Social stratification, classroom climate, and the behavioral adaptation of kindergarten children

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Socioeconomic status (SES) is the single most potent determinant of health within human populations, from infancy through old age. Although the social stratification of health is nearly universal, there is persistent uncertainty regarding the dimensions of SES that effect such inequalities and thus little clarity about the principles of intervention by which inequalities might be abated. Guided by animal models of hierarchical organization and the health correlates of subordination, this prospective study examined the partitioning of children's adaptive behavioral development by their positions within kindergarten classroom hierarchies. A sample of 338 5-y-old children was recruited from 29 Berkeley, California public school classrooms. A naturalistic observational measure of social position, parent-reported family SES, and child-reported classroom climate were used in estimating multilevel, random-effects models of children's adaptive behavior at the end of the kindergarten year. Children occupying subordinate positions had significantly more maladaptive behavioral outcomes than their dominant peers. Further, interaction terms revealed that low family SES and female sex magnified, and teachers' child-centered pedagogical practices diminished, the adverse influences of social subordination. Taken together, results suggest that, even within early childhood groups, social stratification is associated with a partitioning of adaptive behavioral outcomes and that the character of larger societal and school structures in which such groups are nested can moderate rank–behavior associations.

child development | social dominance | stress | mental health

Acts of dominance and subordination are the most universal, prototypical features of the hierarchical social organization that characterizes much of invertebrate to vertebrate phylogeny, from roundworms (1) and fruit flies (2) to cichlid fish (3), nonhuman primates (4, 5), and human children (6–9). Across these diverse species, group organization is shaped by ordered, linearly transitive social relationships, the evolutionary emergence of which has been variably attributed to the adaptive advantages of divisions of labor and social roles (10), cooperative breeding (11), leadership provision (9, 12), checks on aggression (13), and/or constraining disease transmission (14). Irrespective of its possible adaptive value, exposure to agonistic subordination systematically alters key biological processes, such as cytokine signaling (15) and stress reactivity pathways (16, 17), modifies neurotransmitter and neurotrophin expression patterns in critical brain regions (18), and undermines disease resistance among subordinate groups (19, 20).

Such neurobiologically mediated liabilities of social stratification also apply to human societies, which are partitioned by ordered differences in education, income, and job prestige—the defining parameters of socioeconomic status (SES). These differences exert powerful constraints on human health, well being, and development, rendering SES the single most potent determinant of health within human populations (21, 22). Beginning even early in life, disadvantaged, subordinate groups bear disproportionate burdens of disease and disorder, with poorer children sustaining higher rates of low birth weight (23), traumatic injury (24), infectious diseases (25), dental caries (26), psychiatric and developmental–behavioral disorders (27), and poor academic performance (28). Growing evidence suggests, moreover, that childhood exposures to socioeconomic inequalities establish enduring developmental trajectories, leading to lifelong differences in the rates and severities of medical conditions, disorders of mental health, and educational and occupational underachievement (29–32). Thus, childhood inequalities may figure prominently in the ontogeny of health disparities within the overall society, acting as a developmental progenitor of global, SES-linked differences in adult health and morbidity.

The severity of a social hierarchy's biological and health effects, however, shows substantial variability within and across species (33) and plasticity over historical and evolutionary time (34, 35). Such species-typical variation in the "virulence" of social ordering is commensurate with, and perhaps analogous to, the substantially differing slopes of SES–health gradients by nation and state (36). The origins of this variability (37) are obscured by a lack of consensus regarding the causal elements of health disparities and debate surrounding the preeminence of material vs. psychosocial resource inequalities (see, e.g., refs. 28 and 38–40). Such uncertainty about the operational dimensions of SES is even more consequential in the case of childhood inequalities, because children may be differentially susceptible to exposures in both the material (41, 42) and psychosocial (29, 43) domains. Further, children are inherently more reliant on the adult world for the selection and provision of the contexts to which they are exposed, and disadvantage within those contexts may have disproportionate and lasting influences on lifelong health (30). Understanding variation in the health-altering effects of social stratification may thus assist in discerning its functional core.

