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Family Background, School-Age Trajectories of Activity Participation, and Academic Achievement at the Start of High School

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Applying latent class and regression techniques to data from the NICHD Study of Early Child Care and Youth Development ($n = 997$), this study explored the potential academic advantages of time spent in out-of-school activities. Of particular interest was how these potential advantages played out in relation to the timing and duration of activity participation and the family contexts in which it occurred. Participation closer to the start of high school—including consistent participants and latecomers—was associated with higher grades at the transition into high school, especially for youth from low-income families. Sensitivity analyses indicated that this link between school-age activity participation and adolescent academic progress was unlikely to be solely a function of selection. It also tended to be more pronounced among youth from lower-income families, although without varying by other aspects of family status or process.

As the lifelong socioeconomic returns to education have surged, so too have the stakes of academic success in the K–12 system, and these high stakes have motivated parents to find ways to gain a competitive edge for their children in school (Goldin & Katz, 2008; Morgan, 2005). Increasingly, sports, arts, and other activities are viewed by parents as an advantage for children, with the social, cognitive, and other skills and resources cultivated in these activities promoting engagement in school (Mahoney, Harris, & Eccles, 2006; Vandell, Pierce, & Dadisman, 2005). Importantly, the connection between children's out-of-school activity participation and their academic experiences may be one channel through which family-related disparities in academic progress emerge and widen, as children from more economically or socially advantaged backgrounds are more likely to be exposed to these activities in the first place (Lareau, 2003).

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The purpose of this study is to unpack these links among family background, out-of-school activity participation, and academic achievement in order to better understand the interplay of in-school and out-of-school experiences and the role of this interplay in the intergenerational transmission of advantage. Life course theory offers guidance that can uncover new insights into these oft-studied associations (see Elder, 1998). Specifically, it focuses on dynamic contextualized trajectories of behavior that link children and parents within families and connect interpersonal processes to larger social structures. Thus, it highlights the potential value of identifying critical periods of activity participation in young people's development, viewing activity participation as a cumulative history rather than as discrete events, and considering broadly how the same experiences might have variable implications for children from different kinds of families. To do this theoretically grounded unpacking, this study applied latent class analysis and other techniques to data on a large number of children followed into adolescence, identifying basic categories of school-age extracurricular activity

participation, examining differences in one early high school academic outcome (GPA) across these categories, and exploring how these differences vary as a function of both process- and status-related aspects of family background. Such research helps to elucidate issues of "when" and "who" in interventions organized around the potential positive role of out-of-school activities in youths' lives.

Activity Participation, Academic Progress, and Inequality

The increased investment of U.S. parents in out-of-school activities reflects their growing views of such activities as more than just a way to support their children's positive development. They also see it as a way for their children to gain a competitive edge over peers in school. These views are more common at the high end of the socioeconomic spectrum, and such parents have greater means to act on their views. Still, the perceived value of activity participation extends across diverse communities of families (Kornrich & Furstenberg, 2013; Lareau, 2003).

Empirical evidence appears to back up this view. Activity participation in multiple areas—including sports, performing arts, and community programs, to name just a few—is associated with an array of favorable developmental outcomes across childhood and adolescence, including academic achievement, and these associations persist across diverse segments of the population (Eccles & Gootman, 2002). Although a significant portion of these associations is no doubt due to the family, child, and community characteristics that select children into activities, they also reflect the ways in which participation in organized adult-led programs enhances social competence and critical thinking skills, strengthens attachments to conventional institutions, connects youth to mentors and prosocial peers, and supports positive identity development (Crosnoe, 2002; Eccles & Barber, 1999; Farb & Matjasko, 2012; Fredricks & Eccles, 2010; Mahoney, Lord, & Carryl, 2005; Rosewater, 2009; Simpkins, Delgado, Price, Quach, & Starbuck, 2013). At the same time, activity participation partially mediates links between family resources and young people's academic progress (Covay & Carbonaro, 2010; Lareau, 2003). Even though such socioeconomically advantaged youth may be more likely to select into activities, they may not necessarily benefit as much from them. Put another way, stratification may reduce access to activities among the socioeconomically disadvantaged youth who have the most to gain from them (Mahoney, Lord, & Carryl, 2005; Vandell & Shumow, 1999).

This evidence of links among family background, out-of-school activity participation, and academic achievement among U.S. youth has helped to support activity-based interventions aiming to buffer against developmental risks and to reduce family-related disparities in developmental outcomes, including schooling (Vandell et al., 2005). Efforts to further inform this programmatic action would be enhanced by theoretically guided attempts to better understand the specific temporal and contextual circumstances in which the general link between activity participation and academic achievement is stronger and weaker than average. The overarching goal of this study is to do just that by drawing on life course theory.

Looking for New Angles of Inquiry

The view of life course theory is that developmental trajectories are shaped by experiences in proximate settings of everyday life and pathways through institutional structures, which, in turn, are embedded in broader and more abstract contexts, such as stratification systems. This approach emphasizes how the dynamic and contextualized nature of children's lives is both influenced by and factors into societal inequality (Crosnoe & Johnson, 2011; Elder, 1998). As such, it is relevant to considering the connection between activity participation out of school and achievement in school—two experiences in institutional structures—across different kinds of families, with family background tapping into proximate contexts and connecting families to larger social systems. In this way, the theory points to three angles of inquiry.

First, beginning with the initial social pathway, activity participation is a dynamic sequence of behavior, roles, and settings that plays out over time. Consequently, when considering its significance for young people, activity participation may be better conceptualized as a summative history rather than as a discrete event (Fredricks & Eccles, 2006; Posner & Vandell, 1999). Generally, participation is captured in snapshots, with youth differentiated in terms of whether they are involved in an activity at some point. Yet, two youth with the same participation status in 1 year may have different histories or futures of activity participation, and so their similarity at one point may not indicate similarity over time. Thus, understanding whether activity participation per se or the duration and timing of activity participation matters is important (Fredricks & Eccles, 2006). In taking such a dynamic approach, this study focuses on participation histories after entry into and throughout school, given that the transition into school marks the upsurge in children's exposure to formal activities and in the competition between in-school and out-of-school demands (Mahoney et al., 2006; Vandell et al., 2005).

