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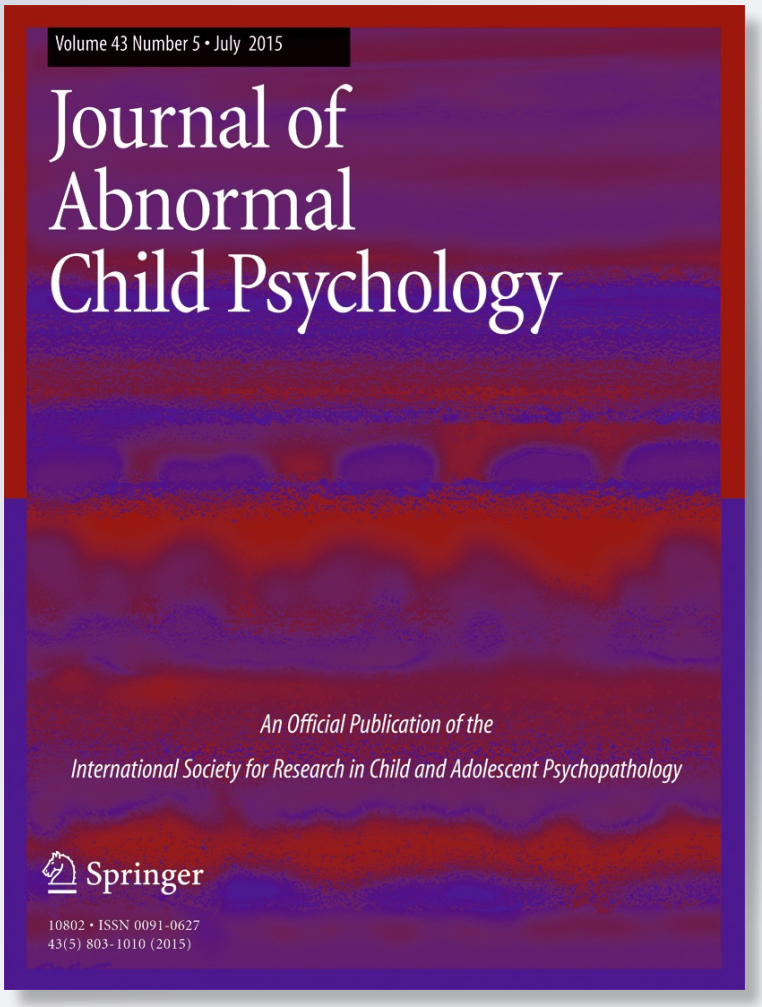
Journal of Abnormal Child Psychology
An official publication of the International Society for Research in Child and Adolescent Psychopathology

ISSN 0091-0627
Volume 43
Number 5

J Abnorm Child Psychol (2015)
43:985-998
DOI 10.1007/s10802-014-9955-9



Springer

J Abnorm Child Psychol (2015) 43:985–998
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Common Versus Specific Correlates of Fifth-Grade Conduct Disorder and Oppositional Defiant Disorder Symptoms: Comparison of Three Racial/Ethnic Groups

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Published online: 20 November 2014

Abstract The extent to which risk profiles or correlates of conduct disorder (CD) and oppositional defiant disorder (ODD) symptoms overlap among youth continues to be debated. Cross-sectional data from a large, representative community sample (N=4,705) of African-American, Latino, and White fifth graders were used to examine overlap in correlates of CD and ODD symptoms. About 49 % of the children were boys. Analyses were conducted using negative binomial regression models, accounting for several confounding factors (e.g., attention deficit/hyperactivity disorder symptoms), sampling weights, stratification, and clustering. Results indicated that CD and ODD symptoms had very similar correlates. In addition to previously established correlates, several social skills dimensions were significantly related to ODD and CD symptoms, even after controlling for other correlates. In contrast, temperamental dimensions were not significantly related to CD and ODD symptoms, possibly because more proximal correlates (e.g., social skills) were also taken into account. Only two factors (gender and household income) were found to be specific correlates of CD, but not ODD, symptoms. The pattern of common and specific correlates of CD and ODD symptoms was replicated fairly consistently across the three racial/ethnic subgroups. Implications of these findings for further research and intervention efforts are discussed.

Keywords Conduct disorder · Oppositional defiant disorder · Risk factors · Race/ethnicity · Children

Electronic supplementary material The online version of this article (doi:10.1007/s10802-014-9955-9) contains supplementary material, which is available to authorized users.

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Introduction

Conduct disorder (CD) and oppositional defiant disorder (ODD) symptoms are common among children and adolescents (e.g., Boylan et al. 2007; Loeber et al. 2000; Maughan et al. 2004) and are associated with a wide range of mental health problems later in life, including anxiety, mood, and substance use disorders (e.g., Fergusson et al. 2005; Kim-Cohen et al. 2003; Nock et al. 2007). According to the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association 1994), CD refers to "a repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated" (p. 85) and ODD reflects "a recurrent pattern of negativistic, defiant, disobedient, and hostile behavior toward authority figures" (p. 91). As noted by Angold et al. (1999) in their meta-analysis, older studies have often collapsed CD and ODD into a single diagnostic category. More recent research has largely shifted toward conceptualizing these disorders as distinct entities (e.g., Burns et al. 1997; Greene et al. 2002; Nock et al. 2007; Rowe et al. 2010). However, the extent to which risk profiles or correlates of CD and ODD symptoms overlap among youth continues to be debated (e.g., Boden et al. 2010; Burke et al. 2002). The purpose of this study was to expand this line of research by examining the extent to which various individual and psychosocial correlates of CD and ODD symptoms overlap, using data from a large, representative community sample of African-American, Latino, and White boys and girls.

Common Versus Specific Risk Factors and Correlates of CD and ODD

Several conceptual views have been offered in regard to the similarity of correlates and risk factors of CD and ODD symptoms. At least three general strands of models can be distinguished. A first approach argues that CD and ODD are mostly a function of common risk factors, such as similar underlying genetic makeup (e.g., Eaves et al. 2000). A second, somewhat similar approach, referred to as the differential severity model by Rowe et al. (2002), is based on a linear gradation hypothesis. It posits that the risk factors for CD and ODD are similar (e.g., social disadvantage, parental psychopathology), but that CD is more strongly related to these risk factors than is ODD (e.g., Frick et al. 1992; Rey et al. 1988). A third approach hypothesizes that both common and unique influences are related to CD and ODD (e.g., Dick et al. 2005; Tuvblad et al. 2009; Waldman et al. 2001). Investigations of the utility of these conceptual approaches and their variants are ongoing.

