SCHOOL-RELATED OUTCOMES FROM A RANDOMIZED CONTROLLED TRIAL OF ADOLESCENT DEPRESSION PREVENTION PROGRAMS

By

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ABSTRACT OF THE THESIS

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Previous research has demonstrated the effectiveness of school-based depression prevention programs in reducing depressive symptoms and improving functioning. The present study examined the important question of whether these programs have positive effects on school-related outcomes. Students at 10 middle and high schools in New Jersey were randomized to weekly sessions of Interpersonal Psychotherapy – Adolescent Skills Training (IPT-AST) or group counseling (GC). Analyses examined whether there were intervention effects on participants' grades, attendance rates, and disciplinary outcomes over approximately one year post-intervention. In addition, demographic characteristics and pre-intervention values on relevant variables (e.g., grades pre-intervention) were examined as moderators of intervention effects. Level of change in depressive symptoms was assessed as a predictor of outcomes. Results did not indicate significant intervention effects on any outcome variable. Moderators of intervention effects included family income on overall grades, age pre-intervention on math grades, and number of tardies pre-intervention on numbers of tardies post-intervention. Moderation outcomes indicated more favorable effects of IPT-AST among certain higher-risk subgroups. Participants who experienced meaningful improvements in their depressive symptoms had

significantly more positive outcomes on overall grades than those who did not experience improvements in their symptoms, regardless of intervention condition. Although study participants experienced decreases in their academic performance over the study period, post hoc analyses suggested their trajectories were favorable compared to normative trends. Findings indicate that IPT-AST and GC may have had modest positive effects on academic performance; results on rates of attendance and disciplinary incidents were less notable. Further research is needed to clarify the effects of depression prevention programs on these school-related outcomes.

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Introduction

Major depression is a highly prevalent condition which affects about one-fifth of individuals in their lifetime (Kessler et al., 2005). Rates of depression increase markedly during adolescence, with lifetime prevalence rates rising from 3% by age 13 to 21% by age 18 (Hankin et al., 1998). Due to the persistent and recurring nature of the disorder, those affected remain at increased risk over time (Joiner, 2000). Depression during adolescence has been shown to significantly increase the risk for adult depression, substance dependence, and suicidal behaviors, as well as other negative outcomes such as failing out of school and experiencing recurrent unemployment (Fergusson & Woodward, 2002; Pine, Cohen, Gurley, Brook, & Ma, 1998).

Research on Depression Prevention

Given the serious and enduring consequences of adolescent depression, prevention programs have received increased attention in recent years (Stice, Shaw, Bohon, Marti, & Rohde, 2009). In a meta-analysis, Stice and colleagues (2009) examined the effects of 32 depression prevention programs for youth, some of which were universal and others of which were targeted towards youth at increased risk ('selective' programs for youth with a known risk factor for depression and 'indicated' programs for youth with elevated symptoms of the disorder). Thirteen programs led to significant reductions in depressive symptoms, a proportion that compared favorably to those of prevention programs for other problems (i.e., human immunodeficiency virus, obesity, and eating disorders). On average, selective and indicated ('targeted') programs had moderate and significant effects on depressive symptoms, while universal programs had effects that were non-significant. Moreover, three targeted programs (two based on cognitive-

behavioral [CB] therapy and one based on interpersonal psychotherapy) significantly reduced participants' risk for a future depressive disorder (Clarke et al., 1995; Clarke et al., 2001; Garber et al., 2009; Stice, Rohde, Seeley, & Gau, 2008; Stice et al., 2009; Young, Mufson, & Davies, 2006).

Since Stice and colleagues' (2009) meta-analysis, research on adolescent depression prevention programs has continued to be promising, with several studies finding significant effects on depressive symptoms (McCarty, Violette, Duong, Cruz, & McCauley, 2013; Rohde, Stice, Shaw, & Briere, 2013; Stice, Rohde, Gau, & Wade, 2010; Wijnhoven, Creemers, Vermulst, Scholte, & Engels, 2014). Interpersonal Psychotherapy – Adolescent Skills Training (IPT-AST), which is the focus of the current study, has consistently demonstrated positive effects on depressive symptoms. IPT-AST is an indicated, group-based depression prevention program based on interpersonal psychotherapy for depressed adolescents. In two studies comparing IPT-AST to usual school counseling (Young et al., 2006; Young, Mufson, & Gallop, 2010), adolescents who participated in IPT-AST had significantly fewer depressive symptoms and were less likely to receive a depression diagnosis through six months post-intervention than adolescents in the usual care condition. In a study on universal implementations of IPT-AST and a CB program, Horowitz and colleagues (2007) found that students who participated in IPT-AST or CB groups had significantly fewer depressive symptoms than students in a no-intervention control group. In line with meta-analytic findings that targeted programs are more effective than universal programs (Merry et al., 2011; Stice et al., 2009), students with baseline depression scores in the top 25th percentile showed stronger intervention effects; within that subgroup, effect sizes were large (Horowitz,

Garber, Ciesla, Young, & Mufson, 2007). The most recent examination of IPT-AST compared the intervention to group counseling (GC), which school counselors delivered at the same frequency as IPT-AST. Although the two groups did not have significantly different rates of depression onset over the first six months post-intervention, IPT-AST participants reported greater reductions in depressive symptoms than GC youth over that period (Young et al., 2015).

School-Based Prevention Programs

As elucidated by the prevalence of school-based programs in the adolescent depression prevention literature, schools are viewed as an optimal setting for adolescent interventions. School-based services address many of the social and practical barriers to adolescent mental health care (Amaral, Geierstanger, Soleimanpour, & Brindis, 2011; Committee on Adolescent Health Care Services and Models of Care for Treatment Prevention and Healthy Development, National Research Council, & Institute of Medicine, 2009; Lyon, Ludwig, Stoep, Gudmundsen, & McCauley, 2013) by increasing accessibility, ensuring confidentiality, and not requiring parent involvement (American Academic of Pediatrics Committee on School Health, 2004; Farmer, Burns, Phillips, Angold, & Costello, 2003). At the same time, schools face a conundrum with regards to such activities: Schools have a primary aim to educate students, and prevention programs require reallocation of the limited resources available to support that aim (Gottfredson & Gottfredson, 2002).

Educators face tremendous pressure to produce certain levels of academic performance from their students. In our current public education system, educators are compelled to focus on meeting the high academic performance requirements of the No

Child Left Behind Act (National Research Council & Institute of Medicine Committee on the Prevention of Mental Disorders and Substance Abuse Among Children Youth and Young Adults, 2009). Schools that fail to meet "adequate yearly progress" standards are at risk of corrective actions including replacement of school staff and restructuring of their school (Bush, 2001, p. 3). In this educational climate, there has been reduced focus on attending to students' social and emotional needs – if there is limited evidence that such programs further schools' primary mission to educate students in core academic areas, educators may feel they have limited incentive to support them (National Research Council & Institute of Medicine Committee on the Prevention of Mental Disorders and Substance Abuse Among Children Youth and Young Adults, 2009). Thus, in order to mobilize the resources needed to successfully implement prevention programs in schools, researchers should aim to demonstrate that they dovetail with schools' educational aims.

Examining the Impact of Depression Prevention Programs on School Outcomes

There have been repeated calls to broaden the scope of intervention research and look beyond symptom-level changes. In his article on child and adolescent psychotherapy research, Kazdin (2002) argued that outcomes in many other domains (e.g., school functioning, relationships with peers and family) are relevant to youth functioning and long-term prognosis and urged research in those areas. Given the potentially far-reaching effects of depression prevention programs, Cuijpers (2012) advocated for assessments of their effects on educational, economic, and social role functioning. Despite this, functional outcomes have only been examined for a few adolescent depression prevention programs (e.g., McCarty, Violette, Duong, Cruz, & McCauley, 2013; Rohde et al., 2013;

Stice, Rohde, Gau, & Wade, 2010; Young et al., 2015) and focus on school-related effects has been particularly limited (Hoagwood et al., 2007).

Research on the relationship between depression and academic functioning indicates that depression prevention programs may have positive effects on school-related outcomes. In their studies on early adolescents, Roeser and colleagues (1998) found associations between depressive symptoms and lower year-end grade point averages (GPAs), greater likelihood of skipping classes, and classroom resistance behaviors such as failure to complete assignments. Similarly, Jones (2008) found that adolescents with depressive symptoms had lower GPAs than their unaffected counterparts and that these effects were largest among middle school students and students from certain minority groups. In a recent longitudinal study on 10- to 18-year-olds, Verboom and colleagues (2014) demonstrated a bidirectional relationship between depressive symptoms and academic performance in girls. Similarly, Jaycox et al. (2009) found that depression in 13- to 18-year-olds predicted lower adolescent-reported academic efficacy and parent-reported school functioning six months later.

Given these associations, it is interesting that there is minimal research on the school-related outcomes of depression prevention programs, especially those administered in schools. Among studies on depression prevention programs, only two have examined school-related outcomes: In their study on a school-based group CB intervention for adolescents with elevated depressive symptoms (the Positive Thoughts and Action [PTA] Program), McCarty et al. (2013) included student- and teacher-completed measures of subjective school problems (e.g., perceived adaptation, motivation, attention) but did not find significant intervention effects. In their study on

IPT-AST in parochial high schools, however, Young and colleagues (2012) found that adolescents in IPT-AST were less likely to be asked to leave school for academic or behavioral reasons than adolescents who received usual care. In an additional set of analyses on that study, Haimm et al. (2013) found that – although there were no between-group differences in GPA – IPT-AST participants trended towards more favorable outcomes on rates of attendance and tardiness.

Albeit somewhat limited, there is a more substantial body of research on the school-related outcomes of other types of school-based mental health prevention programs. In their meta-analysis on empirically-based school interventions targeted at academic and mental health functioning, Hoagwood and colleagues (2007) found that some universal programs had positive effects on academic outcomes (Catalano et al., 2003; Ialongo et al., 1999). Among targeted programs, investigations of school-related outcomes have appeared mostly in research on interventions for externalizing problems. Fast Track, for instance, is a multicomponent, multiyear intervention that was administered to students who screened at risk for antisocial behavior in first grade. At the end of first grade, participants in Fast Track were less likely than participants in the control condition to use special education services, and they had better reading test scores and language arts grades (Conduct Problems Prevention Research Group, 1999). By the end of third grade, intervention effects on reading achievement and grades diminished, although Fast Track participants continued to use fewer special education services (Conduct Problems Prevention Research Group, 2002). In fourth and fifth grade, there were no longer any intervention effects on school-related outcomes (Conduct Problems Prevention Research Group, 2004). In earlier research on a program for older youth with

externalizing problems (the Social Moral Reasoning Development Program), Arbuthnot (1992) examined tardiness, absenteeism, and school grades. One year post-intervention, participants in the experimental group had fewer absences and tardies as well as improved grades in English and humanities compared to participants in the control group (Arbuthnot, 1992; Hoagwood et al., 2007).

While the school-related outcomes of these programs are impressive, it is important to note they were relatively intensive compared to depression prevention programs such as IPT-AST. Fast Track was multiple years, and the Social Moral Reasoning Development Program included 16-20 group sessions. Even so, students only appeared to experience school-related effects in certain areas. Moreover, many school-related outcomes remain unclear, since research teams have chosen to focus on different areas and measure them in various ways (Arbuthnot, 1992; Conduct Problems Prevention Research Group, 1999, 2002, 2004; Hoagwood et al., 2007). To increase understanding of programs' school-related effects and enable program comparisons, it is important that programs examine school-related outcomes using common and objective metrics.

