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Normative Developmental Trajectories of Aggressive Behaviors in African American, American Indian, Asian American, Caucasian, and Hispanic Children and Early Adolescents

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Abstract The current 5-year accelerated longitudinal investigation modeled the developmental trajectories of aggressive behaviors in 10,107 predominantly minority (>70%; African American, American Indian, Asian American, and Hispanic) children and early adolescents (Kindergarten through 8th grade, 49% female youth) from lower to lower–middle socioeconomic strata. Based on a two-part latent growth model, findings suggest that the probability and frequency of aggressive behavior use decreases slightly (linear) through the elementary school years and then increases as children move into middle school (quadratic). Though mean level differences were found across ethnic and racial groups, socioeconomic strata, and particularly by sex at initial status, rates of change over time across all groups were invariant. Findings suggest that potential socialization differences, if any, occur pre-Kindergarten in all groups.

Keywords Aggressive behavior · Race · Ethnicity · Developmental trajectories · Two-part latent growth models · SEM

Over the past two decades, a number of longitudinal investigations have identified aggressive and disruptive behavior as one of the most salient developmental precursors of later conduct problems, violence, and delinquency (Broidy et al. 2003; Loeber and Stouthamer-Loeber 1998; Tremblay 2000a, b). Most of this evidence has been based on studies of high risk youth (and thus, non-normative; Huesmann et al. 1984; Loeber and Hay 1997) or on studies of "normal" children and adolescents from Canada (Haapasalo and Tremblay 1994; Tremblay et al. 1999), Great Britain (Farrington 1995), Scandinavian countries (Pulkkinen and Tremblay 1992; Stattin and Magnuson 1989), and New Zealand (White et al. 1990).

A second issue related to the normative study of aggression is that very few data sets exist that allow a study of normative developmental changes in aggressive behavior across different racial and ethnic groups. In fact, many samples that have been followed longitudinally did not contain adequate sub-samples of minority youth to be able to distinguish differences or similarities in the development of aggression (Tremblay et al. 1999). In addition, because race and socioeconomic (SES) level are often confounded, these studies have focused on race or SES merely as statistical controls (e.g., Deater-Deckard et al. 1996). In addition, many longitudinal studies of aggressive behavior have included only males, and thus, few investigations have examined changes in these behaviors over time for females. Thus, the current investigation had the following main goals: (a) to model the developmental trajectories of aggressive behaviors in a large sample of predominantly minority male and female youth from the American Southwest (African American, American Indian, Asian American, Caucasian, and Hispanic); and (b) to test for potential similarities or differences in this development across racial groups and socioeconomic strata as well as by sex.

Aggression over Time: Is it Stable or not?

The seminal review by Olweus (1979) of 16 longitudinal studies of aggressive behavior provided consistent evidence that these behaviors are stable over time (average stability

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coefficient: .63), whether short-term (6 months) or over a longer period (22 years). Similarly, based on SEM analyses of a core sample of approximately 400 participants followed over 22 years, Huesmann et al. (1984) documented stability coefficients of .63 between the ages of 8 and 19 years and .73 between 19 and 30 years of age; this study also provided a stability coefficient of .46 over the entire project period. Similar results have been found in a number of different samples across different developmental contexts (e.g., Cairns and Cairns 1994). Thus, studies such as these support the stability over time of aggressive behaviors. In recently reviewing the evidence, Tremblay (2000a) noted that this very finding may have "thwarted our ability to move the field beyond the puzzling statement that aggression, antisocial behaviour, and delinquency are highly stable phenomena without much predictive accuracy" (p. 135).

On the other hand, other studies have provided evidence that aggressive behavior in fact declines from infancy into childhood or adolescence (Cairns et al. 1989; Loeber and Stouthamer-Loeber 1998). Investigations by Tremblay and colleagues (e.g., Haapasalo and Tremblay 1994) on Canadian samples have provided evidence that the frequency of physical aggression actually declines with age, though they also found some evidence of increases in what they called indirect aggression between the ages of 4 and 8 years. Similarly, Cairns and colleagues (1989) followed a sample of 220 girls and boys over the course of 6 years, from childhood through early adolescence, and based on peer ratings, self reports, and teacher assessments, found decreases existed in the number of aggressive incidents over time. As Tremblay (2004) recently noted, children exhibit aggressive behaviors during very early childhood, and they learn to inhibit these behaviors over time presumably through positive socialization effects in the immediate environment. This finding suggests that the developmental course of aggression might be quadratic during early childhood to adolescence.

Development of Aggressive Behaviors in Different Racial Groups, SES Strata, and by Sex: Similarities or Differences?

Though some investigations of aggression have been conducted on inner-city, minority youth (e.g., Estell et al. 2002), including studies that evaluated interventions seeking to address aggressive behaviors (e.g., Hudley and Graham 1993), very little evidence exists about *developmental changes of aggressive behaviors* in different racial and ethnic groups. Some of the studies that do exist in this area have focused on middle or late adolescence, a time when perhaps the most dramatic and potentially differentiating developmental changes may have already taken place, or they have exclusively focused on male youth. Part of the problem has been that few data sets exist large enough and sufficiently diverse to effectively model developmental trajectories of male and female children and early adolescents from different racial and ethnic groups across different socioeconomic contexts.

Two competing hypotheses exist based on related work in this area that inform our study. The first *difference hypothesis* suggests that we would expect to find unique developmental trajectories in different racial groups over time. We would also expect to find distinctly different patterns of change in different levels of SES and for male and female children. These predictions largely rest on ideas of context-specificity. One example of this difference hypothesis is the work of Deater-Deckard and colleagues (Deater-Deckard et al. 1996; Deater-Deckard and Dodge 1997) who found that early harsh parental discipline had a greater effect on subsequent aggressive behavior of children in African American in comparison to Caucasian families. Similarly, we might expect different patterns of changes in aggressive behaviors over time when we consider youth who live in extreme poverty versus those who live in an average neighborhood or when we consider male and female youth. In other words, consistent with the difference hypothesis, race, SES, and sex might have important moderating influences on the development of aggressive behaviors over time.

The alternative hypothesis is one of similarity in the development of aggressive and disruptive behaviors over time across racial groups, strata of SES, and by sex. Again, this prediction largely rests on indirect evidence from work, which has examined the developmental processes, namely, the patterns of associations between predictors and measures of aggression and disruptive behaviors. Rowe et al. (1994) tested this very idea in five large data sets that contained over 15,000 youth. Their findings provided strong support for the similarity hypothesis, indicating that race did not account for variability in the patterns of associations between known predictors (e.g., measures of the family environment, peer pressure, and school involvement), and outcomes (e.g., aggression, delinquency, and conduct disorder). These two competing hypotheses about the predictions of change in aggressive behaviors informed our study. Because of the scarcity of work that models the development of aggressive behaviors over time in different racial groups that have different levels of SES and sex, we did not have an a priori hypothesis or prediction about the trajectory of change.

Given the contradictory results about the developmental course of aggressive behaviors, that is, whether they are stable or decreasing over time, a latent growth modeling (LGM) approach was used to investigate individual change in aggressive behaviors from Kindergarten to 8th grade. Because some evidence exists that aggressive behaviors

decline over time while other evidence suggests that the development might be more quadratic in shape, we also tested for this possibility by adding a quadratic term to the LGM. To tease apart the separate effects of ethnicity/race, SES, and sex on these behaviors, both main effects as well as interaction terms were added to the model. This strategy allowed a determination whether the average trajectory for aggressive behavior was different across ethnic/racial groups (African American, American Indian, Asian American, Caucasian, and Hispanic) as well as males and females at varying levels of SES. A LGM approach was selected rather than the semi-parametric group-based approach taken by other researchers (Blumstein and Cohen 1979; Bongers et al. 2004; Nagin 1999; Nagin and Tremblay 1999) because we did not expect that distinct subgroups would exist in a normative population; in addition, we were interested in average developmental changes over time rather than specific "types" or patterns of change. In addition, we chose LGM because by doing so we could model aggressive behaviors using two-part latent growth models (Brown et al. 2005) that allow the researcher to model highly skewed data, such as the prevalence or probability as well as the frequency of aggressive behaviors.

Methods

The sample for the current study is based on the PeaceBuilders violence prevention evaluation project conducted in the Tucson metropolitan area (Embry et al. 1996; Flannery et al. 2003; Vazsonyi et al. 1999, 2004). In all analyses, we controlled for intervention effects; the intervention was implemented in all classrooms of eight original elementary schools, Kindergarten through 5th grade, during the first 2 years of data collection (4 assessments); there was no intensive intervention subsequently during the annual assessments over the course of 3 years (3 assessments). In the current investigation, we focused on all children with valid teacher reported ratings of aggressive behaviors. A substantial portion of the sample was added to the data set during times 5, 6, and 7, when all middle school children at seven feeder schools were invited to participate in annual follow-ups of the target sample. Thus, though the initial sample of the evaluation project included 4,679 children in Kindergarten through 5th grade (6th grade at one elementary school), an additional 7,000 children were added in subsequent assessments at the feeder middle schools from two major school districts, resulting in a total sample of 11,969 children.

