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Examining Swedish Profit and Nonprofit Child Care: The Relationships between Adult-to-Child Ratio, Age Composition in Child Care Classes, Teaching and Children's Social and Cognitive Achievements

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Because of severe economic cuts in the child care budget in Sweden from 1990 to 1993, a sharp increase in the number of children in child care classes has been observed (Lidholt & Norrman, 1994). Average class sizes have risen throughout the country, although there are great differences between, and even within, communities. In the early 1980s, it was rare to have more than 15 children in a class. In 1993, one third of classes had at least 18 children. Simultaneously with the increase in classes, the number of employees in child care centers decreased. During the 1980s, there were, on average, four children per full-time employee. In 1993, the number of children per full-time employee had increased to as much as six (Lidholt & Norrman, 1994). New laws have also had a significant impact on the Swedish child care system. Until 1991, profit-run child care centers could not, based on Swedish law, receive public funding. The average annual cost for one child in public agencies was about $10,000 US in 1993. The federal government and funding from local authorities subsidized approximately 90% of the cost, with parental fees financing the remaining 10%. This made it impractical to run private child care without public funding. However, after 1991, the local

This study investigated the effects of program auspice (nonprofit vs. profit child care), adult-to-child ratios (1:4.6–1:8.7), and age span of the child care class on teaching and children's social and cognitive achievement. The sample included 394 3- to 5-year-old children from 32 child care centers. Results show that the profit child care centers had larger child groups than nonprofit child care centers, a lower adult:child ratio, and a positive staff attitude toward teaching goals. Age, gender, social background, and age span of the child care class were significant predictors of children's social and cognitive achievements. Adult-to-child ratio and teaching style did not prove to be good predictors of children's social or cognitive achievements.

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authorities were authorized to help fund private child care. In Stockholm, for instance, private nonprofit and profit child care centers receive approximately the same subsidies as public centers, provided the centers comply with specified quality-related parameters (e.g., the hiring of trained teachers, yearly evaluation and planning, accessibility for disabled and at-risk children). Nonprofit private child care in Stockholm has doubled between 1991 and 1994, leaving 16% of all children attending child care in private nonprofit centers and 5% in profit child care. Thus, the transformations that occurred in the beginning of the 1990s within the Swedish child care system make a naturalistic experiment feasible. The main purpose of this study is to examine the potential effects of adult:child ratio and profit child care on teaching and children's social and cognitive achievements.

According to Kagan (1991), a nonprofit organization, such as public child care, is unlikely to exploit the consumer (the parents) because it cannot distribute profit to those who control the organization. Conversely, in a profit-oriented organization, such as profit child care, in which parents cannot directly evaluate the quality of the services the children actually receive and the children are not qualified to evaluate the services themselves, there are motivation and legal sanctions to promote increased profit. Accordingly, profit firms are more likely to cut costs and reduce quality. Based on this reasoning, nonprofit child care centers are likely to be superior in quality relative to profit child care centers. Research does not consistently verify this assumption, however (Cost, Quality & Child Outcome Study Team, 1995; Kagan, 1991; Penn, 1995). Although profit child care centers have been characterized by lower adult:child ratios, they generally have a better-trained staff (Kagan, 1991; Penn, 1995). Group size and the quality of the environment (including quality of interactions between staff and children) are not clearly related to type of child care program (Cost, Quality & Child Outcome Study Team, 1995; Kagan, 1991; Penn, 1995).

Adult:child ratio is considered by policy researchers, regulation authorities, and lay persons to influence child care quality and children's development. Statistically reliable relationships have been moderately positive in some studies (e.g., Clarke-Stewart, Gruber, & Fitzgerald, 1994; Cost, Quality & Child Outcome Study Team, 1995; Holloway & Reichart-Erickson, 1988; Howes, Phillips, & Whitebook, 1992; Howes, Rodning, Galluzzo, & Myers, 1988), whereas others (e.g., Broberg, Hwang, Lamb, & Ketterlinus, 1989; Deater-Deckard, Pinkerton, & Scarr, 1996; Palmérus & Hägglund, 1987; Russel, 1990; Scarr, Eisenberg, & Deater-Deckard, 1994) have failed to support the notion of higher child care quality in cases with higher adult:child ratios. Such contradictory findings suggest the importance of other predictors of child care quality. For instance, a strong consensus among teachers and their aides involves the idea that educational goals and the means to accomplish these goals could compensate for a decreased adult:child ratio. This interpretation is consistent with the findings of Russel (1990) and Palmérus and Hägglund (1987). Variation in teacher education and experience are also likely relevant in explaining child care quality (Clarke-Stewart et al., 1994). Another possibility is that the relationship between child care quality and adult:child ratio is nonlinear. In this respect, differences in the adult:child ratio have a negligible effect beyond a certain ratio (e.g., 7 children or more per

