lunch); therefore, it is possible that differences in the composition of the risk factors and sample distribution had a negative impact on the power to detect significant associations. Both hypotheses of lower level of implementation and higher individual/contextual risk require further study because the data used in this study are not suited to comprehensively address this issue.

4.2 Reduction of Impact for Females

Because the focus in this study was on overt and physical forms of aggressive, disruptive behavior, the lack of a distal GBG impact for females may be due to the overall lower rates of female aggressive, disruptive behavior and their lower prevalence in antisocial and violent outcomes. Indeed in our sample, the prevalence of females in the *persistent high* group was half of that found for males. In addition, in the *persistent high* class of Cohort 1, the intercept for females was lower than that of Cohort 1 *persistent high* males, indicating the females had an overall lower level of aggressive, disruptive behavior as defined in this study. However, as was shown by Schaeffer et al. (2006), the main difference is in the prevalence and not in the growth shape. Furthermore, the proximal impact among the *persistent high* females might

indicate that highly aggressive, disruptive females respond to the universal intervention in a similar fashion as their male counterparts, lending some modest support to the life course/social field theory being applicable to both genders. It is quite possible, however, that the classroom levels of aggressive, disruptive behavior may impact males and females somewhat differently.

The lack of significant distal impact among females is consistent with findings in cross-sectional and short-term longitudinal studies. This research has found that aggression in girls is associated with peer rejection and depression during childhood (Crick, 1996; Crick and Grotpeter, 1995), but a link to serious antisocial behavior problems later in life has yet to be established. In addition, it is possible there are gender differences in the early antecedent risk factors of the developmental courses that lead to later consequences. The course of aggressive, disruptive behavior may manifest itself differently in females, and it may not have the same salience during the course of development nor the same outcomes as found in males. With regards to the last possibility, researchers are starting to explore a broader array of deleterious long-term outcomes that might result from early female aggressive, disruptive behavior patterns, such as health problems (Serbin and Karp, 2004) and maladaptive parenting (Zoccolillo et al., 2004).

Our results for females might have been stronger if risks and outcomes more relevant to female development were included. For example, an assessment of relational aggression may have increased our understanding of female antisocial pathways. However, it has been found that relational and physical aggression tends to be highly correlated among both females and males (Henington et al., 1998; Tomada and Schneider, 1997), suggesting that females who display high rates of physical aggression may also exhibit high rates of relational aggression. In fact, we found the course of aggressive, disruptive behavior among females differed more in terms of the prevalence than in the developmental pattern. Stronger results might also have been seen if the early antecedent measures included more parameters focused on internalizing behavior, such as depression, compared with more externalizing behavior, such as aggressive, disruptive behavior. Indeed, our previous work has shown that in females later psychological well-being (PWB) is most strongly linked to first grade PWB. Overall it is evident that there is a need for further research about early female aggression and developmental paths that could help more accurately explain the results seen in females with the GBG intervention.

4.3 Strengths and Limitations

A major strength of this study is the design of the randomized intervention trial, which used an epidemiologically defined population of all youth entering first grade in 19 schools. The replication of the intervention with a second cohort adds strength to these analyses as well. Based on the design, we were able to effectively test hypotheses regarding the association between early aggressive, disruptive behavior and later ASPD and/or violent and criminal behavior as well as the impact of a preventive intervention on this association.

The current study focused on the associations of disruptive behaviors observed by teachers in the classroom, thus adding to research on the relationship between school attainment and social adjustment (Dishion, 1990). Although results from teacher ratings may not be equivalent to those from other sources, such as self, peer, or parent reports, our research as well as the work of other groups has shown that teacher ratings of aggressive, disruptive behavior have the highest level of agreement with student self reports and have equivalent levels of agreement to those found between parent and student self reports of problem behavior (Kellam et al., 1998; Lochman et al., 1995; Loeber et al., 1984).

Importantly, this research strongly supports predictions based on the organizational approach to development in which we argue that early successful social adaptation in the face of prominent developmental challenges tends to promote later adaptation. In this paper we

focused on a critical developmental challenge (i.e., the transition to the first grade classroom) and how this early transition leads to the course of development over elementary school and is related to later developmental outcomes such as ASPD and criminal and violent behavior. We were able to show that under favorable intervention conditions (e.g., sufficient support and mentoring) youth, in particular males, with early social maladaptive responses to school can be helped, and their risk for long-term acting-out negative outcomes subsequently can be reduced.

