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An Ecological Analysis of After-School Program Participation and the Development of Academic Performance and Motivational Attributes for Disadvantaged Children

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This longitudinal study evaluated after-school program (ASP) participation and the development of academic performance (school grades, reading achievement) and teacher-rated motivational attributes (expectancy of success, effectance motivation) over a school year. Participants were 599 boys and girls (6.3 to 10.6 years) from an urban, disadvantaged city in the United States. An ecological analysis of after-school arrangements identified 4 patterns of care: ASP care, parent care, combined parent/self-sibling care, and combined other-adult/self-sibling care. Aspects of academic performance and motivational attributes were significantly higher ($p < .05$) at the end of the school year for children in ASP care compared with those in the 3 alternative patterns of care. Differences were marked for children rated as highly engaged in ASP activities.

Developing basic academic skills and the motivational attributes that support successful academic performance are salient tasks of middle childhood (Henrich, Wheeler, & Zigler, in press; Masten & Coatsworth, 1998). Although many children negotiate these developmental tasks effectively, those growing up in economic disadvantage are less likely to do so. For example, assessments of academic performance (i.e., achievement tests, school grades) show that children from low-income families are often less prepared to begin school (Zigler, 1998), demonstrate deficits in school achievement during childhood (Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Pungello, Kupersmidt, Burchinal, & Patterson, 1996), and experience continued risk for academic failure during adolescence (e.g., National Center for Education Statistics, 2001) when compared with their more affluent counterparts.

Motivational attributes that support successful academic performance also differ according to childhood economic disadvantage. Specifically, disadvantaged children have been found to hold relatively low expectancies of success about their performance on tasks that are novel and challenging and low effectance motivation with respect to internally guided effort and pleasure to pursue such tasks (Gruen & Zigler, 1968; Malakoff, Underhill, & Zigler, 1998; Turner, 1995). These motivational attributes are, in turn, associated with the academic performance of children (Henrich et al., in press; Zigler, Bennett-Gates, Hodapp, & Henrich, 2002).

This study investigated the relation between after-school program (ASP) participation and the development of academic performance and related motivational attributes in a sample of disadvantaged children. The focus on ASPs is warranted for two interrelated reasons. First, ASPs represent an increasingly common after-school context for school-age children. According to national estimates between 1991 and 1997, the number of children enrolled in before- and after-school programs increased from 1.7 to 6.7 million (Capizzano, Tout, & Adams, 2000; Seppanen et al., 1993). Substantive federal support for the 21st-Century Community Learning Centers' (21CCLCs) ASPs began in 1998. The 21CCLCs now target $1 billion in annual funds to low-performing schools in disadvantaged areas, serving approximately 1.2 million children (Mahoney & Zigler, in press).

Second, stated goals and measured outcomes from recent, large-scale ASP evaluations of low-income children identify the promotion of academic skills as a major program objective (e.g., Huang, Gribbons, Kim, Lee, & Baker, 2000; Klein & Bolus, 2002; U.S. Department of Education, 2003; Welsh, Russell, Williams, Reisner, & White, 2002). Given the

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recent growth of ASPs and the resources invested in these programs, the extent to which ASPs achieve this objective of improved academic skills is a critical question. The existing body of literature, however, is discrepant on whether, and in what direction, academic-related outcomes may be affected by ASP participation. Several studies have found a positive association between ASP participation and academic skills (e.g., Cosden, Morrison, Albanese, & Marcias, 2001; Huang et al., 2000; Klein & Bolus, 2002; Posner & Vandell, 1994; Sheley, 1984; Welsh et al., 2003), whereas others have found null effects or negative associations (e.g., Bissell, Dugan, Ford-Johnson, & Jones, 2002; National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network, 2004; Pettit, Laird, Bates, & Dodge, 1997; U.S. Department of Education, 2003; Vandell & Corasaniti, 1988).

We suggest that the discrepant findings result from variability in research designs and sample characteristics across the studies. On this score, scholars have argued that an ecological systems perspective to development offers a useful framework for conceptualizing ASP participation (Vandell & Posner, 1999). This framework provides a basis for synthesizing the existing literature on ASP participation and academic-related outcomes and guidance for conducting future studies in this area.

An Ecological Systems Perspective to ASP Participation

From an ecological systems perspective, development occurs through a complex process of interactions within and between the individual and the environmental contexts in which he or she is involved over time (e.g., Bronfenbrenner, 1979; Bronfenbrenner & Morris, 1998). Efforts to understand academic-related differences between disadvantaged children and their more affluent counterparts have benefited from an ecological systems approach to development. However, this research is limited by its focus on certain contexts such as the family and school (Vandell, Pierce, & Dadisman, 2005). Research examining the relationship between academic functioning and children's involvement in after-school settings has only recently emerged (Mahoney, Larson, Eccles, & Lord, 2005; National Research Council and Institute of Medicine, 2002; Vandell, Pierce, et al., 2005).

Conceptualizing ASP participation from an ecological perspective requires that multiple aspects of the after-school ecology be considered (Vandell & Posner, 1999). To begin, socioeconomic conditions characterize the environment in which ASPs are located, and these conditions are linked to academic-related outcomes associated with program participation. For example, studies conducted with low-income children tend to show positive relationships between ASP participation and academic ability (e.g., Posner & Vandell, 1994, 1999; Welsh et al., 2002) compared with those involving middle-class or economically heterogeneous populations (e.g., Marshall et al., 1997; NICHD Early Child Care Research Network, 2004; Vandell & Corasaniti, 1998). The greater associated benefits of ASP participation for poor children appears to result from the relative paucity of after-school enrichment opportunities in disadvantaged areas and the fact that unsupervised after-school care is particularly problematic for children living in high-risk, disadvantaged areas (Marshall et al., 1997; McHale, Crouter, & Tucker, 2001; Pettit, Bates, Dodge, & Meece, 1999; Pettit et al., 1997).