Developmental trends in academic performance must also be taken into account when interpreting program effects. Recent research has indicated that academic performance and school attendance rates decrease in the transition from middle to high school (Rosenkranz, de la Torre, Stevens, & Allensworth, 2014) as well as over the high school years (Balfanz & Byrnes, 2012; Roderick, Kelley-Kemple, Johnson, & Beechum, 2014). Such findings suggest that the normative trend is reductions in grades and attendance rates over time. Students with depressive symptoms may be particularly susceptible to declines due to symptom-related impairment (Jones, 2008; Roeser et al.,

1998; Verboom, Sijtsema, Verhulst, Penninx, & Ormel, 2014) and increased risk of depression onset (Horwath, Johnson, Klerman, & Weissman, 1992). Thus, school-related outcomes of depression prevention programs need to be considered in light of normative trajectories in grades and attendance rates during adolescence as well as symptom-related impairments in those domains.

The Current Study

The current study continued the search for evidence of school-related effects associated with depression prevention programs. While information from subjective measures of school performance and functioning is undoubtedly useful, results on objective measures may be more influential to educators who are concerned about dedicating resources to such programs. As such, this study examined the effects of two school-based depression prevention programs on participants' grades, attendance rates, and disciplinary incidents from pre-intervention to approximately one year post-intervention. Given the literature on trends in adolescents' academic performance over time (Rosenkranz, de la Torre, Stevens, & Allensworth, 2014), participants' academic trajectories were also compared to normative trends. Results were intended to empower schools to make more informed decisions about whether to implement these programs by furthering understanding of the relationship between youth depression programs and school functioning.

Methods

Data for this study came from the Depression Prevention Initiative (DPI), a randomized controlled trial (RCT) comparing IPT-AST to GC for adolescents at risk of depression (Young et al., 2015).

Participants and Procedures

Participants were seventh to tenth grade students recruited from 10 middle and high schools in New Jersey. A two-stage screening process identified students with subthreshold depressive symptoms: (1) Students with parental consent and who provided assent completed a self-report measure of depressive symptoms (the Center for Epidemiologic Studies – Depression Scale [CES-D]; Radloff, 1977) and (2) students with elevated CES-D scores who provided consent and assent completed a structured psychodiagnostic interview (the Schedule for Affective Disorders and Schizophrenia for School-Age Children; Kaufman, Birmaher, Brent, & Rao, 1997) to confirm the presence of subthreshold depression and exclude youth with more significant psychopathology. One hundred eighty-six students were randomized to either IPT-AST (N=95) or GC (N=91). Adolescents were assessed at pre-intervention, post-intervention, and six, 12, 18, and 24 months post-intervention. School-related data was also collected through two years post-intervention. The current study includes data collected through approximately one year post-intervention.

Interventions

IPT-AST. IPT-AST is a manual-based depression prevention program comprised of two individual pre-group sessions; eight weekly group sessions; an individual or

dyadic (adolescent and parent) mid-group session; and four individual booster sessions over the six months following the group.

During pre-group sessions, a leader introduces the group, inquires about the adolescent's current relationships, and helps the adolescent to identify interpersonal goals to address during the group (e.g., reducing conflict with a parent, increasing social support from friends). In group sessions, adolescents receive psycho-education, learn specific interpersonal skills, and practice using those strategies. The psycho-education component involves defining prevention, learning about depression and its symptoms, and exploring the bidirectional relationship between mood and interpersonal interactions. Interpersonal skills include expressing one's feelings ("I statements") and acknowledging one's understanding of the other person's perspective ("put yourself in their shoes"). Adolescents practice skills in-session through group activities and role plays and outside of session by working on relationships in their own lives.

In the mid-group session, the adolescent applies the skills from group to a particular relationship or situation associated with his/her interpersonal goals. The adolescent is encouraged to invite a parent to the mid-group session so he/she can address a parent-related issue or elicit increased support from his/her parent in working on another relationship. Booster sessions aim to solidify the adolescent's understanding and utilization of interpersonal skills. The adolescent applies the skills learned in group to deal with current life stressors and increase social support.

There were 18 IPT-AST groups in DPI, each including three to seven adolescents. All groups had two co-leaders. For most groups, one leader was a clinical psychologist and the other was a doctoral student in clinical psychology.

GC. The GC intervention was intended to emulate the group programs typically offered in schools. However, in order to provide a stringent control condition, the frequency and duration of GC matched that of IPT-AST. Thus, GC participants received more intensive care than adolescents usually receive in school-based preventive care (Young et al., 2015; Young et al., 2010). GC consisted of a pre-group session; eight weekly group sessions; a mid-group session; and four booster sessions.

So that GC reflected normal practices as closely as possible, there were no limitations on the content of GC sessions. In order to get a sense of group leaders' approaches, they were each asked to complete a Therapy Procedures Checklist (TPC) halfway through and at the end of their group. Reports on the TPC indicated that cognitive techniques were used most frequently in 12 groups, and psychodynamic techniques were used most frequently in four.

There were 16 GC groups in DPI, each including two to eight adolescents. The large majority of groups were conducted by a single group leader. Most leaders had a master's degree in education, counseling, or a related field; five were graduate students in master's or doctoral programs; and one was a doctoral-level psychologist.

Measures

At the end of each academic year during which a student was participating in the study, research personnel obtained paper records with information on his/her school-related performance; school administrative staff typically provided students' report cards and disciplinary records. Data on grades, attendance, and disciplinary incidents were organized into quarterly time points pre- and post-intervention. Pre-intervention data came from the academic quarter that ended most immediately before the student started

attending groups, and post-intervention data came from the academic quarter that ended most immediately after the student's group ended (an average of 0.97 [standard deviation {*SD*}=0.55] months after the end of group). Data from four subsequent academic quarters were also included in analyses. On average, those time points occurred 4.66 (*SD*=1.59), 8.35 (*SD*=0.69), 10.66 (*SD*=0.61), and 13.04 (*SD*=0.54) months post-intervention.

Grades. Grades for each class were available on a zero- to 100-point scale. To detect changes in overall academic performance across quarters, a mean score including all grades (i.e., core academic and elective subjects) was calculated for analysis. In accordance with prior intervention studies examining changes in academic performance (Conduct Problems Prevention Research Group, 1999, 2002, 2004), separate analyses were conducted for the core academic subjects of math and English language arts (ELA). For interpretive purposes, the outcome variables for overall, math, and ELA grades were calculated as change scores from their pre-intervention values.

One school district provided students' grades on an A to F rather than zero- to 100-point scale. For students in that district's schools, the numeric range for each grade (e.g., A+ is 98 to 100, A is 94 to 97) was used to assign a numeric grade on the 100-point scale. For each letter grade A+ through D, the corresponding numeric grade was the median of the letter grade's numeric range (e.g., A+ was 99, A was 95.5). Since a grade below 65 was considered failing in that district, all numeric grades below 65 from all other schools were averaged to calculate a numeric grade of 55.6 for a letter grade of F.

Attendance. The total numbers of absences and tardies in each academic quarter were entered for analysis. Two districts provided attendance data for the full academic year rather than by quarter. For students in those districts, the total numbers of absences

and tardies each year were divided by four. Those numbers were entered in the last possible time point of each academic year (i.e., the first or second post-intervention time point for the first academic year and the fifth post-intervention time point for the second academic year). Like the outcome variables for grades, the outcome variable for absences was calculated as a change score from the number of absences during the pre-intervention quarter. Due to the statistical analyses required for tardies (described below) and the presence of non-integers from the two districts that only provided attendance data on a yearly basis, the outcome variable for tardies was rounded to the nearest integer for the number of tardies during each academic quarter.

Disciplinary incidents. School disciplinary records included a description of each school staff-reported incident, the date of each incident, and the action taken by school staff in response to it. The total numbers of disciplinary incidents (1) in the academic quarter preceding the intervention and (2) in the entire post-intervention period were calculated for analysis.

Data Analysis

Grades and attendance. Mixed effects modeling was used to analyze grade and attendance outcomes. This approach was appropriate given its ability to account for the clustered nature of the data, wherein participants were nested within groups, which were nested within intervention arms, while accommodating participants' repeated assessments over time (Diggle, Liang, & Zeger, 1994). Visual inspection of means plots of grades and attendance rates over time indicated that these outcomes did not change in a linear, log-linear, or polynomial form (e.g., quadratic, cubic). Because hierarchical linear modeling (HLM) requires outcomes to fit a particular mathematical form to compose the level one

equation, it was not possible to use HLM for these outcomes. Thus, mixed-model analysis of variance (MMANOVA) was selected as an appropriate alternative (Schwarz, 1993). MMANOVA is a 'mixed' model because it includes both fixed effects (e.g., intervention condition) and random effects (e.g., groups). In contrast to HLM, MMANOVA models time as a categorical classification variable and does not assume a specific relationship between outcome values and time. As a result, in studies where the primary effect of interest is the on-average difference between interventions across the study period, the trajectories of outcome variables may change flexibly over time (Linehan et al., 2006). MMANOVA may be conceptualized as an extension of repeated measures analysis of variance, wherein MMANOVA accommodates the additional level of clustering due to group interventions, flexibility in modeling the covariance matrix over repeated assessments, and missing data.

For each outcome variable, MMANOVA was used to examine: (1) the overall effect of time point, which quantified whether there were differences across time points regardless of intervention condition; (2) the average effect of intervention condition, which indicated whether the intervention conditions differed on-average across all post-intervention time points; and (3) the interaction between time point and intervention condition, which specified whether intervention effects varied across post-intervention time points. Linear contrasts were used to examine differences within time points.

Since MMANOVA requires approximately normal distribution of dependent variables (Beckman, Nachtsheim, & Cook, 1987), the first step was to test the distribution of each outcome measure. Overall grades, math grades, and ELA grades were all normally distributed, as indicated by their Shapiro-Wilk values of greater than or

equal to 0.90 (Shapiro & Wilk, 1965). Absences and tardies, on the other hand, were not normally distributed. Absences were transformed with a shifted logarithmic transformation, which resulted in a Shapiro-Wilk value of 0.91. Tardies, however, remained non-normally distributed when various Box-Cox transformations were applied (Box & Cox, 1964). To accommodate this, outcomes on tardies were examined with a generalized linear mixed model (GLMM; analyses are described separately below) (Wolfinger & O'Connell, 1993).

As in previous applications of MMANOVA (e.g., Crits-Christoph et al., 1999), the relevant pre-intervention score in each model (i.e., overall grades, math grades, ELA grades, or numbers of absences in the academic quarter pre-intervention) was used as a covariate. To determine whether demographic characteristics significantly affected participants' outcomes, variables for gender, age, family income, and ethnicity (whether the student was a member of an ethnic or racial minority group) were also included as covariates; these variables were selected in order to mirror the analytic procedures in DPI's main outcomes study (Young et al., 2015).

In each MMANOVA model, the initial fixed effects were intervention condition, time point, the interaction between intervention condition and time point, the relevant pre-intervention score, school, and all demographic variables; the random effects were clustering attributable to intervention group and within-participant repeated measures. In these initial models, the variance attributable to group estimated to zero, because the study data was not rich enough to estimate all of the specified terms. Therefore, with no appreciable loss of model fit, a more simplistic model was used. In order to focus on clustering attributable to repeated measures within each participant, the revised model did

not include a term for variance attributable to group. If a demographic or interaction variable did not significantly predict outcomes in a given model, it was removed from the model, and the analysis was subsequently re-run without it.

As previously noted, MMANOVA is able to accommodate missing data on dependent variables; students with missing grade or attendance data in a given academic quarter were retained in analyses as long as they had data from at least one post-intervention time point. Because MMANOVA assumes that patterns in missing data are independent of values on outcome variables, it was necessary to investigate whether between-group differences in missing data patterns influenced outcomes on grades and attendance rates (Hedeker & Gibbons, 1997). Thus, pattern-mixture models were used. For each outcome variable, participants were categorized as having complete post-intervention data on or not, and each original MMANOVA model was augmented to include the interaction between data completeness and intervention condition. Significant interactions would indicate a meaningful relationship between data completeness and intervention condition in predicting outcomes, while non-significant interactions would mean there was insufficient evidence for such relationships.