Empirical studies have identified a broad range of individual and psychosocial correlates and risk factors that are related to CD and ODD symptoms among children and adolescents (for a detailed review of this literature, see Burke et al. 2002). Selected findings are summarized below, focusing mostly on domains relevant for the current study. Individual correlates and risk factors include male gender (e.g., Bird et al. 2001; Maughan et al. 2004); race/ethnicity, with African-American children exhibiting higher symptomatology (e.g., Bird et al. 2001; Fabrega et al. 1993; Lahey et al. 1995); temperamental factors, such as inflexibility, intense and reactive responding, and low inhibitory control (Frick and Morris 2004; Nigg 2006; Rettew et al. 2004; Sanson and Prior 1999); impulsivity and attention deficit/hyperactivity disorder (ADHD; e.g., Greene et al. 2002; Maughan et al. 2004); and poor social skills or impaired social functioning (e.g., Greene et al. 2002; Matthys et al. 1995). Psychosocial correlates and risk factors include living in adverse or impoverished socioeconomic conditions (e.g., Boden et al. 2010; Greene et al. 2002; Lahey et al. 1995; Loeber et al. 1995; Rowe et al. 2010); violence exposure at home and in the community (e.g., Boden et al. 2010; Ford et al. 1999; McCabe et al. 2005); and stressful life events (e.g., Bird et al. 2001; Tiet et al. 2001).

Although these individual and psychosocial correlates have been associated with both CD and ODD in several studies, results have not always been consistent. For example, Boden et al. (2010) used prospective data from a New Zealand birth cohort to examine whether various psychosocial risk factors, maternal smoking during pregnancy, male gender, and IQ were significant predictors of CD and ODD at ages 14–16. Although the risk factor profiles of CD and ODD were very similar, a noteworthy finding was that male gender was related only to CD. In addition, the strength of associations between individual predictors and CD and ODD differed significantly in a few cases (e.g., family socioeconomic disadvantage). Similarly, using longitudinal data from 1,420 individuals aged 9–21 years, Rowe et al. (2010) found that male gender was related to CD but not to ODD. These findings call into question results from some prior studies indicating that gender was a common correlate or risk factor of CD and ODD. Another illustrative example pertains to race/ethnicity, for which studies have shown mixed patterns of group differences (e.g., Bird et al. 2001; Fabrega et al. 1993; Lahey et al. 1995). These inconsistencies are likely a function of several study features, including the specific racial/ethnic subgroups represented in the sample, the particular racial/ethnic subgroup designated as the baseline category during data analysis, and the extent to which race/ethnicity is confounded with other sociodemographic factors (see, e.g., Lahey et al. 1995). Further clarification of these racial/ethnic group differences is needed.

Thus it remains unclear which of the three conceptual approaches described above offers the most useful framework for understanding the correlates and risk factors of CD and ODD symptoms. In general, there appears to be fairly robust

empirical evidence for both commonality and specificity in correlates and risk factors of CD and ODD; in some studies common or shared correlates appear to be the predominant pattern (e.g., Rowe et al. 2002; 2010), whereas other studies point to a higher degree of specificity in the correlates of CD and ODD (e.g., Shanahan et al. 2008). Moreover, there is considerable uncertainty regarding which correlates or risk factors should be conceptualized as specific to either CD or ODD. As noted by Rowe et al. (2010), to date, the only clear exception appears to be child gender. In fact, they suggested that male gender may be a specific risk factor for CD, which is consistent with findings from some recent studies (e.g., Boden et al. 2010; Rowe et al. 2010). Some features of the extant empirical literature likely contributed to this situation. First, many findings come from clinically referred samples of boys. Additional research with community samples comprising both genders is important to evaluate whether these patterns of findings replicate to non-referred youths and to girls. Second, findings have been qualified in some studies by confounding factors such as comorbid ADHD and gender (see Burke et al. 2002). More systematic control of these confounding factors in empirical studies is needed to advance the extant research on common and specific correlates of CD and ODD. Third, few comparisons of the correlates of CD and ODD across different racial/ethnic subgroups have been reported in the literature. More systematic comparisons across racial/ethnic subgroups are necessary to determine whether correlate-outcome patterns replicate across different racial/ethnic subgroups. Fourth, some risk factor domains have been studied fairly extensively as potential correlates of CD and ODD (e.g., adverse parenting behaviors, social disadvantage), whereas others remain relatively understudied (e.g., temperament, social skills). More systematic inclusion of such constructs in research on common and specific correlates of CD and ODD is important to allow for a more balanced evaluation of the merits of the differing conceptual approaches described above. Some of these gaps in the literature were addressed in this study.

Current Study

The purpose of this study was to examine the extent to which individual and psychosocial correlates of CD and ODD symptoms overlap in a large, representative community sample of African-American, Latino, and White fifth graders, both for the total sample and across racial/ ethnic subgroups. All associations were controlled for gender and ADHD symptoms, which have been shown to be important confounding factors in prior research. Guided by the empirical literature summarized above, measures of household income as percentage of the federal poverty level (FPL), life events, and violence exposure were investigated as fairly well-established correlates of CD and ODD symptoms. Because findings from McCabe et al. (2005) point to the importance of considering violence exposure at more than one level of a child's ecological context, measures of violence exposure at home and in the neighborhood were each included.

Specific dimensions of the child's temperament assessing aspects of the child's general activity level and self-regulation were examined as putative correlates of interest in a more exploratory fashion. Self-regulation includes effortful control of attention (e.g., persistence, nondistractibility) and flexibility as important subcomponents. Although high general activity level and low effortful control have been linked to elevated externalizing behavior problems, conduct problems, and delinquency (e.g., Frick and Morris 2004; Sanson et al. 2004; Windle 1992; Zhou et al. 2007), these temperamental dimensions are often not included in studies examining common and specific correlates of CD and ODD symptoms. Measures of social skills are also relatively scarce in this literature, even though poorer functioning in perspective-taking, empathy, moral reasoning, and social-information processing, as well as egocentric peer representations, have been linked to externalizing behavior, aggression, and conduct problems (e.g., Cohen and Strayer 1996; Dodge 2011; Matthys et al. 1995; Tavecchio et al. 1999), whereas better social competence and social skills, including higher levels of cooperation and self-control, have been inversely associated with externalizing behavior problems (Bornstein et al. 2010; Gresham et al. 2011). In view of these findings, measures of social skills also were included in this study as putative correlates of CD and ODD symptoms.

We are not aware of any prior studies that also included this entire set of correlates. Regarding the expected pattern of common versus specific correlates of CD and ODD symptoms, the available literature did not permit the formulation of firm hypotheses, with the exception of male gender, which was posited to be a specific correlate of child CD symptoms, after adjusting for the effects of all other correlates.

Methods

Participants

This study used data from the first wave of Healthy Passages ™, a study of adolescent health–related behaviors, outcomes, and risk and protective factors in 5,147 fifth graders and their primary caregivers (PCGs) in three research sites: University of Alabama at Birmingham, University of Texas Health Science Center at Houston, and University of California at Los Angeles/RAND Corporation. Institutional review boards at each research site and the Centers for Disease Control and Prevention approved the study.