Within the broader socioeconomic environment, however, ASPs represent only one possible after-school arrangement for children. Care from parents, other adults (e.g., relatives), and without adults (e.g., self-care) are common alternatives (e.g., Hofferth, Brayfield, Diech, & Holcomb, 1991). Consideration of these alternative care contexts is necessary to understand the place of ASPs in the after-school ecology for two reasons. First, they provide a specific basis from which to compare the impact of ASP participation. For example, Posner & Vandell (1994) found that children who regularly participated in ASPs demonstrated higher levels of academic performance than those whose regular after-school arrangement was mother care or informal adult care (i.e., relatives, neighbors). In addition, unsupervised after-school care has been linked to poor academic outcomes for children in several studies (e.g., National Research Council and Institute of Medicine, 2003; Pettit et al., 1997; Vandell & Posner, 1999; Vandell & Shumow, 1999).

Second, although different after-school care contexts may be physically distinct, they are not necessarily independent in terms of a child's experience. A child's after-school ecology can involve several different after-school arrangements in a given week or within the same afternoon (Hofferth et al., 1991; Vandell & Posner, 1999). It is estimated that 40% of school-age children of employed mothers do not have a primary after-school care arrangement, suggesting they experience multiple arrangements (Capizzano et al., 2000; see also Pettit et al., 1997). Accordingly, a methodological approach that can identify a child's pattern of involvement across different after-school care arrangements is required to characterize accurately the ecology of ASP partici-

pation. Research that follows this approach is scarce but suggestive of its importance. For example, in a retrospective account of children's after-school care, Pettit et al. (1997) found that although self-care was linked to negative adjustment in general, children who experienced a combination of self-care and activity-oriented care earned higher grades than did those who experienced only self-care.

Finally, within the ASP setting itself, variation in program characteristics and individual differences in program involvement require consideration. For example, consistent with decades of research on early child care (for reviews see National Research Council and Institute of Medicine, 2000, 2003), ASP quality parameters, such as higher ratios of children to staff, predict negative staff–child interactions (Rosenthal & Vandell, 1996), which in turn predict poorer grades in reading and math for boys (Pierce, Hamm, & Vandell, 1999). Moreover, low-income children have been shown to experience the greatest gains in academic performance when they participate in ASPs that are fully implemented and attend such programs regularly (Cosden et al., 2001; Kane, 2004; U.S. Department of Education, 2003; Welsh et al., 2002).

Beyond being present in ASPs, a potentially important aspect of participation—engagement in program activities—has received limited empirical attention. Engaging activities are challenging, enjoyable, and appealing because they effectively balance the demands placed on individuals with their existing abilities and interests (Csikszentmihalyi, 1990; Larson, 2000; Newmann, 1992). Activities that engage children are particularly conducive to learning and skill development (Larson, 2000; National Research Council and Institute of Medicine, 2004; Vandell, Shernoff, Pierce, Bolt, Dadisman, & Brown, in press). On this score, it is noteworthy that compared with experiences in the home, classroom, or while hanging out with friends, students participating in after-school activities report relatively high levels of engagement (Hansen et al., 2003; Larson, 2000; Vandell, Shernoff, et al., 2005). Given that many ASPs hold as a goal the promotion of academic skills (Huang et al., 2000; Klein & Bolus, 2002; U.S. Department of Education, 2003; Welsh et al., 2002), students who are engaged in these settings should demonstrate higher academic-related outcomes than their peers who attend ASPs without engaging in the available activities.

The Present Study

In this longitudinal investigation we took an ecological approach to studying ASP participation and the development of academic performance and related motivational attributes in a sample of disadvantaged children. The approach called for the identification of individual patterns of after-school care across several arrangements and the comparison of children with different after-school care patterns in terms of academic-related outcomes over the school year.

Based on the preceding literature review, there were four main study expectations. First, we expected that the opportunities for learning and skill development provided by ASPs would be conducive to developing academic performance and supporting motivational attributes. Accordingly, children whose pattern of after-school care is characterized by regular participation in ASPs were expected to be high on these dimensions compared with children with alternative patterns of after-school care. Second, the associated benefits of regular ASP participation were expected to be most apparent compared with outcomes of children whose pattern of after-school care lacks regular adult supervision (i.e., nonadult care). Third, for children with a pattern of after-school care that involves regular adult supervision (other than from ASP providers), academic-related outcomes were expected to be intermediate. Finally, among children who regularly participate in ASPs, the associated benefits of such participation were expected to be greatest for students who show high engagement in program activities.

The participants are in first, second, and third grades. As such, grade-related differences in rates of ASP participation were not expected (e.g., Marshall et al., 1997; Vandell & Shumow, 1999). However, we anticipated that the associated benefits of ASP participation would be more apparent for older children because of a potentially longer history of program involvement. Based on prior research (Hofferth et al., 1991; Vandell & Posner, 1995) we also expected that, compared with girls, boys' after-school arrangements would be more likely to involve nonadult care. The associated outcomes of regular ASP participation were not expected to differ for boys and girls.

Method

Participants

During the fall of 2002, 818 students enrolled in the first, second, and third grades of three public schools in the Northeastern United States were invited to participate in a long-term study of children's after-school time and well-being. No exclusionary or

restrictive criteria were imposed. Active, signed consent from a parent or legal guardian (hereafter referred to as parents) was required for participation. Parental consent was obtained for 73% of this population ($N = 599$). The sample is balanced by gender (48.5% female) and is racially/ethnically diverse (i.e., 50% Hispanic, 36% Black, 10% White, 2% Asian, and 2% other). The sample diversity is substantially similar to the total population of students served by the participating schools.