Tardies. Since the variable for tardies was not normally distributed, it violated the assumption of normally distributed dependent variables in MMANOVA. In addition, given that tardies are a count outcome, they required a model that accommodates such variables. Thus, tardies necessitated use of GLMM, which is a special type of mixed model used for count data (Atkins, Baldwin, Zheng, & Gallop, 2013). GLMM was used to assess (1) the overall effect of time point; (2) the average effect of intervention condition; and (3) the interaction between time point and intervention condition in

predicting tardy rates during the post-intervention period. In GLMM, numbers of tardies pre-intervention and demographic variables were included as covariates. Pattern-mixture models were also used to assess whether tardy data was missing at random.

Disciplinary incidents. According to descriptive analyses, the majority (61%) of students with complete disciplinary data did not have a disciplinary incident post-intervention. Among those who did have an incident, 54% had one or two and 46% had three or more. Due to their low frequency, disciplinary incidents were examined over the entire post-intervention period rather by academic quarter. Thus, it was not possible to examine the effect of time point or the interaction between time point and intervention condition in predicting disciplinary incidents over the post-intervention period.

Given the known non-independence of disciplinary incidents (Gregory, Cornell, & Fan, 2011), an ordinal scale was expected to be less biased than a simple count. As a result, ordinal regression (Scott, Goldberg, & Mayo, 1997) was used to test for a between-group difference in rates of disciplinary incidents post-intervention. Students were divided into three groups for the analysis: No disciplinary incidents, one or two disciplinary incidents, and three or more disciplinary incidents. Along with the aforementioned demographic variables, the number of disciplinary incidents in the academic quarter pre-intervention was included as a covariate. Pattern-mixture models were used to determine whether data on disciplinary incidents was missing at random.

Moderator and predictor effects. Moderation analyses were conducted to test whether pre-intervention values or demographic characteristics significantly moderated outcomes on grades, absence rates, or disciplinary incidents. Analyses examined the interaction between each variable and intervention condition in predicting outcomes by

incorporating each interaction into the relevant statistical model (MMANOVA for grades and absences; GLMM for tardies; and ordinal regression for disciplinary incidents).

An additional question of interest was whether change in depressive symptoms, regardless of intervention condition, predicted school-related outcomes. To explore this, meaningful change in depressive symptoms was examined as a predictor of grades, attendance, and disciplinary incidents. In line with the methods of the DPI main outcomes study (Young et al., 2015), meaningful change in depressive symptoms was indicated when participants had at least a 50% reduction in their CES-D (Radloff, 1997) score from baseline to six months post-intervention (i.e., through the end of booster sessions). Overall, 65 (35%) DPI participants (38 [40%] in IPT-AST and 27 [30%] in GC) experienced at least a 50% improvement on the measure.

Hypotheses

Due to the exceedingly small body of research on school-related outcomes from depression prevention programs (Haimm, Young, Sheshko, & Gallop, 2013; McCarty et al., 2013; Young et al., 2012), this study was exploratory in nature.

Effects of intervention condition. The primary foci of this study were to examine whether IPT-AST and GC had different effects on grades, attendance, or disciplinary incidents over approximately one year post-intervention and to assess whether pre-intervention variables or demographic factors moderated intervention effects. Since GC leaders were school staff and some reportedly focused on school-related issues during their groups, participation in GC was predicted to have some impact on grades. However, the superior depression-related effects of IPT-AST (Young et al., 2015) were predicted to have counterbalanced that advantage, resulting in no significant

differences between IPT-AST and GC participants' outcomes on grades. This hypothesis was supported by Haimm et al.'s (2013) finding that IPT-AST and usual school counseling had similar effects on students' GPAs. Yet given Haimm and colleagues' (2013) findings that participation in IPT-AST led to fewer absences and tardies than usual school counseling and Young and colleagues' (2012) finding that IPT-AST youth were less likely to be asked to leave school for academic or behavioral problems, it was hypothesized that IPT-AST would have superior effects on students' rates of attendance and disciplinary incidents over the post-intervention period.

Moderator and predictor effects. Regarding the question of moderation, it was hypothesized that there may be greater evidence of intervention effects among students who had initially lower grades or higher rates of absences, tardies, or disciplinary incidents, because intervention response may have translated more to improvement in academic performance (Jones, 2008) or behavior (Benas et al., in press) when it was an area of difficulty. There were no specific hypotheses about demographic variables moderating outcomes.

Based on research showing an association between depressive symptoms, academic performance, and school functioning (Jaycox et al., 2009; Jones, 2008; Roeser et al., 1998; Verboom, Sijtsema, Verhulst, Penninx, & Ormel, 2014), it was hypothesized that students who experienced meaningful decreases in their depressive symptoms would have more favorable outcomes on grades, attendance rates, and disciplinary incidents than students who did not experience such change. There was no evidence to suggest these outcomes would vary significantly by intervention condition.

Results

Participant Information

Demographic characteristics. Among the 186 participants in the study, the sample included 124 (67%) females and 62 (33%) males. Pre-intervention, students were a mean of 14.21 (*SD*=1.22) years old. In the academic year of the intervention, 67 participants (36%) were in seventh grade, 37 participants (20%) were in eighth grade, 51 participants (27%) were in ninth grade, and 31 participants (17%) were in tenth grade. Seventy-one participants (38%) were White/non-Hispanic and 115 (62%) were from an ethnic or racial minority group. Participants were from families with a wide range of annual incomes (less than $10,000: *N*=11 [6%]; between $10,000 and $24,999: *N*=21 [11%]; between $25,000 and $59,999: *N*=44 [24%]; between $60,000 and $89,999: *N*=27 [15%]; between $90,000 and $179,999: *N*=60 [32%]; $180,000 and above: *N*=22 [12%]).

Data retention. Table 1 shows the numbers and percentages of participants with valid data on each measure at each time point. For academic and disciplinary outcomes, the rates of valid data were generally high, ranging from 88% to 99% of the total sample across all time points. The amount of valid data on attendance outcomes was somewhat lower at certain time points due to two school districts only providing absence and tardy data for each full academic year. Rates of valid data ranged from 74% to 92% for absences and from 75% to 94% for tardies. IPT-AST and GC did not have significantly different rates of missing data on any variable at any time point.

The completeness of school-related data was similar to the completeness of other DPI data immediately post-intervention but lower than other DPI data at later time points. Among measures collected by the research team, 183 participants (98% of total sample)

had data post-intervention, 175 participants (94% of total sample) had data six months post-intervention, and 173 participants (93% of total sample) had data 12 months post-intervention. This difference in data completeness at later time points is attributable to the fact that the research team was able to continue administering study measures to participants who changed schools during the study period, but they were unable to obtain school records from those participants' new schools.

Pattern-mixture models indicated that findings were not sensitive to missing data; intervention effects were not dependent on missing data patterns.

Descriptive outcomes. Table 2 displays participants' mean grades, attendance rates, and numbers of disciplinary incidents across all academic quarters in the study period. The table includes results for the full sample and within groups. Figures 1, 2, and 3 show the trajectories of each outcome by intervention condition (for grades, attendance rates, and disciplinary incident rates, respectively). As seen in the table and figures, there was some fluctuation on the outcome measures over time, but they remained fairly consistent overall.

Intervention Effects

Table 3 shows the statistical findings from MMANOVA and GLMM analyses examining the effects of intervention condition on grades and attendance rates.

Overall grades. MMANOVA indicated that the interaction between intervention condition and time point did not significantly predict participants' overall grades during the post-intervention period. When those variables were examined separately, intervention condition did not have a significant effect on overall grades, but time point had a marginally significant effect on them ($F[4, 674]=2.36$, $p=0.05$). On average,

participants had a significantly smaller reduction from their overall grades pre-intervention in the third post-intervention quarter compared to the first (t[682]=2.67, p=0.01), fourth (t[668]=2.37, p=0.02), and fifth (t[669]=2.03, p=0.04) post-intervention quarters. In other words, participants had the highest post-intervention grades in the third post-intervention quarter, which was often the fall marking period.

Over the post-intervention period, changes in overall grades were not significantly different for IPT-AST and GC participants. Compared to their overall grades pre-intervention, IPT-AST participants had an estimated mean (*EM*) change (adjusting for overall grade pre-intervention, time point, and within-participant correlation attributable to repeated measures) of -1.24% (standard error [*SE*]=0.48%), while GC participants had an *EM* change of -1.47% (*SE*=0.49%) during the post-intervention period. The mean difference of 0.22% was not statistically significant. Furthermore, linear contrasts of model-based estimates clarified that there was not a significant effect of intervention condition at any single post-intervention time point.

Math grades. MMANOVA results demonstrated that neither intervention condition alone, time point alone, nor the interaction between intervention condition and time point significantly predicted changes in math grades during the post-intervention period. During the post-intervention period, changes in math grades were not significantly different for IPT-AST and GC participants. Compared to their math grades pre-intervention, IPT-AST participants had an *EM* change of -2.38% (*SE*=0.78%), and GC participants had an *EM* change of -2.64% (*SE*=0.78%) across all post-intervention time points. The mean difference of 0.25% was not statistically significant. Moreover,

linear contrasts showed there was no significant effect of intervention condition at any individual post-intervention time point.

ELA grades. Again, MMANOVA results did not indicate that intervention condition alone, time point alone, or the interaction between intervention condition and time point significantly predicted changes in ELA grades over the post-intervention period. On average, changes in ELA grades were not significantly different for IPT-AST and GC participants during the post-intervention period. From pre-intervention, IPT-AST participants had an *EM* change of -1.21% (*SE*=0.81%) and GC participants had an *EM* change of -0.61% (*SE*=0.83%) across all post-intervention quarters; the mean difference of 0.61% was not statistically significant. Linear contrasts did not indicate significant between-condition differences at any specific post-intervention time points.

Absences. As with outcomes on grades, neither intervention condition alone, time point alone, nor the interaction between intervention condition and time point significantly predicted changes in absence rates during the post-intervention period. Overall, IPT-AST and GC participants did not have significantly different outcomes on absence rates over the post-intervention period. Compared to pre-intervention, IPT-AST participants had an *EM* increase of 0.44 (*SE*=0.10) absences and GC participants had an *EM* increase of 0.59 (*SE*=0.10) absences across all post-intervention academic quarters. The mean difference of 0.15 absences was not statistically significant. Linear contrasts also indicated that outcomes on absences rates were not significantly different for IPT-AST and GC participants within any individual post-intervention time points.

Tardies. GLMM indicated that the interaction between intervention condition and time point did not significantly predict participants' tardy rates over the post-intervention

period. When intervention condition and time point were examined as independent fixed effects, only time point significantly predicted outcomes on tardy rates (F[4, 731]=4.15, p=0.002). Tardy rates in the first and second post-intervention quarters were significantly lower than in the third (versus first: t[731]=2.40, p=0.02; versus second: t[731]=2.54, p=0.01), fourth (versus first: t[731]=2.30, p=0.02; versus second: t[731]=2.43, p=0.02), and fifth (versus first: t[731]=2.72, p=0.01; versus second: t[731]=2.94, p=0.003) post-intervention quarters.

IPT-AST and GC participants did not have significantly different outcomes on tardy rates over the post-intervention period. IPT-AST participants had an *EM* of 1.28 (*SE*=0.19) tardies per academic quarter, and GC participants had an *EM* of 1.02 (*SE*=0.15) tardies per academic quarter; the mean difference of 0.26 tardies was not statistically significant. Linear contrasts of within-time point differences confirmed that there were no significant between-group differences in tardy rates at specific post-intervention time points.