Second, turning to the next social pathway, academic achievement is an evolving multidimensional

phenomenon, with the domains that require attention shifting across stages of schooling. Achievement within and across domains may be deflected and magnified by institutional structures that introduce uncertainty and disruption and lead to sorting, all of which can increase the influence of outside forces beyond cognitive and academic skills (Morgan, 2005; Plank & Jordan, 2001). School transitions, for example, are periods in which students' academic positions may be reshuffled in ways that do not reflect academic abilities. Some students do better during these transitions because their past histories enable them to be better prepared academically to meet the challenges of a new environment, but others get ahead of even equally prepared peers because their past experiences and opportunities give them inside information, connections, and resources that help them navigate the new school environment. If activity participation enhances human, social, and cultural capital, therefore, it may be especially important during the reshuffling of school transitions (Breen & Goldthorpe, 2001; Jackson, 2013). Key transitions after school entry are the transition into middle school and the transition into high school. Of the two, the latter is likely to be a critical time for nonacademic experiences like activity participation to make a difference academically. It is when relationships and settings are disrupted, when curricular differentiation (and choice and options in coursework) increases dramatically, and when the sequential curricular pathways to higher education become increasingly hard to alter (Crosnoe & Huston, 2007; Gamoran & Hannigan, 2000).

Third, as for the context in which these pathways intersect, family background can be thought of on multiple levels. According to Crosnoe and Cavanagh (2010), two general sets of family characteristics are status (the structure and social positions of families that shape children's opportunities and resources) and process (the intra-family interpersonal dynamics that directly influence the development of competencies). Both are relevant to understanding the family advantages that are passed down across generations, and both are dynamic. Importantly, the two tend to co-occur but are not substantially overlapping. Some families may have material or human capital resources to provide for children without providing nurturance or stimulation, and vice versa (McLanahan, 2004; McLoyd, 1998; Steinberg, 2001). Advantages in each domain, therefore, are important to consider. As stated earlier, the connection between activity participation and inequality is generally thought of in terms of cumulative advantage: family socioeconomic and interpersonal resources selecting children into activities that then widen their initial edge. Yet, cumulative advantage—essentially a mediational model—does not exclude the possibility of a risk × protection interplay that might chip away at the overall advantage that children from well-off or well-organized families have. In such an interplay, participation may do more to support academic progress for children from more disadvantaged backgrounds, even if they are less likely than their peers from more advantaged backgrounds to be in such activities in the first place (Farb & Matjasko, 2010; Vandell et al., 2005).

Study Aims

Following these life course insights into the associations among out-of-school activity participation, academic progress, and family background, our first aim is to capture different activity histories through school in terms of duration and timing. The second aim is to explore how such histories predict academic achievement at the start of high school. The hypothesis is that more participation (duration) and more consistent participation (timing) will be associated with better grades. The third aim is to explore the degree to which structural and socioeconomic aspects (e.g., parent education, family income and structure) and process-related aspects (e.g., sensitivity, supportive home environment) of family background condition links between activity histories and academic achievement. We expect to see evidence of a risk × protection interplay. No matter whether children from disadvantaged family backgrounds are less likely to participate in out-of-school activities, participation that they do demonstrate will be more tightly linked to their academic progress, compared to children from more advantaged backgrounds. In pursuing the second and third aims, we expect consistent activity participation to be most beneficial, followed by participation more proximal to the beginning of high school.

METHODS

Data

The NICHD Study of Early Child Care and Youth Development (SECCYD) has followed a sample of children from birth through adolescence, with the original goal of exploring the role of early child care arrangements in children's development but eventually growing into a more general study of the contexts and processes of the early stages of the life course (http://www.nichd.nih.gov/research/supported/Pages/seccyd.aspx). Families were recruited from hospitals in which mothers had just given birth around Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; and Madison, WI. To be included in the

sampling frame, mothers had to be over 18 years of age and conversant in English; infants had to be singletons and healthy; and families could not be planning to move. When infants were 1-month-old, 1,364 families were enrolled. Although the sample was not nationally representative, it was diverse in many ways, with 24% non-White children, 11% mothers without a high school education, and 41% families with incomes below 200% of the federal poverty line for their household size.

Major data collections occurred at roughly 2-year intervals from 1 month through the start of elementary school, then in first, third, and fifth grades, and then again at age 15, with some smaller-scale data collections in between these major assessment points. A variety of methodologies (e.g., direct assessments, surveys, observations) targeted children, parents, caregivers, and school personnel in home, laboratory, and school settings. Our analytical sample included the 997 youth in the 1-month data collection who also participated in the ninth grade data collection. The Stata suite of *mi* commands estimated any remaining item- or survey-level missing data (StataCorp, 2011).

Measures

Table 1 provides descriptive statistics for all study variables.

Academic Achievement

After youth completed ninth grade, their principals were contacted to complete a questionnaire about academics at their schools and to provide school transcripts and course catalogs. These school materials were then coded by Westat, Inc. to measure a variety of indicators of academic achievement. For this study, we used comprehensive grade point average (GPA) in ninth grade, which was based on a standard 4-point scale and summarized officially recorded grades in all subjects. As seen in Table 1, the average GPA in the sample was just above 3.0, meaning that students generally received Bs.