Procedures

Data were collected by trained project staff from teachers in grades K through 8 who received extensive instructions on how to complete the relatively brief inventory of questions on each child in the classroom. The study was approved by each school district human subject review board as well as a University IRB. Teachers received data collection packets and a payment of $20 for participation at each data collection.

Analytic Sample

Of the 11,969 children in the sample, only 1,862 of them had no teacher-reported aggression measures. These cases were deleted from the sample leaving 10,107 children with at least one time of the teacher-reported aggression. As can be seen in Table 1, almost equal numbers of male and female children were included in the analytic sample. In terms of ethnicity/race, 56% of the sample was of Hispanic origin, 27% Caucasian, 10% American Indian, 5% African American, and 2% Asian American. The socioeconomic status mean was M=2.68 (SD=.98) on a scale ranging from 1 (lowest SES) to 4 (highest SES; see below for further details). Forty-eight percent of the sample indicated that

Table 1 Demographic characteristics of the analytic sample and the deleted sample

Variable		Analytic sample n=10,107 (%)	Deleted respondents n=1,862 (%)	Difference test
Sex	Female	49	52	χ^2 (1)=1.49^{ns}
	Male	51	48	
Ethnicity/race	African American	5	6	χ^2 (4)=88.80***
	American Indian	10	5	
	Asian American	2	1	
	Caucasian	27	35	
	Hispanic	56	53	
SES	1 (lowest)	15	7	χ^2 (3)=243.42***
	2	25	61	
	3	38	22	
	4 (highest)	22	10	
PeaceBuilders	Intervention	48	69	χ^2 (1)=50.31***
	No intervention	52	31	

***p<0.001

they had received the PeaceBuilders intervention. This number was slightly higher than the size of the original cohort because additional children in non-target schools received the intervention not as part of the original study or design.

Missing Data

Table 2 shows the timing of assessments and the number of children assessed in each of the 16 time points covered over the seven data collection periods. As a result of this design, the percentage of data missing for the estimation of the growth in the prevalence and frequency of aggressive behavior over the 7 waves was quite large (60–80% for prevalence and frequency). In addition to sample construction issues, subject attrition rates were due to relatively high residential mobility within school districts and across school districts in the metropolitan area. To insure statistical conclusion validity (Cook and Campbell 1979), all of the statistical models were fit with Mplus, which allows for the inclusion of respondents with missing data by using full information maximum likelihood (FIML) estimation (Muthén and Muthén 1998–2004). In FIML estimation with missing data, observations are sorted into missing data patterns, and each parameter is estimated using all available data for that particular parameter.

All of the respondents were utilized in the analysis except for the ones for whom no teacher-reported aggression measures existed at any of the time points. Comparing the analytic sample to the deleted respondents (see Table 1), no differences existed by sex, but a significantly larger number of Caucasian children and a significantly smaller number of American Indian children were eliminated because they had no teacher-report aggression measures. On average, the children who were dropped from the study were from a lower socioeconomic level than were those who were retained. In addition, fewer of the children who engaged in PeaceBuilders were dropped due to no teacher-reported aggression measures in any of the waves. This was largely the case because of the focus on the initial PeaceBuilders participants who were closely followed in comparison to youth added later during middle school.

Measures

Sex Participant sex was rated by teachers as either "0=male" or "1=female." When teacher data were missing on a child, the same information was collected through archival records from the school districts.

Race Indicators of race were collected from archival data sources provided by the school districts. These data classified youth as "1=African American," "2=American Indian," "3=Asian American," "4=Caucasian," and "5=Hispanic."

Table 2 Accelerated longitudinal cohort design: total number of children by grade (analytic sample)

Assessments (data collection)	Grade level														
	K-0	K-0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	8.0
1.0 (1)	•		•		•		•		•		•					
1.5 (2)		•		•		•		•		•		•				
2.0 (3)			•		•		•		•		•		•			
2.5 (4)				•		•		•		•		•		•		
3.0 (5)					•		•		•		•		•		•	
4.0 (6)							•		•		•		•		•	•
5.0 (7)									•		•		•		•	•
Sample (*n*)	555	689	966	1,117	1,798	1,247	2,152	1,093	2,569	1,006	2,718	1,160	4,020	41	1,638	1,099

Seven data collection points over the course of 5 years; the sample of grade level 6.5 is small because there was a single elementary school of 8 with a 6th grade that was part of the initial study, and thus only 41 children were assessed when there were 2 assessments per year on K through 5th grade students.

SES SES or neighborhood disadvantage was measured by using 1990 Census data based on 13 tracts where study participants resided when they attended their first school (for similar approaches using five indicators, see Sampson 1997; Sampson et al. 1999). For each tract, three variables were employed, namely (1) median household income, (2) education level (percentage of adults 25 years or older with high school education or less), and (3) percentage of the families living below poverty; each variable was rank ordered (from 1=low to 4=high) relative to the information from other tracts. Based on this rank ordering, a "final rank," also on a 4-point scale, was developed by "averaging" the rank information from each of the three Census indicators. Thus, the final rank ranged from 1=lowest level of SES to 4=highest level of SES. The lowest level of SES (1) was characterized by a median family income of $16,314, 44% of families living below poverty, and 82% of adults 25 years or older with a high school education or less. The highest level (4) in this sample was characterized by a median family income of $32,842, 11% of families living in poverty, and 46% of adults 25 years or older with a high school education or less. To contextualize the level of SES of the entire sample, it is important to note that 3 of the 4 levels of SES were below the county average SES where the study took place (e.g., median income); in addition, it is also worth noting that the national average for families living in poverty, for example, was 11% in 1990 (U.S. Census 2004). So, the highest SES stratum in the current sample approximately corresponds to the national average; this stratum included only about one fifth of the study sample. Thus, the sample can be best characterized as one of low to lower–middle SES.

Aggressive Behavior (TRF) Physical and non-physical aggressive and disruptive behavior was measured by the 25-item Achenbach's Child Behavior Checklist Teacher Report Form (Achenbach 1991). Teachers were asked to recall children's behavior over the last two months. Examples include "The child argues a lot," "The child gets in many fights," and "The child threatens people." Responses were given on a 3-point Likert-type scale: "1=not true," "2=somewhat or sometimes true," or "3=very true or often true." A total score was computed by averaging all 25 items which produced a reliable indicator (alpha >.85 across groups and assessment periods) of aggression (Flannery et al. 2003; Vazsonyi et al. 1999, 2004). A score of "1" on this measure indicates "zero aggression." A score greater than "1" indicates "non-zero aggression." A potential criticism of teacher reports may be systematic biases in rating; however, because of the longitudinal design coupled with the fact that children move from teacher to teacher annually in U.S. elementary schools, we believe that the potential for systematic biases in assessments were minimized.

The measure was assessed a total of 7 times from Kindergarten to 8th grade, but effectively at 16 different time points because data were collected twice during the first two project years, during fall and spring semesters (Table 2). Table 3 includes the univariate statistics for the non-zero and the zero part of this aggressive behavior measure at each time point and the number of children for whom this measure is reported as non-zero or zero. Examining the average frequency of non-zero aggressive behaviors, a gradual decrease and then increase in the mean level of non-zero aggression reported by teachers can be seen over the 16 time points. Examining the average percentage of students with reports of no (1) aggressive behaviors across the same time points and calculating the actual frequency of non-zero aggressive behavior, respondents who are reported by their teachers as using some level of aggression in their interactions gradually decreased from a mean of 69% in Kindergarten to a low of 57% in Grade 3.5, rising by Grade 8 to 64%. Frequency rates were calculated from the total number of children who had non-zero aggressive scores at a time point, divided by the total number of students at that time point. For example, in Kindergarten (see Table 3), 384 of the 555 children who had teacher-reports had non-zero reports of aggressive behavior—for a rate of 69 % in Kindergarten. The frequency of aggressive behaviors over the 16 time points appeared to decline during grade school and then to increase as children enter 8th grade.