Disciplinary incidents. According to ordinal regression analyses, there was not a significant effect of intervention condition on rates of disciplinary incidents post-intervention. Among participants with valid data, 51% (*N*=48) of IPT-AST participants and 57% (*N*=52) of GC participants had zero disciplinary incidents during the post-intervention period. Seventeen percent (*N*=16) of IPT-AST participants and 20% (*N*=18) of GC participants had one or two disciplinary incidents, and 19% (*N*=18) of IPT-AST participants and 12% (*N*=11) of GC participants had three or more disciplinary incidents.

Moderator and Predictor Effects

Moderation analyses examined whether pre-intervention values (e.g., overall grades in the pre-intervention academic quarter), age pre-intervention, gender, ethnicity, or family income moderated the effects of intervention condition on grades, attendance, or disciplinary outcomes. Change in depressive symptoms was also examined as a predictor of outcomes on grades, attendance, and disciplinary incidents.

Overall grades. Overall grades pre-intervention, age pre-intervention, gender, and ethnicity did not moderate the effects of intervention condition on overall grades post-intervention. Family income, however, was a significant moderator (F[5, 176]=2.81, p=0.02), indicating that differences between IPT-AST and GC participants' outcomes on overall grades varied as a function of family income. As shown in Figure 4, among families with a gross income of less than $10,000 per year, IPT-AST participants improved by an *EM* of 3.09% (*SE*=2.27%) across the post-intervention period, while GC participants decreased by an *EM* of 4.12% (*SE*=1.78%) over that time. This difference of 7.20% (*SE*=2.85%) favoring IPT-AST was statistically significant (F[1, 164]=6.41, p=0.01). Among families with a gross income ranging from $25,000 to $59,999 per year, on the other hand, IPT-AST participants decreased by an *EM* of 2.63% (*SE*=0.91%), while GC participants only decreased by an *EM* of 0.05% (*SE*=1.08%). This smaller difference of 2.58% (*SE*=1.40%) favoring GC was marginally significant (F[1, 166]=3.41, p=0.07). Changes in overall grades did not significantly differ between IPT-AST and GC participants in any of the other income groups (i.e., $10,000 to $24,999; $60,000 to $89,999; $90,000 to $179,999; or at least $180,000).

Change in depressive symptoms was a significant predictor of outcomes on overall grades (F[1, 176]=6.71, p=0.01); on average, academic performance outcomes were significantly more favorable among participants who experienced meaningful improvements in their depressive symptoms (i.e., at least a 50% reduction in their CES-D score) over the intervention period (*EM* change in overall grades=-0.07% [*SE*=0.59%]) than those who did not experience a meaningful reduction in their symptoms (*EM* change in overall grades=-1.96% [*SE*=0.42%]).

Math grades. Math grades pre-intervention, gender, ethnicity, and family income did not moderate the effects of intervention condition on math grades post-intervention. Change in depressive symptoms did not predict outcomes on math grades. Age pre-intervention was a marginally significant moderator of the effects of intervention condition (F[1, 189]=3.04, p=0.08), indicating that differences between IPT-AST and GC participants' outcomes on math grades varied as a function of their age. For interpretive purposes, a median split was initially conducted in order to divide the sample into younger and older participants. The median split for younger versus older participants was 14.28 years. Next, because research has indicated that age-related decreases in math grades are attributable to the transition from middle to high school (Rosenkranz et al., 2014) and because the median split caused some ninth grade youth to be classified as younger and others to be classified as older, the sample was divided based on whether participants were in middle or high school during the intervention year. Since findings were similar for both variables and whether participants were in middle or high school is more inherently meaningful, that variable was used for interpretation. As shown in Figure 5, middle school students had more favorable outcomes on math grades than high school

students overall (middle school *EM* change=-2.06% [*SE*=0.76%] versus high school *EM* change=-3.09% [*SE*=0.85%]). However, among IPT-AST participants, outcomes were very similar for the middle and high school subgroups, and actually slightly more favorable for high school students (middle school *EM* change=-2.43% [*SE*=1.05%] versus high school *EM* change=-2.34% [*SE*=1.20%]). Among GC participants, on the other hand, high school students had larger decreases in their math grades than middle school students (middle school *EM* change=-1.69% [*SE*=1.07%] versus high school *EM* change=-3.84% [*SE*=1.20%]). While middle school IPT-AST participants had somewhat less favorable outcomes than their GC counterparts, high school IPT-AST participants had more favorable outcomes. This result suggests that IPT-AST may have prevented against normative age-related deterioration in math grades (Rosenkranz et al., 2014). Although providing some clarification on age-related intervention effects, none of these between-group comparisons were statistically significant.

ELA grades. ELA grades pre-intervention, age pre-intervention, gender, ethnicity, and family income did not moderate the effects of intervention condition on ELA grades post-intervention. Change in depressive symptoms did not predict outcomes on ELA grades.

Absences. Neither number of absences pre-intervention, age pre-intervention, gender, ethnicity, nor family income moderated the effects of intervention condition on number of absences post-intervention. Change in depressive symptoms did not predict outcomes on absence rates.

Tardies. Neither age pre-intervention, gender, ethnicity, nor family income moderated the effects of intervention condition on number of tardies post-intervention. In

addition, change in depressive symptoms did not predict outcomes on tardies. However, number of tardies pre-intervention was a marginally significant moderator of intervention condition effects (F[1, 730]=2.99, p=0.08). For interpretive purposes, the sample was divided into three groups by mean number of tardies during the pre-intervention quarter: zero tardies (60% of the sample with valid data); one tardy (19% of the sample with valid data); and two or more tardies (21% of the sample with valid data). As shown in Figure 6, IPT-AST participants who had zero tardies or one tardy during the pre-intervention quarter had slightly higher tardy rates than their GC counterparts over the post-intervention period (zero tardies pre-intervention: IPT-AST *EM*=0.85 [*SE*=0.17] versus GC *EM*=0.58 [*SE*=0.13]; one tardy pre-intervention: IPT-AST *EM*=1.24 [*SE*=0.40] versus GC *EM*=0.82 [*SE*=0.27]). In contrast, IPT-AST participants who had two or more tardies during the pre-intervention quarter had fewer tardies than those GC participants over the post-intervention period (IPT-AST *EM*=4.07 [*SE*=1.14] versus GC *EM*=4.61 [*SE*=1.18]). Although informative, none of these differences reached statistical significance.

Disciplinary incidents. Neither number of disciplinary incidents pre-intervention, age pre-intervention, gender, ethnicity, nor family income moderated the effects of intervention condition on number of disciplinary incidents post-intervention. Change in depressive symptoms did not predict outcomes on disciplinary incidents.

Academic Outcomes Compared to Normative Data

Given the lack of convincing evidence for IPT-AST's or GC's effects on school-related outcomes, post hoc comparisons assessed how participants' outcomes compared to normative trajectories in adolescents' academic performance. There is a paucity of

research on academic trends in adolescence; however, in a recent brief report, the University of Chicago Consortium on Chicago School Research reported the eighth and ninth grade GPAs for a cohort of Chicago Public School (CPS) students in the 2007-2008 and 2008-2009 academic years (Rosenkranz et al., 2014). Thus, in an exploratory manner, DPI participants' outcomes on overall, math, and ELA grades were compared to those of that cohort. Because the CPS students' grades were reported on a four-point scale, they were recalculated to match this study's zero- to 100-point grade scale.

Figure 7a compares DPI participants' grades at their first and last assessment points (i.e., the pre-intervention and fifth post-intervention quarters) to CPS students' grades in the eighth and ninth grades. As shown in the figure, DPI participants had higher grades than CPS students at both time points. Although DPI participants had decreases in their overall (-0.98%), math (-2.64%), and ELA grades (-0.80%) over the study period, those decreases were substantially smaller than those of CPS students, who had average decreases of 5.75% in their overall grades, 4.67% in their math grades, and 5.00% in their ELA grades from eighth to ninth grade.

To confirm that these more favorable outcomes among DPI participants were not solely attributable to those who did not transition from middle to high school during the study (i.e., the students who were in seventh, ninth, or tenth grade at baseline), a second comparison was conducted with the subgroup of DPI participants who were in eighth grade at baseline. Again, DPI participants' grades at their first and last assessment points were used. Among that subgroup of DPI participants, the decreases in overall (-2.20%) and math grades (-3.34%) were still smaller than among CPS students (decrease in overall grades=-5.75%; decrease in math grades=-4.67%). Moreover, among DPI

participants in eighth grade, ELA grades increased by an average of 1.89%, which contrasts with the decrease of 5.00% among CPS students. These comparisons suggest that, as compared to normative trajectories, DPI participants had relative stability in their grades.

Discussion

This study aimed to examine the effects of two adolescent depression prevention programs on school performance and functioning. Despite calls to broaden the outcomes examined in intervention research (Cuijpers et al., 2012; Kazdin, 2002) and evidence for an association between depressive symptoms and lower academic functioning (Jaycox et al., 2009; Jones, 2008; Roeser et al., 1998; Verboom et al., 2014), there has been minimal research on whether youth depression prevention programs have school-related effects (Haimm et al., 2013; McCarty et al., 2013; Young et al., 2012). Examination of objective school performance indicators has been even more limited; in fact, only one known study has included such variables (Haimm et al., 2013; Young et al., 2012). Thus, the current study aimed to assess whether the superior depression-related effects of IPT-AST compared to GC (Young et al., 2015) translated to more favorable school-related outcomes.

Effects of Intervention Condition

For grades, it was hypothesized that IPT-AST and GC participants would not have significantly different outcomes. While some GC groups reportedly focused on school issues, IPT-AST had better effects on depressive symptoms (Young et al., 2015), potentially counterbalancing GC's advantage. This hypothesis was confirmed, in that there were no intervention effects on overall, math, or ELA grades over the post-intervention period. In addition, intervention condition and time point did not significantly interact to predict any outcomes on grades. There was a marginal effect of time point on overall grades post-intervention, attributable to smaller decreases in overall

grades in a post-intervention quarter that tended to fall near the beginning of the academic year.

For attendance rates, it was hypothesized that findings would be similar to those of Haimm and colleagues (2013), who found that adolescents who participated in IPT-AST trended towards significantly more favorable attendance outcomes than those who received usual school counseling. However, this effect was not replicated, with neither intervention condition nor the interaction between intervention condition and time point predicting absence or tardy rates post-intervention. Across groups, absence rates did not significantly vary by time point, but tardy rates were significantly lower in the first and second post-intervention quarters than in the third, fourth, and fifth post-intervention quarters. This finding suggests that the interventions may have had initial preventive effects against increases in tardies, although this is speculative without a no-intervention control condition.

For disciplinary incidents, the hypothesis that IPT-AST participants would have more favorable disciplinary outcomes than GC participants was based on Young et al.'s (2012) finding that parochial school students who received IPT-AST were less likely than students who received usual school counseling to be asked to leave school for academic or behavioral reasons. Again, this finding was not replicated, as there was not a significant effect of intervention condition on total number of disciplinary incidents post-intervention. It is possible that this lack of replication is due to this study's disciplinary outcome variable including all disciplinary incidents (ranging from cell phone use to assault) and actions (ranging from verbal reprimands to out-of-school suspensions), while Young and colleagues (2012) specifically examined more serious problems for which

students were asked to leave school. Since public school students cannot be asked to leave school, out-of-school suspension was deemed the most comparable alternative punishment and examined in post hoc analyses. Over the post-intervention period, just 10 participants (four in IPT-AST and six in GC) received an out-of-school suspension. Within the small number of out-of-school suspensions, there was no evidence of more favorable effects of IPT-AST over GC. However, it is possible that significant between-condition differences would emerge over a longer follow-up period (e.g., 18 months, as used by Young et al. [2012]). Thus, in future studies, it may be important to extend the follow-up period and target attention towards more serious disciplinary incidents.