TABLE 1
Descriptive Statistics of Full Sample ($n = 997$)

	Freq. (%)	*M (SD)*
Outcome and Focal Predictors		
GPA in ninth grade		3.03 (0.70)
School-age activity trajectories		
Nonparticipants	28.79	
Consistent participants	33.30	
Dropouts	23.57	
Latecomers	14.34	
Family Background		
Maternal education		
Less than high school	8.02	
High school	20.06	
Some college	32.80	
College or more	39.12	
School-age average income-to-needs		4.37 (3.56)
School-age episodes of family stability		5.54 (1.20)
School-age episodes with both biological parents		4.59 (3.24)
School-age average maternal sensitivity		16.58 (2.19)
School-age average HOME score		39.67 (5.48)
Covariates		
Gender (female)	49.95	
Race/ethnicity		
Black	11.63	
Latino/a	5.72	
White	77.43	
Other race/ethnicity	5.22	
Achievement test score (54 months)		425.38 (18.70)
Internalizing behavior (54 months)		4.46 (4.23)
Externalizing behavior (54 months)		10.12 (6.76)
% college graduates in neighborhood[1]		32.56 (19.38)
% high income in neighborhood[1]		16.99 (15.14)
% professionals in neighborhood[1]		38.79 (16.03)

[1]Measured with 2000 Census at the start of elementary school.

Activity Trajectories

Mothers reported on children's out-of-school time use during first through fifth grades. Structured activities were defined as group or individual lessons or activities such as music lessons or coached sports. At first and second grade, mothers reported whether their children participated in structured activities between 7:00 a.m. and 7:00 p.m. during nonschool hours in a typical week (1 = participated in activities, 0 = no such participation). At third through fifth grade, mothers reported how many minutes per week their children participated in structured activities between school dismissal and 6:00 p.m. during a typical week. For these latter time points, binary indicators were constructed for any activity participation (1 = any nonzero minutes per week, 0 = no reported participation). At age 15, when children were in ninth grade, youth self-reported whether they were involved in certain activities after school or during the weekend, including organized sports, arts (e.g., music, dance, drama), homework groups, or clubs (1 = participated in activities, 0 = no such participation). Nine out of ten children were involved in at least one structured activity in ninth grade. As described in the plan of analyses, these binary

variables were used to identify activity trajectories with latent class analysis.

Family Background

The focus of our exploration of moderators of links between activity trajectories and academic progress was the family. Consequently, a variety of family factors were measured longitudinally after school entry to capture the dynamic family context.

The first set of family background factors tapped into basic family circumstances and organization. First, maternal education was the only family factor that was measured at a single point in time rather than longitudinally, given some documented problems with the longitudinal reporting of educational attainment (see Technical Note 13 on study website). When children were 1-month-old, mothers reported how many years of education they had completed, from which a binary indicator of whether their mother was college-educated was constructed (just below 40% in Table 1). Second, the average family income-to-needs ratio was calculated by dividing total family income by the federal poverty thresholds for their family sizes and then taking the average of all year-specific income-to-needs ratios (a mean ratio of 4.4 in Table 1). Third, family structure and stability was measured in two ways. Longitudinal mother-reported household rosters and relationship statuses were used to code children as living with married biological parents, cohabiting parents, married stepparents, cohabiting stepparents, or in a single-mother household at multiple points from the beginning of first grade. Based on Cavanagh and Huston's (2006) measurement of family instability as movement between categories across waves, we defined family stability as continuity in family structure between waves. These time-specific variables allowed the creation of a count variable of episodes of family stability (with a point given for each major/minor data collection in which no change in family structure since the prior data collection was recorded, regardless of what that family structure might be) and a count variable of the number episodes during which youth lived with both of their biological parents (compared to any other family structure variable). The average counts were high at around 5.5 and 4.6, respectively (Table 1).

The second set of family background measures tapped into some basic family processes. Trained NICHD observers coded videotapes of children and their mothers engaging in structured interactions at the first, third, and fifth grade waves. Maternal sensitivity at each wave was constructed as a composite of observations of supportive presence, respect for autonomy, and reflected hostility, each of which were scored using rating scales ranging from 1 (very low) to 7 (very high). These maternal sensitivity scores were then averaged across waves, with a mean of nearly 17 out of 21 (Table 1) and good internal reliability (Cronbach's alpha ranging from .80 to .85). Finally, a modified version of the Home Observation of Measurement of the Environment (HOME; Caldwell & Bradley, 1984) inventory score consisted of 58 dichotomous items (1 = behavior observed by study personnel or reported by parents). Trained NICHD observers used direct observation and semi-structured interviews to assess the quality and quantity of support, stimulation, and structure provided to children in their homes, with total scores having good internal reliability (Cronbach's alpha ranging from .82 to .84). Because two items in the HOME inventory were also related to activity participation, we omitted them from the final scale. This scale was then averaged across waves to create a general measure for the elementary school years, with a mean of almost 40 out of 58 (Table 1).

Covariates

To account for other factors that might be simultaneously related to school-age activity trajectories and academic achievement at the start of high school, several covariates also were measured, including gender (1 = female) and race/ethnicity (dummy variables for White, Black, Latino/a, and some other race/ethnicity). To account for academic and socioemotional skills prior to school entry that might have selected children into school-age activity trajectories and also influenced their subsequent academic achievement, we drew on the Woodcock-Johnson Psycho-Educational Battery (WJ-R) and the Child Behavior Checklist (CBCL; see Achenbach, 1991) when children were 4.5 years old. For the former, NICHD-generated W scores for the Applied Problems subtest (which gauges math achievement) were calculated using the Rasch ability scale (see Jaffe, 2009). They ranged from 332 to 473, with moderate internal reliability across scores on 60 items (Cronbach's alpha = .84). For the latter, mothers reported the frequency with which they had observed internalizing (e.g., withdrawn, somatic complaints, anxious/depressed) and externalizing (e.g., delinquent, aggressive) behaviors or symptoms in their children on a 0–2 Likert scale. Finally, because the quality of activities, programs, and schools in part depends on the larger communities in which they are embedded, we also created a set of continuous measures tapping into neighborhood affluence (see Dupéré, Levental, Crosnoe, & Dion, 2010) based on block group data from the 2000 Census: percentages of neighborhood residents with a Bachelor's degree, with incomes exceeding $100,000, and in professional or managerial occupations.