Data Analysis: Two-part Latent Growth Models (LGM)

We fit a series of two-part latent growth models (LGM) to answer our research questions about the development of aggression in a racially diverse sample (Brown et al. 2005; Muthén 2002; Olens and Schafer 2001). This series of models was fit to the teacher reports of aggressive behavior collected over 16 time points (effectively, grades 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 7.0, 8.0). Because of the addition of so many respondents in Grade 6 (see Table 2), the intercept of the growth models was centered at Grade 6. As with most data collected on aggressive, externalizing, and internalizing behaviors, the most common, modal, score at each time point usually denotes "zero" symptoms. The result is data that are highly skewed. A common means of dealing with this difficulty is to use a log transformation on these scores; however, the resulting transformed scores seldom have greatly improved distributions. The new two-part growth modeling approach allowed us to substantially improve the normality of the frequency of the non-zero aggression scores, an underlying assumption for the use of LGMs. In addition, because we

Table 3 Univariate statistics for the prevalence (zero and non-zero component) and frequency (non-zero use versus non-use) of teacher-reported aggressive behavior

Aggression level	*n*	*M*	SD	Range
Grade 0.0				
Non-zero	384	1.608	0.524	1.040–2.920
Zero	171	1	0	1
Frequency	555	0.692	0.462	0–1
Grade 0.5				
Non-zero	438	1.529	0.464	1.040–3.000
Zero	251	1	0	1
Frequency	689	0.636	0.482	0–1
Grade 1.0				
Non-zero	582	1.463	0.424	1.040–3.000
Zero	384	1	0	1
Frequency	966	0.602	0.490	0–1
Grade 1.5				
Non-zero	729	1.463	0.426	1.040–3.000
Zero	388	1	0	1
Frequency	1,117	0.653	0.476	0–1
Grade 2.0				
Non-zero	1,144	1.468	0.487	1.040–3.000
Zero	654	1	0	1
Frequency	1,798	0.636	0.481	0–1
Grade 2.5				
Non-zero	817	1.489	0.507	1.040–3.000
Zero	430	1	0	1
Frequency	1,247	0.655	0.476	0–1
Grade 3.0				
Non-zero	1,275	1.494	0.482	1.040–3.000
Zero	877	1	0	1
Frequency	2,152	0.592	0.491	0–1
Grade 3.5				
Non-zero	623	1.468	0.467	1.040–3.000
Zero	470	1	0	1
Frequency	1,093	0.570	0.495	0–1
Grade 4.0				
Non-zero	1,683	1.503	0.482	1.040–3.000
Zero	886	1	0	1
Frequency	2,569	0.655	0.475	0–1
Grade 4.5				
Non-zero	647	1.518	0.506	1.040–3.000
Zero	359	1	0	1
Frequency	1,006	0.643	0.479	0–1
Grade 5.0				
Non-zero	1,662	1.486	0.449	1.040–3.000
Zero	1,056	1	0	1
Frequency	2,718	0.611	0.488	0–1
Grade 5.5				
Non-zero	792	1.536	0.498	1.040–3.000
Zero	368	1	0	1
Frequency	1,160	0.683	0.466	0–1
Grade 6.0				
Non-zero	2,593	1.572	0.514	1.040–3.000
Zero	1,427	1	0	1
Frequency	4,020	0.645	0.479	0–1
Grade 6.5				
Non-zero	26	1.531	0.495	1.080–3.000
Zero	15	1	0	1
Frequency	41	0.634	0.480	0–1

Table 3 (continued)

Aggression level	*n*	*M*	SD	Range
Grade 7.0				
Non-zero	1,001	1.543	0.499	1.040–3.000
Zero	637	1	0	1
Frequency	1,638	0.611	0.488	0–1
Grade 8.0				
Non-zero	705	1.556	0.518	1.040–3.000
Zero	394	1	0	1
Frequency	1,099	0.641	0.480	0–1

Aggressive behavior was scored 1–3; therefore zero aggression was 1.

modeled both the growth in frequency of non-zero aggression use and likelihood (probability) of use, more information about the normative changes in the use of aggression for elementary and middle school children was obtained.

In this set of models, the original distribution of aggressive behavior outcomes as reported by teachers was decomposed into two parts, each modeled by separate, but correlated, growth functions (Fig. 1). In Part 1 of the model, we separated "zero" aggression ("1=not true") from the rest of the distribution of aggression ("2=somewhat or sometimes true," or "3=very true or often true") by creating a binary indicator at each time point that denoted "any positive level" of aggressive behavior (coded 1) from reports of "zero" aggression (coded 0). These "zero" aggression versus "any positive level" of aggression variables were then analyzed as a random-effects logistic growth function with the log-odds of aggression regressed on growth factors. Simultaneously with Part 1, in Part 2 of the model, we fit a traditional continuous variable growth model to the non-zero portion of the aggression variables. Because the "zero" portion had been removed, the distribution of the non-zero portion was no longer skewed, but had a symmetric distribution at each time point. Each non-zero level of aggressive behavior ("any positive level") was modeled as a LGM with growth factors of non-zero level of aggression regressed on the same demographic and intervention variables as above using the traditional methods of latent growth modeling for continuous, normally distributed variables (Muthén and Muthén 1998–2004). In this part of the model, however, "zero" aggression reports within each time period were treated as missing data for the frequency of non-zero aggression. That is, any report of "zero" aggression contributed no information to the growth parameter estimates of frequency of aggression trajectories; but, all of the information of "any positive" aggressive behavior use was used in the estimation of the growth parameters. The advantage of this two-part growth model for highly skewed data such as these is that we model the growth in prevalence—the occurrence of non-zero aggressive behavior as compared to zero aggressive behavior—and, simultaneously model the growth in the frequency of the non-zero portion of aggression. Therefore, we can describe the growth trajectory for non-zero aggressive behaviors, controlling for the actual change or growth in prevalence over the same time period.

We first determined simultaneously the unconditional (without covariates) form for each part of the two models (Part 1 and 2), then we included demographic variables as covariates as well as a dummy variable as a control that indicated whether the student had been part of the Peace-Builders intervention or not to examine inter-individual differences in growth trajectories. The demographic variables selected were sex (1=female, 0=male), socioeconomic status (4 levels used as a continuous variable), and race (4 dummy variables indicating African American, American Indian, Asian American, and Hispanic, with Caucasian as the comparison group).[1, 2]

[1] Children are nested in different SES strata; thus, modeling individual nesting effects might provide finer and perhaps better tests of SES effects. However, because only four strata ranging from low SES to lower–middle SES were developed, differentiating potential effects within this highly restricted range did not appear to be salient, and of course, analytically, it was a challenge due to the small number of strata.

[2] We also need to acknowledge an additional level of nesting in the data, namely students located within schools; this provides another source of potential variability in the tested relationships and developmental processes, but also one for an increased probability of Type I errors due to underestimates of the standard errors. However, because of study design features (all convenience samples of entire schools located in the same general vicinity in the original sample of 8 schools), the small number of schools for most data collection periods of the original 8 schools (which limits the ability to complete multi-level models), and because of the complexity of the LGM approach used, no "true" multi-level analytic approach was employed to model school-level nesting effects. However, in an effort to deal with the issue and to examine whether student nesting effects in schools were related to the growth parameters, a model with dummy coded variables representing the schools as the sole set of predictors was tested. Findings provided evidence that the model with the schools entered as predictors (BIC= 26,689 and adj. BIC=26,518) fit the data less well than the model without the school predictors (BIC=26,631 and adj. BIC=26,510). In addition, school effect variables accounted for a mere 0.1% to 0.3% of the variance in the growth parameters.