Largely missing from research on the health effects of stratification, however, has been a consideration of how experiences of social subordination per se, themselves prevalent sources of human adversity (44), may be related to disorders of mental and physical health, educational failure, and maladaptive behavior, especially in the young. ("Maladaptive" and "adaptive behavior" refer to behavior that reflects, respectively, difficult or well-adjusted accommodation to novel or challenging circumstances, such as a kindergarten classroom.) The works of Pellegrini (45, 46), Hawley (9), and Fehr (47) and their colleagues, describing the developmental emergence, behavioral signs, and socioemotional sequelae of childhood dominance and egalitarianism, are notable and important "down payments" on such a research agenda. To further examine linkages between subordination and maladaptive health outcomes, we studied a socioeconomically and ethnically diverse sample of kindergarten children, assessing

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associations between experiences of dominance–subordination and patterns of maladaptive behavior.

Because such associations may be moderated by characteristics of the child, family, or classroom (see, e.g., refs. 48–50), we also examined interactive influences among sex, family SES, and the interpersonal classroom "climate" on social position and its behavioral concomitants, using multilevel, random-effects models that adjusted for individual classroom enrollment. We hypothesized that occupying subordinate classroom positions might be associated with more maladaptive and risk-linked profiles of behavioral development. Understanding relations between early social ordering and presyndromal, stress-related behavior problems may be especially important, given evidence that troubled early behavior is predictive of the longer-term emergence of developmental psychopathology (e.g., refs. 51 and 52) and that interventions in the first few years of life may be disproportionately effective and enduring (29).

Results

Both same sex and intersex dominance interactions between children were directly observed and recorded. Same-sex interactions predominated, varying from ~60% to 85% of the encounters recorded in a single classroom. For individual children, however, the proportion of same-sex interactions ranged from 0 to 100%, with some children initiating dominance encounters exclusively with either same- or opposite-sex peers. Social positions derived mathematically from observations of such dominance interactions were significantly associated with ranks obtained from an alternative ranking algorithm ($r = 0.75$, $P < 0.001$), average research assistant (RA) ratings of rank ($r = 0.62$, $P < 0.001$), and average teacher ratings ($r = 0.40$, $P < 0.001$) but were unassociated with children's self-rankings ($r = 0.03$, P = NS). Pearson correlation coefficients for relations among independent and outcome variables showed that both genders and children of all family SES backgrounds were equally likely to assume dominant and subordinate ranks within their classroom hierarchies. More subordinate social positions were moderately but significantly related to less teacher-reported problematic externalizing behavior ($r = -0.14$, $P < 0.05$) and academic competence ($r = -0.13$, $P < 0.05$) and showed trends toward associations with greater depressive symptoms ($r = 0.09$, $P < 0.10$) and poorer peer relationships ($r = -0.09$, $P < 0.10$).

As shown in the first row of Table 1, however, significant intraclass correlations were identified for all six of the outcome measures, indicating that each was statistically clustered within the kindergarten classrooms. Multilevel, random-effects models were therefore estimated, and results are summarized in Table 1. Adjusted for class membership, sex was significantly associated with five of the six outcomes, with girls having the expected lower scores for inattention and externalizing behavior and higher scores for peer relationships, academic competence, and prosocial behavior. (Prosocial behavior is defined as voluntary behavior intended to benefit another child.) SES was related to all six outcome measures, with children of higher SES families showing more positively adaptive behaviors compared with low-SES peers. Classroom social position was also significantly associated with four of the six outcomes, even after adjustment for sex and SES. Subordinate children had more depressive behaviors and inattention, fewer positive peer relationships, and diminished academic competence.

Significant two- and three-way interactions were also identified (Table 1), and because comparable patterns of effects were found across the behavioral outcomes, only those for depression and prosocial behavior are highlighted. Inspection of these interactions yielded three principal findings.

First, as shown in Fig. 1, the influence of social position on prosocial behavior varied by family SES, with moderate levels of such behavior found among dominant children but substantially higher or lower levels among subordinate children of differing SES. The highest levels of prosocial behavior were found among subordinate children from high-SES families and the lowest levels among similarly low-ranking children from low-SES families. Equivalent SES × social position interaction effects, in the reverse direction, were found for inattention and externalizing behavior problems. Inspection of other, significant three-way interactions showed that both sex and teacher learner-centered pedagogical practices (LCPs) further modified and elucidated the rank × SES effects. The high prosocial behavior found among subordinate, high-SES children, for example, was primarily among girls with high-LCP teachers; similarly, the lowest levels of depression were found among subordinate, high-SES girls with high-LCP teachers. Both female sex and teacher LCPs exaggerated the influence of SES on subordinate children.