adult), but at lower ratios (e.g., 4–6 children per adult) are more likely to affect children's development. Because studies concerned with adult:child ratios have typically investigated the effects of differences between ratios of 1:7 or lower, clear, positive effects might not emerge until comparisons include both low and high ratios.

Research on child care teaching provides only limited answers to questions of what constitutes high-quality teaching (McCartney & Jordan, 1991; Scarr & Eisenberg, 1993; Stipek, Feiler, Daniels, & Milburn, 1995). Traditionally, child care practice in Sweden has been child centered, with a large proportion of staff time devoted to child-initiated activities and indirect teaching, i.e., teaching is embedded in meaningful activities or connected to the child's everyday experiences (Pearson & Leys, 1985). The aims of child care practice are to provide both care and educational stimulation. The stimulation of socioemotional development has been considered a critical factor. Most child care centers, regardless of teaching style, usually allow the children to play freely throughout a large part of the day (Ekholm & Hedin, 1991; Sundell, 1988, 1994a). Explicit programs seldom regulate the instructional settings. Rather, teaching is characterized by few fixed goals, few teacher-led activities, and ample time for free exploration or free play (Ekholm & Hedin, 1991; Sundell, 1988, 1994a). It is rare that the teaching activities are organized in school-related subjects (e.g., geography, arithmetic, reading, and writing). However, there are examples of child care centers that use a more direct teaching method (Sundell, 1988, 1994a), in which the content is determined by the teachers themselves and the aim of the activities is to realize teacher goals. This demands planned, goal-directed, and teacher-led activities, activities that emphasize explicit skill teaching and a gradual transfer of responsibility for learning from the teacher to the pupil (Pearson & Leys, 1985). Swedish studies (Ekholm & Hedin, 1991; Sundell, 1988, 1994a) on children's social and cognitive achievements in child care also confirm the use of the dimension indirect versus direct teaching. In the present study, teaching was measured according to the degree of indirect versus direct teaching.

One unique aspect of the Swedish child care system is the formation of age-mixed classes. Only 6% of all classes have same-aged children (Statistics Sweden, 1994). In 51%, the age span between the youngest and the oldest child is 3 years at most; in 43%, the age span is larger (e.g., children between 1 and 5 years of age). The recommendation of mixed-age as opposed to same-age classes rests on the principle that young children have a natural propensity for social interaction. The wider age span, therefore, is assumed to increase the mixed-age interaction among the children, which, in turn, is assumed to promote children's socioemotional and intellectual development (Swedish Government Official Reports, 1981). The presumed advantages with a mixed-age class are (a) it provides greater opportunities of cooperation and consideration among its members, (b) the number of conflicts is reduced, (c) it is natural for older children to help younger ones, and (d) younger children learn from older ones (e.g., on how to resolve conflicts). Swedish research, however, has not confirmed any of these assumptions. According to a review of the comparative Swedish research on the age composition in nursery and compulsory schools (Sundell, 1994b), a large age span

is likely to be detrimental to children's speech and cognitive development but inconclusive when it comes to children's social development.