The participating schools are located in an economically disadvantaged, urban city with a population of approximately 140,000. The economy of the city is based primarily on education, health and social services, manufacturing, and retail trade. Approximately 25% of all persons under age 18 in the city lived in poverty in 2000, and more than 95% of students attending the public schools were eligible to receive free or reduced lunch during the 2002–2003 school year. During the 2002–2003 school year, the vast majority of fourth-grade students from the participating public schools failed to meet state minimal proficiency requirements in reading, writing, and math.

The three public schools involved in this study were selected, in part, because they are located in geographically distinct areas and are among the most disadvantaged in the city. The median annual household income for this sample, including all forms of public assistance and compensation, is $16,794 for an average family size of 4.4 persons, and 57% of the participating families live in poverty according to the 2002 Census thresholds.

Procedure

Recruitment. The recruitment procedure began by mailing information about the study (i.e., a brochure describing the project and letter of invitation to participate in the study) along with a consent form to the home of each target child's parent. This information was initially provided in English, Spanish, and Portuguese and a return addressed, stamped envelope was provided to send back the consent form. This mailing was followed by telephone calls to parents (in their native language) to ensure that the study information was received, answer any questions about the study, and explain how to return the consent form if desired. For parents who could not be reached by mail or phone, information packets and consent forms were distributed to each target child in their classroom to be brought home to his or her parent. Additional recruitment strategies included visits to the target child's home to invite parents to participate in person, meeting with parents during the ASP, and attending parent–teacher evenings at the schools and other relevant school and community events. If, at any point, a parent declined to participate or asked not to be contacted again, they were excluded from all subsequent recruitment efforts. Similar strategies were employed to collect parent surveys from consenting parents.

Data collection. Data collection was conducted at two time points during the 2002–2003 school year. Classroom teachers completed surveys about the participating students once in the fall and again in the late spring. Additionally, at these same time points, ASP staff completed surveys for participants enrolled in an ASP. Research project staff delivered and retrieved these surveys on an individual basis. Participating parents received a survey that was mailed to their homes with an accompanying return addressed stamped envelope in the fall. Parents who were unable or unwilling to complete the written survey were offered the opportunity to be interviewed in their homes or another place of their choosing; seven parents chose an interview. Student academic school records containing information on participant school grades and reading achievement at the end of the school year were collected by research staff during the late spring and summer of 2003. Across the four information sources, complete data were obtained for the 599 consenting participants as follows: parent survey or interview = 84%, classroom teacher survey = 99% (fall) and 93% (spring), ASP staff survey = 84% (fall) and 94% (spring), school grades = 85%, and reading achievement = 83%.

Measures

ASP description. The ASPs in this investigation are part of a citywide after-school initiative throughout the public school district, and all the programs were carried out within the public schools between 3:00 and 6:00 p.m. The broad goals of the programs are: (a) to provide a safe and supportive environment after school and (b) to promote the academic and social competence, and physical health of the participants. The programs are funded by a mix of local, state, and federal sources. All of the programs have received some support from a federal 21CCLC grant.

Each school conducts ASP activities separately by grade. A lead teacher directs the activities with assistance from additional adult staff, youth workers, and volunteers. The content areas of each ASP are similar and include time for snack, homework, enrichment learning (e.g., computers, visitors, musical

instruments), supervised recreation (e.g., kick ball, basketball, board games), and art. As an indication of the general quality of the programs, the School Age Care Environment Rating Scale (SACERS; Harms, Jacobs, & White, 1996) was administered during a program observation in the spring of 2003. The SACERS provides an indication of quality in seven program areas as well as an overall rating of quality on a 7-point scale (1 = inadequate, 3 = minimal, 5 = good, 7 = excellent). The median overall quality of the programs in this study was 3.82 ($SD = .51$). Based on information from ASP staff surveyed during the 2003–2004 school year, the typical program lead teacher was female (78%) and White (67%), had a 4-year college degree (56%), and was between 25 and 36 years of age.

After-school care arrangements. Parents reported the number of hours between 3:00 and 6:00 p.m. during a typical school week that the target child was involved in each of four types of after-school arrangements: (a) care by a parent or legal guardian, (b) care in an ASP, (c) nonadult care (including in-home and out-of-home self-care and sibling care), and (d) care by another adult (including relatives, babysitters, and adult friends). For each arrangement, responses were coded in 3-hr blocks of time along a 6-point scale (1 = no involvement, 2 = 1–3 hr/week, 3 = 4–6 hr/week, 4 = 7–9 hr/week, 5 = 10–12 hr/week, and 6 = 13–15 hr/week). As the interval considered was 3:00 to 6:00 p.m., the scale corresponds to the number of days during the school week that a child experienced any of the four after-school care arrangements (i.e., 1 = none, 6 = all 5 days). Complete information for time spent in each after-school arrangement was available for 93% (467/502) of responding parents.

Because the time spent in after-school arrangements was reported by parents on only one occasion during the school year (primarily in the late fall or early winter), it was of interest to determine the validity of their reports. ASP attendance records (recorded on a daily basis by ASP staff) were collected for participants across the school year. The correspondence between parent reports of time spent in an ASP was compared with staff attendance records of the percentage of days each child attended an ASP during the fall and spring. The correlation was equally high and significant during the fall, $r(434) = .71$, $p < .001$, and spring, $r(455) = .71$, $p < .001$. The correlation between staff-recorded attendance during fall and spring was also high, $r(574) = .87$, $p < .001$. Accordingly, ASP participation was relatively stable over the school year, and parent-reported information corresponded well—concurrently and as a predictor of spring attendance—with staff-recorded attendance. This is consistent with the short-term stability of after-school care arrangements reported elsewhere (e.g., Pettit et al., 1997; Vandell & Posner, 1999).