Second, Fig. 2 displays the significant interaction between social position and LCPs, indicating that the strong influence of

Table 1. Multilevel, random-effects models for spring teacher-reported maladaptive behavior and competencies

Factor	Depression	Inattention	Externalizing	Peer relationships	Academic competence	Prosocial behavior
Intraclass correlation	0.22***	0.08**	0.21***	0.24***	0.11***	0.19***
Fixed effects: coefficients						
Sex	−0.04	−0.28***	−0.10*	0.10*	0.14**	0.25***
SES	−0.11†	−0.24***	−0.31***	0.23***	0.17**	0.13*
Social position (pos)	0.14**	0.13 *	−0.07	−0.14**	−0.15**	−0.03
Classroom culture	−0.02	0.04	−0.02	0.09†	0.07	0.12*
Sex × SES	−0.08	−0.08	−0.05	0.11*	0.01	0.08
Sex × Social pos	−0.02	−0.04	−0.01	0.03	0.06	0
Sex × Class climate	0.05	0.05	0.03	0.01	−0.08	−0.05
SES × Social pos	−0.07	−0.11*	−0.11*	0.05	0.05	0.11*
SES × Class climate	−0.05	0.03	−0.03	−0.01	0.03	0
Social pos × Class climate	−0.12*	0.02	−0.05	0.07	−0.02	0.07
Sex × SES × Social pos	−0.12*	−0.14**	−0.04	0.08	0.05	0.12*
Sex × SES × Class climate	0.07	0.01	0.07	−0.09†	0.04	−0.04
Gender × Social pos × Class climate	−0.17***	−0.12*	−0.11*	0.13**	0.05	0.11*
SES × Social pos × Class climate	0.13**	0.05	0.11*	−0.07	−0.09	0
Classroom random effects parameters: estimates (SE)						
Intercept SD	0.39	0.00	0.16	0.40	0.36	0.44
Residual SD	0.82	0.87	0.84	0.79	0.89	0.81
Wald χ^2	39.0***	75.0***	67.7***	50.6***	30.4**	59.5***

$^{\dagger}P \le 0.10$; *$P \le 0.05$; **$P \le 0.01$; ***$P \le 0.001$.

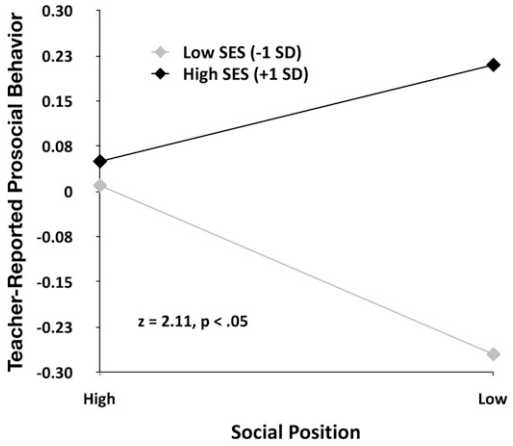

Fig. 1. Prosocial behavior by social position and family SES at 1-SD increments from the mean (−1 and +1 SD).

classroom rank on children's depression in low-LCP classes nearly disappeared among those from classrooms with high-LCP teachers. Within the subset of classrooms in which teacher LCPs averaged a full SD above the mean, the relation between social position and depression was essentially absent. Third, inspection of how sex moderated the effects of rank and LCP on depression showed that girls from low-LCP classrooms had the steepest association between social position and depression, whereas girls from high-LCP classes showed a reverse gradient. Thus, girls in subordinate positions showed the most adverse effects of low LCPs and the greatest protective effects of high-LCP classrooms. Comparable interactions between sex, social position, and classroom climate were found for five of the six adaptive behavioral outcomes. The three highlighted interactions were probed using tests of simple slopes as described by Aiken and West (53), assigning to the tested moderator variable the conditional values of ±2 SD from its mean and using multilevel modeling to adjust for classroom membership. Results confirmed the differences in slope indicated by visual inspection.