Child care research has typically evaluated children's cognitive development using intelligence and verbal ability tests. Furthermore, it has addressed the issue of social development using ratings of sociability, compliance, and self-regulation (Clarke-Stewart et al., 1994). However, the bulk of research has relied heavily on single sources of measurement that might result in a serious measurement problem regarding children's social competencies (cf. Bierman, Smoot, & Aumiller, 1993; Coie & Dodge, 1988). Whereas peers probably have the best opportunities to comment on different aspects of social behavior, young children's perceptions might be biased and undifferentiated. Teachers are likely to provide more differentiated ratings, but they might not have access to the variety of social contexts in which important peer interactions occur and they could be influenced by the impressions made by children in classroom settings. Direct observation provides an objective measure of children's peer interaction. However, some important social behaviors probably occur with relatively low frequency and are thus difficult to assess in the restricted times and settings sampled by observations. Given the strengths and weaknesses of each measurement technique, the use of multiple measures (peer ratings, teacher ratings, and behavioral observations) provides a more reliable basis for interpretation in comparison with the use of one method alone.

Although research provides a tentative foundation for hypotheses concerning the relationship between type of child care (profit or nonprofit), adult:child ratio, age span in the child care class, teaching, and children's development, no particular study has included comparisons that encompass all of the above elements. The present study, therefore, examined how adult:child ratio, age composition of child group, and teaching were related to children's achievements in non-experimental, profit, and nonprofit child care. The child variables assessed included verbal abilities, intelligence, and social competence.

METHOD

Setting

Thirty-two child care centers (16 profit and 16 nonprofit), all located in Stockholm, participated in the study. Of the nonprofit centers, eight were public and eight were private; the latter are operated by parent cooperatives. Of the profit centers, eight were run by the same company on a franchise basis, and eight were smaller companies consisting of one or two centers and owned by the center's director. All directors, except for three, were trained child care center teachers and, on average, had worked 7 years as nursery school teachers. Two of the directors, without nursery school education, worked in private nonprofit child care centers and one in a public child care center. All 16 directors in the profit child care centers had worked earlier in public child care. They based their decision to

start a profit child care center primarily on the idea that there is greater opportunity to realize instructional visions. No one mentioned the prospect of becoming rich or of earning more money as an important motive. Separate analyses (Sundell & Ståhle, 1996) revealed that none of the companies had made a significant profit during the assessment years 1994 and 1995. The public centers recruited their children through a general queue, whereas the private child care centers used their own queuing system.

The child care centers were selected to include the entire range of socioeconomic groups in the city. For each public center recruited, three private centers (one nonprofit and two profit) were recruited from the same neighborhood. The centers were located in diverse social housing areas. The frequency of residents living on social welfare benefits varied from 0.4% to 14.6% of the adults (M = 4.5%, SD = 3.5%); the frequency of apartment rentals varied from 0% to 68% (M = 17.9%, SD = 19.6%); the frequency of skilled and unskilled workers varied from 44% to 77% (M = 60.6%, SD = 9.6%); and the frequency of immigrants varied from 2% to 23% (M = 8.1%, SD = 5.4%). The four measures of socioeconomic status (SES) of the housing area were standardized using z-scores and then summed to yield a SES index. Internal consistency of the subscores of the SES index was assessed by computing an alpha coefficient (Cronbach, 1951). An alpha coefficient of .90 was observed, which compares well with generally accepted standards of reliability (De Vellis, 1991). The nonprofit and profit nursery schools did not differ significantly according to the neighborhood SES (M = 0.00), $F(1/31) = 0.15$.

In addition to location, the only restrictions in recruitment were that the child care centers contain two or three child classes and that they had been in operation for at least one year at the time of the study. The reason for the restriction of the sample to only two or three child care classes was that child care centers run by parent cooperatives in Stockholm consisted of no more than three classes and there were no profit centers consisting of only one class. From each center, one class was randomly selected to be included in the study.

Subjects

From the 32 classes all 436 Swedish-speaking children between 3 and 5 years of age and their parents were asked to participate in the study. The refusal rate was only 1%. Thirty-one children did not participate because of illness. Thus, the final study group was composed of 394 (90%) of the original sample of children (106 in public, 79 in private nonprofit, and 209 in private profit child care centers). On the first visit, 117 children were in the age range 36 to 47 months, 142 were from 48 to 59 months, and 135 were from 60 to 71 months. The group was made up of 47% boys, 12% were immigrants, 21% belonged to working-class families, 26% belonged to the middle-class, and 53% were from professional families in which one or both parents had professional or executive positions and graduate training.