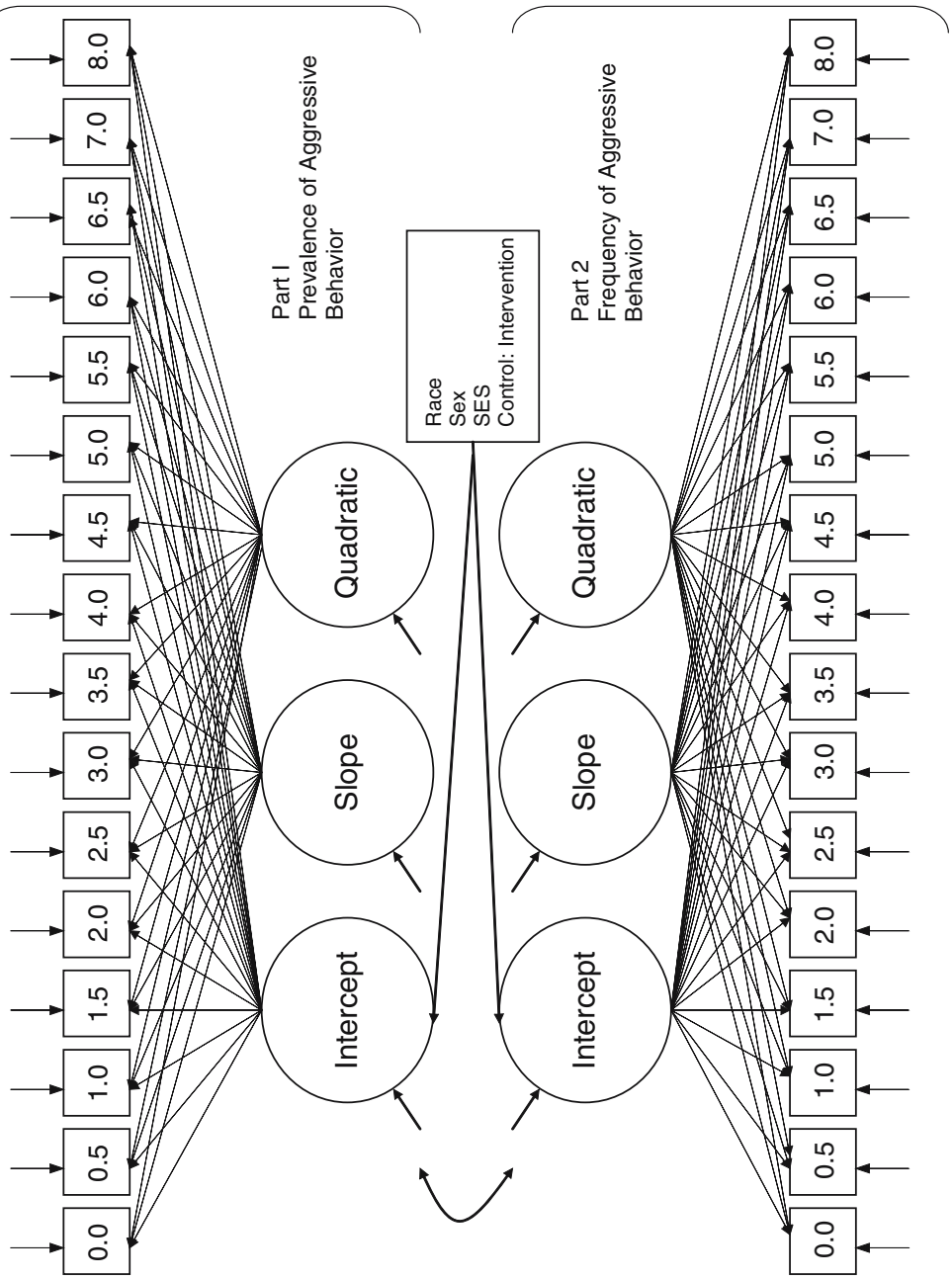

Fig. 1 Two-part latent growth model

For the teacher-reported levels of aggressive behavior, both the "zero" versus "any positive level" (prevalence) and the frequency of non-zero aggressive behavior on outcomes were modeled as linear growth, estimating the intercept (centered at Grade 6) and a slope. The examination of the estimated means of the frequency and prevalence measures over time suggested that both evidenced a quadratic component. That possibility was also tested. To represent the potential conditionality of the probability of aggression outcome on the initial use of any aggression (non-zero), the intercepts of the two growth models were allowed to covary. All of the models were fit with Mplus 3.01 (Muthén and Muthén 1998–2004) and maximum likelihood estimation that provided parameter estimates with robust standard errors under MAR via numerical integration. In addition, the predictors of interest (sex, race, and SES) were added sequentially to the unconditional model one at a time. If a predictor was significantly related to the growth parameters (prevalence and frequency), it was retained prior to adding the next predictor. Model fit was assessed at each step by a chi-square difference test of the log likelihood values, comparing the model with the newly added predictor to the previous conditional model.

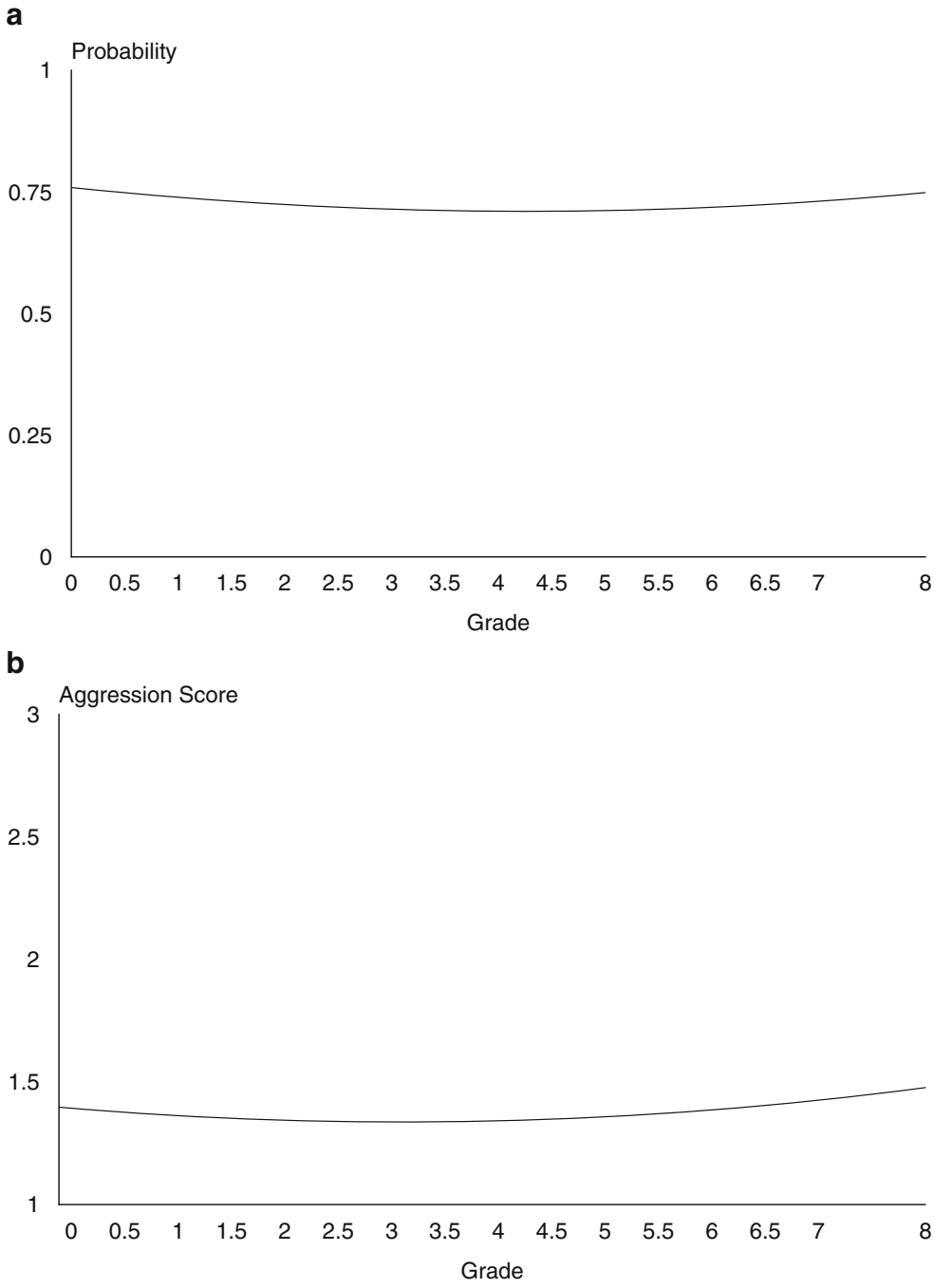

Fig. 2 **a** Fitted mean trajectory for respondents for growth in the probability of teacher-reported aggressive behavior (unconditional model). **b** Fitted mean trajectory for respondents for growth of non-zero teacher-reported aggressive behavior (unconditional model)

Results

Unconditional No-predictors Model

We simultaneously fit linear models to Parts 1 and 2 as well as quadratic models for both parts. The $\Delta\chi^2$ test that compared a linear model to one that included quadratic or acceleration terms for both parts of the model indicated, indeed, that the growth in prevalence and frequency of teacher-reported aggressive behavior was quadratic, $\Delta\chi^2$= 29.18, df=2, p<.001; critical χ^2 df (2)=5.99. The models in Part 1 (prevalence) and Part 2 (frequency) did not have to be the same, but in our case they were. The prevalence and frequency of non-zero aggression use as reported by teachers was best modeled as a quadratic growth model consisting of an intercept, a slope, and a quadratic term for both Part 1 and 2, χ^2=661, df=105; RMSEA=.03, p=1.00. Results of the probability of aggressive behavior use versus non-use (Part 1) indicated that in Grade 6, the teachers rated the children's likelihood of using aggression as 72%

Table 4 Fitted model of changes in probability of use versus non-use and in frequency of aggressive behavior