ASP engagement. In the fall and spring, ASP staff completed a 10-item scale about each child's engagement in program activities. The scale items were evenly divided between engagement in five academic and five nonacademic/recreational program activities, and the wording of items was counterbalanced to be positive or negative. Although academic-related outcomes are of interest, the engagement measure included nonacademic/recreational activities because it has been demonstrated that skill development and learning that occur in these activities also contribute to the development of academic skills and educational success (e.g., Mahoney et al., 2005). Items assessed the child's level of enjoyment, effort, and interest in the program activities (e.g., ''The child enjoys participating in the activity''; ''The child tries hard at the activity''; ''The child's attention is focused during the activity''). Responses were rated on a 5-point scale ranging from 1 (*very untrue of the child*) to 5 (*very much true of the child*). Cronbach's alphas were .85 and .84 in the fall and spring, respectively. The fall-to-spring correlation for the engagement scale was .37 ($p < .001$). ASP engagement in the fall and spring were summed and averaged to derive each student's level of overall engagement across the school year.

Academic performance. School academic records provided information on participant school grades and reading achievement at the end of the school year. School grades in reading, math, writing, language, social studies, and science were coded separately on a 4-point continuum ranging from 1 (*unsatisfactory or failing*) to 4 (*excellent or ''A''*). These subject grades were summed and averaged to create an overall measure of school grades. Cronbach's alpha was .90.

Performance on the Developmental Reading Assessment (DRA) was used to assess reading achievement (Beaver, 1997). The DRA assesses reading comprehension and fluency through a series of progressively challenging stories. Scores are based on each student's accuracy while reading aloud, retelling, and answering questions about the stories, and the test scale ranges from 0 to 44. A nationally representative, 10-state study of kindergarten through third-grade teachers found the instrument to have good internal consistency (Cronbach's alpha = .98) and interrater reliability (Cronbach's alpha = .80; Williams, 1999). The sampled school

district does not provide a math-related parallel to the DRA for students below the fourth grade.

Motivational attributes. Two scales from EZ-Yale Personality Questionnaire (Zigler, Bennett-Gates, & Hodapp, 1999) were used: expectancy of success and effectance motivation. The expectancy of success scale assesses the degree to which one expects to succeed or fail on a new task (e.g., ''The child is sure things will work out when he/she has new work to do at school''; ''The child is easily discouraged''). The effectance motivation scale measures the intrinsic pleasure derived from solving difficult problems (e.g., ''The child works for the pleasure the work gives him/her''; ''The child works hard even when no reward is available''). For both scales, classroom teachers rated items on a 5-point scale ranging from 1 (*very much untrue*) to 5 (*very much true*) of the child, and the wording of items was counterbalanced to be positive or negative. Cronbach's alpha for both scales was .92. The correlation coefficients from fall to spring were .73 and .77 for the expectancy of success and effectance motivation scales, respectively ($p < .01$). The psychometric properties for this scale have been established for young persons diverse in age (preschool to late adolescence), those residing in low-income environments, and those in special education (Henrich et al., in press; Zigler et al., 1999; Zigler et al., 2002).

Family poverty status. Parents reported the total household income (including earnings, public assistance, compensation, and other forms of support) and the number of persons living in the home (including the ages of all children). Poverty status was then defined consistent with the 2002 Census thresholds for poverty and coded on a 4-point scale: 1 = extremely poor (below 50% of the poverty threshold), 2 = poor (50% to 100% of the poverty threshold), 3 = near poor (101% to 175% of the poverty threshold), 4 = nonpoor (above 175% of the poverty threshold). The poverty status of the sample was as follows: 22% extremely poor, 35% poor, 27% near poor, and 16% nonpoor.

Race/ethnicity. Parent-reported information concerning the race/ethnicity of the target child's biological mother and father was the primary information source used to establish each child's race/ethnicity. If parent information was not available, two alternative sources were consulted: (a) the child's school record or (b) classroom teacher surveys. Whenever disagreement occurred among the alternative sources, the modal race/ethnicity was chosen.

Caregiver employment. As part of the annual survey or interview, the child's primary caregiver reported whether he or she was working for pay outside of the home. In 78% of cases, the primary caregiver was the child's biological mother. Responses were coded dichotomously (1 = not employed, 2 = employed). The majority of working caregivers were employed full-time between 9:00 a.m. and 5:00 p.m.

Baseline academic adjustment. Fall teacher ratings of academic adjustment were obtained using one scale—academic competence—from a slightly modified version of the Interpersonal Competence Scale (ICS; Cairns, Leung, Gest, & Cairns, 1995). The modification involved using a 5-point scale (rather than 7-point) ranging from 1 (*very untrue of the child*) to 5 (*very much true of the child*). The academic competence factor involved two items (i.e., ''good at spelling,'' ''good at math''). Cronbach's alpha for the two-item academic factor was .71. The psychometric properties of the ICS have been demonstrated (Cairns et al., 1995) and independently validated in samples diverse in terms of race/ethnicity and economic status, rural and urban status, and for students from 1st through 12th grades (e.g., Estell, Farmer, Cairns, & Cairns, 2002; Farmer, Estell, Bishop, O'Neal, & Cairns, 2003).

School-day classroom. The classroom that each child attended during the school day was identified from school enrollment rosters during the fall of 2002 and coded categorically.

Analytic Strategy

The analytic strategy involved four steps. First, a pattern-analytic approach was used to identify profiles of individual involvement across the four after-school arrangements. This approach was chosen for two reasons: (a) it is consistent with an ecological systems perspective guiding the study expectations, and (b) the pattern approach allows the *amount* of time a child spends across *each* of the possible after-school arrangements to be considered. The Sleipner statistical package for pattern-oriented analysis (Bergman & El-Khouri, 2002) was used to identify the patterns of after-school care. Three features of the program were employed: (a) the residue procedure identified multivariate outlier cases that show extreme patterns across cluster variables, (b) the cluster procedure identified initial patterns using Ward's clustering algorithm, and (c) the relocation procedure reassigned persons to an alternate pattern if doing so reduced the error sums of squares of the solution. The number of after-school care patterns was selected according to the relevance of each pattern for evaluating the study expectations, the extent

to which each pattern provided distinct information about after-school care arrangements, and the reduction in error sums of squares and increase in variance accounted for by each additional pattern (cf. Bergman, Magnusson, & El-Khouri, 2003; Mahoney, 2000).