Procedure

The classes were visited twice, once in the autumn and then five months later in the spring. For economic reasons, data collection was spread over a two-year period: 24 classes were visited in the autumn of 1993 and in the spring of 1994; 8 were visited in the autumn of 1994 and in the spring of 1995. By repeating the assessment of child development outcomes on two separate occasions during the study, it was possible to look for relations that were replicated across time. There was no significant difference ($p > .05$) between the 24 classes initially studied and the 8 studied one year later.

The observers were graduate students in either psychology or pedagogy, had considerable experience working with children, and had extensive training in the testing procedures. The tests and interviews were administered individually in a separate room at the centers. The tests took between 30 and 40 minutes per child. In addition to the tests and interviews, teachers and aides were asked to rate each child on four behavioral dimensions. All parents were asked to give their opinion of the center, specify their involvement in the daily work of the school, distinguish their social and occupational background, identify their social network, and describe their child's earlier care arrangements. Children's free-play behavior was observed on several occasions. In addition, the observers studied the frequency of instructional, caregiving, and free activities during each assessment period of one week.

Child Assessments

Cognitive Achievement. Colored progressive matrices are considered well suited for use with young children because of their nonverbal attribute (Raven, Court, & Raven, 1995). This frequently used test has been reported to yield data of high reliability with children as young as four years old and is capable of measuring a person's intellectual output in a rather pure factorial sense (Raven, Court, & Raven, 1995).

Verbal Abilities. Children's verbal abilities were evaluated by two subtests. The first, a vocabulary test (Ljungblad, 1989), is similar to the Peabody Picture Vocabulary Test. The test includes 24 items, with each item consisting of four pictures, of which one corresponds to the item measured. Each item was read out loud to the child and the child was then asked to index the corresponding picture. According to Ljungblad (1989), the reliability (split/half) of the test is .74. The second test measures children's capacity to report a story to a doll that they themselves had heard earlier, using pictures of the main characters in the story as a guide. The latter was used to minimize differential memory effects in children. The procedure and stimulus material are similar to those used previously (e.g., Feagans & Farran, 1981, 1994). Each story contained 19 information units with three action sequences. These information units were noun and verb phrases that were essential elements of the story. For instance, the actors in the story were information units and each unique action by the actors was an information unit. Redundant information that occurred throughout the story was not considered a

new information unit. The children's responses were (audio) taped, transcribed, and rated separately for level of production. Two different stories were used. If a child heard the first story in the autumn, then the second was used in the spring. The number of information units was the primary measure of accuracy of the paraphrase. Separate analyses of two random subsamples of the children revealed no significant differences between the two stories regarding the number of paraphrased information units: in the autumn, F (1/295) = 0.16 and in the spring, F (1/150) = 0.25. Both verbal ability tests have been found to differentiate between children as young as 3 years of age (Sundell, 1994a).

Social Skills. Children's social skills were assessed using three types of data. The first type of data, *peer nominations*, was registered through interviews. The children were asked to name, from a photo of all the children in the group, three peers that they liked most to play with and three that they liked least. The number of times a child was named by his or her peers was calculated for each child. The average number of liked-most nominations was 2.14 (SD = 1.65) in the autumn and 2.12 (SD = 1.68) in the spring; the average number of liked-least nominations was 1.38 (SD = 1.71) in the autumn and 1.58 (SD = 1.87) in the spring. These scores were standardized (z-score) by center and used as the dependent variable in subsequent analyses. This approach was chosen after first using the standardized scores according to Coie and Dodge's (1983) standard sociometric classification (i.e., popular, rejected, neglected, controversial, and average). However, because preliminary analyses revealed low agreement in the classification between fall and spring ($0.06 < \phi < 0.30$), the approach was eventually abandoned.

The second type of data, *behavior ratings*, was attained through the teachers. Each child was rated according to its cooperative and fighting behavior. These dimensions are strongly related to children's peer relations in kindergarten and elementary school (Newcombe, Bukowski, & Pattee, 1993). Cooperative refers to someone who is agreeable, cooperative, and gives everyone a turn. The fighting dimension refers to children who have the tendency to initiate fights and arguments and whose general behavior is characterized by ill will. On both dimensions, teachers rated the child on a five-point scale (1 = not at all characteristic of the child to 5 = very characteristic of the child).