Despite IPT-AST having superior depression-related outcomes (Young et al., 2015), the lack of intervention effects on school-related outcomes is not entirely surprising. These results reflect those of studies on many other school-based mental health interventions which did not have positive academic outcomes compared to their control conditions. For example, in a study on the PTA Program, which is another indicated depression prevention intervention, McCarty et al. (2013) did not find intervention effects on measures of subjective school problems. In addition, in a study on Reaching Educators, Children and Parents, which is a psychosocial intervention to treat concurrent internalizing and externalizing problems, Weiss and colleagues (2003) did not find effects on grades or attendance. The interventions that have had positive impacts on academic performance have tended to be more intensive, involving students' parents and teachers and having longer durations (Hoagwood et al., 2007). Fast Track, for instance, is a multiyear intervention for externalizing problems consisting of (1) a universal classroom program on social and emotional development, (2) parenting groups, (3) child

social skills training groups, and (4) weekly academic tutoring (Conduct Problems Prevention Research Group, 1999, 2002, 2004). Even among such programs, effects have been mixed, only appearing on certain measures and tending to diminish over time (Arbuthnot, 1992; Conduct Problems Prevention Research Group, 1999, 2002, 2004; Hoagwood et al., 2007). As a result, it may be unreasonable to expect significant intervention effects from a brief program such as IPT-AST.

It is also possible that this study's lack of intervention effects is due to GC's rigor as a control condition. Compared to Young and colleagues' trial comparing IPT-AST to usual school counseling (Young et al., 2010), GC was a stringent control condition; GC groups met as frequently as IPT-AST groups, and several GC leaders followed evidence-based protocols (Young et al., 2015). Moreover, GC leaders were school staff, while IPT-AST leaders were research personnel, and receiving care from a member of the school community may have enhanced participants' sense of support and/or accountability at school. Given that a sense of school connectedness is closely linked to students' academic and behavioral outcomes (Anderman, 2002; Sánchez, Colón, & Esparza, 2005), enhanced school connectedness among GC participants may have positively impacted their academic performance.

Studies that have demonstrated intervention effects on school-related outcomes have tended to include control conditions that were not matched with their experimental conditions in frequency and intensity. Fast Track, for example, was compared to no-intervention control condition (Conduct Problems Prevention Research Group, 1999). Other studies used treatment-as-usual control conditions, which tended to include less contact (Catalano et al., 2003; Young et al., 2010), therefore preventing intervention

effects from being specifically attributed to differences in content. Without a no-intervention control group, it is difficult to disentangle whether this study found no intervention effects on school-related outcomes because (1) neither IPT-AST nor GC had school-related effects or (2) GC was a rigorous control condition and both interventions had positive effects. Although the finding that DPI participants had more positive academic trajectories than CPS students (Rosenkranz et al., 2014) suggests the former possibility is less likely, it cannot be ruled out.

Moderator and Predictor Effects

Moderation analyses produced several key findings which indicated that certain demographic characteristics and behavioral patterns pre-intervention interacted differently with IPT-AST and GC in predicting school-related outcomes. For example, family income moderated intervention effects on overall grades, wherein outcomes were significantly different for IPT-AST and GC participants in the lowest income group (gross family income of less than $10,000 per year). In that subgroup, IPT-AST participants' overall grades post-intervention were higher than pre-intervention, while GC participants' overall grades were lower than pre-intervention. Among participants from families with a gross income ranging from $25,000 to $59,999, on the other hand, outcomes were more favorable for GC participants at a marginally significant level. Although both IPT-AST and GC participants in that subgroup experienced decreases in their overall grades from pre- to post-intervention, GC participants had smaller decreases. Outcomes were not different among other income subgroups. These results suggest that IPT-AST may specifically benefit the academic performance of adolescents from low-income families, a finding that aligns with previous IPT-AST research which has

indicated that IPT-AST has positive effects on the school functioning of inner city youth (Young et al., 2012).

Results also indicated that age pre-intervention was a marginally significant moderator of the effects of intervention condition on math grades. For interpretive purposes, the sample was divided based on whether students were in middle or high school during the intervention year. Within IPT-AST, outcomes on math grades were very similar for middle and high school students, and actually slightly more favorable for high school students. Within GC, on the other hand, outcomes were considerably worse among high school students than middle school students. Across interventions, middle school IPT-AST participants had slightly less favorable outcomes than middle school GC participants. Among high school students, however, IPT-AST participants had more favorable outcomes. These findings suggest that IPT-AST may be protective against age-related decreases in math performance (Rosenkranz et al., 2014), although the lack of significant between-group differences suggests these effects are modest and that replication is needed.

Finally, number of tardies during the pre-intervention quarter was a marginally significant moderator of intervention effects on tardies over the post-intervention period. Among participants with few (i.e., zero or one) tardies pre-intervention, average rates of tardies post-intervention were also low, although IPT-AST participants had slightly higher rates than GC participants. In contrast, among participants with more tardies pre-intervention, average rates of tardies post-intervention were also higher, but IPT-AST participants had lower rates than their GC counterparts. Thus, among participants with more problematic behavior in this domain, IPT-AST was associated with more favorable

outcomes. In line with the moderation effects of family income on overall grades and age on math grades, this finding indicates that IPT-AST was associated with more positive effects than GC among certain higher-risk subgroups. This should be explored in future research.

Based on the established association between depressive symptoms and school functioning (Jaycox et al., 2009; Jones, 2008; Roeser et al., 1998; Verboom et al., 2014), it was hypothesized that meaningful decreases in depressive symptoms (i.e., at least a 50% score reduction on the CES-D) during the course of the intervention would predict more favorable school-related outcomes, regardless of intervention condition. For overall academic performance, this hypothesis was supported: Participants who experienced meaningful improvements in their depression symptomatology had significantly more favorable outcomes on their overall grades than participants who did not experience such improvement. This is a powerful result in support of these depression prevention interventions; when IPT-AST or GC achieved its primary aim to reduce depressive symptoms, benefits generalized to academic performance. Because more IPT-AST participants than GC participants were intervention responders (Young et al., 2015), this finding lends further support to the utility of IPT-AST as a depression prevention program in schools.

Interestingly, the effect of change in depressive symptoms did not hold for math grades, ELA grades, attendance outcomes, or disciplinary incidents. The lack of significant effects on math and ELA grades suggests that the effects on overall grades were primarily driven by responders' outcomes in other subject areas (e.g., science, social studies, foreign languages, and special subjects). This may be due to educators' particular

emphasis on performance in math and ELA, as those subjects are the focus of standardized testing in New Jersey (State of New Jersey Department of Education, 2014). Moreover, the lack of effects on attendance and disciplinary outcomes suggests that depressive symptoms, particularly at the subthreshold level, may be more closely associated with academic performance than school-related functioning in other domains. This notion has been supported in the literature (Roeser et al., 1998) but should be further investigated in future research.

Comparison to Normative Trends in Academic Outcomes

Over the course of this study, participants exhibited some small decreases in their academic performance. This raised questions about how their outcomes compared to normative trajectories in adolescents' academic performance. Research has indicated that student engagement decreases with each additional year students are in school (Busteed, 2013), a trend which is presumably associated with negative effects on academic achievement. Although research examining adolescents' achievement trajectories is quite limited, it was possible to compare this study's participants to a cohort of CPS students who were tracked across their transition from eighth to ninth grade. While DPI participants had some decreases in their grades, they were considerably smaller than those of CPS students (Rosenkranz et al., 2014). Despite being a single comparison to an underperforming school district (Illinois State Board of Education, 2014), this exploratory assessment provides initial support for the possibility that IPT-AST and GC may have prevented against normative reductions in academic performance.

Limitations

Although methodologically rigorous, this study had several limitations. This study lacked a no-intervention control condition, and it was therefore challenging to assess whether IPT-AST and GC had preventive effects on adolescents' school performance and functioning. Because there was not a no-intervention control condition, it is unknown whether the lack of intervention effects indicates that the programs had limited impact on school-related outcomes or that they both had positive effects. As discussed above, it was possible to compare participants' academic outcomes to those of eighth to ninth grade CPS students (Rosenkranz et al., 2014), which provided some evidence for preventive effects. However, the CPS study did not report sufficient statistics to conduct more formal comparisons, and the populations in the DPI and CPS studies may have differed in important ways which contributed to the observed differences. In addition, comparisons to other students' attendance and disciplinary outcomes were not possible.

A second limitation was that group dates were not evenly distributed throughout the academic year, meaning the effects of time point on certain outcomes (i.e., overall grades and tardy rates) may be attributable to the times of year that academic quarters tended to end. Thus, those findings must be interpreted with caution.

It is also important to note that use of paper records from 10 schools necessitated flexibility in data entry methods and caused some data to be missing. In particular, attendance data in two school districts was only provided on a yearly basis. Although the statistical analyses for absences accommodated that missing data, the analyses for tardies did not, and students in those two districts were excluded from the tardy analyses. As a result, these findings should be interpreted cautiously. Students' changing of school

districts also contributed to missing data, as records could not be obtained from students' new, non-participating schools. However, statistical analyses indicated that data was missing at random, meaning that intervention effects were not biased by missing data.

Finally, although this study examined many indicators of academic performance and school functioning, it was not comprehensive. It is possible that significant intervention effects occurred on school-related measures that were not included in this study, such as standardized test scores or retention rates. Although this study's cumulative findings render this unlikely, the possibility cannot be ruled out. Consequently, researchers conducting future studies in this area may be advised to examine those measures in addition to those used in this study. Ultimately, the field would benefit from establishing a common set of objective school-related metrics to be included in all research studies on youth mental health interventions; this would facilitate systematic program comparisons and allow for meta-analyses.

Summary and Conclusions

Overall, this study provided mixed results on how two depression prevention programs impacted academic performance and school functioning. Results on academic outcomes were more positive than those on attendance rates and disciplinary incidents, suggesting such programs may have stronger effects on academic performance than other school behaviors.

Similar to many other studies on school-based mental health programs (Hoagwood et al., 2007), there were no significant effects of intervention condition on school-related outcomes. However, IPT-AST was associated with more favorable effects among certain higher-risk subgroups (e.g., those from families with an income of less

than $10,000 per year), suggesting IPT-AST may be slightly superior for specific populations that may require more support.

Across groups, participants who reported meaningful improvements in their depressive symptoms had better academic outcomes overall. This finding indicates that when depression prevention programs are effective, the benefits are often broader than symptoms alone – when the intervention meets its primary objective to decrease depressive symptoms, participants also fare better in the important realm of academic achievement. Because more IPT-AST than GC participants responded to their respective intervention in terms of depression symptomatology (Young et al., 2015), this result lends further support to the favorability of IPT-AST over GC.

Notably, the slight superiority of IPT-AST occurred in the context of participants in both conditions having reductions in their grades over the study period. However, when matched with a cohort of CPS adolescents, the decreases in grades were smaller among this study's participants (Rosenkranz et al., 2014). The finding that both interventions were associated with positive academic outcomes compared to normative trends suggests they may have prevented against more negative trajectories. Further research is needed to assess the validity of this finding.

Although these findings are encouraging, they do not suggest that depression prevention programs are the panacea for school performance and functioning among adolescents at risk of depression. Under the aim to incentivize schools to dedicate resources to such programs by demonstrating that they align with educational priorities, this study's positive findings may be highlighted. At the same time, it must be made clear that school-related effects have so far appeared to be modest and variable across

outcomes. Yet research on the school-related outcomes of depression prevention programs is in its nascent stage, and findings have been inconsistent (Haimm et al., 2013; McCarty et al., 2013; Young et al., 2012). Although objective measures of school performance and functioning are challenging to collect and analyze, they may provide an important means of advocating for the provision of depression prevention programs in schools. However, if additional research on these programs continues to produce similar results on school-related variables, advocacy for dissemination and implementation may need to be strengthened in other ways. For instance, perhaps these programs' positive effects on mental health (McCarty et al., 2013; Rohde et al., 2013; Stice et al., 2010; Stice et al., 2009; Wijnhoven et al., 2014; Young et al., 2015; Young et al., 2006; Young et al., 2010) should be more strongly emphasized as intrinsically important, particularly as the focus of education shifts from academic achievement alone to promoting the healthy development of the whole child (ASCD & Centers for Disease Control & Prevention, 2014).