Students were recruited from fifth-grade classrooms in public schools in each of three geographic areas: (1) Los Angeles County, CA, (2) Birmingham, AL, and (3) Houston, TX. Eligible schools had an enrollment of at least 25 fifth graders, representing over 99 % of students enrolled in regular academic classrooms in the three geographic areas. A cluster probability sampling procedure was used to select schools from each site. Within the randomly sampled schools, all fifth graders (English- and Spanish-speaking) enrolled in regular academic classrooms were invited to participate. Design weights were constructed to reflect different school selection probabilities based on racial/ethnic composition. Nonresponse weights were created to model nonresponse as a function of school, student gender, and student race/ethnicity. These two sets of weights were combined into a final weight that represented the population of fifth graders in the public schools in each site's geographic area. Of the 11,532 fifth graders enrolled in the 118 randomly selected schools, 6,663 of their PCGs who either agreed to be contacted about the study or who were unsure were invited to participate; 5,147 (77.3 %) of them completed an interview (24.4 % [unweighted] of the fifth graders were White, 35.2 % Latino, 34.1 % African-American, 6.3 % Other). Additional details about the Healthy Passages study are provided elsewhere (Windle et al. 2004; Schuster et al. 2012).

After excluding 321 children who were not among the three main target racial/ethnic groups (i.e., African-American, Latino, and White) and 121 with incomplete data on some measures used in this study, a final analytic sample of 4,705 (91.4 %) remained. Key sample characteristics and descriptive statistics of the study variables for the analytic sample are shown in Table 1. The sample excluded from analysis (i.e., the 442 children who either were of other race/ethnicity or had incomplete data) had a significantly higher proportion of Latino children ($\chi^2[5]=133.98$, $p<0.001$), fewer ADHD symptoms (weighted $M=1.79$ vs. 2.23; $F[1,115]=12.67$, $p<0.01$), fewer ODD symptoms (weighted $M=2.31$ vs. 3.25; $F[1,115]=19.13$, $p<0.001$), lower levels of behavioral flexibility (weighted $M=11.34$ vs. 11.96; $F[1,115]=9.84$, $p<0.01$), and lower levels of responsibility (weighted $M=8.01$ vs. 8.81; $F[1,115]=15.56$, $p<0.001$) than the analytic sample. However, both samples did not differ significantly in gender, age, household income as percent of the FPL, violence exposure at home and in the neighborhood, CD symptoms, activity level, task orientation, cooperation, assertion, self-control, and life events.

Procedures

All three Healthy Passages research sites used standardized data collection materials and protocols, including training manuals, field manuals, and validation procedures. Materials describing the Healthy Passages study and the Healthy Passages Permission to Contact Form were distributed to eligible students in their classrooms. Students were asked to take these materials home and share them with their PCGs. PCGs who agreed to learn more about the study were contacted by project staff to schedule a home visit. Alternative locations were available for PCGs who preferred to meet with field interviewers at another location. After obtaining written informed consent from the PCG and written assent from the child, anthropometric measurements were taken for both. Then, one field interviewer conducted the child interview and another conducted the PCG interview. These interviews consisted of a computer-assisted personal interview (CAPI) component followed by an audio–computer-assisted self-interview (A-CASI) segment. The PCG and child completed their interviews separately in private spaces. English and Spanish versions of the CAPI/A-CASI interviews were available. On average, it took about 3 hours for the field interviewers to complete data collection, including consent procedures, anthropometrics, CAPI, and A-CASI with the PCG and child. Additional assessments included a school staff survey, school records data, teacher surveys, census tract data, and neighborhood observations. PCGs were reimbursed $50 and children were reimbursed with a $20 gift card from a national chain store for their participation. Participating schools also received monetary reimbursement.

Measures

CD, ODD, and ADHD Symptoms The presence of CD, ODD, and ADHD symptoms in the past year was assessed by PCGs with 28 items adapted from the Diagnostic Interview Schedule for Children Predictive Scales (DPS; Lucas et al. 2001; Leung et al. 2005). The DPS is a widely-used screening tool that is based on the Diagnostic Interview Schedule for Children. It has been shown to identify children who display symptoms of 11 *DSM-IV* (American Psychiatric Association 1994) diagnoses (Leung et al. 2005). The CD subscale was based on eight items, the ODD subscale on 12 items, and the ADHD subscale on eight items. PCGs rated the presence of each symptom on a dichotomous scale (1 = *Yes*, 0 = *No*). Affirmative responses were summed to create the given subscale score. The internal consistency as estimated by the Kuder-Richardson Formula 20 coefficient of reliability was 0.63 for the CD, 0.79 for the ODD, and 0.76 for the ADHD subscales. Higher values on each subscale indicated the presence of more symptoms in the past year.[1]

[1] Other work with this sample has examined the factor structure and possibility of differential item functioning among the three racial/ethnic groups for the ADHD, CD, and ODD subscales of the DPS. Findings from latent variable analyses have revealed that comparisons among the three racial/ethnic groups can be conducted with minimal bias at the scale level for the ADHD, CD, and ODD subscales (Wiesner et al. 2014).

Table 1 Descriptive statistics for study variables for the total sample and for each racial/ethnic subgroup

Variable	Total Sample (N=4,705)	White (n=1,247)	Latino (n=1,736)	African-American (n=1,722)	p
Race/Ethnicity[a]					
Latino	1,736 (36.9)				
African-American	1,722 (36.6)				
White	1,247 (26.5)	–	–	–	–
Male gender [a]	2,321 (49.3)	641 (51.4)	869 (50.0)	811 (47.1)	0.214
Household Income as %FPL[a, b]					
≤100	1,543 (32.8)	65 (5.2)	748 (43.0)	730 (42.4)	0.000
101–299	1,565 (33.3)	258 (20.7)	637 (36.7)	670 (38.9)	
≥300	1,334 (28.4)	879 (70.5)	190 (10.9)	265 (15.4)	
Any violence exposure at home [a]	477 (10.1)	122 (9.8)	142 (8.2)	213 (12.4)	0.000
Any violence exposure in neighborhood [a]	911 (19.4)	113 (9.1)	316 (18.2)	482 (28.0)	0.000
Child age (Years)[c]	10.63 (0.64)	10.59 (0.56)	10.64 (0.66)	10.64 (0.67)	0.092
ADHD symptoms[c]	2.24 (2.14)	2.08 (2.19)	1.98 (1.91)	2.61 (2.27)	0.000
DOTS-R: behavioral flexibility[c]	12.05 (2.87)	12.86 (2.53)	11.27 (3.13)	12.25 (2.61)	0.000
DOTS-R: activity[c]	12.20 (3.91)	11.34 (3.80)	12.71 (3.78)	12.30 (4.02)	0.000
DOTS-R: task orientation[c]	12.89 (3.14)	12.72 (2.77)	13.00 (3.35)	12.91 (3.18)	0.049
SSRS: cooperation[c]	8.15 (2.47)	7.99 (2.77)	8.38 (2.41)	8.03 (2.60)	0.002
SSRS: assertion[c]	9.86 (2.52)	11.03 (2.21)	9.11 (2.62)	9.78 (2.30)	0.000
SSRS: responsibility[c]	8.89 (2.40)	9.90 (1.97)	7.95 (2.56)	9.11 (2.14)	0.000
SSRS: self-control[c]	8.85 (2.63)	9.81 (2.40)	8.14 (2.79)	8.87 (2.40)	0.000
Life events[c]	4.74 (2.71)	4.39 (2.70)	4.52 (2.62)	5.21 (2.75)	0.000