Plan of Analyses

The first step in the analyses was to identify trajectories of school-age activity participation, which was performed by applying latent class analysis (LCA) to the six binary indicators of after-school activity participation described earlier. The LCA was conducted in Mplus with a measurement model that partitioned individuals into groups or latent classes according to trends in scores on dichotomous variables, either variables tapping multiple constructs during one period or, as the case here, variables tapping the same construct across multiple periods (Muthén & Muthén, 2010). Tests for the number of classes suggested that a four-class solution was most appropriate (Vuong-Lo-Mendell-Rubin likelihood ratio test $p = 0.163$, Lo-Mendell-Rubin adjusted likelihood ratio test $p = 0.180$, parametric bootstrapped likelihood ratio test $p = 0.000$). These four classes were simple and straightforward: nonparticipants who were never in activities, consistent participants who were always in activities, dropouts who were in activities only during the initial grades of elementary school, and latecomers who were in activities only during the final grades of elementary school and in ninth grade. The four-class solution was also in line with our theoretical expectations that youth would have consistent participation or instead move in and out of activities at certain points rather than intermittently. As shown in Table 1, 29% of the sample were nonparticipants, 33% were consistent participants, 24% were dropouts, and 14% were latecomers.

The next step of the analyses was to estimate the degree to which these school-age activity trajectories predicted key indicators of academic achievement at the start of high school, net of and in interaction with family background, and other factors. These analyses were conducted with linear regression in Stata:—first with the activity variables as the sole predictors and then adding the covariates and the family background factors. Final modeling estimated multiple sets of activity trajectory × family background interactions.

RESULTS

Descriptive Picture of Youth Following Different Activity Trajectories

Table 2 displays means on the study variables within each latent class of school-age activity participation.

TABLE 2
Descriptive Statistics by School-Age Activity Trajectories

	School-Age Activity Trajectories, Mean (SD) or Proportion			
	Nonparticipants$_a$	*Consistent Participants*$_b$	*Dropouts*$_c$	*Latecomers*
Outcome				
GPA in ninth grade	2.64 (0.76)	3.32_a (0.56)	2.95_{ab} (0.69)	3.13_{abc} (0.62)
Family Background				
Maternal education				
Less than high school	0.20	0.01_a	0.06_{ab}	0.04_{ab}
High school	0.34	0.08_a	0.21_{ab}	0.18_{ab}
Some college	0.32	0.28	0.42_{ab}	0.29_c
College or more	0.14	0.63_a	0.31_{ab}	0.48_{abc}
School-age average income-to-needs	2.52 (2.09)	6.12_a (4.21)	3.96_{ab} (2.74)	4.65_{abc} (4.01)
School-age episodes of family stability	5.27 (1.44)	5.70_a (1.11)	5.60_a (1.02)	5.65_a (1.00)
School-age episodes with both biological parents	2.96 (3.36)	5.87_a (2.51)	4.53_{ab} (3.23)	4.99_{ab} (3.10)
School-age average maternal sensitivity	15.46 (2.29)	17.40_a (1.82)	16.52_{ab} (2.12)	16.93_{ab} (1.93)
School-age average HOME score	36.05 (5.97)	42.30_a (3.84)	39.88_{ab} (5.04)	40.46_{ab} (4.42)
Covariates				
Gender (female)	0.44	0.60_a	0.44_b	0.50_b
Race/ethnicity				
Black	0.26	0.02_a	0.09_{ab}	0.09_{ab}
Latino/a	0.07	0.04	0.05	0.08
White	0.62	0.88_a	0.81_{ab}	0.78_{ab}
Other race/ethnicity	0.05	0.06	0.05	0.05
Achievement score (54 months)	417.20 (20.64)	431.29_a (14.94)	425.46_{ab} (19.66)	427.21_{ab} (15.29)
Internalizing behavior (54 months)	4.77 (4.19)	4.17 (4.29)	4.63 (4.21)	4.30 (4.23)
Externalizing behavior (54 months)	11.35 (7.35)	8.79_a (6.23)	10.70_b (6.22)	9.85 (7.11)
% college graduates in neighborhood[1]	22.07 (14.73)	41.80_a (19.51)	31.23_{ab} (17.51)	34.36_{ab} (19.38)
% high income in neighborhood[1]	9.30 (8.95)	24.30_a (16.71)	15.38_{ab} (13.03)	18.07_{ab} (16.28)
% professionals in neighborhood[1]	29.88 (12.82)	46.60_a (15.59)	37.76_{ab} (14.06)	40.21_{ab} (16.52)
n	269	299	216	213

Note. Means or proportions with different subscripts differed significantly ($p < .05$).
[1]Measured with 2000 Census at the start of elementary school.

These descriptive statistics revealed a uniform pattern of bifurcation, with consistent participants and latecomers on one side and dropouts and nonparticipants on the other. These differences were evident in ninth grade GPA. The disparity between consistent participants and nonparticipants equaled about 97% of a standard deviation in GPA, with latecomers and dropouts falling in between but closer to consistent participants and nonparticipants, respectively.

These differences in academic progress by participation trajectory, however, were likely due to other systematic differences among the latent classes. Consistent participants and latecomers were more often girls and had college-educated mothers, relative to nonparticipants and dropouts. Consistent participants and latecomers also had more positive childhood profiles. For example, the disparity between consistent participants and nonparticipants for internalizing behavior was almost a fifth of a standard deviation. Consistent participants and latecomers also tended to live in more socioeconomically advantaged neighborhoods (e.g., a consistent vs. nonparticipant difference of 99% of a standard deviation in neighborhood income). Finally, consistent participants and latecomers came from more economically and socially advantaged families than their respective peers. Mean-level differences between consistent participants and nonparticipants equaled 101% of a standard deviation on the income-to-needs ratio and 114% of a standard deviation on the HOME score.