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Table 1

Numbers and percentages of participants with valid data on each outcome measure at each study time point

	Pre-Intervention *N* (%)	**First Post-Intervention *N* (%)**	**Second Post-Intervention *N* (%)**	**Third Post-Intervention *N* (%)**	**Fourth Post-Intervention *N* (%)**	**Fifth Post-Intervention *N* (%)**
Overall grades	184 (99)	183 (98)	174 (94)	167 (90)	166 (89)	166 (89)
Math grades	184 (99)	183 (98)	172 (92)	167 (90)	166 (89)	166 (89)
ELA grades	180 (97)	182 (98)	174 (94)	167 (90)	165 (89)	164 (88)
Absences	172 (92)	171 (92)	165 (89)	138 (74)	137 (74)	162 (87)
Tardies	174 (94)	173 (93)	165 (89)	140 (75)	139 (75)	162 (87)
Disciplinary incidents	185 (99)	184 (99)	171 (92)	165 (89)	164 (88)	164 (88)

Table 2

Mean grades, attendance rates, and disciplinary incidents across the pre- and post-intervention academic quarters

	Pre-Intervention Mean (*SD*)	**First Post-Intervention Mean (*SD*)**	**Second Post-Intervention Mean (*SD*)**	**Third Post-Intervention Mean (*SD*)**	**Fourth Post-Intervention Mean (*SD*)**	**Fifth Post-Intervention Mean (*SD*)**
Overall Grades						
IPT-AST	84.64 (7.33)	82.88 (8.59)	83.42 (7.83)	83.42 (8.40)	82.98 (8.74)	83.08 (8.98)
GC	84.04 (8.75)	82.31 (9.81)	83.36 (9.67)	85.18 (8.07)	83.71 (8.68)	83.66 (9.32)
Full Sample	84.35 (8.04)	82.60 (9.18)	83.39 (8.77)	84.28 (8.26)	83.34 (8.69)	83.37 (9.13)
Math Grades						
IPT-AST	81.31 (10.51)	80.12 (11.63)	79.02 (12.01)	78.99 (11.55)	78.71 (11.52)	78.50 (12.69)
GC	81.41 (11.42)	79.17 (12.44)	80.36 (11.10)	80.53 (11.98)	79.55 (12.26)	78.95 (14.24)
Full Sample	81.36 (10.94)	79.65 (12.01)	79.70 (11.55)	79.75 (11.75)	79.13 (11.86)	78.72 (13.44)
ELA Grades						
IPT-AST	80.62 (11.96)	79.64 (12.28)	79.57 (12.34)	79.68 (12.26)	79.26 (12.25)	78.62 (14.32)
GC	80.51 (11.15)	79.53 (13.15)	79.45 (12.16)	81.50 (11.87)	80.40 (11.83)	80.95 (12.32)
Full Sample	80.57 (11.54)	79.59 (12.68)	79.51 (12.22)	80.57 (12.07)	79.82 (12.02)	79.77 (13.38)
Absences						
IPT-AST	1.94 (3.05)	2.11 (2.99)	1.99 (2.52)	1.98 (2.51)	2.10 (2.49)	2.15 (2.19)
GC	2.02 (2.65)	2.40 (2.39)	2.28 (4.00)	2.04 (4.14)	2.82 (6.05)	2.19 (4.49)
Full Sample	1.98 (2.84)	2.25 (2.71)	2.13 (3.30)	2.01 (3.40)	2.46 (4.61)	2.17 (3.49)
Tardies						
IPT-AST	1.23 (3.24)	1.32 (2.36)	1.15 (1.99)	2.23 (3.93)	2.24 (4.56)	1.63 (2.72)
GC	1.10 (2.18)	1.27 (2.97)	1.37 (3.86)	1.61 (3.42)	1.70 (2.91)	1.65 (3.04)
Full Sample	1.17 (2.76)	1.29 (2.67)	1.26 (3.02)	1.92 (3.69)	1.97 (3.82)	1.64 (2.87)
Disciplinary Incidents						
IPT-AST	0.14 (0.48)	0.18 (0.72)	0.13 (0.46)	0.49 (0.96)	0.42 (1.12)	0.36 (1.00)
GC	0.37 (1.19)	0.42 (0.18)	0.21 (0.73)	0.21 (0.63)	0.36 (1.26)	0.32 (0.96)
Full Sample	0.25 (0.91)	0.30 (0.98)	0.17 (0.60)	0.35 (0.83)	0.39 (1.19)	0.34 (0.98)

Table 3

Effects of condition, time point, and the interaction by condition and time point on participants' grade and attendance outcomes in the post-intervention period

	Numerator *df*	**Denominator *df***	***F*-value**	***p*-value**
Overall Grades[a]				
Condition	1	187	0.11	0.74
Time Point	4	674	2.36	0.05^{+}
Condition by Time Point	4	670	0.41	0.80
Math Grades[a]				
Condition	1	187	0.05	0.82
Time Point	4	676	1.34	0.25
Condition by Time Point	4	672	0.37	0.83
ELA Grades[a]				
Condition	1	176	0.27	0.60
Time Point	4	663	0.26	0.91
Condition by Time Point	4	655	0.36	0.84
Absences[a]				
Condition	1	169	0.00	1.00
Time Point	4	573	1.38	0.24
Condition by Time Point	4	570	1.31	0.26
Tardies[b]				
Condition	4	731	1.37	0.24
Time Point	4	731	4.15	0.002**
Condition by Time Point	1	727	0.43	0.79

Note. ^{+}p=0.05 **p<0.01

[a] Analyzed with mixed model analyses of variance.
[b] Analyzed with generalized linear mixed models.

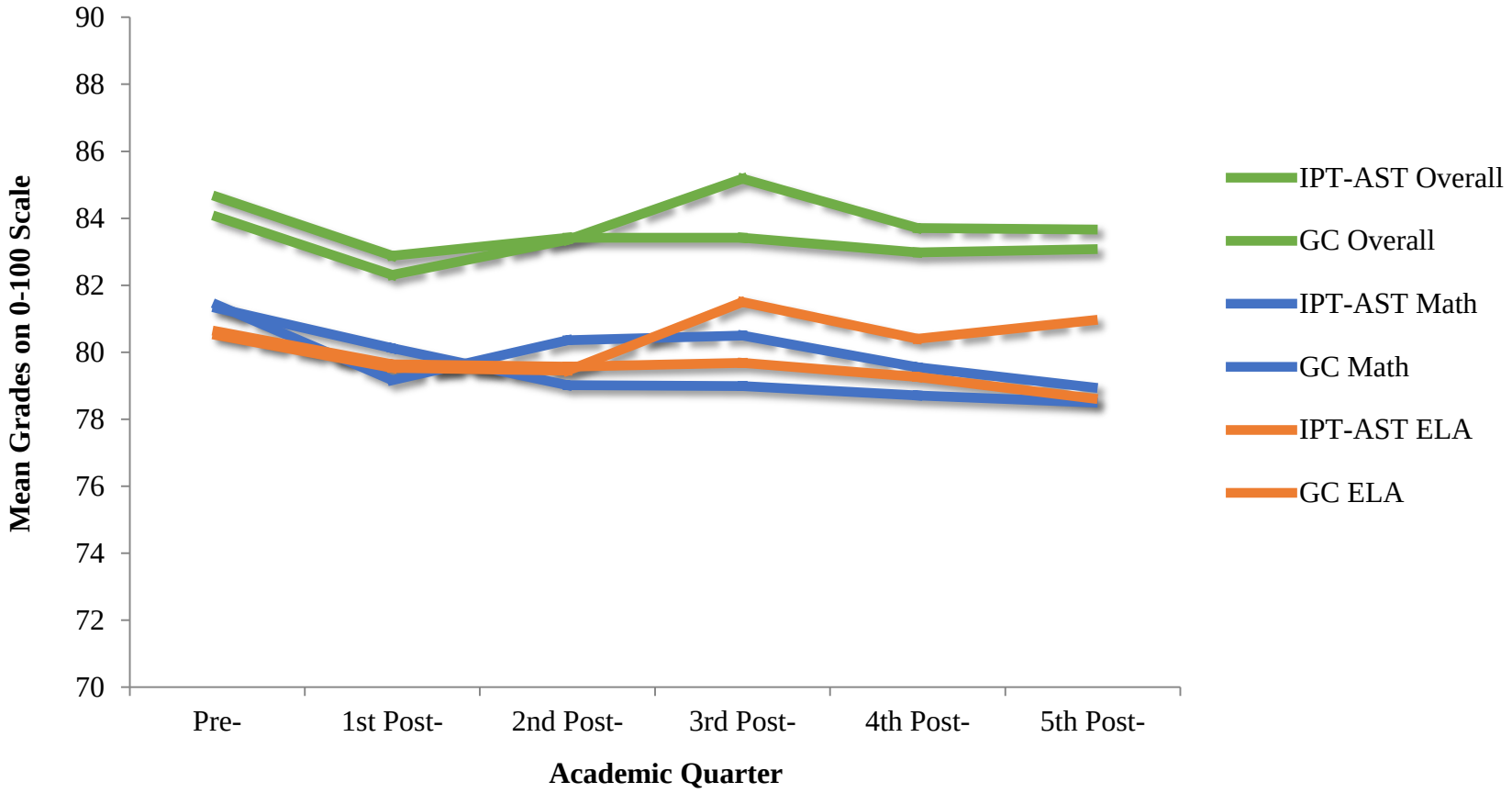

Figure 1. Trajectories of mean overall, math, and ELA grades by intervention condition