The third type of data was *behavior observations*. For each observational period, the observer coded the social behavior samples of the child with peers or staff during free play. Within an observational period, each child was observed 10 times, with each sample lasting 15 seconds. The time samples were spaced evenly throughout the observational period; i.e., the child's behavior was coded approximately twice a day. For each observational unit, the observer recorded the incidence of any of 22 discrete behaviors or states (coded as present or absent within each interval), using a coding taxonomy from Lamb, Hwang, Bookstein, Broberg, Hult, & Frodi (1988). Interobserver agreement, assessed by correlating the scores reported by independent observers, was satisfactory ($rs > .80$). Following Lamb et al. (1988), two composite variables were derived from the behavioral observations. These included positive peer-related behaviors (the sum of the observed indices of *initiate play*, *imitate*, *touch*, *proffer*, *accept*, and

laugh/smile) and negative peer-directed behaviors (the composite total for *threats, reject bid, take toys away from others, strike/hit,* and *cry*).

The means, standard deviations, and Pearson's correlation coefficients for the child assessment variables are depicted in Table 1. While most of the test-retest correlations are comparatively high ($rs > .50$), indicating that the data are reliable, practically all of the intercorrelations between the variables ranged from modest to moderate, which would argue against the reduction of child assessment variables through composite variables. Thus, nine child assessment variables comprised the final data-analytic set.

Predictors

To explain children's development 21 predictors were used. The predictors, based on the results of Swedish investigations, had been found to be positively related to children's social and cognitive-linguistic development (e.g., Ekholm & Hedin, 1991; Lamb et al., 1988; Sundell, 1988, 1994a).

Family Background. The child's family background was measured by six variables: parents' socioeconomic status (using a taxonomy developed by Statistics Sweden, 1982), family type (one- or two-parent families), cultural background (immigrant or non-immigrant), and social support system, as described by the parents (i.e., if the parents reported that people outside of the extended family [e.g., social worker and child care center teacher] were significant in the upbringing of their child). Additional to these variables were the child's age and gender.

Enrollment. By mapping each child's child care experience through the preschool period, four enrollment variables were obtained: age at first entry into child-care (outside of own family), number of different child-care arrangements (family child care, center care, relative, etc.), length of child care, and hours spent each day in child care.

Child Group. The total number of children in the class was registered, as was the age composition of the class (the number of children younger than 3 years of age and the age span in months between the youngest and the oldest child in the class).

Adult-to-Child Ratio. Data for personnel and children were collected on a monthly basis but are aggregated over a period of one year (from July to June). The number of half- and full-time employed staff was transformed into number of full-time staff. In the parent cooperatives, the parents' normal work time (e.g., cleaning and cooking at the center) was included in the staff data. On average, the adult:child ratio was 6.3 children per full-time employee, with 4.6 as the lowest and 8.7 children as the highest value per full-time employee.

Mixed-Age Interaction. The children's mixed-age interaction was registered using two measures. The first was obtained through systematic observations. Each child was observed on 10 occasions in the autumn and 10 in the spring. The average age difference in months between the child and his or her playmates was then calculated. The second measure was obtained using the peer nominations.

Table 1. Correlations Among the Nine Child Assessment Variables ($N = 394$)