Overall, these descriptive results suggested a great deal of selectivity into trajectories of participation in after-school activities after starting school. The multivariate analyses, which we turn to next, were intended to control for some of this selectivity.

Linking School-Age Activity Trajectories to Ninth Grade Academic Achievement

The multivariate analyses indicated that trajectories of activity participation from the start of elementary school through the start of high school strongly predicted academic achievement in high school in general and in relation to family background. Model 1 in Table 3 included only the activity trajectory latent class variables as predictors of ninth grade GPA, essentially replicating the descriptive statistics for GPA from Table 2. Any kind of participation in after-school activities was significantly and positively associated with youth's GPA, but the magnitude of this association varied by specific activity trajectory. Consistent participants had a GPA advantage at the start of high school over nonparticipants that equaled 99% of a standard deviation in GPA. The observed effect sizes were 46 and 75% of a standard deviation in GPA for activity dropouts and latecomers, respectively, relative to nonparticipants.

To account for some likely selection mechanisms that might have driven the initially observed associations between school-age activity trajectories and ninth grade GPA, Model 2 added measures of family background (coefficients presented in Table 3) and the other personal, family, and neighborhood covariates (coefficients presented in the Appendix). The addition of these factors to the model substantially attenuated the activity trajectory coefficients. The initially observed GPA difference between dropouts and nonparticipants was completely accounted for by the family background factors and the covariates. The initially observed difference between consistent participants and nonparticipants was reduced by 75%, relative to Model 1. Although it remained significant, its magnitude was in the more moderate range of 25% of a standard deviation in GPA. A similar but somewhat less pronounced pattern emerged for latecomers. Whereas the magnitude of the GPA difference between consistent participants and nonparticipants was greater than the corresponding difference between latecomers and nonparticipants in Model 1, the magnitude for both associations was similar in Model 2.

Ancillary analyses (not shown) entered each covariate and family background measure into the model one by one to explore changes in the activity trajectory class coefficients associated with each addition. Doing so revealed that maternal education (i.e., college graduate), average maternal sensitivity, and average HOME score during elementary school did the most to account for the observed attenuation of these coefficients between Models 1 and 2. The addition of preschool achievement and neighborhood advantage to the model also had an effect on the magnitude of the activity trajectory coefficients.

Like the bivariate results in Table 2, therefore, the multivariate results in Table 3 revealed a bifurcation between consistent participants and latecomers versus dropouts and nonparticipants. Testing each activities trajectory as the reference group supported this bifurcation, with the GPA of consistent participants and latecomers significantly different from nonparticipants and the GPA of consistent participants significantly different from dropouts. Most (but not all) of the differences across this bifurcation reflected factors that channeled youth into different activity trajectories or that co-occurred with such trajectories while also influencing their academic progress. In other words, the initially observed "effects" were not broadly causal.

Exploring Family Background as a Moderator

To examine whether the link between activity participation from early elementary school through early high school and ninth grade GPA varied by family background, Model 3 included interactions between each

TABLE 3
Linear Models Predicting Ninth Grade GPA by School-Age Activity Trajectories

	Unstandardized Coefficients (SE)	
	(1)	*(2)*
School-Age Activity Trajectories (Ref: Nonparticipant)		
Consistent participant	0.694 (0.064)***	0.177 (0.068)**
Dropout	0.319 (0.061)***	0.078 (0.055)
Latecomer	0.526 (0.075)***	0.180 (0.070)*
Family Background		
Mother is college-educated		0.245 (0.067)**
School-age average income-to-needs		0.001 (0.008)
School-age episodes of family stability		0.003 (0.027)
School-age episodes with both bio. parents		0.032 (0.011)*
School-age average maternal sensitivity		0.024 (0.016)
School-age average HOME score		0.014 (0.007)†
Constant	2.598 (0.046)***	−1.157 (0.932)
Pseudo R^2	0.147	0.362
n	993	989
School-Age Activity Trajectories (Ref: Consistent)		
Nonparticipant	−0.694 (0.064)***	−0.177 (0.068)*
Dropout	−0.375 (0.064)***	−0.099 (0.059)†
Latecomer	−0.168 (0.068)*	0.003 (0.062)
Family Background		
Mother is college-educated		0.245 (0.067)**
School-age average income-to-needs		0.001 (0.008)
School-age episodes of family stability		0.003 (0.027)
School-age episodes with both bio. parents		0.032 (0.011)*
School-age average maternal sensitivity		0.024 (0.016)
School-age average HOME score		0.014 (0.007)†
Constant	3.293 (0.042)***	−0.980 (0.937)
Pseudo R^2	0.147	0.362
n	993	989
School-Age Activity Trajectories (Ref: Dropout)		
Nonparticipant	−0.319 (0.061)***	−0.778 (0.055)
Consistent participant	0.375 (0.064)***	0.099 (0.059)†
Latecomer	0.207 (0.074)**	0.102 (0.066)
Family Background		
Mother is college-educated		0.245 (0.067)**
School-age average income-to-needs		0.001 (0.008)
School-age episodes of family stability		0.003 (0.027)
School-age episodes with both bio. parents		0.032 (0.011)*
School-age average maternal sensitivity		0.024 (0.016)
School-age average HOME score		0.014 (0.007)†
Constant	2.917 (0.046)***	−1.079 (0.933)
Pseudo R^2	0.147	0.362
n	993	989
School-Age Activity Trajectories (Ref: Latecomer)		
Nonparticipant	−0.526 (0.075)***	−0.180 (0.070)*
Consistent participant	0.168 (0.068)*	−0.003 (0.062)
Dropout	−0.207 (0.074)**	−0.102 (0.066)
Family Background		
Mother is college-educated		0.245 (0.067)**
School-age average income-to-needs		0.001 (0.008)
School-age episodes of family stability		0.003 (0.027)
School-age episodes with both bio. parents		0.032 (0.011)*
School-age average maternal sensitivity		0.024 (0.016)
School-age average HOME score		0.014 (0.007)†
Constant	3.124 (0.057)***	−0.977 (0.931)
Pseudo R^2	0.147	0.362
n	993	989

Note. Model 2 controlled for gender, race/ethnicity, achievement test scores (54 months), internalizing behavior (54 months), externalizing behavior (54 months), and the percentage of neighborhood residents who were college graduates, high-income, and professional.