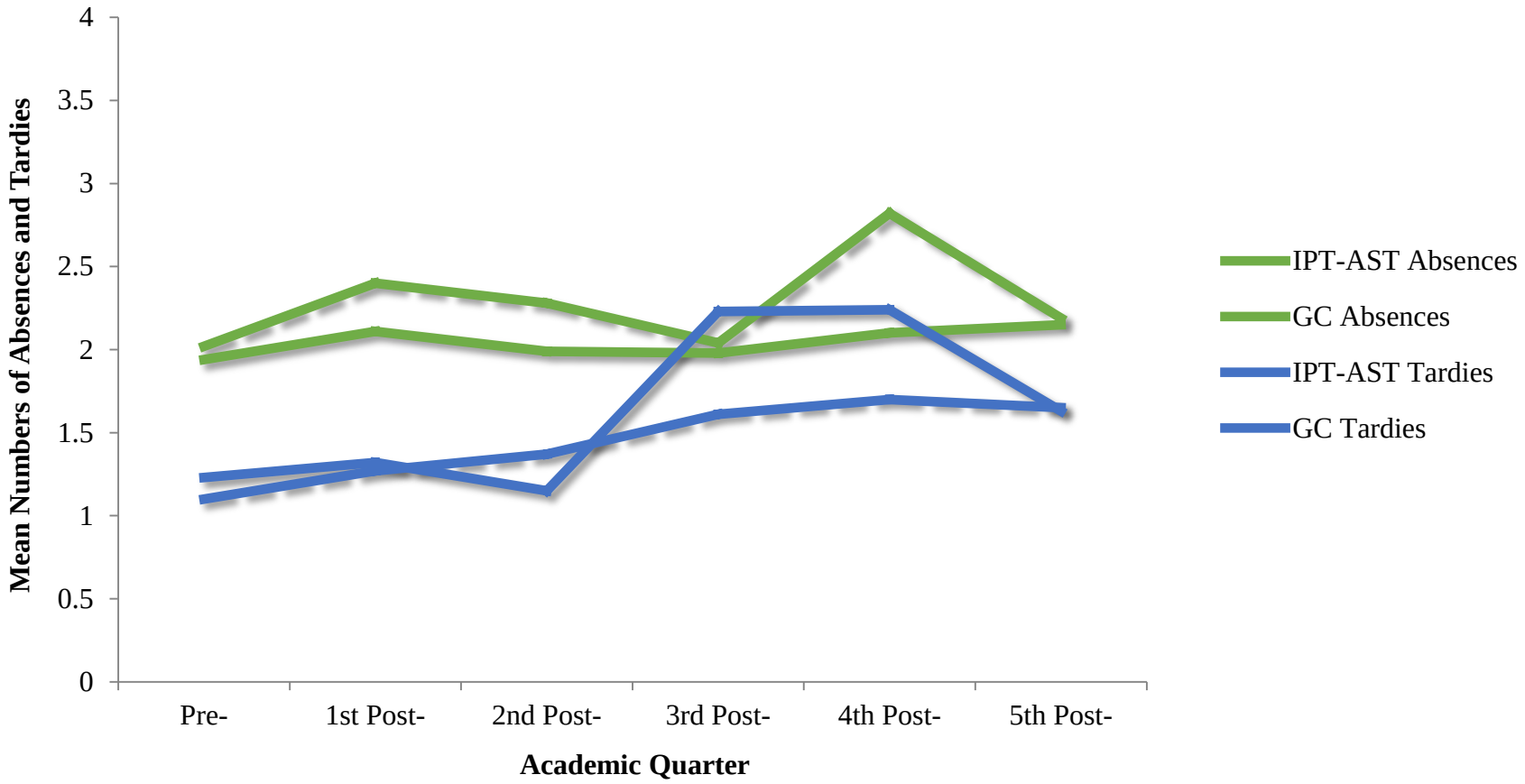

Figure 2. Trajectories of mean absence and tardy rates by intervention condition

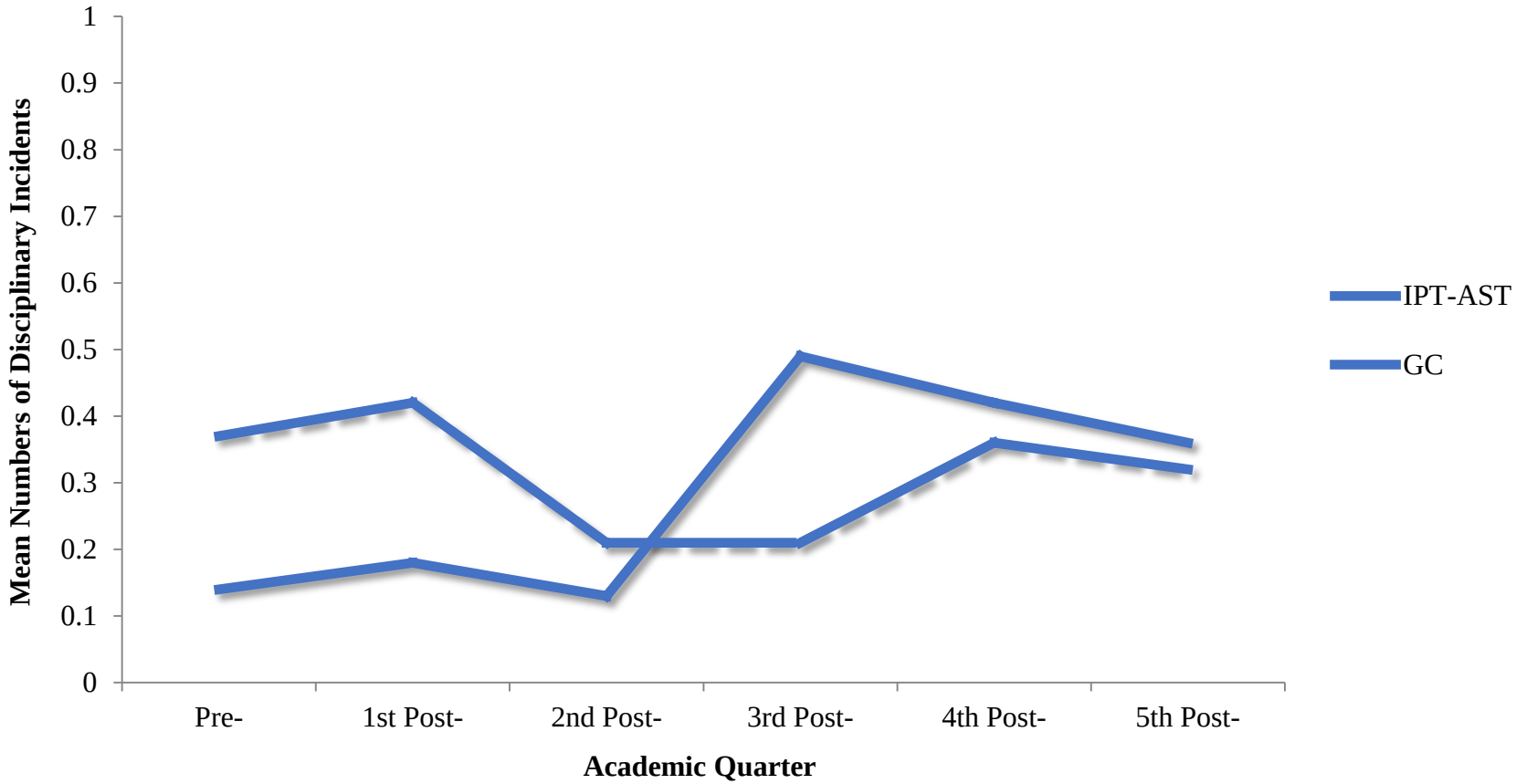

Figure 3. Trajectories of mean numbers of disciplinary incidents by intervention condition

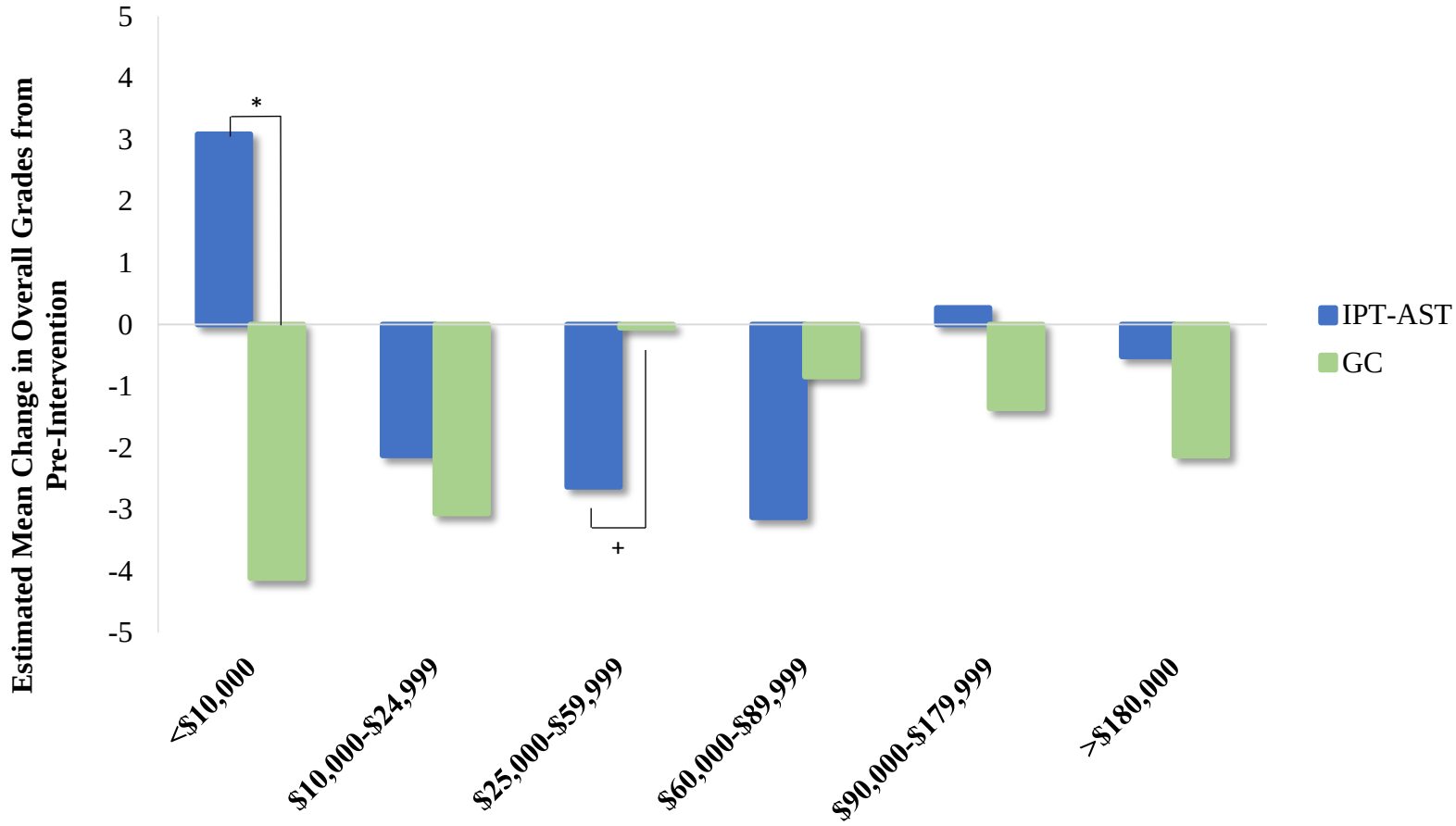

Figure 4. Interaction between family income and intervention condition in predicting estimated mean changes in overall grades from pre-intervention

Note. ^{+}p=0.07 *p<0.05

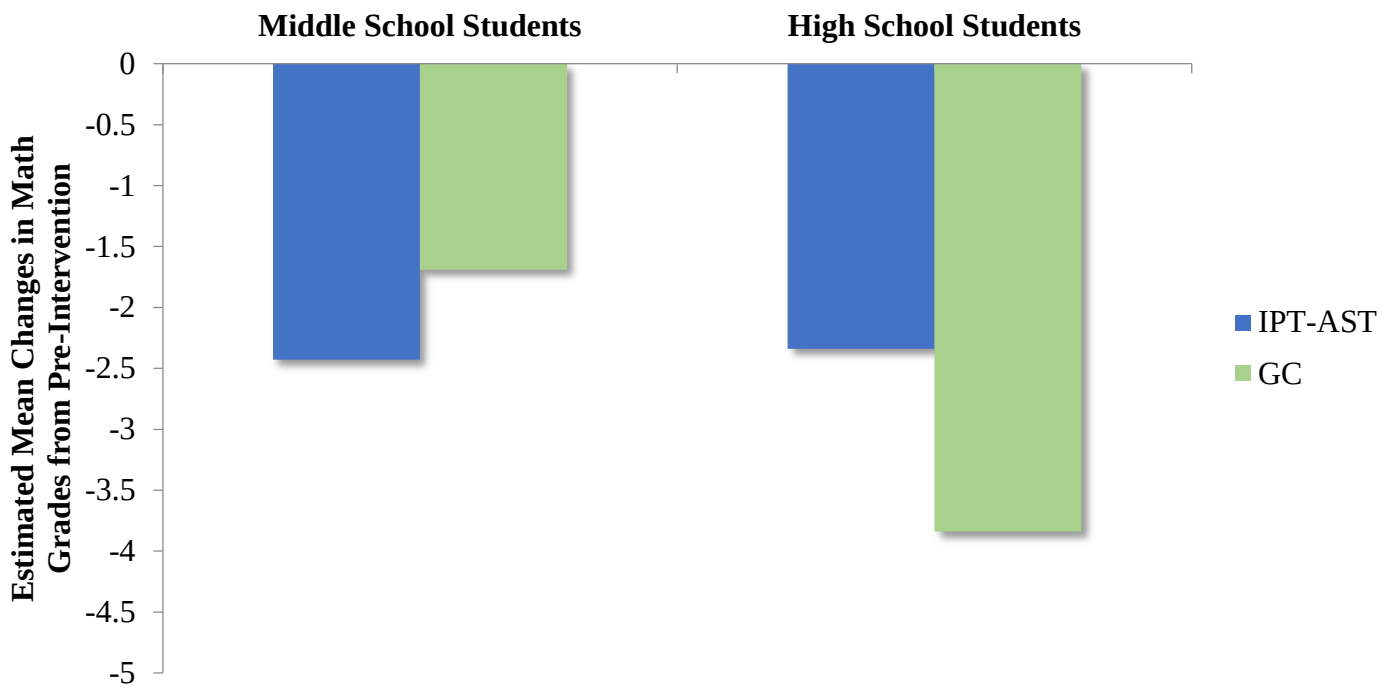

Figure 5. Interaction between participant school level and intervention condition in predicting estimated mean change in math grades from pre-intervention