	Intercept			Slope			Quadratic		
	b	SE	*β*	*b*	SE	*β*	*b*	SE	*β*
Part 1: prevalence of aggressive behavior (use versus non-use)									
Mean growth factor	2.138***	0.118		0.045*	0.021		0.011**	0.004	
Female	−1.213***	0.056	−0.22						
African American	0.604***	0.131	0.05						
American Indian	0.019	0.101	0.00						
Asian American	−1.289***	0.245	−0.05						
Hispanic	−0.171**	0.065	−0.03						
SES	−0.236***	0.031	−0.09						
Control: PeaceBuilders	0.211***	0.062	0.04						
R^2	6.3%								
Part 2: frequency of non-zero aggressive behavior									
Mean growth factor	1.569***	0.022		−0.034***	0.004		0.006***	0.001	
Female	−0.234***	0.010	−0.23						
African American	0.133***	0.024	0.06						
American Indian	0.012	0.019	0.01						
Asian American	−0.217***	0.053	−0.05						
Hispanic	−0.015	0.012	−0.01						
SES	−0.026***	0.006	−0.05						
Control: PeaceBuilders	0.014	0.012	0.01						
R^2	5.9%								

Predictors included sex (female), socioeconomic status (SES), race (African American, American Indian, Asian American, and Hispanic), and intervention status (PeaceBuilders). Variance of the Slope terms for Part 1 and Part 2 were zero, hence could not be predicted. In other words, the teacher reports of children's growth in use versus non-use and growth in frequency of use of non-zero aggression were the same across all children.

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

(intercept=.936, SE=.034, and $p<.001$[3]); that is, in Grade 6, 72% of children showed some non-zero aggressive behavior. Significant growth and acceleration occurred, on average, in the likelihood of using aggression, slope=.049, SE=0.020, $p<.01$; quadratic=0.014, SE=0.004, $p<.001$. The mean of the frequency of non-zero aggressive behavior in Grade 6 was significantly different from zero, $M=1.385$, SE=0.007, and $p<.001$. Linking the 72% probability of showing some non-zero aggression in Grade 6 (see above) with this estimate of the mean frequency of non-zero aggression indicates that, on average, 72% of children were showing fairly low levels of aggressive behavior of 1.4, on the 3 point aggression scale, about half way between "1= not true" and "2=somewhat or sometimes true." In addition, significant growth and acceleration in the frequency of non-zero aggression was found, slope=−0.034, SE=.004, $p<.001$, and quadratic=0.006, SE=0.001, $p<.001$. Figure 2 illustrates the unconditional growth in the prevalence and in the frequency of aggressive behavior over the 16 time periods.

Examination of the growth factor variances of this unconditional model indicated that significant variation existed in the intercept terms for both parts of the model, $\sigma^2=3.943$, SE=.182, $p<.001$ for prevalence, and $\sigma^2=.145$, SE=.004, $p<.001$ for frequency. This suggested significant heterogeneity around the estimated mean levels of aggression use versus non-use and frequency of non-zero aggression at Grade 6. In addition, the intercepts of the two parts of the growth model significantly covaried, $r=.96$, $p<.001$. This association indicated that children with higher propensities to engage in aggressive behavior (at Grade 6) also used aggressive behaviors more frequently and vice versa. For both parts of this unconditional model, very minimal heterogeneity existed in the linear and quadratic growth factors of both the prevalence and frequency portions over the 16 time points; that is, the estimated variances for the slope and quadratic factors in both parts were not significantly different from zero, and therefore were set to be zero to insure the fitted covariance

[3] The fitted equation for the estimation of the growth in the probability of use versus non-use of aggression is a logistic regression model, $1/(1+e^{-(i+s*t+q*t**2)})$.

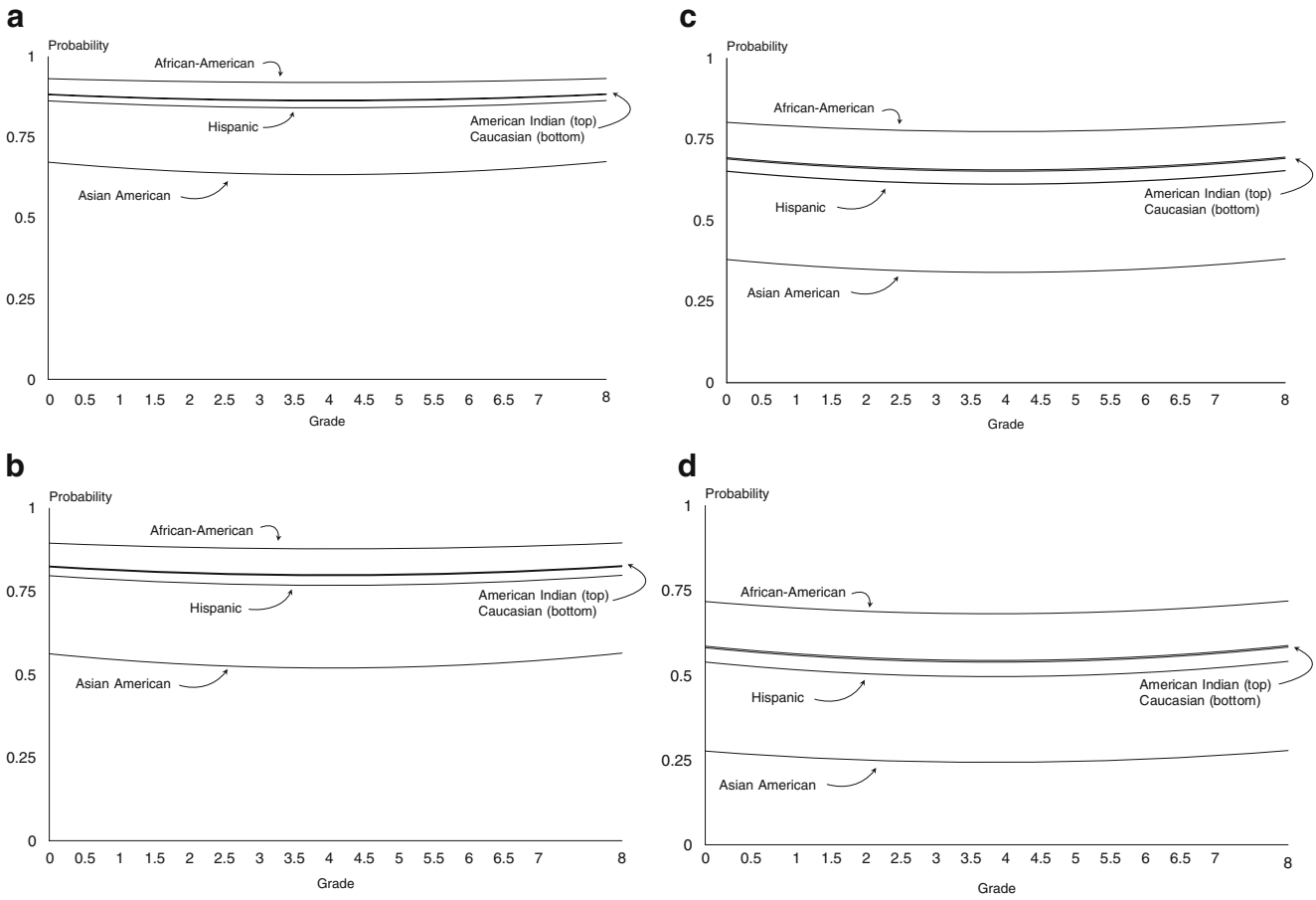

Fig. 3 **a** Fitted trajectory for prototypical low SES male children illustrating the growth in the probability of the use versus non-use of aggressive behavior over 16 time points—grades K to 8. **b** Fitted trajectory for prototypical high SES male children illustrating the growth in the probability of the use versus non-use of aggressive behavior over 16 time points—grades K to 8. **c** Fitted trajectory for prototypical low SES female children illustrating the growth in the probability of the use versus non-use of aggressive behavior over 16 time points—grades K to 8. **d** Fitted trajectory for prototypical high SES female children illustrating the growth in the probability of the use versus non-use of aggressive behavior over 16 time points—grades K to 8

matrix would be positive definite.[4] Thus, teachers reported change, on average, for children over time, but the rate of change in the likelihood of using aggressive behaviors and the frequency of non-zero aggressive behavior use was essentially the same for all children.