Discussion

In his 1962 article, "The Meaning of Poverty," Townsend called attention to the ambiguities inherent in static definitions of poverty, which use such concepts as "prosperity," "equality," and "subsistence" (54). Such definitions, he argued, always fall short of capturing poverty's true meaning in human lives. Poverty should instead be regarded as a dynamic construct, reflective of relative deprivation and based on deficiencies specific to societal expectations. Adam Smith, in *The Wealth of Nations*, published two centuries earlier, invoked human needs for not only "... the commodities which are indispensably necessary for the support of life," but also for those resources that "the custom of the country renders it indecent for creditable people, even of the lowest order, to live without" (55). Townsend's and Smith's attentiveness to the consequences of relative wealth and social ordering anticipated concerns not only for absolute material necessities but also for the steepness of social hierarchies and the perils of occupying degraded and perennially subordinate social positions. Contemporary debate on the causal constituents of socioeconomic disparities in health and development highlights ongoing uncertainty about the relative importance of material vs. psychosocial conditions in the genesis of such disparities (e.g., refs. 28, 38, 39, 56, and 57). Seeking to add a key, early developmental perspective on such uncertainty, the study reported here asked, "Does relative social position, even among small, socioeconomically homologous groups of children, with comparable access to material resources outside the classroom, bear reliable associations with measures of developmental and behavioral well being?"

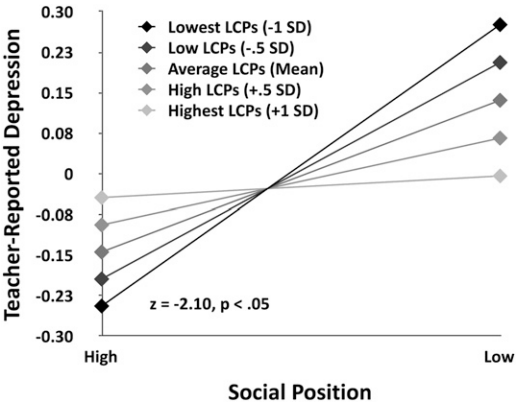

Fig. 2. Depression by social position and learner-centered pedagogical practices at half-SD increments from the mean (−1, −0.5, mean, +0.5, and +1 SD).

Our affirmative answer to that question, which underscores the salience of nonmaterial, inequitable features of proximal social conditions, is based on three core findings. First, dominant and subordinate social positions were apportioned within peer hierarchies without regard for sex or family SES. Girls were as likely as boys to hold dominant (and subordinate) social roles, and placement within the classroom hierarchy was unbiased by family SES. Second, in multilevel analyses controlling for sex, family SES, and classroom, children's dominance positions bore moderate but significant, prospective associations with four of the six teacher-reported outcome measures of adaptive functioning. Children occupying subordinate positions within their classrooms had more depressive symptoms, more frequent episodes of inattention, fewer positive peer relationships, and less evidence of prosocial behavior. Third, a set of significant interactions among predictor variables indicated that children's sex, family SES, and the teacher-guided classroom climate all moderated the association of social position with adaptive child outcomes. Specifically, family SES significantly moderated the relation between rank and prosociality, with subordinate, low-SES children having the lowest levels of prosocial behavior. Further, associations between social position and behavioral endpoints were moderated by teachers' LCPs, with the link between rank and behavior nearly disappearing in classrooms with strong teacher LCPs. In each case, the strongest influence of classroom LCPs in moderating these associations was identified among girls.

The importance of these findings resides not in a powerful accounting for the variance in children's maladaptive, preclinical behavior problems; all reported associations of classroom social position with behavioral endpoints, although unlikely to be ascribable to chance, were limited in potency. Rather, our results' importance lies in their implications for broader questions surrounding the operative dimensions of social stratification in its pervasive linkages to human health, adaptation, and development. If the same graded pattern of morbidity occurs across strata of social rank in both nations and kindergarten classrooms, then surely such patterns converge on common principles to which both might be usefully attributed. More specifically, such a convergence, at levels of human social organization vastly different in size and complexity, suggests that acts of dominance and subordination per se may contribute to the partitioning of health, even after accounting for the known and substantive effects of differences in monetary, proprietary, or professional resources.

The consistency of our findings with those of past research lends added support to their salience for understanding health disparities. In particular, the reported findings are commensurate with past observations on income inequality and social anxiety, the neurobiological substrates of social subordination, and sex differences in the consequences of subordination. In a 20-y body of work pursued by Wilkinson (58–60), for example,

inequalities in wealth and income, as well as the social anxiety and mistrust that such maldistribution of financial resources engenders, have been viewed as "fundamental causes" (61) of social disparities in health and human development. Pellegrini's research documenting hierarchy effects on social cognition suggests pathways by which dominance and subordination might alter or undermine access to such community assets and values (45).