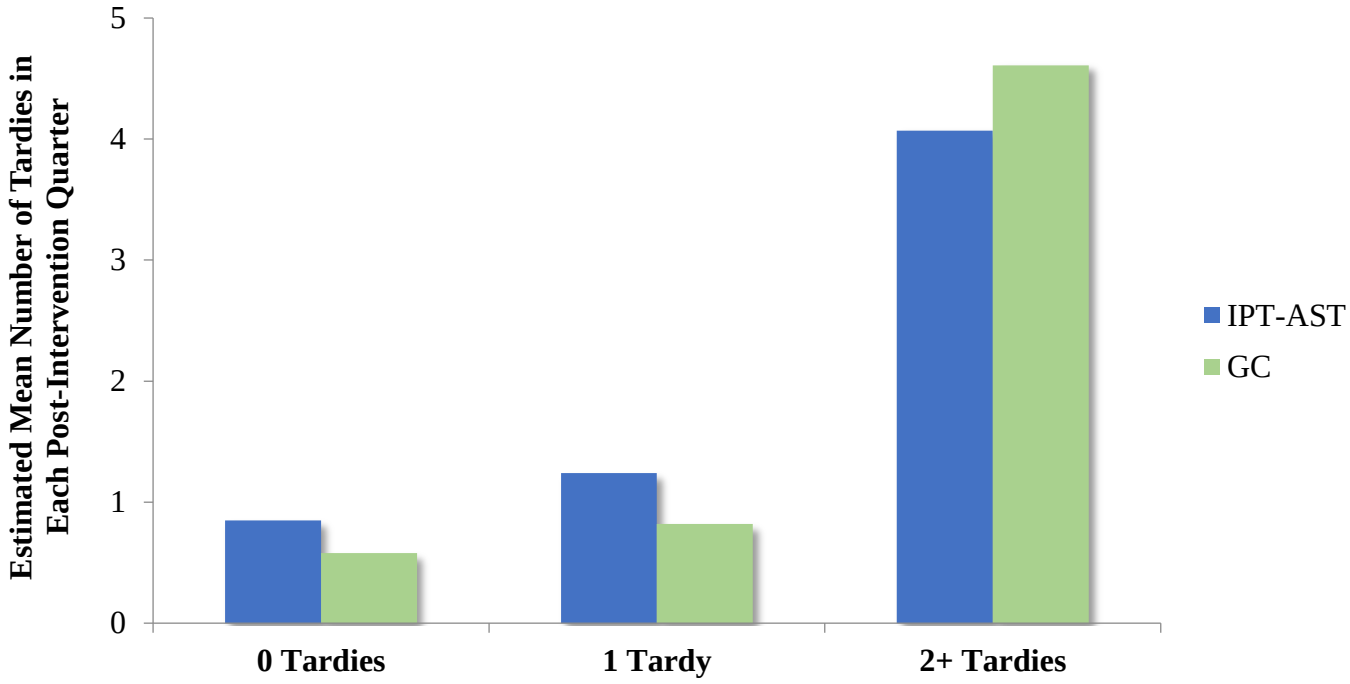

Figure 6. Interaction between number of tardies pre-intervention and intervention condition in predicting number of tardies post-intervention

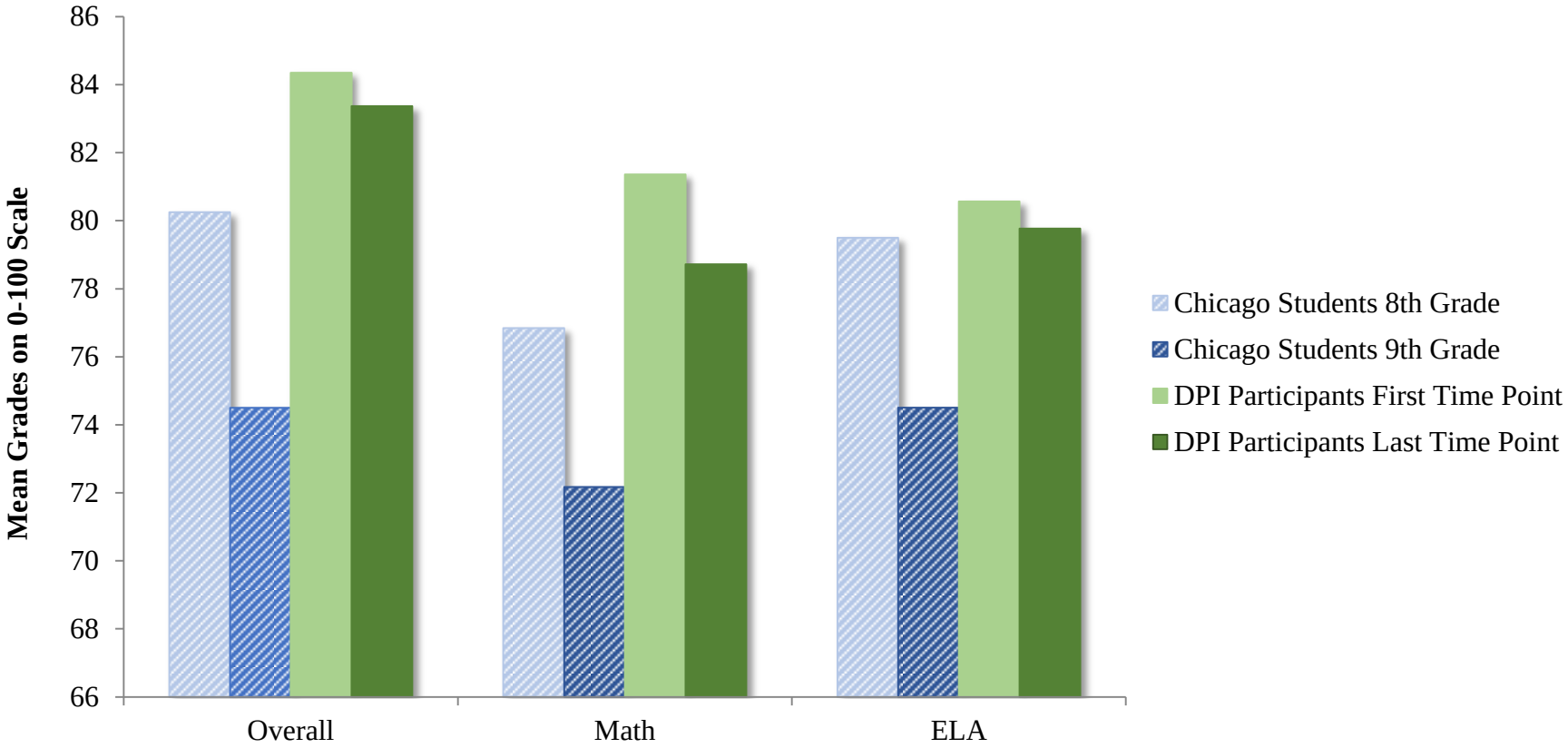

Figure 7a. Comparison of academic performance trajectories for Chicago Public School students transitioning from eighth to ninth grade versus Depression Prevention Initiative participants over the study period

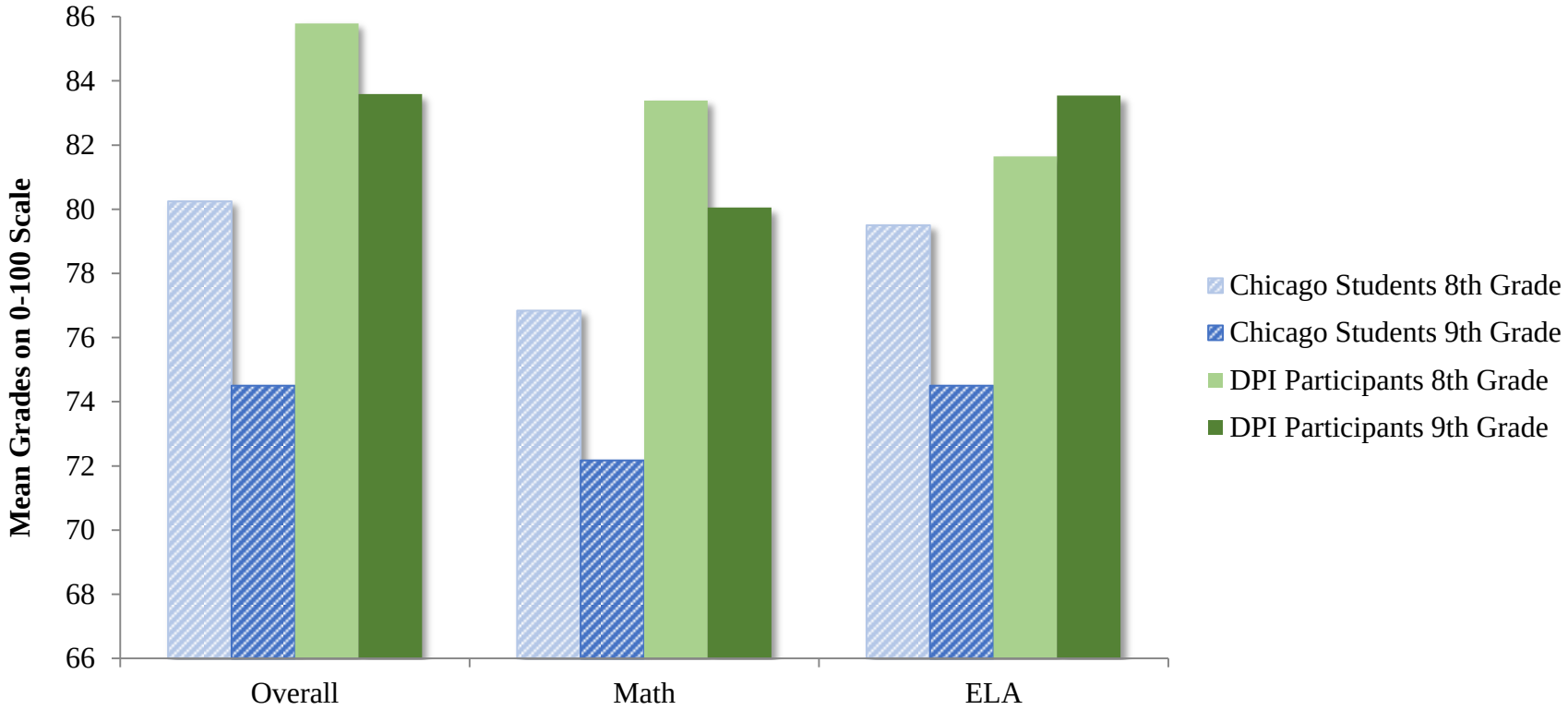

Figure 7b. Comparison of academic performance trajectories for Chicago Public School students versus Depression Prevention Initiative participants who transitioned from eighth to ninth grade