	1	2	3	4	5	6	7	8	9	*M*	*SD*
1 Colored progressive matrices	**0.52**	0.52	0.39	0.01	−0.04	0.06	0.01	0.18	0.11	8.04	5.86
2 Vocabulary	0.43	**0.64**	0.46	0.02	−0.13	0.06	0.00	0.14	0.08	14.19	4.46
3 Capacity to report	0.35	0.48	**0.51**	0.05	−0.16	0.13	0.01	0.20	0.04	30.33	18.00
4 Positive peer-directed behavior	0.01	0.09	0.07	**0.23**	0.08	0.11	0.01	0.00	0.03	77.59	27.64
5 Negative peer-directed behavior	−0.08	−0.04	−0.07	0.17	**0.05**	−0.09	0.09	−0.21	0.22	4.77	9.50
6 Positive sociometric nominations	0.16	0.16	0.14	0.12	0.00	**0.35**	−0.09	0.24	−0.12	2.14	1.65
7 Negative sociometric nominations	0.01	0.05	0.02	0.03	0.08	−0.07	**0.40**	−0.18	0.41	1.38	1.71
8 Sociability (teacher ratings)	0.18	0.22	0.17	0.16	−0.11	0.24	−0.21	**0.55**	−0.54	3.84	1.03
9 Aggression (teacher ratings)	−0.00	−0.02	0.02	0.03	0.14	−0.04	0.36	−0.59	**0.72**	1.95	1.02
M	5.37	12.90	21.98	59.39	3.40	2.12	1.58	3.80	2.02		
SD	4.71	4.50	15.49	34.83	8.81	1.68	1.87	1.05	1.12		

Note: Coefficients below the diagonal represent associations in the autumn. Coefficients above the diagonal represent associations in the spring and coefficients on the diagonal represent test-retest correlations between fall and spring.

The average age difference in months of each child's positive sociometric nominations was calculated, with low values indicating infrequent mixed-aged interactions and high values indicating frequent interactions. The test-retest correlations between autumn and spring were .32 for the observed age difference of the playmates and .49 for the age difference of the positive peer nominations (both $ps < .0001$).

Teaching. Teaching style was indexed by five measures:

1. The staff completed a questionnaire about the goals that were pursued. A direct style of teaching was assumed when the staff gave priority to a number of school-related goals (e.g., teaching the letters of the alphabet) ($M = 1.3$, $SD = 1.4$).
2. The teaching style was observed for a one-week period. The number of hours per week for all planned, teacher-led activities were then summed. Direct style of teaching was assumed when there was a higher frequency of teacher-led activities in which the staff informed or explained things to the children ($M = 11.6\%$, $SD = 4.0$).
3. The observations were also used to determine whether the planned teacher-led activities actually occurred. A larger number of realized planned activities are presumed to indicate a direct style of teaching ($M = 5.9$, $SD = 1.8$).
4. The peer skill observations also contained nine discrete behaviors about the teacher's interaction with the child. In the autumn and in the spring 3,634 and 3,273 observations, respectively, of free play were recorded. From the behavioral observations, a composite variable was derived comprising the sum of the observed indices of teacher verbal and visual teaching. Direct style of teaching was assumed when the teachers had to frequently instruct the child during play ($M = 2.7\%$, $SD = 1.9$).
5. At both observation periods, the behavior of the teachers was also observed for one routine activity (e.g., children dressing before going out to the playground), coding the incidence of any of 12 discrete behaviors. Each teacher was observed from 10 to 20 times during the observation periods, yielding a total of 1,230 observations in the autumn and 2,143 in the spring. From these observations, a composite variable was derived consisting of the sum of the observed indices of verbal and visual teaching. Direct style of teaching was assumed when the teachers had to frequently instruct the children ($M = 28.1\%$, $SD = 10.9$).

The individual behaviors for each of the five teaching measures were converted to *z*-scores and then combined to yield one teaching index for the autumn ($\alpha = .71$) and one for the spring ($\alpha = .66$), with a test-retest reliability of .45 ($N = 32$, $p < .001$).

Consensus Among Staff in Relation to Teaching. Each staff member rated the consensus among staff concerning teaching practice, using a five-point scale (from 1 = staff agrees on all important matters to 5 = staff disagrees on all

important matters). The average rating of the staff was calculated and used as a measure of teaching consensus.

The means, standard deviations, and correlations for the 21 predictors are given in Table 2. Most of the correlations between the variables were modest to moderate, indicating their inclusion in the analyses (Cohen & Cohen, 1975). The relationship between some of the predictors, however, was high, suggesting the need for a reduction of predictors for the final analyses. Of particular importance are the high correlations between the child's age and the length of child care and between profit child care and adult:child ratio and consensus among staff about teaching.