%FPL percent of the federal poverty level, *ADHD* attention deficit/hyperactivity disorder, *DOTS-R* Revised Dimensions of Temperament Survey, *SSRS* Social Skills Rating System. All statistical tests (i.e., differences by race/ethnicity) are adjusted for sampling weights, stratification, and clustering

[a] Total unweighted number (percentage in parentheses)

[b] Variable has missing values for 5.6 % of the analytic sample

[c] Unweighted mean (standard deviation in parentheses

Temperament PCGs answered subsets of items from various subscales of the Revised Dimensions of Temperament Survey (DOTS-R; Windle and Lerner 1986). Items were rated on a 4-point scale from 1 = *usually false* to 4 = *usually true* and summed to form the given subscale score. Three temperamental dimensions were included: *General activity level* (five items; e.g., "Your child can't stay still for long"; Cronbach Alpha (α)=0.77), with higher subscale scores indicating higher levels of activity, fidgety, and restlessness; *Behavioral flexibility* (four items, e.g., "My child resists changes in routine"; reverse-coded; α=0.71), with higher subscale scores indicating greater flexibility in responding to external changes; and *Task orientation* (five items; e.g., "Your child persists at a task until it's finished"; α=0.67), with higher subscale scores indicating greater persistence and low distractibility.

Social Skills PCGs answered subsets of items from the Social Skills Rating System (SSRS; Gresham and Elliott 1990), one of the most widely used instruments for assessing children's social skills in the United States. Items were rated on a 3-point scale from 0 = *never* to 2 = *very often* and summed to derive the given subscale score. Four subscales assessing four dimensions of the child's current prosocial behavior were included: *Cooperation* (seven items; e.g., regarding completion of household tasks; α=0.72), with higher subscale scores indicating more cooperative behavior of the child at home; *Assertion* (seven items; e.g., in social situations or interactions with others; α=0.70), with higher subscale scores indicating more assertive behavior of the child; *Responsibility* (seven items; e.g., in interactions with strangers, or on the phone; α=0.61), with higher subscale scores indicating more responsible behavior of the child; and *Self-control* (seven items; e.g., in dealing with disagreements or controlling his/her own temper; α=0.72), with higher subscale scores indicating better self-control of the child.

Violence Exposure Using the past year as a reference period, children responded to 9 items adapted from the Youth Risk Behavior Surveillance Survey (Centers for Disease Control and Prevention 2006) assessing whether they had directly or

indirectly experienced the given violent act (e.g., "seen someone else threatened or injured with a gun"; "someone threatened or injured you with a knife"; "someone told you that they were going to beat you up or hurt you really bad"). Endorsement of any of these items was followed with contextual probes about the location of such an incident. For the purposes of this study, two dichotomous measures were derived indicating the occurrence of *violence exposure at home* (1 = *Yes*, 0 = *No*) and *violence exposure in the neighborhood* (1 = *Yes*, 0 = *No*) in the past year.

Life Events PCGs and their children reported whether a total of 22 life events or stressors, including death of a family member or close friend, parental divorce or separation, been bullied, having been called names, and change of employment, had occurred in the past year (1 = *Yes*, 0 = *No*), using items adapted from various existing scales and surveys (e.g., Prinstein et al. 2001; Sastry et al. 2003; Yeaworth et al. 1992). PCG-reported and child-reported life events did not overlap and were combined for this study. The total score for this measure ranged from 0 to 22, with higher values indicating the experience of a higher number of life events and stressors.

Demographics PCGs reported their child's gender (coded as 1 = *male*, 0 = *female*), age, and race/ethnicity (coded as two dummy variables: 1 = *Latino*, 0 = *Other*; 1 = *African-American*, 0 = *Other*), as well as annual household income as percentage of the FPL[2] (for either 2004–2005 or 2005–2006, depending on the enrollment year; coded as two dummy variables: 1 = *101 to 299%*, 0 = *Other*; 1 = *300% or more*, 0 = *Other*).

Statistical Analysis

In this study, regression models developed for count data were used (see Cameron and Trivedi 1998; Long 1997). The Poisson regression model commonly serves as a starting point for the prediction of count data. In this model, the probability of a count is determined by a Poisson distribution, where the mean of the distribution is a function of the independent variables and the conditional mean of the outcome is equal to the conditional variance ("equidispersion"; Cameron and Trivedi 1998; Long 1997). If this assumption of equidispersion is violated, then alternative model specifications are required. This includes the Negative Binomial (NB) regression model, which permits overdispersion (i.e., the conditional variance exceeds the conditional mean) and additionally accounts for unobserved heterogeneity among study participants (Long 1997). Analyses were conducted in Stata/SE version 10 (StataCorp LP, College Station, TX), with adjustments for the complex sampling design, including stratification by site, clustering of students within individual schools, and the design/nonresponse weights.

[2] The U.S. Federal Poverty Level is a threshold indicating low income that is updated annually and varies by family size (see U.S. Department of Health and Human Services 2014).

Results

Descriptive Information

Descriptive statistics for study variables for the total analytic sample and for each racial/ethnic subgroup are presented in Table 1. With the exception of child gender and age, all study variables differed significantly by race/ethnicity. In brief, White children came from more affluent homes than African-American and Latino children. Especially when compared to African-American children, White children tended to have lower levels of violence exposure, fewer ADHD symptoms, and fewer life events. Regarding temperament, White children had the highest levels of behavioral flexibility and the lowest levels of general activity and task orientation. Regarding social skills, Latino children showed the highest levels of cooperation, whereas White children had the highest levels on the other three subscales (i.e., assertion, responsibility, self-control).

Appendix 1 in the online supplement provides descriptive information for the measures of CD and ODD symptoms. The proportion of children who showed at least one symptom of the given disorder was much larger for ODD than for CD symptoms (82.7 % vs. 23.6 %). The average number of symptoms also was higher for ODD than for CD symptoms. In addition, the unconditional variance was considerably larger than the mean level for both ODD and CD symptoms. Thus, the raw data showed some evidence of overdispersion, suggesting that alternative model specifications that accommodate overdispersion might be better suited for the two outcome measures than is the Poisson regression model. Finally, Appendix 1 reveals that mean levels of CD and ODD symptoms differed significantly by race/ethnicity. African-American children had higher mean levels of CD symptoms than did children in the other two subgroups, especially Latino children. However, White children had higher mean levels of ODD symptoms than did children in the other two subgroups, especially Latino children.