Second, the identified patterns of after-school care arrangements were evaluated with respect to potential selection influences. These included: family poverty status and caregiver employment (Hofferth et al., 1991; NICHD Early Child Care Research Network, 2004; Pettit et al., 1997), race/ethnicity (Posner & Vandell, 1994; Welsh et al., 2002), and grade and gender (Colwell, Pettit, Meece, Bates, & Dodge, 2001; Hofferth et al., 1991; Vandell & Shumow, 1999). Selection influences found to differ significantly among the identified patterns were included as model effects or covariates in subsequent analyses.

Third, the after-school care patterns were evaluated for differences in spring measures of academic performance and supporting motivational attributes, adjusting for measures of academic functioning and selection influences in the fall. Because academic performance and motivational attributes were significantly intercorrelated, median $r(491) = .55$, $p < .01$, data were analyzed using a multivariate analysis of covariance (MANCOVA).

Finally, after-school care patterns involving regular participation in ASPs were subdivided according to differences in ASP engagement. The subdivision was made on an individual basis according to whether ASP lead teachers rated a child as above or at/below the sample median for engagement in program activities. Academic performance and motivational attributes were then compared between resulting subgroups and alternative patterns of after-school care using MANCOVA.

Results

Patterns of After-School Care Arrangements

Based on parent reports, the percentage of children who spent at least 1 hr per week in each after-school arrangement was as follows: ASP = 30% (140/467), parent care = 79% (387/467), nonadult care = 40% (189/467), and other adult care = 49% (229/467). Table 1 shows the correlations among time spent in these four arrangements. These descriptive findings indicate the likelihood for a multiplicity of after-school arrangements and support the need for analytic strategies able to identify individual patterns of time spent across several after-school arrangements.

Table 1
Intercorrelations Among After-School Care Arrangements

Type of care	1	2	3	4
1. After-school program	—	−.33*	−.11*	−.11*
2. Parent		—	.22*	−.02*
3. Nonadult			—	.21*
4. Other adult				—
M	2.45	4.32	2.34	2.41
SD	2.24	1.98	1.92	1.82

Note. $N = 467$.
*$p < .05$

The pattern analysis identified four patterns of after-school care that explained 61% of the variance in the after-school arrangements considered (see Table 2). This corresponds with suggested criteria for desirable variance to be accounted for when using cluster analytic procedures (e.g., Bergman et al., 2003). The *ASP care* pattern is characterized by children who attended an ASP nearly every afternoon and were also cared for by a parent for a portion of time on some afternoons. Children in the *parent care* pattern were primarily cared for by a parent each afternoon. The *parent/nonadult care* pattern involves children who regularly experienced a combination of parent and nonadult care each afternoon. The final pattern, *other adult/nonadult care*, involves children who experienced a mix of care from other adults and nonadult care across the school week.

Selection Influences

The four patterns of after-school care were examined with respect to possible differences in family poverty status, caregiver employment status, race/ethnicity, grade, gender, and the school-day classroom attended. As shown in Table 3, the patterns differed significantly according to poverty status, $F(3, 421) = 2.67$, $p < .05$; caregiver employment status, $F(3, 442) = 10.29$, $p < .05$; and grade, $F(3, 451) = 3.50$, $p < .05$. No other differences approached significance. Children characterized by the ASP pattern of care were more likely to be in second or third grade, to have a primary caregiver who was employed, and to experience less marked poverty than children in the three alternative patterns of care. Accordingly, subsequent analyses included poverty status and caregiver employment as covariates, and potential main effects and interactions involving grade and gender were modeled to evaluate study expectations.

Table 2
Identified Patterns of After-School Care Arrangements

		After-school care arrangements							
		After-school program		Parent		Nonadult		Other adult	
Pattern label	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
After-school program	134	5.89	0.34	3.28	2.05	1.89	1.65	2.06	1.63
Parent	154	1.01	0.08	5.81	0.47	1.21	0.55	1.92	1.50
Parent/nonadult	86	1.21	0.97	5.64	0.77	5.43	0.91	3.24	2.08
Other adult/nonadult	93	1.02	0.21	2.18	1.13	2.98	1.42	2.99	1.88

Patterns of After-School Care and Academic Performance and Motivational Attributes

To assess differences in academic-related outcomes across the patterns of after-school care, data were analyzed with a 4 (pattern of after-school care) $\times$ 3 (grade) $\times$ 2 (gender) MANCOVA. Covariates included poverty status, caregiver employment status, fall teacher ratings of academic adjustment, expectancy of success, and effectance motivation. Adjusted marginal means for academic performance and motivational attributes are shown in Table 4 for each after-school care pattern.

A significant MANCOVA association was found for pattern of after-school care, $F(12, 744) = 1.84$, $p < .05$; grade, $F(8, 562) = 53.15$, $p < .001$; and gender, $F(4, 281) = 3.06$, $p < .05$. There were no significant interactions. For each of the significant domains, separate analyses of covariance (ANCOVAs) were performed for the dependent variables followed by pairwise t tests to determine which means were significantly different.

As shown in Table 4, reading achievement, $F(3, 295) = 3.37$, $p < .05$, and expectancy of success, $F(3, 290) = 3.56$, $p < .05$, differed significantly according to pattern of after-school care. The reading achievement of children in ASP care was significantly higher than of those in each of the three alternative care arrangements. Expectancy of success was also significantly higher for children in ASP care compared with children in other adult/nonadult care.