The reported mental health sequelae of subordination also recall the previously described attunement of perceptual–attentional and cognitive neural systems to aspects of hierarchical social relationships (2, 3, 62–64). Gianaros et al. (65) have shown that young adults' perceptions of their parents' low social standing is related to greater amygdalar reactivity to threatening facial expressions. Zink et al. (62) found, in an experimental gaming paradigm, that perceived social status and its stability or instability differentially activated dorsolateral and medial prefrontal cortex and amygdala. Even preverbal human infants have mental representations of social dominance, using relative size to predict the outcome of conflict between agents with opposing goals (66). Other investigators (20, 67–70) have delineated the peripheral neuroendocrine pathways activated in response to interindividual conflict and subordination, especially the corticotropin-releasing hormone system that triggers cortisol expression under conditions of social comparison or social evaluative stress (71, 72).

Last, the equivalent engagements of both sexes in subordination processes found here are also reminiscent of Crick's (73) studies of relational aggression in girls and its instrumentality in asserting dominance and control over peers, in a manner parallel to physically aggressive encounters among boys. Sex differences in social adversity-related neurobiology have also been noted in animals, including opposite effects of stress on memory formation in male vs. female rats (74) and sex differences in the impact of early maternal deprivation on rat hippocampal neurogenesis (75). The sex differences reported here in associations among rank, SES, classroom climate, and adaptive behavior might thus stem in part from the persistent psychological stressors of peer group subordination and sex-linked differences in its neurobiological correlates.

Despite substantial concordance between present findings and those of past research, interpretation of the former should be tempered by awareness of the study's several limitations. First, the study sample constituted only ~60% of children enrolled in target classrooms. The sample was socioeconomically and ethnically diverse and largely representative of the Berkeley population from which it was drawn, but sample households had higher annual incomes compared with the overall community. Second, although ascertainment of the primary independent variable, social position, was temporally antecedent to the measurement of outcomes, the study's prospective design spanned only several months within the latter half of the kindergarten year. The absence of an earlier assessment of social dominance in the first few weeks of school disallowed, for example, an assessment of how dominance relationships may have resorted after the schools' winter break. Further, to whatever extent social position and maladaptive behavior may be causally associated (an inference beyond the scope of the current data), the possibility of reverse causation—that is, behavior influencing the assignment of social positions—or confounding by child-invariant properties cannot be excluded. Third, RAs conducting dominance observations were trained to criterion levels of accuracy and interobserver agreement using videotaped and live observations in a separate, university preschool, but the intrusiveness of using video recordings or concurrent observations within study classrooms disallowed "real-time" assessment of interobserver reliability. Nonetheless, the social hierarchies derived from observation were substantially validated by the reports of children's social positions by teachers and RAs. (The lack of a validating correspondence between observation-based estimates of classroom social position and *child self-reports* may have been attributable to the cognitive difficulty of the task for 5-y-old children.) Fourth, within-classroom variation in SES was constrained by policies and predilections resulting in neighborhood children attending mostly neighborhood schools. We were therefore unable to assess with precision or to our satisfaction whether family SES influenced children's social positions in school. Finally, the present analyses offer little insight into how dominance *strategies* (i.e., what behaviors are used to establish and maintain dominant status) may vary by the egalitarian and learner-centered climate of individual classrooms, an important issue that will be addressed in future reports.

These deficiencies in design and measurement notwithstanding, the reported study produces evidence that adaptive functioning and presyndromal behavior problems in young children are partitioned by peer social rank, in a manner comparable to the broader, societal-level disparities in population health. The study suggests that socioeconomic gradients in health and development are the products of more than simply differences in access to money, material goods, medical care, or nutrition. Rather, the evidence implies that even the stratification of young children's peer groups is implicated in the diverging trajectories of lifelong health. What role early developmental exposures to social stratification play in the emergence or tolerance of societal inequalities in adult life is well beyond the current study's scope. Nonetheless, given the known, powerful influences of childhood experiences on developmental processes, especially those during early critical periods, it is not unreasonable to ask whether nonegalitarian social settings in early life might be linked in some manner to the hierarchical character of adult societies.