Sex, Race, SES, and Intervention Status

The variables of interest—sex, race, SES, and intervention status as a control variable—were entered into both parts of the model and regressed on the intercept growth factors. These predictors could only be used to predict differences in the intercept growth factors of the two parts of the model because no heterogeneity existed in the linear and quadratic growth factors of Part 1 or 2. In addition, all other covariances among the growth parameters, within and between model parts, were nonsignificant and fixed to zero as well. All possible interactions of the variables of interest were tested, and none of them reached statistical significance in the prediction of growth parameters. Therefore, they were not retained in the final model. This final main effects model fit the data very well, χ^2=1,091, *df*=215 RMSEA=.02, p=1.00. The predictor variables explained 6.3% and 5.9% of the variation in the intercept growth parameters of Part 1 and Part 2, respectively. These parameter estimates and standard errors for this final two-part latent growth model are presented in Table 4. In addition, the fitted trajectories of the growth in probability of use versus non-use of aggression for prototypical children are illustrated in Fig. 3, and those for the growth in the frequency of non-zero aggression use for similar prototypically children are shown in Fig. 4. These fitted plots are not constructed by splitting the sample, but by using the parameter estimates in Table 4; that is, we substitute prototypical values of the predictors (e.g., for the

[4] Prior to setting the variances to zero, we did fit a model testing the significance of the ethnicity variables in predicting the slopes and quadratic terms of frequency and prevalence of aggression. The effects of ethnicity were not significant.

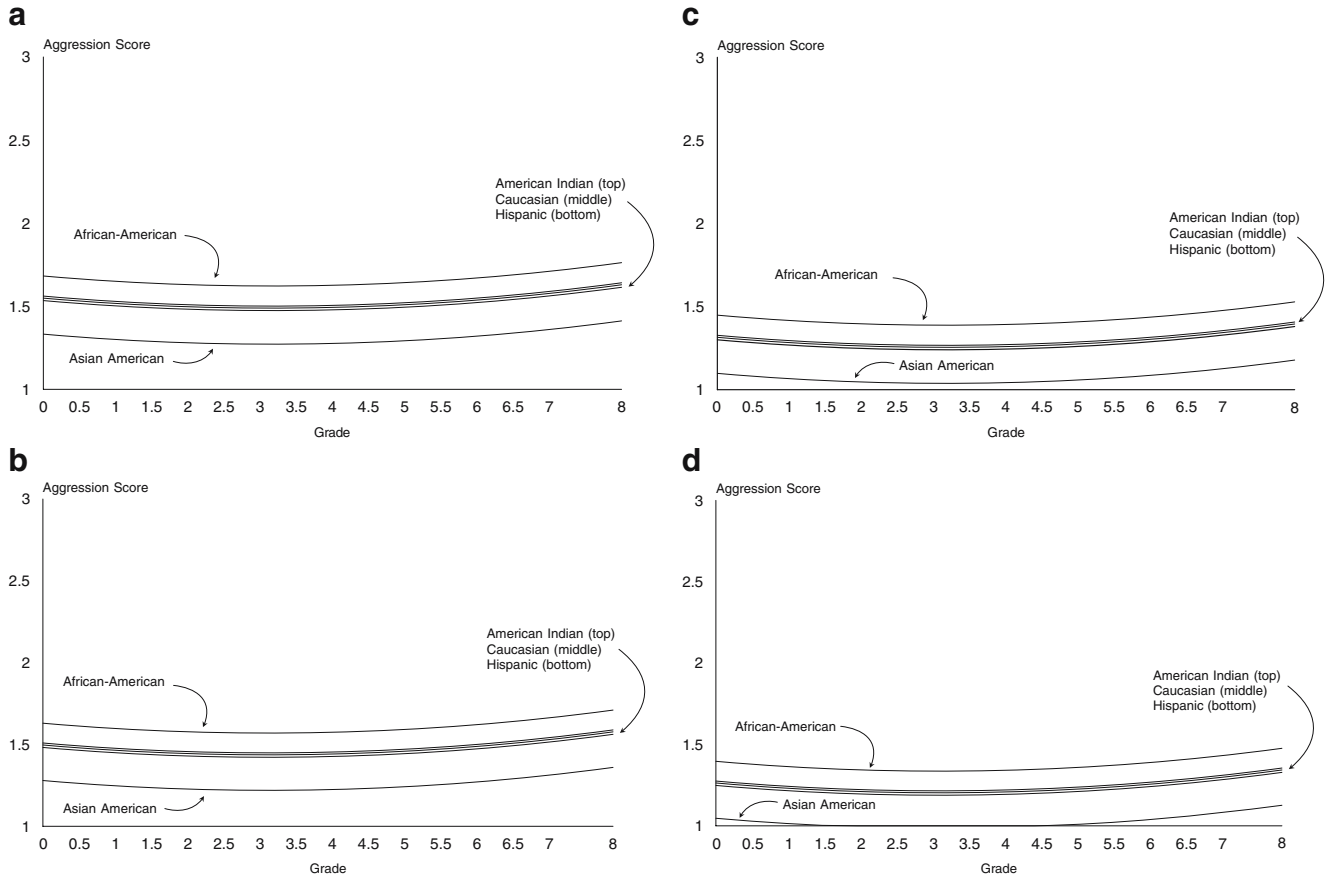

Fig. 4 **a** Fitted trajectory for prototypical low SES male children illustrating the growth in the frequency of the use of non-zero aggressive behavior over 16 time points—grades K to 8. **b** Fitted trajectory for prototypical high SES male children illustrating the growth in the frequency of the use of non-zero aggressive behavior over 16 time points—grades K to 8. **c** Fitted trajectory for prototypical low SES female children illustrating the growth in the frequency of the use of non-zero aggressive behavior over 16 time points—grades K to 8. **d** Fitted trajectory for prototypical high SES female children illustrating the growth in the frequency of the use of non-zero aggressive behavior over16 time points—grades K to 8

race and sex variables 0 and 1, for SES a high (3.5) and low (1.5) level, for PB its mean), and calculate the fitted value for the outcome (use of aggression versus non-use or frequency of non-zero aggression) at each time point.[5]

Significant effects were found in Part 1 (prevalence) of the model (Table 4 and Fig. 3) indicating that females were significantly less likely to use aggressive behavior in Grade 6 than were the males, controlling for the other predictors in the model. African Americans were significantly more likely to use aggressive behavior in Grade 6 than were any other racial group. Hispanics were slightly less likely to use aggression in Grade 6 than were Caucasians, African Americans, and American Indians, but Asian Americans were significantly less likely to use aggressive behavior in Grade 6 than any other racial group, controlling for all else in the model. Socioeconomic status was also significant, controlling for the other predictors; children from higher SES strata were less likely to engage in aggressive behavior in Grade 6 than were those children who lived in lower SES strata.

Significant effects were found in Part 2 (frequency) of the two-part growth model, indicating very similar results to the results found in Part 1 (Table 4 and Fig. 4). Sex was a significant predictor with female youth in Grade 6 being rated as using less non-zero aggression than were the male youth. African Americans were reported by teachers as using non-zero aggressive behavior more frequently than were American Indian, Caucasians, and Hispanics, with the Asian Americans using non-zero aggression the least often of all racial groups, controlling for sex, SES, and intervention status. Children from higher SES strata were reported as using non-zero aggressive behavior less frequently than children from lower SES strata.

[5] The fitted equation for the estimation of the growth in the probability of use versus non-use of aggression is a logistic regression model, $1/(1+e^{-((i+b1*x1+b2*x2+...+bn*xn)+s*t.+q*(t**2))})$. The fitted equation for the estimation of the growth in the frequency of non-zero aggression is the usual linear growth model, $(i+b_1x_1+b_2x_2+...+b_nx_n)+s*t.+q*(t**2)$.

Discussion

The objectives of this study were to examine growth trajectories of over 10,000 predominantly minority children and early adolescents as part of an accelerated longitudinal project over 5 years. More specifically, we were interested in testing two competing hypotheses about potential similarities or differences in the development of the likelihood of aggressive strategies as well as in the development of the frequency or use of non-zero aggressive behaviors in African American, American Indian, Asian American, Caucasian, and Hispanic, male and female youth based on teacher ratings. We also addressed the parallel question whether levels of SES were predictive of differential development of aggressive behavior over time. For this purpose, we used a new two-part latent growth curve analytic procedure which represents a more efficient modeling strategy of data that are characterized by high levels of positive skew and a preponderance of zeros (Brown et al. 2005; Muthén 2002). By modeling both the prevalence or probability (use versus non-use) and the growth in the non-zero component (frequency of actual use) of aggressive behavior, our findings add important information to the literature on the etiological and development of aggression most generally speaking. However, our findings need to be interpreted in light of the fact that only teacher ratings were used in the analyses.