Grade differences were significant for reading achievement, $F(2, 328) = 246.02$, $p < .001$; expectancy of success, $F(2, 322) = 4.55$, $p < .05$; and effectance motivation, $F(2, 322) = 3.16$, $p < .05$. Reading achievement increased significantly with advancing grades. Expectancy of success was higher for second graders compared with first graders. Effectance motivation was higher for second graders compared with first or third graders. Gender differences were significant for expectancy of success, $F(1, 323) = 5.71$, $p < .05$, and effectance motivation, $F(1, 323) = 9.12$, $p < .01$. Girls were rated higher on these motivational attributes than were boys.

Individual Differences in Program Engagement

Academic-related outcomes of ASP participation were expected to depend on the individual's level of engagement in program activities. To evaluate this, the ASP care pattern was divided into two sub-

Table 3
Significant Selection Influences for Identified Patterns of After-School Care

	Pattern of after-school care							
	After-school program		Parent		Parent/nonadult		Other adult/ nonadult	
Selection influence	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Poverty status	2.70_a	0.83	2.44_b	0.99	2.40_b	0.84	2.45_a	0.98
Caregiver employment (%)	66_a		53_b		45_b		52_b	
Grade	2.11_a	0.77	1.88_b	0.82	1.79_b	0.80	1.86_b	0.78

Note. Means in the same row that do not share subscripts differ at $p < .05$ in Fisher's least significant differences comparison.

Table 4
Spring Academic Performance and Motivational Attributes for the Identified Patterns of After-School Care

	Pattern of after-school care							
	After-school program		Parent		Parent/ nonadult		Other adult/ nonadult	
Academic performance/motivational attribute	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Reading achievement	26.89_{a}	1.08	23.68_{b}	0.99	23.68_{b}	1.37	21.72_{b}	1.28
School grades	1.58_{a}	0.05	1.55_{a}	0.05	1.49_{a}	0.07	1.45_{a}	0.06
Expectancy of success	3.49_{a}	0.07	3.31_{ab}	0.07	3.34_{ab}	0.09	3.13_{b}	0.09
Effectance motivation	3.25_{a}	0.08	3.25_{a}	0.07	3.21_{a}	0.10	3.08_{a}	0.09

Note. Adjusted marginal means are reported. Means in the same row that do not share subscripts differ at $p < .05$ in Fisher's least significant differences comparison.

groups based on whether each child who participated in an ASP program was rated by their ASP lead teacher as above or at/below the sample median for engagement in program activities. The resulting subgroups are termed high ASP engagement and low ASP engagement, respectively.

Data were analyzed with a 5 (pattern of after-school care) $\times$ 3 (grade) $\times$ 2 (gender) MANCOVA. Covariates included poverty status, caregiver employment status, and fall teacher ratings of academic adjustment, expectancy of success, and effectance motivation. Adjusted marginal means for academic performance and motivational attributes are shown in Table 5 for each after-school care pattern.

A significant MANCOVA association was found for pattern of after-school care, $F(16, 822) = 2.08$, $p < .01$. Separate ANCOVAs were performed for each of the dependent variables followed by pairwise *t* tests to determine which means were significantly different. There were no significant interactions involving grade level or gender.

As shown in Table 5, reading achievement, $F(4, 282) = 3.40$, $p < .05$; expectancy of success, $F(4, 278) = 3.22$, $p < .05$; and effectance motivation, $F(4, 278) = 2.97$, $p < .05$, differed significantly according to pattern of after-school care and ASP engagement. Children in the high-ASP-engagement subgroup had significantly higher reading achievement than did those in the three alternative care arrangements (i.e., parent, parent/nonadult, and other adult/nonadult). By contrast, the reading achievement of children in the low-ASP-engagement subgroup was significantly higher only compared with children in other adult/nonadult care. Expectancy of success was significantly higher for children in the high-ASP-engagement subgroup compared with children in the three alternative care arrangements. Expectancy of success for children in the low-ASP-

Table 5
Spring Academic Performance and Motivational Attributes for the Identified Patterns of After-School Care and High and Low After-School Program Engagement

	Pattern of after-school care									
	After-school program high engagement		After-school program low engagement		Parent		Parent/ nonadult		Other adult/ nonadult	
Academic performance/motivational attribute	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Reading achievement	28.89_{a}	1.62	26.18_{ab}	1.70	23.68_{bc}	0.99	23.68_{bc}	17.30	21.72_{c}	1.28
School grades	1.67_{a}	0.08	1.57_{a}	0.08	1.55_{a}	0.05	1.49_{a}	0.07	1.45_{a}	0.06
Expectancy of success	3.61_{a}	0.11	3.37_{ab}	0.11	3.31_{b}	0.07	3.34_{b}	0.09	3.13_{b}	0.09
Effectance motivation	3.45_{a}	0.11	2.95_{b}	0.12	3.25_{ac}	0.07	3.21_{abc}	0.10	3.08_{bc}	0.09

Note. Adjusted marginal means are reported. Means in the same row that do not share subscripts differ at $p < .05$ in Fisher's least significant differences comparison.

engagement subgroup did not differ significantly from that of children in the three other arrangements. Finally, effectance motivation for children in the high-ASP-engagement subgroup was significantly higher than that for children in the low-ASP-engagement subgroup and children in other adult/nonadult care. Effectance motivation of children in the low-ASP-engagement subgroup was also significantly lower than that of children in parent care.

Discussion

This longitudinal study is among the first to assess ASP participation from an ecological systems perspective of development. The investigation required that several levels of the child's after-school ecology be considered, including the identification of individual patterns of after-school care across multiple arrangements and individual differences in engagement within the ASP setting itself. Potential differences in academic performance and supporting motivational attributes were then compared across the identified patterns of after-school care and with respect to differences in ASP engagement. This study is made unique by its ecological approach to analysis, focus on a racially/ethnically diverse sample of disadvantaged children at the outset of formal schooling, account of several selection influences, and use of a prospective longitudinal design.