RESULTS

The results are divided into three sections. First, the nonprofit and profit child care centers are compared on pre-selection factors, as well as regulatable (e.g., ratio of staff to children) and process-oriented (e.g., instructional style) variables of child care quality. Second, a possible main effect of profit child care center was assessed using repeated-measures analyses of variance (ANOVA) with child care center (nonprofit vs. profit) as a between factor. Third, the cumulative effects of the child's age, gender, family background, and child care quality are reported.

Pre-Selection Factors and Regulatable and Process-Oriented Variables

In the nonprofit child care centers there were more parents with professional class status (61%) compared to the profit child care centers (48%), χ^2 (1) = 7.18, $p < .01$. The children in the nonprofit child care centers were somewhat older (M = 54.5 months) than in the profit centers (M = 52.3 months), F (1/392) = 4.95, $p < .05$. The analyses did not reveal any significant differences between the profit and nonprofit sectors with respect to the rate of boys in the classes, χ^2 (1) = 3.61, immigrant families, χ^2 (1) = 0.83, or two-parent families, χ^2 (1) = 1.44 (all ps > 05).

Table 3 illustrates that the profit centers differed from the nonprofit centers in three main respects: the former had larger child groups, larger adult:child ratios, and a staff that agreed more fully with the instructional focus of the center. No significant differences were found, however, in teaching style, age composition of the class, and number of trained staff.

Group Effects

In Table 4, the means and standard deviations of all the child assessment variables are presented as a function of program auspice and time of measurement. The 2 (group) × 2 (time) ANOVAS revealed group differences in only one variable, namely that children in profit child care classes were more cooperative than children in nonprofit classes, $F(1, 392) = 4.50$, $p < .05$. For four of the variables there were time differences, indicating an increase in mean scores from autumn to spring: colored progressive matrices, $F(1, 392) = 56.91$, $p < .0001$;

Table 2. Correlations Among the 21 Predictors ($N = 394$)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	*M*	*SD*
1 Child's age	1.0																					53.61	9.82
2 Child's sex	.13	1.0																				0.49	0.50
3 Immigrant family	−.03	.15	1.0																			0.12	0.39
4 Family type	−.09	−.10	−.03	1.0																		0.93	0.30
5 SES	−.06	−.00	.08	−.36	1.0																	1.62	0.76
6 Formal network important	.05	.11	.09	.01	.01	1.0																0.28	0.45
7 Number of child-care arrangements	.07	.04	.03	.14	−.11	.00	1.0															2.45	0.72
8 Length of child care	.43	−.03	−.11	−.13	−.00	.01	−.16	1.0														22.52	14.31
9 Hours spent each day in child care	.09	−.05	−.02	.01	−.03	.02	−.05	.06	1.0													0.93	0.15
10 Age at first entry into child care	.30	.10	.05	.05	−.03	−.01	.24	−.75	−.00	1.0												31.10	13.93
11 Age span in class	−.13	.00	.06	−.11	.07	−.02	−.08	.00	−.04	−.09	1.0											37.03	11.50
12 Number of children less than 3 years old	−.03	−.12	−.00	−.03	.01	−.17	−.08	.10	−.01	−.14	.46	1.0										2.95	2.59
13 Age-difference to playmates in games	.01	−.01	.00	.02	−.09	.05	−.04	−.06	−.04	.07	.10	.05	1.0									6.30	5.11
14 Age-difference to positive nominated mates	−.16	−.02	.01	.02	.06	.00	−.12	−.04	−.08	−.07	.15	.02	.35	1.0								6.50	6.20
15 Number of teachers among staff	−.04	−.03	.01	.07	.04	−.02	.11	−.03	−.08	.00	.14	.05	−.07	−.01	1.0							1.32	0.96
16 Staff work experience	.09	.09	.00	.09	−.06	.16	.02	.03	.00	.03	−.21	−.42	−.05	−.05	.05	1.0						10.67	4.15
17 Teaching index	.02	.06	.02	.00	−.17	.12	.06	.05	.01	−.03	−.17	−.28	−.00	−.00	−.08	.55	1.0					0.00	2.88
18 Consensus among staff about teaching	.07	−.04	.00	.11	−.00	−.07	.19	−.02	−.12	.08	.24	.11	.04	.06	.00	.11	−.20	1.0				2.09	0.54
19 Group size	−.13	.00	.02	−.06	.05	−.03	.23	−.15	.00	.06	.04	−.19	.07	.05	.12	−.23	−.05	.30	1.0			17.51	2.63
20 Staff-child ratio	−.05	.01	−.05	.13	.05	−.05	.22	−.05	.10	−.22	−.20	−.28	.01	−.01	.10	.07	.05	−.65	.67	1.0		0.16	0.03
21 Profit child care	−.11	−.09	−.04	−.06	.16	−.08	.11	.05	.00	−.13	−.08	−.04	−.01	−.12	.32	.15	−.08	−.47	.54	.53	1.0	0.53	0.50