First of all, the study provided evidence of very modest changes over time in both the likelihood of aggressive behaviors as well as in their frequency in the unconditional models with no predictors. Though small significant negative linear effects as well as even more modest quadratic terms were found in both parts of the model that were almost perfectly associated, the overwhelming evidence based on this large sample is that relatively few changes were observed in probability of the use of aggressive behaviors and in the frequency of non-zero aggression over time between Kindergarten and 8th grade. The modest changes we found indicated a slight decrease in aggression following Kindergarten through 4th grade, followed by a slight increase as youth transitioned into middle school. Though the small effects were statistically significant, their sizes, especially in the case of the quadratic terms, do not allow a conclusion or projection based on these data which would suggest that during late childhood and early adolescence aggressive behaviors increase. In fact, these findings are very consistent with a number of studies, which have suggested declines during childhood and adolescence (e.g., Cairns et al. 1989; Tremblay 2004). They are also consistent with recent insights provided by the work by Tremblay and colleagues, namely that perhaps the most interesting time etiologically to study changes in aggression are during infancy. Of course these findings are not necessarily consistent with typological approaches to the study of changes in aggression over time (e.g., Aber et al. 2003; Bongers et al. 2004; Nagin and Tremblay 1999). At the same time, we can not directly speak to these empirical or conceptual approaches as we did not test them, though we look forward to doing so.

Secondly, on the question of support for the similarities versus differences hypothesis in the development and use of aggressive behaviors, we found overwhelming evidence of similarities across ethnic and racial groups. In fact, no variability existed in the slope or quadratic growth parameters across race, SES, and sex in the overall development of prevalence and frequency of non-zero aggressive behaviors. Thus, we did not find unique developmental trajectories in this sample that would support idiosyncratic developmental processes in different racial and ethnic groups (Rowe et al. 1994; cf., Deater-Deckard et al. 1996; Deater-Deckard and Dodge 1997), different SES strata, and in male versus female youth. Suffice it to say that the finding of significant differences in the levels of prevalence and frequency of non-zero aggressive behaviors at Grade 6 is an indication that in a normative population, the development of the probability and frequency of non-zero aggression is best modeled by a quadratic function which, although different at initial status, is similar and invariant in shape across racial groups, by SES strata, and for male and female youth.

Finally, the findings from the current study do provide important evidence of "level" differences that appear established at Kindergarten and that do not show great developmental change over the course of 8 years. Significant group differences were observed at intercept, which was centered at Grade 6. When considering frequency of non-zero aggressive behaviors, African American youth had significantly higher levels of teacher-reported aggressive behaviors and Asian Americans had significantly lower levels of aggression when compared to American Indian, Caucasian, and Hispanic youth. No evidence was found that these latter three groups differed in levels of frequency of aggressive behaviors, though Hispanic youth were rated to be less likely to use aggression than American Indian and Caucasian youth. Differences observed between male and female students were consistent with previous work; male youth were rated as being more likely to use aggression, and they used it more frequently in comparison to female youth. When considering the magnitude of the standardized estimate, this difference was by far the largest in both parts of the model (probability and frequency), four to five times the size of the largest, significant racial group difference. Finally, differences were also found by SES, more pronounced in the probability of use versus non-use of aggression.

These latter differences are consistent with previous work by Tremblay and colleagues (Tremblay 1999) who found similar SES gradients in aggression based on a large Canadian

sample. However, the study also provided evidence that not all low SES youth were at risk for aggressive behaviors as great variability within the low SES group was found—in fact, most children were not at risk. Rather, based on comparisons of children from low to middle class SES strata, this work provided evidence that differences in aggression were explained to a greater extent by variability in family processes in low SES versus average SES youth. In other words, positive socialization pressures by the family had a greater effect in lower SES children than in higher SES children. Thus, we assume that the modest social class difference we observed at initial status is subject to a largely analogous explanation, one that focuses on causally antecedent processes (preceding Kindergarten), such as family socialization efforts or socialization efforts by other adults.

Implications

The findings from the current study provide evidence that supports what Tremblay and colleagues have proposed, namely that there appears no empirical basis for differential onset of aggression during elementary school, during adolescence or adulthood (Tremblay 1999; 2000a, b; 2004; Tremblay et al. 1999). The data underscore the lack of developmental changes during childhood and early adolescence and emphasize potential individual differences in the development of aggression as well as individual differences in the propensity to change in aggressive behaviors pre-Kindergarten. In other words, we believe that most kids who enjoy positive socialization pressures at home or in other early child care settings develop into aggression "desistors" by the time they enter Kindergarten. This parallels Gottfredson and Hirschi's (1990) theoretical work regarding how a key predictor of crime, deviance, and analogous behaviors "develops"—low self-control—namely, in the absence of early socialization efforts by parents or other important adults who in effect instill the ability to delay gratification (for a similar discussions and insights, see Cairns and Cairns 2001; Eron 1990).

Secondly, this also has profound implications for previous etiological work that has mostly focused on external mechanisms of socialization during the school-age years, such as parents (Deater-Deckard et al. 1996; Dodge et al. 1990) or peers (Coie and Kupersmidt 1983; Dodge et al. 2003). It calls into question whether children were more aggressive due to abusive parenting or coercive parenting in a causal sense, but rather because parents and caregivers failed to socialize these children into desisting from these behaviors. Similarly, it calls into question how much peer interactions impact the developmental trajectory of children as we found little evidence of developmental changes in aggression during elementary school. As reviewed by Coie and Dodge (1998), most explanations in the social and behavioral sciences of aggressive behavior etiology focus on both proximal and distal environmental effects and learning mechanisms to produce differences in levels of and in the developmental course, though not exclusively so (e.g., Cairns and Stoff 1996). Underlying these explanations is a worldview consistent with Rousseau, and more recently, Bandura, which suggests that children are born "good" and over time acquire aggressive interpersonal skills. However, as Tremblay (2004) has recently noted based on the evidence that children are most aggressive during very early childhood and that they learn to inhibit these behaviors over time, the competing explanation to "learning aggression" is that children learn over time not to engage in aggressive behaviors, presumably through positive socialization effects in the immediate environment of a child. In other words, they learn to regulate impulses, affect, and behaviors.

Finally, findings also have implications for some of the rather modest observed differences in mean levels at Grade 6 for some of the racial groups of male and female youth at different levels of SES. If these differences are real and not the result of measurement biases (Keiley et al. 2000), then African American children potentially experience systematically different socialization pressures during the early years that are less effective—less effective in the sense that these children are less likely to desist from aggressive behaviors, and that they are slightly more aggressive at Kindergarten age and throughout elementary and middle school in comparison to their peers. The analogous opposite argument can be made for Asian American youth who are slightly less aggressive compared to their peers, as well as for Hispanic youth, though for this latter group, small differences were only found in frequency of use, not in the probability of use versus non-use. Of course, this is highly speculative, and there exist alternative interpretations, including biological ones, regarding what causes the modest observed differences at initial status. Certainly, biological mechanisms underlie the large observed differences between male and female youth (Cairns and Stoff 1996). Future work that follows children from different racial groups beginning at an even younger age may provide additional insights. Clearly, though our study does not provide answers to some of these pointed questions, it does provide substantial evidence based on over 10,000 children and early adolescents that aggressive behaviors do not appear to change much between Kindergarten and 8th grade, that they do not differ across groups, and that the mean level differences by ethnicity/race, SES, and sex most likely pre-date entry into school.

Limitations

The current investigation is not without limitations, especially related to the generalizability of findings. First, the sample part of the study was not random or representative of the general population as it focused on lower SES, minority children. Secondly, within our sample, different racial groups were over- and underrepresented. Third, the sample was limited to lower and lower–middle class youth, so the possibility remains that we could find different developmental changes across other strata of society. Another important limitation is that we exclusively focused on teacher ratings of aggressive behavior which may have introduced bias—underratings for Asian American children or overratings for African American youth. It is important to point out, however, that in most schools and classrooms, the majority of children were ethnic minority youth. Related to this, the addition of alternative measurements of aggressive conduct would have added to the study. Finally, it is also important to note that a more careful study of physical versus social/relational aggression seems an important next step in this line of work, especially as this relates to potential changes over time in aggressive behaviors in male versus female youth. In the current study, aggressive behavior items tapped both physical and non-physical (social/relational) indicators of aggressive behaviors.

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References

Aber, J. L., Brown, J. L., & Jones, S. M. (2003). Developmental trajectories toward violence in middle school: Course, demographic differences, and response to school-based intervention. *Developmental Psychology, 39*, 324–348.

Achenbach, T. M. (1991). *Manual for the child behavior checklist/4–18 and 1991 profile*. Burlington, VT: University of Vermont Department of Psychiatry.

Blumstein, A., & Cohen, J. (1979). Estimation of individual crime rates from arrest records. *Journal of Criminal Law and Criminology, 70*, 561–585.

Bongers, I. L., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2004). Developmental trajectories of externalizing behaviors in childhood and adolescents. *Child Development, 75*, 1523–1537.

Broidy, L. M., Nagin, D. S., Tremblay, R. E., Bates, J. E., Brame, B., Dodge, K. A., et al. (2003). Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: A six-site, cross-national study. *Developmental Psychology, 39*, 222–245.