An ecological approach to analysis was used to clarify the conditions under which ASP participation is linked to academic-related outcomes. Prior research has documented that the associated benefits of ASP participation depend on the alternative after-school arrangements considered (e.g., Posner & Vandell, 1994) and the amount of time spent in these arrangements (e.g., Pettit et al., 1997; Welsh et al., 2002), and that children can experience multiple after-school care arrangements concurrently (e.g., Hofferth et al., 1991; Vandell & Posner, 1999). However, few studies have adopted an analytic procedure that considers these facets simultaneously. To do so, we employed pattern analysis of after-school care arrangements. The resulting patterns provided new information on the after-school ecology of disadvantaged children in general, and the role of ASP participation specifically. Indeed, all of the identified after-school care patterns involved time in more than one arrangement during the school week. Only two patterns—ASP care and parent care—were characterized by a predominant after-school arrangement. Therefore, methodological approaches that can account for variation in both the type and amount of children's after-school care arrangements appear necessary to portray accurately the after-school ecology and may prove useful for studying child care arrangements in general.

This approach was also useful in elucidating comparison groups from which to evaluate the potential benefits of ASP participation. When academic-related benefits have been found in studies of ASP participation, they have been most evident when children are disadvantaged (Posner & Vandell, 1994, 1999; Welsh et al., 2002) and when attendance is regular (Kane, 2004). This seems to be a result of both the paucity of after-school enrichment and structured learning opportunities available in impoverished environments and the problematic outcomes associated with unsupervised arrangements for children in high-risk areas.

The identified after-school care patterns differed significantly on some measures of academic performance and motivational attributes. Children characterized by the ASP care arrangement showed significantly higher reading achievement at the end of the school year compared with children in all other patterns of after-school care and were rated by teachers as holding greater expectancies of success compared with children in the other adult/nonadult care pattern. This held after considering baseline academic functioning and demographic factors measured in the fall. The finding supports a conclusion that among the typical after-school care arrangements poor children experience, ASPs appear unique in their ability to promote academic-related success.

Why should participation in ASPs be superior to alternative patterns after-school care in promoting academic-related outcomes? The ASPs in this study provided a structured, adult-supervised context; a curriculum aimed at promoting academic skill development; resources to support the learning objectives (e.g., books, computers, classroom materials); and staff who tended to hold a college degree (or were actively pursuing one). In this disadvantaged sample, it is unlikely that any of the other after-school contexts were comparable to ASPs on these dimensions. Indeed, children involved in ASPs appear to spend more time in academic, enrichment learning, and adult-supervised play compared with children in other after-school arrangements (Posner & Vandell, 1994, 1999). These studies also show that children in informal and unsupervised care arrangements are more apt to be involved in passive activities such as watching television and ''hanging out.'' Likewise, although regular care from parents did not appear to undermine academic skills, the resources for learning and skill development in the

home environment of poor families may be inferior to the ASP context.

Although the corresponding mean values for school grades and effectance motivation were generally consistent with the preceding results, they did not differ significantly across the identified patterns of care. Indeed, effectance motivation was positively related to ASP participation only when students were highly engaged in program activities. Thus, the skills developed through ASP participation may be sufficient to increase children's success expectations for schoolwork, but fostering internally guided pleasure in performing schoolwork may further require that programs are engaging (i.e., interesting, challenging, enjoyable). It is also noteworthy that the investigation was conducted over a short time span. Prior research suggests that academic-related benefits of ASP participation emerge gradually and differences are not always observed during one school year (e.g., Kane, 2004; Welsh et al., 2002). Thus, follow-up studies from this investigation can be expected to show greater academic-related differences in the outcomes considered.

Academic-related outcomes for children whose pattern of after-school care featured regular supervision from adults (other than ASP teachers and staff) were expected to be intermediate (i.e., lower than patterns emphasizing ASP participation but higher than patterns emphasizing nonadult care). This expectation received partial support. Two patterns—parent care and parent/nonadult care—involved supervision from parents for some part of each afternoon. ASP care participants showed superior academic-related outcomes in some domains compared with children in these parent-supervised arrangements (cf. Posner & Vandell, 1994). However, none of the identified patterns was predominated by nonadult care in this sample. Children in the other adult/nonadult care pattern experienced about 2 days of nonadult care during the school week. This pattern was consistently the least favorable in terms of mean level academic functioning; however, the differences were not significantly different from patterns featuring supervision from parents. One explanation for why nonadult care was not used as an exclusive arrangement is that the sampled communities were characterized by high levels of disadvantage and crime. Such conditions are known to impose risks for children's social and academic adjustment (e.g., Pettit et al., 1999), and nonadult care tends to be less prevalent in impoverished settings (Vandell & Shumow, 1999). Given the possible danger, parents in this sample may have been especially motivated to find supervised after-school care arrangements for their children (Furstenberg, 1993).

Finally, although after-school activities have been shown to be engaging contexts that may facilitate the process of learning and skill acquisition (e.g., Hansen et al., 2003; Larson, 2000; Vandell, Shernoff, et al., 2005), this is among the first studies to examine whether individual differences in activity engagement are linked to outcomes. Results were consistent with the proposal that engagement is an important feature of ASPs. The positive association between ASP care and academic-related outcomes were amplified when engagement in program activities was high. Indeed, at the end of the school year, the mean for all academic-related outcomes was highest for children in the ASP-high-engagement pattern compared with children in the three alternative patterns of after-school care. Significant differences were found in reading achievement, expectancy of success, and effectance motivation.

By comparison, academic-related outcomes for children who showed relatively low engagement in ASPs were less promising. Although these children showed higher reading achievement compared with children in the other adult/nonadult pattern, academic-related outcomes were generally similar to children in the alternative patterns of after-school care. Moreover, effectance motivation for these children was particularly low and significantly different from their highly engaged counterparts and from children in parent care.