Appendix 2 in the online supplement shows the bivariate correlations for all variables. The correlation between CD and ODD symptom levels was $r=0.38$ ($p<0.001$). Correlations between all predictor variables ranged from $r=-0.37$ (i.e., greater behavioral flexibility was related to lower general activity level) to $r=0.63$ (i.e., more assertive behavior of the child was associated with more responsible behavior of the child). Correlations among the DOTS-R and SSRS subscales ranged from $r=-0.29$ to $r=0.35$. Overall, these results indicated that overlap among the outcome and predictor variables, respectively, was not a major concern in this study.

Prediction of CD and ODD Symptoms

Because a formal statistical likelihood-ratio test for overdispersion is not yet available when analyzing complex survey data, Heeringa et al. (2010) recommend examining the 95 % confidence interval for the dispersion parameter in the NB regression model (if it includes the value zero, then the Poisson regression model is preferred). Goodness-of-fit tests for the different model specifications are also not yet available for complex survey data; thus, Heeringa et al. (2010) suggest using graphical techniques to evaluate how closely the predicted counts of the given model match the observed counts in the data. Based on those criteria, the NB regression model was chosen as the final model for ODD and CD symptoms.

Results of univariate NB regression models (each predictor was entered separately without adjustment for other predictors) with the total sample are shown in Table 2 for comparison purposes. Findings from the multivariate NB regression models (all predictors were entered simultaneously) are presented in Tables 3 and 4 for both the total sample and the three racial/ethnic subgroups. The adjusted Wald tests for all multivariate NB regression models shown in Tables 3 and 4 were significant. This means that, in each case, the inclusion of all predictor variables significantly improved model fit compared to an intercept-only model. The rate ratios reported in the two tables indicate the factor by which the mean count is multiplied for a one-unit increase in a given predictor. Thus rate ratios greater than one (less than 1) indicate that an increase in the predictor was related to a higher (lower) expected rate of symptoms, adjusting for the effects of all other predictors. Graphical plots (not shown) revealed that the fit between predicted and observed counts was acceptably close for both outcome measures and better for the NB than the Poisson model. However, it should be noted that the main substantive findings were nearly identical across the NB and Poisson models.

CD Symptoms

Total Sample According to the multivariate NB regression model for the total sample, CD symptoms were significantly predicted by Latino race/ethnicity, male gender, ADHD symptoms, household income at 101–299 % FPL as well as at or above 300 % FPL, cooperation, responsibility, self-control,

Table 2 Univariate rate ratios for conduct disorder symptoms and oppositional defiant disorder symptoms

Predictor	Conduct disorder symptoms (*N*=4,705)		Oppositional defiant disorder symptoms (*N*=4,705)	
	RR	95 % CI (RR)	RR	95 % CI (RR)
Race/Ethnicity[a]				
Latino	0.56***	(0.43, 0.73)	0.67***	(0.62, 0.72)
African-American	1.32*	(1.02, 1.71)	0.84***	(0.78, 0.90)
Male gender	1.70***	(1.45, 1.99)	1.19***	(1.13, 1.26)
ADHD symptoms	1.40***	(1.36, 1.44)	1.20***	(1.18, 1.21)
Household income as %FPL[b]				
101–299	0.76**	(0.64, 0.91)	0.97	(0.90, 1.04)
≥300	0.73***	(0.60, 0.88)	1.15***	(1.07, 1.24)
DOTS-R: behavior flexibility	0.94***	(0.92, 0.97)	0.97***	(0.96, 0.99)
DOTS-R: activity	1.10***	(1.08, 1.12)	1.05***	(1.04, 1.06)
DOTS-R: task orientation	0.91***	(0.89, 0.93)	0.95***	(0.94, 0.96)
SSRS: cooperation	0.86***	(0.83, 0.88)	0.90***	(0.89, 0.91)
SSRS: assertion	0.95**	(0.92, 0.99)	1.00	(0.98, 1.01)
SSRS: responsibility	0.99	(0.96, 1.03)	1.01	(1.00, 1.03)
SSRS: self-control	0.84***	(0.81, 0.87)	0.92***	(0.91, 0.94)
Life events	1.16***	(1.12, 1.19)	1.06***	(1.05, 1.08)
Violence exposure: home	1.61***	(1.25, 2.07)	1.22***	(1.12, 1.33)
Violence exposure: neighb.	1.57***	(1.28, 1.94)	1.15***	(1.06, 1.25)

Univariate estimates adjusted for sampling weights, stratification, and clustering. *RR* rate ratio, *CI* confidence interval, *ADHD* attention deficit/hyperactivity disorder, *%FPL* percent of the federal poverty level, *DOTS-R* Revised Dimensions of Temperament Survey, *SSRS* Social Skills Rating System

[a] Reference category was White

[b] Reference category was ≤100 % FPL (the few children with missings on this variable were pooled with the reference group)

* $p<0.05$. ** $p<0.01$. *** $p<0.001$

Table 3 Estimated rate ratios from the negative binomial regression model for conduct disorder symptoms

Predictor	Total sample (N=4,705)		White (n=1,247)		Latino (n=1,736)		African-American (n=1,722)	
	RR	95 % CI (RR)	RR	95 % CI (RR)	RR	95 % CI (RR)	RR	95 % CI (RR)
Race/Ethnicity[a]								
Latino	0.55***	(0.42, 0.73)	–	–	–	–	–	–
African-American	1.02	(0.78, 1.34)	–	–	–	–	–	–
Male gender	1.32***	(1.15, 1.52)	1.44**	(1.13, 1.82)	1.26*	(1.02, 1.56)	1.28*	(1.02, 1.61)
ADHD symptoms	1.28***	(1.23, 1.33)	1.22***	(1.13, 1.31)	1.36***	(1.27, 1.47)	1.22***	(1.15, 1.29)
Household income as %FPL[b]								
101–299	0.81*	(0.68, 0.97)	0.68	(0.44, 1.05)	0.84	(0.66, 1.06)	0.78	(0.61, 1.01)
≥300	0.73*	(0.56, 0.94)	0.58*	(0.37, 0.91)	1.36	(0.92, 2.02)	0.67*	(0.49, 0.93)
DOTS-R: behavior flexibility	1.02	(0.99, 1.05)	1.06*	(1.01, 1.12)	1.02	(0.98, 1.07)	0.97	(0.92, 1.01)
DOTS-R: activity	0.99	(0.97, 1.01)	0.98	(0.94, 1.02)	1.03	(0.99, 1.07)	0.97	(0.94, 1.01)
DOTS-R: task orientation	0.99	(0.97, 1.01)	0.98	(0.94, 1.02)	0.99	(0.96, 1.03)	0.99	(0.96, 1.01)
SSRS: cooperation	0.97*	(0.93, 1.00)	1.03	(0.98, 1.07)	0.92*	(0.86, 0.99)	0.98	(0.94, 1.03)
SSRS: assertion	1.01	(0.97, 1.04)	0.93**	(0.88, 0.98)	1.01	(0.95, 1.08)	1.03	(0.99, 1.08)
SSRS: responsibility	1.07***	(1.03, 1.11)	1.02	(0.97, 1.07)	1.11**	(1.04, 1.19)	1.04	(0.98, 1.10)
SSRS: self-control	0.88***	(0.85, 0.91)	0.85***	(0.79, 0.91)	0.92*	(0.86, 0.98)	0.85***	(0.82, 0.89)
Life events	1.06***	(1.03, 1.09)	1.08**	(1.03, 1.14)	1.03	(0.98, 1.07)	1.06***	(1.03, 1.10)
Violence exposure: home	1.13	(0.87, 1.46)	1.14	(0.77, 1.68)	1.09	(0.64, 1.84)	1.06	(0.76, 1.48)
Violence exposure: neighb.	1.02	(0.85, 1.23)	0.95	(0.70, 1.29)	0.90	(0.62, 1.31)	1.07	(0.82, 1.41)
Dispersion (α)	0.88	(0.70, 1.11)	0.42	(0.20, 0.87)	1.49	(0.97, 2.30)	0.71	(0.51, 0.98)
Adjusted wald test	$F(16, 100)$ =58.12, p=0.000		$F(14, 102)$ =24.22, p= 0.000		$F(14, 102)$ =25.80, p= 0.000		$F(14, 102)$ =27.38, p= 0.000	