***$p < .001$. **$p < .01$. *$p < .05$. †$p < .1$.

activity trajectory class and each family background factor. Similar to Model 2, maternal education and school-age episodes with both biological parents were positively associated with GPA. Most interactions were not statistically significant, with the exception of family socioeconomic status. The two significant interactions were interpreted by calculating and graphing predicted GPA values for youth in each activity trajectory at various values of average family income-to-needs ratio, with all covariates held to their sample means.

The measure of family status—family income-to-needs ratio—moderated the association between each activity trajectory class and GPA (at the $p < .10$ level for consistent participants and at the $p < .05$ level for latecomers), relative to nonparticipants. We looked at the difference in GPA between participants (however defined) and nonparticipants from families with income-to-needs ratios of 2 (200% of the poverty line, or low-income, with cell coverage across activity classes often sparse at the lowest ratio), 3 (300%), 4 (400%, a rough barometer of the middle class), and 5 (500%, or more affluent, with cell coverage across activity classes often sparse at higher ratios).

Figure 1 depicts these comparisons for latecomers and nonparticipants. Note that latecomers' GPAs were fairly steady across the income distribution, but the GPA difference between latecomers and nonparticipants was not. This difference was wider at the lower income-to-needs ratios but shrunk as the income-to-needs ratio increased. Thus, the apparent benefit of activity participation only toward the end of elementary school and beginning of high school was confined to youth from lower-income families—nonparticipants did worse academically than latecomers—but did not appear to be a benefit among youth from higher-income families. This same pattern also drove the marginally significant family income-to-needs × consistent participants interaction. In sum, we found evidence that the apparent benefit of activity participation was confined only to youth from more socially disadvantaged family backgrounds (i.e., in line with a protective effect). A GPA advantage for participants (mainly among latecomers, although somewhat for consistent participants) was observed only when family income was low. Among youth in higher-income families, activity participation (or its timing) did not differentiate GPA.

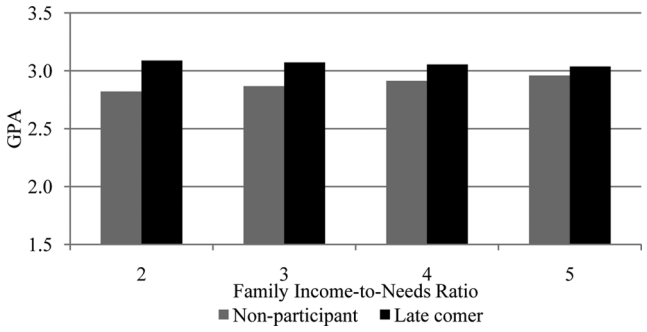

FIGURE 1 Predicted values of ninth grade GPA, by activity trajectory and family income-to-needs ratio.

Sensitivity Analyses

The results presented so far suggest that school-age activity participation closer to the start of high school—including consistent participation up through high school and latecomers closer to high school—may be related to higher academic achievement at the transition into high school, especially for youth from low-income families. We performed some additional analyses to further explore and test these patterns.

First, because GPA may vary according to students' positions in curricular hierarchies, we conducted ancillary analyses that controlled for ninth grade level of math and English coursework. From the ninth grade transcript data, math level was a multi-point sequence following normative national-level patterns of enrollment, truncated to reflect the ninth grade endpoint (0 = no math; 1 = remedial or general; 2 = algebra I; 3 = geometry; 4 = algebra II of higher), and English level was a binary measure differentiating Honors, AP, IB English versus all other classes. When sample respondents were in ninth grade, the mean math level was 2.4, meaning that most students were enrolled in algebra I or geometry, and 26% were in some kind of advanced English class. Both measures of coursework predicted ninth grade GPA. Advanced English enrollment was associated with an increase in GPA of 30% of a standard deviation, and every increase in math course level was associated with an increase of 52% of a standard deviation in GPA. The inclusion of these measures, however, did not substantially alter the observed effect sizes of the activity trajectories.

Second, the tendency for observed "effects" of activity participation to be attenuated or even washed out by the covariates included in the model suggested that these effects were highly endogenous, reflecting the influence of shared factors underlying both activity participation and GPA. We could only account for confounds that were measurable in the SECCYD, but unmeasured and unmeasurable confounds also could exist. To gauge the sensitivity of the main effect results of activity participation to this other set of confounds, we performed a class of post-hoc robustness calculations. Specifically, the Impact Threshold for Confounding Variables (ITCV) quantified how much an unobserved confound would have to be correlated with both predictor and outcome to reduce the focal coefficients in our regression to nonsignificance (Frank et al.,

2008). The equation is:

$$r_{xy} - r^{\#}_{xy}/1 - r^{\#}_{xy}, \text{ where } r^{\#}_{xy} = t/\text{SQRT}[(n - q - 1) + t^2],$$

where t is the critical t-value, n is the sample size, and q is the number of model parameters. When covariates are included in the model, the equation becomes:

$$\text{ITCV}_{\text{no covariates}} \times [\text{SQRT}(1 - R^2_{xg})(1 - R^2_{yg})],$$

where g is the set of covariates, R^2_{xg} is the R^2 value from a regression predicting the focal independent variable by the covariates, and R^2_{yg} is the R^2 value from a regression predicting the outcome by the covariates.