4.4 Future Research

One direction for future research is to mount a trial where the GBG intervention is implemented throughout elementary school as opposed to only first and second grade. This design might not only improve the impact among the *persistent high* group, but also more importantly reduce the risk for later aggressive, disruptive behavior and violent and criminal behavior among the *escalating medium* group. In addition, it might be useful to nest indicated and treatment interventions within a universal implementation of the GBG intervention. In this way, we could address the children who begin to show sub-clinical or clinical levels of oppositional defiant and/or conduct disorder.

We make the argument that the lack of a significant impact in the second cohort was due to lower levels of monitoring and mentoring. However, very little systematic information is available regarding sufficient levels of implementation to detect an intervention impact. Thus, trials that randomize the level of monitoring and mentoring are needed to determine the required amount of implementation to prevent different types of outcomes under different intervention protocols. Importantly, it can be argued that the required level of implementation might be related to the level of risk in the population. The significant intervention impact among the *stable low* males in the second cohort can be seen as some support for this point of view.

In order to examine the generalizability of the findings presented in this study, replications involving populations varying in terms of ethnicity, socioeconomic status, and neighborhood or community characteristics will need to be conducted. In addition, more research is needed to address the question of how to sustain implementation quality over time and settings, given the decline seen in implementation quality in the second cohort. We have argued that the nonsignificant distal impact of the GBG among females in the *persisting high* class was likely due to lower prevalence of aggressive, disruptive behavior in females relative to males; therefore, larger samples are needed to provide for an adequately powered statistical test of the GBG impact on females. Finally, testing of the GBG impact on relational aggression may be informative, as would examining the GBG impact on relational young adult outcomes, such as partner violence or parenting.

Understanding variation in developmental processes within and across gender in epidemiologically defined populations is a cardinal requirement for the advancement of prevention programs. A major prevention strategy developed over the last several decades is based on uncovering early antecedents along developmental paths leading to successful and unsuccessful social adaptational trajectories and directing interventions at the antecedent mediators or moderators to promote successful adaptation and well-being as well as prevent problem outcomes (Kellam and Langevin, 2003). The results reported here support this strategy, but they also point to missing areas of knowledge about development that would allow progress from this strategy to move ahead. Results reported here for males, particularly higher risk males, and the absence of impact for females calls strongly for research in this area of gender and development.

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Figure 1.
Proximal Intervention Impact in Cohort 1 Males (N=199).

Figure 2.
Distal Impact (ASPD) in Cohort 1 Males (N=199).

Figure 3.
Distal Impact on ASPD and Violent and Criminal Behavior Combined and Alone in Cohort 1
Males (N=199)

Figure 4.
Proximal Intervention Impact in Cohort 1 Females (N=204).

Figure 5.
Proximal Impact in Cohort 2 Males (N=181)

Figure 6.
Distal Impact in Cohort 2 Males (N=181).

Figure 7.
Distal Impact on ASPD and Violent and Criminal Behavior Combined and Alone in Cohort 2 Males (N=181)

Figure 8.
Proximal Impact Cohort 2 Females (n=184).

Table 1
Sample Description

	Cohort 1 N=403	Cohort 2 N=365	Difference Test
Male	199 (49.4%)	181 (49.6%)	n.s.
African-American	302 (74.9%)	266 (72.9%)	n.s.
Free/Reduced Price Lunch	209 (51.9%)	267 (73.2%)	p< 0.001
GBG Intervention	238 (59.1%)	208 (57.0%)	n.s.
Fall of First Grade Aggression	2.0 (SD=1.1)	1.8 (SD=0.9)	p<0.010
Age in Fall of First grade	6.4 (SD=0.5)	6.3 (SD=0.4)	p<0.011
ASPD			
ASPD Diagnosis Prevalence	62 (20.2%)	62 (22.0%)	n.s.
Amount Missing	96	83	
ASPD and Violent and Criminal Behavior			
Both	27 (8.8%)	23 (8.2%)	n.s.
ASPD only	35 (11.4%)	39 (13.8%)	
Violent and Criminal Behavior only	24 (7.8%)	18 (6.4%)	
Neither outcome	221 (72.0%)	202 (71.6%)	
Amount Missing	96	83	
Number of Missing Points			
0–1	(48.9%)	(29.9%)	p<0.001
2–3	(17.6%)	(32.9%)	
4–5	(19.1%)	(14.5%)	
6–9	(14.4%)	(22.7%)	