Estimates adjusted for sampling weights, stratification, and clustering. *RR* rate ratio, *CI* confidence interval, *ADHD* attention deficit/hyperactivity disorder, *%FPL* percent of the federal poverty level, *DOTS-R* Revised Dimensions of Temperament Survey, *SSRS* Social Skills Rating System

[a] Reference category was White

[b] Reference category was ≤100 % FPL (the few children with missings on this variable were pooled with the reference group)

* p<0.05. ** p<0.01. *** p<0.001

and life events, after adjusting for the effects of all other predictors (Table 3). Specifically, Latino race/ethnicity (p<0.001; relative to White race/ethnicity) and household income at 101–299 % FPL as well as at or above 300 % FPL (p<0.05; relative to household income at or below 100 % FPL) were significantly associated with a lower rate of CD symptoms in the multivariate model. After controlling for all other predictors, male gender was significantly related to a higher rate of CD symptoms (p<0.001). A higher number of ADHD symptoms, more responsible behavior of the child, and a higher number of life events were also significantly related to a higher rate of CD symptoms in the multivariate model (p<0.001 for each), whereas more cooperative behavior of the child at home (p<0.05) and better self-control of the child (p<0.001) were significantly associated with a lower rate of CD symptoms. Notably, the significant predictive effect of responsibility on CD symptoms only emerged in the multivariate model (i.e., its univariate predictive effect was not significant). Finally, African-American race/ethnicity, behavioral flexibility, general activity level, task orientation, assertion, violence exposure at home, and violence exposure in the neighborhood did not significantly predict CD symptoms in the multivariate model, even though the univariate effects of these predictors on CD symptoms were all significant.

Racial/ethnic Subgroups Next, the multivariate NB regression models were rerun for each racial/ethnic subgroup to examine whether the pattern of predictors with significant effects on the rate of CD symptoms was consistent across African-American, Latino, and White children. As shown in Table 3, the significant predictive effects of male gender, ADHD symptoms, and self-control on the rate of CD symptoms were consistently replicated across African-American, Latino, and White children. In contrast, the significant predictive effects of household income at or above 300 % FPL and life events on CD symptoms were replicated only in White and African-American children (i.e., the predictive effect for

Table 4 Estimated rate ratios from the negative binomial regression model for oppositional defiant disorder symptoms

Predictor	Total sample (N=4,705)		White (n=1,247)		Latino (n=1,736)		African-American (n=1,722)	
	RR	95 % CI (RR)	RR	95 % CI (RR)	RR	95 % CI (RR)	RR	95 % CI (RR)
Race/Ethnicity[a]								
Latino	0.72***	(0.66, 0.78)	–	–	–	–	–	—
African-American	0.76***	(0.71, 0.82)	—	—	—	—	—	—
Male gender	1.04	(0.99, 1.09)	1.05	(0.98, 1.12)	1.02	(0.95, 1.10)	1.04	(0.95, 1.14)
ADHD symptoms	1.15***	(1.13, 1.17)	1.07***	(1.05, 1.09)	1.19***	(1.15, 1.23)	1.15***	(1.12, 1.18)
Household income as %FPL[b]								
101–299	1.00	(0.93, 1.07)	1.01	(0.86, 1.19)	1.01	(0.92, 1.12)	0.97	(0.86, 1.09)
≥300	1.06	(0.98, 1.15)	1.02	(0.86, 1.19)	1.26**	(1.09, 1.46)	1.01	(0.90, 1.13)
DOTS-R: behavior flexibility	1.00	(0.99, 1.01)	1.00	(0.98, 1.01)	1.01	(1.00, 1.03)	0.99	(0.96, 1.01)
DOTS-R: activity	1.00	(0.99, 1.01)	0.99	(0.98, 1.01)	1.01	(0.99, 1.02)	1.00	(0.99, 1.02)
DOTS-R: task orientation	1.00	(0.99, 1.01)	1.00	(0.99, 1.02)	1.00	(0.99, 1.01)	1.01	(0.99, 1.02)
SSRS: cooperation	0.95***	(0.94, 0.96)	0.98*	(0.96, 1.00)	0.93***	(0.92, 0.95)	0.96***	(0.94, 0.98)
SSRS: assertion	1.01	(1.00, 1.03)	0.99	(0.97, 1.01)	1.01	(0.99, 1.04)	1.01	(0.98, 1.04)
SSRS: responsibility	1.05***	(1.04, 1.06)	1.02*	(1.00, 1.03)	1.07***	(1.04, 1.09)	1.04***	(1.02, 1.06)
SSRS: self-control	0.93***	(0.92, 0.94)	0.90***	(0.89, 0.92)	0.95***	(0.93, 0.97)	0.91***	(0.89, 0.92)
Life events	1.03***	(1.01, 1.04)	1.01	(1.00, 1.03)	1.04***	(1.02, 1.06)	1.02**	(1.01, 1.04)
Violence exposure: home	1.04	(0.96, 1.12)	1.07	(0.97, 1.18)	0.98	(0.86, 1.12)	1.01	(0.89, 1.15)
Violence exposure: Neighb.	1.01	(0.94, 1.08)	1.00	(0.89, 1.11)	0.96	(0.88, 1.06)	1.04	(0.93, 1.16)
Dispersion (α)	0.21	(0.17, 0.25)	0.02	(0.00, 0.08)	0.29	(0.24, 0.36)	0.24	(0.19, 0.30)
Adjusted Wald test	$F(16, 100)$ =120.29, p=0.000		$F(14, 102)$ =63.36, p=0.000		$F(14, 102)$ =64.68, p=0.000		$F(14, 102)$ =65.06, p=0.000	

Estimates adjusted for sampling weights, stratification, and clustering. *RR* rate ratio, *CI* confidence interval, *ADHD* attention deficit/hyperactivity disorder, *%FPL* percent of the federal poverty level, *DOTS-R* Revised Dimensions of Temperament Survey, *SSRS* Social Skills Rating System

[a] Reference category was White

[b] Reference category was ≤100 % FPL (the few children with missings on this variable were pooled with the reference group)

* $p<0.05$. ** $p<0.01$. *** $p<0.001$

Latino children was in the opposite direction but not significant). The significant predictive effects of cooperation and responsibility on CD symptoms were replicated only in Latino children. Finally, two additional significant predictive effects emerged in the multivariate model for White children (but not for children in the other two racial/ethnic subgroups), which were nonsignificant for the total sample: greater flexibility in responding to external changes ($p<0.05$) was significantly related to a higher rate of CD symptoms, and more assertive behavior of the child ($p<0.01$) was significantly associated with a lower rate of CD symptoms.