The ITCV value for the consistent participants coefficient from Model 2 in Table 3 was .16, meaning that some unaccounted for factor would have to be correlated with activity participation at .42 or higher and with GPA at .39 or higher for its inclusion in our model—if we could include it—to wash out that significant coefficient. This test instills some confidence in the coefficient, as meeting that magnitude of correlation for two separate variables is difficult. The ITCV value for latecomers was lower, indicating that an unknown confound would have to be correlated with this variable and GPA at .18 to reduce it to nonsignificance, a lower bar (although still higher than all of the measured covariates). Thus, for the full sample, GPA differences related to consistent activity participation have a higher degree of causal inference than for activity dropouts.

Third, additional descriptive and multivariate analyses also were conducted to explore the specific types of activities subsumed within our typology of general activity participation throughout school. Doing so, however, posed challenges, given the data available. Based on how the data were collected, we could only identify activity type at fourth, fifth, and ninth grades, which meant that the full typology of activity trajectories (which encompassed activity participation in first through ninth grades) could not be replicated within each activity type. Instead, we focused on consistent participants and then broke down activity participation by type at these later grades.

TABLE 4
Specific Activity Types for Consistent Participants

	Frequency (%)		
	Fouth Grade	*Fifth Grade*	*Ninth Grade*
Sport	66.98	42.99	88.65
Fine arts performance lesson	47.22	38.41	56.27
Interest group or club	18.83	13.11	29.05
Academic tutoring	13.89	13.72	21.17
n	324	328	327

Note. Percentages do not add up to 100% because some respondents participated in more than one type of activity.

Table 4 displays this breakdown of activity type among consistent participants. Types included sports, fine arts performance lessons, interest groups or clubs, and academic tutoring or homework clubs. At fourth, fifth, and ninth grades, consistent participants were overwhelmingly involved in individual or team sports (e.g., tennis, soccer) and fine arts performance lessons (e.g., piano lessons, dance classes). For example, about 43% of them played sports in fifth grade while 38% took performance lessons. By ninth grade, activity participation was extremely common. More than 9 in 10 respondents at the ninth grade survey participated in some kind of after-school activity, with sports being the most common among consistent participants (89%) followed by fine arts performance lessons (56%). Moreover, many youth participated in multiple activities at the end of elementary school but especially at the beginning of high school.

Of the four types of activities, participation in artistic activities in fifth grade was significantly associated with GPA in ninth grade for youth with disadvantaged family backgrounds. Additionally, participation in academic tutoring and in interest clubs in ninth grade was associated with ninth grade GPA in general. The associations of academic tutoring or homework groups with GPA were moderated by episodes of family instability, but this moderation did not take the form of protection. Among youth with fewer episodes of family stability, those in academic tutoring or clubs in ninth grade had lower GPAs than their peers who were not in such activities, but this gap closed as episodes of family stability increased. Part of this pattern, however, may be due to selection wherein students with fewer process-related supports at home and who were already struggling academically were placed in such extracurricular activities. Although we could not estimate how much the general activity pattern reflected any one type of specific activity, the results of these additional analyses suggest that artistic, academic, and interest-based clubs and activities offer clues as to how process-related aspects of family background are related to activity participation and GPA.

DISCUSSION

Activity participation has received a great deal of attention in both research and policy in recent decades. In general, the consensus seems to be that, in moderate doses, activity participation has value for young people (Farb & Matjasko, 2010; Mahoney et al., 2006). Yet, this general consensus subsumes a number of issues that need to be better illuminated—to what domains

of development does activity participation matter most, can activity participation serve as a channel of the intergenerational transmission of inequality and a buffer against certain risks of family background at the same time, how robust are the observed benefits of activity participation? Drawing on life course theory, this study explored the SECCYD in order to delve into these issues. The bottom line of our analyses is that activity participation throughout school was related to academic achievement at the start of high school, which not surprising. Our contribution was showing how it mattered in certain ways under certain conditions.

To begin, the link between school-age activity participation and youths' academic achievement in high school seemed to be rooted in a mixture of proximity to high school entry and duration. Children ultimately did better academically if they participated in activities, but only if they consistently participated through the end of elementary school and they had not yet dropped out of participation by the start of high school or if they entered activities at older ages more proximal to the beginning of high school. Thus, "duration" mattered, but so did timing, in that there also appeared to be a fadeout in the absence of a "booster" at the end of elementary school or the beginning of high school; in other words, early investment did not seem to have lasting relevance unless it carried over time. One exception to this pattern was that children from low-income families appeared to gain more from beginning activities later on in elementary school, suggesting that the "threshold" value of limited participation might be greater for children in more difficult circumstances. Also noteworthy is the suggestion, from the ITCV analyses, that the observed effects of late participation were lower in causal inference (although still at acceptable levels) than those for consistent participation. This pattern indicates that duration is perhaps less idiosyncratic metric than timing.

Staying with the issue of family background, our expectations that the association of activity participation histories with later academic achievement would vary by family background processes and statuses were not supported for process-related aspects but were confirmed for a status-related aspect. Family income provided the evidence of protective family moderation, defining segments of the population in which activity participation and academic progress were most tightly coupled. This moderation took the form of protection for latecomers' GPA among children from low-income families, with a similar pattern for consistency at a less stringent level of significance. Thus, even though family disadvantages may be barriers to a youth's participation in out-of-school activities, their links to academic achievement may be buffered by such participation. This protection angle is in line with intervention efforts that use activity participation to help children in need (Granger, 2008). Which specific factors underlie this protection is unclear, but they could include mentorship, skill-building, and/or safety, all important avenues for future research.