Brown, E. C., Catalano, C. B., Fleming, C. B., Haggerty, K. P., & Abbot, R. D. (2005). Adolescent substance use outcomes in the Raising Healthy Children Project: A two-part latent growth curve analysis. *Journal of Consulting and Clinical Psychology, 73*, 699–710.

Cairns, R. B., & Cairns, B. D. (1994). *Lifelines and risks: Pathways of youth in our time*. New York: Cambridge University Press.

Cairns, R. B., & Cairns, B. D. (2001). Aggression and attachment: The folly of separatism. In A. C. Bohart & D. J. Stipek (Eds.), *Constructive and destructive behavior: Implications for family, school and society* (pp. 21–47). Washington, DC: APA.

Cairns, R. B., Cairns, B. D., Nekermann, H. J., Ferguson, L. L., & Gariepy, J. L. (1989). Growth and aggression: 1. Childhood to early adolescence. *Developmental Psychology, 25*, 320–330.

Cairns, R. B., & Stoff, D. M. (1996). Conclusion: A synthesis of studies of the biology of aggression and violence. In D. M. Stoff & R. B. Cairns (Eds.). *Aggression and violence: Genetic, neurobiological, and biosocial perspectives* (pp. 337–351). Mahwah, NJ: Erlbaum.

Coie, J. D., & Dodge, K. A. (1998). Aggression and antisocial behavior. In N. Eisenberg (Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed.) (pp. 779–862). New York: Wiley.

Coie, J. D., & Kupersmidt, J. B. (1983). A behavioral analysis of emerging social status in boys' groups. *Child Development, 54*, 1400–1416.

Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design and analysis issues for field settings*. Boston, MA: Houghton Mifflin.

Deater-Deckard, K., & Dodge, K. A. (1997). Spare the rod, spoil the authors: Emerging themes in research on parenting and child development. *Psychological Inquiry, 8*, 230–235.

Deater-Deckard, K., Dodge, K. A., Bates, J. E., & Pettit, J. E. (1996). Physical discipline among African American and European American mothers: Links to children's externalizing behaviors. *Developmental Psychology, 32*, 1065–1072.

Dodge, K. A., Bates, J. E., & Pettit, G. S. (1990). Mechanisms in the cycle of violence. *Science, 250*, 1678–1683.

Dodge, K. A., Lansford, J. E., Burks, V. S., Bates, J. E., Pettit, G. S., Fontaine, R., et al. (2003). Peer rejection and social information-processing factors in the development of aggressive behavior problems in children. *Child Development, 74*, 374–393.

Embry, D., Flannery, D. J., Vazsonyi, A. T., Powell, K., & Atha, H. (1996). PeaceBuilders: A theoretically driven, community-based model for early violence prevention. *American Journal of Preventive Medicine, 12*, 91–100.

Eron, L. D. (1990). Presidential address: Understanding aggression. *The Bulletin of the International Society for Research on Aggression, October*, 5–9.

Estell, D. B., Cairns, R. B., Farmer, T. W., & Cairns, B. D. (2002). Aggression in inner-city early elementary classrooms: Individual and peer-group configurations. *Merrill-Palmer Quarterly, 48*, 52–76.

Farrington, D. P. (1995). The twelfth Jack Tizard memorial lecture: The development of offending and antisocial behavior from childhood: Key findings from the Cambridge study in delinquent

development. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 36*, 929–964.

Flannery, D. J., Vazsonyi, A. T., Liau, A., Guo, S., Powell, K. E., Atha, H., et al. (2003). Initial behavior outcomes for Peacebuilders universal violence prevention program. *Developmental Psychology, 39*, 292–308.

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford: Stanford University Press.

Haapasalo, J. & Tremblay, R. E. (1994). Physically aggressive boys from ages 6 to 12: Family background, parenting behavior, and prediction of delinquency. *Journal of Consulting and Clinical Psychology, 62*, 1044–1052.

Huesmann, L. R., Eron, L. D., Lefkowitz, M. M., & Walder, L. O. (1984). Stability of aggression over time and generations. *Developmental Psychology, 20*, 1120–1134.

Hudley, C., & Graham, S. (1993). An attributional intervention to reduce peer-directed aggression among African-American boys. *Child Development, 64*, 124–138.

Keiley, M. K., Bates, J., Dodge, K., & Pettit, G. (2000). A cross-domain analysis: Externalizing and internalizing behaviors during 8 years of childhood. *Journal of Abnormal Child Psychology, 28*, 161–179.

Loeber, R., & Hay, D. (1997). Key issues in the development of aggression and violence from childhood to early adulthood. *Annual Review of Psychology, 48*, 371–410.

Loeber, R., & Stouthamer-Loeber, M. (1998). Development of juvenile aggression and violence: Some common misconceptions and controversies. *American Psychologist, 53*, 242–259.

Muthén, B. (2002). Beyond SEM: General latent variable modeling. *Behaviormetrika, 29*, 81–117.

Muthén, L. K., & Muthén, B. O. (1998–2004). *Mplus user's guide* (3rd ed.) Los Angeles, CA: Muthén & Muthén.

Nagin, D. S. (1999). Analyzing developmental trajectories: A semiparametric, group-based approach. *Psychological Methods, 4*, 139–157.

Nagin, D., & Tremblay, R. E. (1999). Trajectories of boys' physical aggression, opposition, and hyperactivity on the path to physically violent and nonviolent juvenile delinquency. *Child Development, 70*, 1181–1196.

Olens, M. K., & Schafer, J. L. (2001). A two-part random-effects model for semicontinuous longitudinal data. *Journal of the American Statistical Association, 96*, 730–745.

Olweus, D. (1979). Stability of aggressive reaction patterns in males: A review. *Psychological Bulletin, 86*, 852–875.

Pulkkinen, L., & Tremblay, R. E. (1992). Patterns of boys' social adjustment in two cultures and at different ages: A longitudinal perspective. *International Journal of Behavioural Development, 15*, 527–553.

Rowe, D. C., Vazsonyi, A. T., & Flannery, D. J. (1994). No more than skin deep: Ethnic and racial similarity in developmental process. *Psychological Review, 101*, 396–417.

Sampson, R. J. (1997). Collective regulation of adolescent behavior: Validation results from eighty Chicago neighborhoods. *Journal of Adolescent Research, 12*, 227–244.

Sampson, R. J., Morenoff, J., & Earls, F. (1999). Beyond social capital: Spatial dynamics of collective efficacy for children. *American Sociological Review, 64*, 633–660.

Stattin, H., & Magnuson, D. (1989). The role of early aggressive behavior in the frequency, seriousness, and types of later crime. *Journal of Consulting and Clinical Psychology, 57*, 710–718.

Tremblay, R. E. (1999). When children's social development fails. In D. P. Keating & C. Hertzman (Eds), *Developmental health and the wealth of nations: Social, biological, and educational dynamics* (pp. 55–71). New York: Guilford.

Tremblay, R. E. (2000a). The development of aggressive behaviour during childhood: What have we learned from the past century? *International Journal of Behavioural Development, 24*, 129–141.

Tremblay, R. E. (2000b). The origins of youth violence. In C. von Hofsten & L. Backman (Eds.), *Psychology at the turn of the millennium, vol. 2: Social, developmental, and clinical perspectives* (pp. 77–88). Florence, KY: Taylor & Francis/Routledge.

Tremblay, R. (2004). Decade of behavior distinguished lecture: Development of physical aggression during infancy. *Infant Mental Health Journal, 25*, 399–407.

Tremblay, R. E., Japel, C., Perusse, D., Boivin, M., Zoccolloilo, M., Montplaisir, J., et al. (1999). The search for the age of "onset" of physical aggression: Rousseau and Bandura revisited. *Criminal Behaviour and Mental Health, 9*, 8–23.

U.S. Census (2004). *Historical poverty tables. Number of families below the poverty level and poverty rate: 1959 to 2003.* Accessed January 24, 2005, from http://www.census.gov/hhes/poverty/histpov/hstpov13.html.

Vazsonyi, A. T., Belliston, L. M., & Flannery, D. J. (2004). Evaluation of a school-based, universal violence prevention program: Low, medium, and high risk children. *Youth Violence and Juvenile Justice, 2*, 185–206.

Vazsonyi, A. T., Vesterdal, W. J., Belliston, L., & Flannery, D. J. (1999). The utility of child self reports and teacher ratings in classifying official delinquency status. *Studies on Crime and Crime Prevention, 8*, 225–244.

White, J. L., Moffitt, T. E., Earls, F., Robins, L., & Silva, P. A. (1990). How early can we tell?: Predictors of childhood conduct disorder and adolescent delinquency. *Criminology, 28*, 507–534.