Gender and Grade

Some gender and grade findings were not anticipated. First, compared with girls, boys were expected to be overrepresented in patterns of after-school care featuring nonadult care. This was not supported. Parents may, in general, be more apt to place boys in unsupervised after-school arrangements (Hofferth et al., 1991; Vandell & Shumow, 1999). However, in this case, the high-risk environment in which the sample resides may have motivated parents to avoid nonadult care regardless of the child's gender. Second, motivational attributes were higher for girls than for boys. This gender difference may result from the tendency for boys to receive more direct, negative feedback about academic failure from classroom teachers compared with girls (E. F. Zigler, personal communication, February 21, 2005).

Older children with patterns of after-school care emphasizing ASP participation were expected to show higher academic-related outcomes than were

younger children with this pattern. This was not supported. The assumption was that older children may have had a longer history of ASP participation that predated this investigation. However, data were not available to verify this assumption. Moreover, the quality of ASPs that older children may have attended in the past and their level engagement in program activities at that time are also not known. A second expectation was that ASP participation would be similar across grade levels. However, children in first grade were less likely to participate in ASPs than were those in second or third grade. This may be because primary caregivers elected to keep younger children at home under parent supervision when possible. Alternatively, younger children may be more likely than older children to have younger siblings in parental care because of the spacing of children's ages, which could contribute to parents' decision not to enroll their child in out-of-home care arrangements.

Methodological Considerations

Many of the findings were derived from pattern analysis, and evaluation of study expectations followed a categorical approach to analysis as a result. The categorical approach was appropriate for the research questions considered and consistent with the ecological systems perspective guiding the investigation. However, other studies of ASPs following a continuous approach to analysis (e.g., regression, correlation, and siblings) have also been effective in generating knowledge about this care arrangement. The complementary nature of pattern analytic and variable-based approaches has been noted many times (e.g., Bergman et al., 2003). It is, however, important to recognize the trade-offs when following one or the other approach. For instance, the use of linear, largely additive models (e.g., regression) to assess after-school care does not capture the nonlinear, reciprocal interactions across multiple arrangements (e.g., Mahoney & Bergman, 2002). By contrast, identifying discrete patterns of after-school care does not always account fully for the variability in any single after-school arrangement. With these trade-offs in mind, the present findings correspond with those derived from more traditional analytic approaches used in prior research on ASPs and provide new information about the role of multiple care arrangements after school.

A second methodological issue is that the patterns of after-school arrangements discriminated student performance on a standardized test of reading achievement better than did end-of-year school grades. This may be because standardized test performance (rated on 45-point scale) compared with school grades (rated on a 4-point scale) has more variability or because school grades are based on subjective as well as objective aspects of student ability. Indeed, the schools in this study used different approaches to reporting student grades (e.g., letter grades vs. a satisfactory continuum). Although the different grading approaches could be coded reliably, the variability nevertheless renders a less precise interpretation of student ability compared with the standardized test.

Limitations and Future Directions

The study has limitations that provide directions for future research. First, the amount of time children spent in after-school care arrangements was based on parent reports of a typical school week taken on one occasion during the school year. Parents have been found to be reliable informants of after-school care (Pettit et al., 1997) and children tend not to change primary arrangements over the school year (Vandell & Posner, 1995). However, the possibility that the identified patterns of care changed during the study was not considered. Indeed, prior research has shown that year-to-year stability and change of child care arrangements influences adjustment (e.g., NICHD Early Child Care Research Network, 2004; Vandell & Posner, 1995). Accordingly, employing more frequent assessments of after-school care may help to clarify the differences in academic-related outcomes found in this study.

Second, on average, children in this sample experienced some nonadult care during a typical school week. However, as noted earlier, none of the identified patterns revealed nonadult care as a predominant after-school arrangement; rather, nonadult care tended to co-occur with care from parents or other adults (cf. Pettit et al., 1997). It is also noteworthy that nonadult care involved both self-care and sibling care. There is very little research on the impact of sibling care on the recipients, but some studies indicate that older siblings are effective tutors and caregivers and that the experience can be beneficial (e.g., Burton & Jarrett, 2000; Zukow-Goldring, 1995). Accordingly, an ''unpacking'' of nonadult care with respect to the presence or absence of siblings and the characteristics of the siblings providing care is an area for further study (Vandell & Posner, 1999).

Third, few aspects of the ASP context were assessed. Whether ASPs are positively associated with

academic outcomes can be expected to vary according to dimensions of program quality. These include quality parameters that are structural (e.g., ratios of staff to children) and process oriented (e.g., the social climate of the ASP; e.g., National Research Council and Institute of Medicine, 2003; Pierce et al., 1999). This limitation also holds for individual differences in ASP engagement. ASP engagement is a dimension of program quality (Vandell et al., 2004). However, an important direction for future research is to understand what drives ASP engagement. We suspect that more traditional features of program quality will help explain individual differences in engagement. In addition, the content of ASPs—the activities available to students and how they are conducted—should also be informative (e.g., National Research Council and Institute of Medicine, 2004). These program-level features are likely to interact with aspects of the child (e.g., temperament). Thus, research aimed at identifying the fit between program features and individual characteristics is needed.

Finally, although several known selection influences were modeled in the analyses, influences that were not studied may also be important. Broader features of the social ecology such as neighborhood safety could influence after-school care arrangements and participation rates (Vandell & Posner, 1999). Likewise, experiences in the family context (Vandell & Ramanan, 1991) or unmeasured characteristics of the child could also affect the type of after-school care experienced (NICHD Early Child Care Research Network, 2004). Although research on ASPs has been largely concerned with outcomes related to participation, it is important that future research develop and evaluate conceptual models of selection processes. In this effort, an ecological systems perspective is likely to be useful.

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