Main-effects Versus Moderator-effects Model Specification Finally, a nested multivariate NB regression model was tested for the total sample to examine whether the addition of interactions between race/ethnicity and each predictor (all interactions were added simultaneously in step two) significantly improved model fit relative to the main-effects model shown in Table 3. Findings revealed that model fit improved significantly after the addition of the interaction terms in step two, Adjusted Wald $\Delta F(28)=3.29$, $p<0.001$, and interactions with race/ethnicity were significant for four of the 13 predictors (i.e., household income, behavioral flexibility, cooperation, and assertion). Appendix 3 in the online supplement provides the estimated rate ratios for the significant interaction terms.

ODD Symptoms

Total Sample Results of the multivariate NB regression model for the total sample revealed that ODD symptoms were significantly predicted by Latino and African-American race/ethnicity, ADHD symptoms, cooperation, responsibility, self-control, and life events (Table 4). After controlling for the effects of all other predictors, Latino and African-American race/ethnicity ($p<0.001$; relative to White race/ethnicity), more cooperative behavior of the child at home ($p<0.001$), and better self-control of the child ($p<0.001$) were

significantly associated with a lower rate of ODD symptoms. In addition, a higher number of ADHD symptoms ($p<0.001$), more responsible behavior of the child ($p<0.001$), and a higher number of life events ($p<0.001$) were significantly related to a higher rate of ODD symptoms in the multivariate model. Similar to the findings for CD, the significant predictive effect of responsibility on ODD symptoms only emerged after controlling for the effects of all other predictors (i.e., its univariate effect was not significant). Finally, male gender, household income as percent of the FPL, behavioral flexibility, general activity level, task orientation, assertion, violence exposure at home, and violence exposure in the neighborhood did not significantly predict ODD symptoms in the multivariate model, even though the univariate effects of these predictors on ODD symptoms were significant (except for the assertion measure).

Racial/ethnic Subgroups The multivariate NB regression models were again rerun for each racial/ethnic subgroup to determine whether the effects of significant predictors on the rate of ODD symptoms were consistent across African-American, Latino, and White children. As shown in Table 4, there was a remarkable degree of consistency across racial/ethnic subgroups. The significant predictive effects of ADHD symptoms, cooperation, responsibility, and self-control on the rate of ODD symptoms were replicated across African-American, Latino, and White children. In addition, the significant predictive effect of life events on ODD symptoms was replicated in Latino and African-American children, but not in White children. Finally, an additional significant predictive effect emerged in the multivariate model for Latino children (but not for children in the other two racial/ethnic subgroups): Latino children from households with incomes at or above 300 % FPL ($p<0.01$) had a significantly higher rate of ODD symptoms than those from households with incomes at or below 100 % FPL. Given that this predictive effect was non-significant for the total sample, this finding for Latino children might be due to chance.

Main-effects Versus Moderator-effects Model Specification To determine whether the addition of interactions between race/ethnicity and each predictor (all interactions were added simultaneously in step two) significantly improved model fit relative to the main-effects model shown in Table 4, a nested multivariate NB regression model was tested for the total sample. Results showed that model fit improved significantly after the addition of the interaction terms in step two, Adjusted Wald $\Delta F(28)=5.55$, $p<0.001$, and interactions with race/ethnicity were significant for four of the 13 predictors (i.e., ADHD symptoms, cooperation, responsibility, and self-control). The estimated rate ratios for the significant interaction terms are provided in Appendix 3 in the online supplement.

Discussion

This study used data from a large, representative community sample of children from three racial/ethnic subgroups to examine the specificity and commonality in correlates of CD and ODD symptoms. Several main conclusions resulted from the findings. First, common correlates of CD and ODD symptoms emerged as the predominant pattern in this study, although there also was evidence for specificity in correlates. Regarding the latter, gender and household income were found to be linked only to CD symptoms after adjusting for other correlates. This finding was particularly noteworthy because it is consistent with results from other recent studies (e.g., Boden et al. 2010; Rowe et al. 2010), which indicate that male gender might be a specific risk factor for CD after various confounding factors have been taken into account. The current findings provide additional empirical support for these results from prior studies.

Several other variables emerged as common or shared correlates of CD and ODD symptoms, including ADHD symptoms, race/ethnicity, life events, responsibility, self-control, and cooperation, even after adjusting for the effects of all other correlates. The direction of the vast majority of these multivariate associations was consistent with their univariate associations and the extant literature (e.g., Bird et al. 2001; Bornstein et al. 2010; Greene et al. 2002; Gresham et al. 2011; Maughan et al. 2004; Tiet et al. 2001). Interestingly, the multivariate model findings indicated that ethnic-minority status, especially Latino race/ethnicity, was related to a lower rate of CD and ODD symptoms compared with White race/ethnicity. This fits well with research showing that ethno-cultural factors can influence thresholds for the acceptability of youth's behavior and parents' interpretation of youth's mental health symptoms (e.g., Roberts et al. 2005; Weisz et al. 1997). For example, cultural values such as *respeto* and *simpatía* (e.g., Calzada et al. 2010; Triandis et al. 1984) might function as protective factors that result in lower rates of CD and ODD symptoms, especially among Latino children. However, it is important to note that some studies (e.g., Bird et al. 2001) have revealed other patterns of race/ethnicity differences in rates of CD and ODD symptoms. Such inconsistencies across studies might be the result of adopting different analytical approaches. In this study, *DSM-IV* symptoms were assessed using a dimensional approach, whereas Bird et al. (2001) examined diagnoses of *DSM-III-R* disorders. It is widely recognized that dimensional and categorical approaches are both valuable but have different advantages and disadvantages. For example, the creation of binary diagnosis status measures from continuous measures is often based on arbitrary cut-points and results in loss of statistical power (see Helzer et al. 2006; Moffitt et al. 2008). This can contribute to discrepancies in findings across studies that are using different analytical approaches (Fergusson and

Horwood 1995; Rowe et al. 2010). Clearly, the question of whether CD and ODD symptoms vary by race/ethnicity awaits further clarification.