Our results further suggest that the health influences of peer subordination and family social class are multiplicative, with the most behaviorally compromised children occupying lower social positions and coming from lower-SES families. Although the formation of hierarchical social organizations is a conserved, perhaps even lawful, propensity of multiple species, including *Homo sapiens*, the severity of such hierarchies and their health consequences are not indelible, immutable legacies of our evolutionary past. Both human societies and kindergarten classrooms can be moved, with intention and effort, from despotic to more equitable and favorable social conditions, as shown here by the moderating influence of teachers' classroom climates on the "virulence" of subordination. Taken together, the observations presented, along with emerging knowledge of the critical developmental susceptibilities of the first 5 y of life, render even more crucial and compelling the provision, in early childhood settings, of more supportive, egalitarian, and generous social environments.

Methods

Kindergarten children from six East San Francisco Bay Area public schools were enrolled in a longitudinal study (the Peers and Wellness Study) of social dominance, responses to adversity, and mental and physical health. The sample comprised 338 children from 29 classrooms, enrolled in three successive cohorts, approximately equal in size, from 2003 to 2005. Study children ranged in age from 4.8 to 6.3 y (mean 5.3 y, SD 0.3 y), included 163 girls and 175 boys, and were of multiple ethnicities (41% white, 18% African American, 10% Asian, 4% Latino, 21% multiple ethnicities, 2% other, and 5% missing ethnicity). Annual household incomes ranged from <$10,000 to >$400,000 (mean $60,000–$79,999). The highest level of educational attainment in study households ranged from less than a high school diploma to advanced degrees, and 75% of caregivers had at least a college degree, a level commensurate with the educational profile of the recruitment communities. The sample's demographic profile was representative of the sociodemographic and ethnic diversity of the Berkeley–Oakland metropolitan area. Forty-five percent of children attended a morning class; 40% attended an afternoon class; and 16% attended full-day kindergarten.

Families were recruited through home mailings, presentations at kindergarten parent welcome nights, and in-person recruitment during school drop-off and pick-up times. Families who were not fluent in either English or Spanish were excluded to ensure adequate comprehension of study questionnaires. The 338 study children represented 59% of kindergartners enrolled in the 29 classrooms. Primary caregivers were 87% biological mothers, 9% biological fathers, 2.5% adoptive mothers, 0.6% biological grandmothers, and 0.9% "other" relations. Schools were awarded $20 per enrolled child; teachers' time for completing study questionnaires was reimbursed at $30 per child; and parents and children were collectively given $100 in gift certificates over the course of the study year. The Committee for the Protection of Human Subjects

at the University of California, Berkeley and the Committee on Human Research at the University of California, San Francisco reviewed and approved the study's design, recruitment plan, and measurement procedures.

Socioeconomic Status. SES was indexed using the sum of standardized scores for parent-reported highest education level (1 = some grade school; 2 = completed grade school; 3 = some high school; 4 = completed high school; 5 = some college or 2-y degree; 6 = 4-y college graduate; 7 = some graduate or professional school; 8 = graduate or professional degree) and household income (1 = <$10,000; 2 = $10,000–14,999; 3 = $15,000–19,999; ... 15 = $400,000–499,999). The SES summary measure ranged from −3.13 to 1.64, with a mean of −0.01 and SD 0.88.

Kindergarten Social Position. Individual dominance positions in kindergarten social hierarchies were ascertained using a modification of Strayer and Trudel's (6) naturalistic behavioral observation method developed for preschool classrooms. Observations were conducted in the winter months (January through March) of the kindergarten year, during structured, semistructured, and free play activities, and social dominance was operationally defined, following the definition first advanced by Schjelderupp-Ebbe (76) and updated by Drews (77), as a pattern of repeated interactions in which the outcome consistently favored the same dyad member. Before observations began, an extensive library of video clips illustrating dyadic and triadic dominance interactions was compiled in a research preschool of the Institute of Human Development, University of California, Berkeley. RAs underwent training in the recognition and scoring of an array of dominance–subordination behaviors, which included object and attention struggles, physical and relational aggression, soliciting instruction or leadership, reprimands, deferential speech, etc. Training comprised formal teaching sessions on the theory, recognition, and measurement of social dominance, onsite co-observation and instruction in the university preschool, and practice scoring within the video library. Scoring involved identifying the initiator and target of the interaction, the behavior, and a judgment regarding which of the children assumed subordinate and dominant roles in the completed interaction. All RAs achieved an accuracy level of >90% with the video library, and interrater agreement for pairs of RAs observing in the university preschool was computed and averaged 87%.