Notably, however, this pattern of protection from activity participation (the threshold effect) did not extend to the more process-related aspects of family background. Why would later activity participation be an academic benefit in *socioeconomically* disadvantaged families but not in more *interpersonally* disadvantaged families? Perhaps disadvantages in the quality of home environment and the interpersonal supports that go along with it (vs. family resources) might be a harder disadvantage to take. For example, we found an association between ninth grade GPA and episodes spent with both biological parents yet no moderation by activity participation trajectory. The supports that come with living with both parents (a process-related advantage) thus confer an academic advantage regardless of activity participation, whereas later activity participation offers an extra benefit despite the status-related *dis*advantage of a lower socioeconomic status. This pattern is a reminder that family statuses and processes may covary but do not always go hand in hand (Crosnoe & Cavanagh, 2010).

This variability of the potential academic significance of activity participation by time, outcome, and background suggests that the "one size fits all" approach is limited in this area. Indeed, the results of the study speak most directly to policy and practice in terms of "tailoring" attention to specific groups of youth most in need and/or potentially most responsive to action. For example, past research has shown that efforts to use activity participation to improve youth outcomes have greater returns when focused on socioeconomically disadvantaged populations (Mahoney et al., 2005; Vandell & Shumow, 1999). This study suggests that these efforts should promote consistent activity participation, but especially as children get older and progress through school. Such policy discussions become increasingly important as the public investment in extracurricular activities declines and as the scope of the school extracurriculum shrinks (Stearns & Glennie, 2010). At the same time, the study findings indicate that a movement away from school-supported extracurricula during the No Child Left Behind era might be counterproductive, with activities often viewed as academic distractions actually serving as academic supports. Schools may be better able to provide the consistency in participation highlighted here, especially for children from low-income families who have less access to such activities outside of school (Rosewater, 2009).

Yet, these conclusions are also preliminary and require much more thorough examination before they

can effectively inform policy and practice. Although we took several steps to improve causal inference (e.g., the ITCV calculations), much more needs to be done along these lines, perhaps by finding community-based instrumental variables to isolate the activity effects. Just as important, although our dynamic approach to measuring activity participation is valuable, it was based on fairly blunt indicators of participation—whether a child participated in a range of activities, not the breadth, intensity, engagement, or quality of all different activities (see Bohnert, Fredricks, & Randall, 2010; Fredricks & Eccles, 2006; Kataoka & Vandell, 2013).

Based on developmental theories and past research about school transitions, our approach considered activity participation throughout elementary school and at the beginning of high school. We were unable to include information on middle school due to issues with data availability and model fit, but creating full trajectories of activity participation from the beginning to the end of schooling is a worthy endeavor for future research. Furthermore, we explored differences across different types of activities but could not systematically compare participation histories across types, which is clearly a need. Finally, any time variability in effects is uncovered, the question of other sources of variability becomes pertinent. As mentioned in the Methods section, our sample was diverse yet not nationally representative, which limits generalizability and might preclude having statistical power to detect group differences. Differences in links between activity participation and academic achievement by gender and race need to be explored, as does variability over time.

Following up on these issues and addressing limitations can help to strengthen what we have uncovered here. The prominence of activity participation in ecological models of development (and education), in policies targeting at-risk children and youth, and in media coverage of parenting in high and low socioeconomic strata suggest that doing so is important and timely. These findings underscore that, although much of the focus in recent years has been on early childhood interventions, sustained efforts in later childhood and beyond may be needed to promote youth development.

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APPENDIX
Coefficients for Covariates Predicting Ninth Grade GPA in Linear Regressions

	Unstandardized Coefficients (SE)
Reference Group: Nonparticipant	
Gender (female)	0.245 (0.039)***
Race/ethnicity (ref: White)	
Black	−0.104 (0.106)
Hispanic	−0.020 (0.103)
Other race/ethnicity	−0.112 (0.102)
Achievement score (54 months)	0.006 (0.002)**
Internalizing behavior (54 months)	−0.003 (0.006)
Externalizing behavior (54 months)	−0.000 (0.005)
% college graduates in neighborhood[1]	0.005 (0.004)
% high income in neighborhood[1]	−0.001 (0.002)
% professionals in neighborhood[1]	−0.004 (0.004)
Reference Group: Consistent Participant	
Gender (female)	0.245 (0.039)***
Race/ethnicity (ref: White)	
Black	−0.104 (0.106)
Hispanic	−0.020 (0.103)
Other race/ethnicity	−0.112 (0.102)
Achievement score (54 months)	0.006 (0.002)**
Internalizing behavior (54 months)	−0.003 (0.006)
Externalizing behavior (54 months)	−0.000 (0.005)
% college graduates in neighborhood[1]	0.005 (0.004)
% high income in neighborhood[1]	−0.001 (0.002)
% professionals in neighborhood[1]	−0.004 (0.004)
Reference Group: Dropout	
Gender (female)	0.245 (0.039)***
Race/ethnicity (ref: White)	
Black	−0.104 (0.106)
Hispanic	−0.020 (0.103)
Other race/ethnicity	−0.112 (0.102)
Achievement score (54 months)	0.006 (0.002)**
Internalizing behavior (54 months)	−0.003 (0.006)
Externalizing behavior (54 months)	−0.000 (0.005)
% college graduates in neighborhood[1]	0.005 (0.004)
% high income in neighborhood[1]	−0.001 (0.002)
% professionals in neighborhood[1]	−0.004 (0.004)
Reference Group: Latecomer	
Gender (female)	0.245 (0.039)***
Race/ethnicity (ref: White)	
Black	−0.104 (0.106)
Hispanic	−0.020 (0.103)
Other race/ethnicity	−0.112 (0.102)
Achievement score (54 months)	0.006 (0.002)**
Internalizing behavior (54 months)	−0.003 (0.006)
Externalizing behavior (54 months)	−0.000 (0.005)
% college graduates in neighborhood[1]	0.005 (0.004)
% high income in neighborhood[1]	−0.001 (0.002)
% professionals in neighborhood[1]	−0.004 (0.004)

[1]Measured with 2000 Census at the start of elementary school.
***$p < .001$. **$p < .01$. *$p < .05$. †$p < .1$.