The significant positive multivariate association of responsibility with CD and ODD symptoms should be regarded as tentative because it only became significant when confounding factors were taken into account and because prior research would have predicted an inverse relationship. Post hoc analyses (not shown) were conducted to explore whether it is more appropriately encapsulated as a curvilinear relationship. They revealed that the quadratic term of responsibility was significantly negatively associated with CD and ODD symptoms in the total sample, after controlling for its linear effect and all other correlates. However, this effect was not replicated in any racial/ethnic subgroup and appeared to be based on relatively few children. Thus, further research is needed to better understand the nature of the relationship between responsibility and CD and ODD symptoms.

Second, with some important exceptions (e.g., cooperation, responsibility, life events, household income as percent of the FPL), the pattern of common and specific correlates of CD and ODD symptoms was replicated in a quite consistent manner across the three racial/ethnic subgroups that were included in this study. The degree of replication across racial/ethnic subgroups was particularly high for the correlates of ODD symptoms. These findings are even more remarkable considering that the White children in this study generally came from less disadvantaged backgrounds than did the Latino and African-American children. Although it is premature to draw firm conclusions because studies on this issue are scarce and because it is possible that CD and ODD correlates may differ among distinctive Latino subgroups (e.g., Island Puerto Ricans; see Bird et al. 2001), the findings from this study suggest that differential exposure to adverse background factors among racial/ethnic subgroups may not always translate into distinctive correlate–outcome patterns as a function of race/ethnicity. This is encouraging from an applied perspective because substantial overlap in correlates of CD and ODD symptoms across different racial/ethnic subgroups implies that it may be sufficient to target the same components in prevention and intervention programs, irrespective of race/ethnicity. However, it is important to keep in mind that the extensive overlap in correlates of CD and ODD symptoms across racial/ethnic subgroups might be a direct function of the predictor set that was examined in this study. Generality in correlates of CD and ODD symptoms across racial/ethnic subgroups, if further substantiated in independent research, also does not preclude the possibility that culturally-sensitive implementation is important for maximizing intervention effectiveness in distinct racial/ethnic subgroups. Results from the moderator-effects analyses might be used to identify the factors that could be targeted for maximizing intervention effectiveness in specific racial/ethnic subgroups (e.g., for Latino children, cooperative behavior could be targeted).

Third, measures of specific dimensions of the child's temperament and social skills are relatively scarce in the extant literature and thus were examined as putative correlates of CD and ODD symptoms. The findings of this study showed that social skills were considerably more salient putative correlates of CD and ODD symptoms than were temperamental dimensions, which were largely not significantly related to either outcome when the effects of all other correlates were controlled. This suggests that measures of social skills should be more systematically included in future studies on the correlates of CD and ODD symptoms, in particular those capturing levels of self-control and cooperation of the child, which have also been found to be related to broad externalizing behavior problem constructs (Bornstein et al. 2010; Gresham et al. 2011). Observed associations for assertion, however, were generally nonsignificant and those for responsibility should be interpreted with caution for the reasons described above. Because the univariate associations of the temperamental dimensions with CD and ODD symptoms were significant, the lack of significant multivariate associations in this study does not necessarily imply their etiological irrelevance. Several theoretical conceptualizations posit that temperament may translate into externalizing behavior problems in an indirect fashion, including through applying maladaptive social skills and competencies during transactions with the social environment (e.g., Bates et al. 1991). Although rigorous tests of specific hypothesized pathways are needed, initial evidence is promising insofar as temperamental dimensions, such as high levels of effortful control, have been linked with adaptive social competence (see Zhou et al. 2012), and better social skills have been found to be inversely related to externalizing behavior problems (Bornstein et al. 2010; Gresham et al. 2011). Therefore, a plausible alternative interpretation of the role of temperamental and social skills dimensions in this study purports that distal temperament correlates became nonsignificant after proximal social skills correlates of CD and ODD symptoms were taken into account. This speculation should be explored in prospective analyses.

Fourth, in addition to one of the social skills dimensions (assertion), violence exposure at home and in the neighborhood were not related to CD and ODD symptoms when the effects of all other covariates were taken into account. It is noteworthy that the univariate associations of both violence exposure measures with CD and ODD symptoms were significant and consistent with those reported in the literature (e.g., Boden et al. 2010; Ford et al. 1999; McCabe et al. 2005), which supports their inclusion in this study. However, other correlates and socioeconomic background factors turned out to be more salient correlates in the multivariate analyses, demonstrating again the importance of controlling for confounding and/or more distal factors in this line of research.

The current findings should be viewed in the context of various study limitations. First, CD and ODD symptoms were

assessed via parent rating scales. Information from independent diagnostic data was not available for this study, but would be useful to address concerns about informant bias and shared measurement variance. However, it should be noted that some correlates in this study were based on child (rather than parent) reports, which alleviates these concerns to some extent. Second, the study was conducted with a large, representative community sample of African-American, Latino, and White fifth graders attending public schools in three metropolitan areas in the United States. Thus, study findings may not readily generalize to clinical samples, as well as to other racial/ethnic subgroups (e.g., Asian-Americans, Native Americans), age groups, and geographical areas. Similar research with these underrepresented groups is important for cross-validation purposes. Third, the conceptual overlap between some temperamental dimensions and psychopathology symptoms is problematic because it might have inflated observed associations between the two constructs (e.g., Nigg 2006; Rettew et al. 2004; Sanson and Prior 1999; Sanson et al. 2004). However, it is unlikely that this greatly affected the main conclusions from this study because temperament–psychopathology associations usually change little after the removal of overlapping items (e.g., Lemery et al. 2002). Fourth, the reliability of some measures (e.g., CD symptoms) used in this study was relatively low. However, this is not unexpected for measures that assess symptoms with low base rates (such as cruelty towards animals which is a symptom of CD). Finally, the cross-sectional nature of the study design does not permit inferences about the directionality of the observed associations. Longitudinal research is needed to further substantiate the direction of the associations between individual correlates and CD and ODD symptoms and to elucidate the underlying processes that account for such associations.

Despite these limitations, this study addressed important unresolved questions in the literature on common and specific correlates of CD and ODD symptoms. Future research on this issue should more systematically include measures of social skills and examine other dimensions of temperament and self-regulation that were not available in this study (e.g., deficits in executive functioning, emotional dysregulation, negative reactivity/emotionality). Comparison of common and specific correlates of CD and ODD symptoms by gender is also warranted.

Acknowledgments The Healthy Passages study was funded by the Centers for Disease Control and Prevention (Cooperative Agreements (CCU409679, CCU609653, CCU915773, U48DP000046, U48DP000057, U48DP000056, U19DP002663, U19DP002664, and U19DP002665). The content of this report is solely the responsibility of the authors and does not necessarily represent the official position of the Centers for Disease Control and Prevention. We thank Lionel Santibáñez for editorial assistance with the manuscript.

Conflict of Interest The authors declare that they have no conflict of interest.

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