Noldus Observer software (version 5.0) running on Compaq iPAQ Pocket PC computers was used to record dominance interactions. After 1 wk of class habituation to the observer's presence, two female RAs were deployed on alternating days to conduct event and focal sampling over a period of several weeks. Event sampling consisted of scanning classroom behavior for the targeted categories of interactions and recording the noted components. Focal sampling was used later in the observation period, as a means of securing additional observations of children or pairs of children for whom relatively few interactions had been previously recorded. A total of 32,620 lines of observational data were recorded on 9,641 interactions among 577 children in 29 classrooms (~28 observations per child). Data were processed and cleaned by deleting redundant and contradictory lines, those containing no subordination codes, and those in which a teacher intervened. Next, MatMan 1.1 matrix analysis software by Noldus (78) was used to transform dominance–subordination sequences into classroom-specific dominance matrices. Matrices were reordered to fit a linear hierarchical model using an algorithm developed by de Vries (79). Through an iterative process, the algorithm minimizes the number and strength (absolute difference in ranks) of inconsistencies and reorders individuals into a maximally linear rank order. Despite the frequency and intensity of the behavioral observations, no encounters were recorded between some pairs of children in each classroom, and in such cases, relative rank was inferred from the aggregate data using the matrix software.

To validate the assignment of dominance positions, the Batchelder-Bershad-Simpson method, which was derived from an algorithm introduced by Elo (80) and modified for application to animal dominance data by Jameson et al. (81), was used to reanalyze matrix data for each classroom. In addition, the two RAs and teacher in each classroom were asked, at the end of the several-week observation period, to rank children along three dimensions of social dominance—access to resources, popularity, and leadership—and average rankings were computed across dimensions. Finally, children were asked to estimate their own social positions using a child version of the MacArthur ladder (82), which asked participants to place an image of themselves on a drawing of a 10-rung play yard ladder relative to children at the top who "get to be first in line, get other kids to do what he/she wants, get to play with whatever toy she/he wants and usually win games" and children at the bottom with the opposite characteristics.

Classroom Climate. The teacher-engendered classroom climate was assessed using the Assessment of Learner-Centered Practices (ALCP) developed by McCoombs and colleagues (83, 84). The ALCP consists of two scales—one for teachers and the other for children—with three parallel subscales of Positive Relationships, Motivational Support for Learning, and Facilitates Learning and Thinking. Teachers completed a questionnaire version (ALCP-T), and children responded to an interview version (ALCP-C). Because our interest centered on children's perceptions of the child-centered and motivational milieu of each individual classroom, the ALCP-C factor score was used as a measure of children's perceptions of classroom climate. Principal Components Analysis of all six reporter subscales resulted in an ALCP-C factor with loadings of 0.64–0.76.

Adaptive Functioning. Adaptive functioning was assessed during the spring of the kindergarten year, 3 to 4 mo after the winter dominance observations, using a 145-item, teacher-report measure, the MacArthur Health and Behavior Questionnaire-Teacher version [HBQ-T (85)]. Six HBQ-T subscales representative of adaptive development were chosen as dependent measures. First, the Depression subscale of the Internalizing scale and the Externalizing scale were completed as indicators of broad, presyndromal mental health symptoms. The Depression subscale contains six items such as "Feels worthless or inferior" and "Unhappy, sad, or depressed," and the Externalizing scale comprises items such as "Taunts and teases other children" and "Argues a lot with adults." Second, the Inattention subscale of the ADHD Symptoms scale, with six items such as "Distractible, has trouble sticking to any activity," was used to index attentional difficulties. Third, the Peer Relations (11 items, e.g., "Has lots of friends at school") and Prosocial Behavior (20 items, e.g., "Can work easily in a small peer group") scales indexed children's strengths in relating to others. Finally, the Academic Competence subscale of the Academic Functioning scale (five items, e.g., "How would you describe this child's current school performance in reading-related skills?") was used as a measure of the child's school performance. Alpha coefficients for the six teacher-report subscales range from 0.76 to 0.94 (85).

Statistical Analyses. After inspection of the distributions of independent and outcome variables, bivariate associations were examined using Pearson correlation coefficients. Because of the substantial nesting of dependent measures within classroom, multilevel, random-effects modeling (xtmixed in Stata/MP 12.0) procedures were used to evaluate hypothesized relations among sex, SES, kindergarten social position, classroom climate, and teacher-reported adaptive functioning. Where significant two- or three-way interactions were found, interactive effects were probed using Cohen and Cohen's (86) technique of plotting regression equations using 1 SD above and below the mean for each component variable.

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