Table 3. Regulatable and Process Child Care Variables as a Function of Child Care Center ($N = 32$ centers)

	Nonprofit		Profit		
	M	*SD*	*M*	*SD*	*F*(1/30)
Hours opened/day	10.12	0.68	10.51	0.53	3.88
Space (m^2/child)	11.81	2.14	11.10	1.86	0.91
Size of class	16.00	2.36	19.02	1.94	15.92**
Children <3 years	3.53	2.58	2.84	2.64	0.43
Age span (months)	36.81	11.72	36.43	11.70	0.04
Staff-child ratio	0.18	0.02	0.15	0.02	14.58**
Staff	2.81	0.39	2.83	0.32	0.01
Nursery school teachers	1.06	0.77	1.62	0.96	3.35
Assistant teachers	1.27	0.80	0.70	1.09	1.13
Non-trained staff	0.40	0.62	0.51	0.81	0.06
Staff's work experience (years)	11.10	5.26	9.84	3.42	0.67
Instructional style	0.21	3.46	−0.21	4.17	0.10
Staff consensus	3.69	0.94	2.71	1.05	7.69*

Notes: *$p < .01$
**$p < .001$

vocabulary, $F(1, 392) = 43.17$, $p < .0001$; capacity to report, $F(1, 392) = 57.48$, $p < .0001$; and negative peer-directed behavior, $F(1, 392) = 5.10$, $p < .05$. The 2 (group) × 2 (time) ANOVAS for two of the social skill measures revealed that children in the profit child care classes decreased their fighting behavior from autumn to spring while children in nonprofit child care classes proved to be stable in this rating, $F(1, 392) = 4.04$, $p < .05$. In addition, children in the profit child care classes increased their positive peer-directed behavior from autumn to spring; children in nonprofit child care classes showed no change in their observed behaviors, $F(1, 392) = 68.59$, $p < .0001$.

Group status was not a major determinant of individual differences among children, and so was excluded from subsequent analyses. Consequently, attention was focused on identifying important predictors of individual differences.

Cumulative Effects

Multiple regression analyses with forced entry were conducted to examine the combined and independent contributions of the child's age, gender, and family background from the regulatable child care quality variables on children's achievements. This method is suitable for analyzing the collective and separate effects of two or more independent variables on a dependent variable (Pedhazur, 1982). Because some of the conceptually similar variables are highly correlated (e.g., group size and adult:child ratio), only one of these variables was selected to represent both variables. Representative variables were favored over combining variables into composites because the former seemed to represent the data more

Table 4. Means and Standard Deviations of Scores on Child Assessment Variables as a Function of Group and Time of Measurement ($N = 494$)

	Nonprofit		Profit	
	Autumn	**Spring**	**Autumn**	**Spring**
Colored Progressive Matrices				
M	5.49	8.00	5.26	8.08
SD	4.97	6.26	4.46	5.60
Vocabulary				
M	13.00	14.28	12.80	14.12
SD	4.73	4.99	4.29	4.03
Capacity to report				
M	23.88	34.78	22.06	29.22
SD	16.50	28.11	14.45	18.65
Positive sociometric nominations				
M	0.04	0.21	0.04	0.10
SD	1.53	0.97	0.94	0.98
Negative sociometric nominations				
M	0.02	0.09	0.00	−0.03
SD	0.96	1.00	0.96	1.06
Cooperates				
M	3.73	3.75	3.91	3.93
SD	1.04	1.10	1.04	0.96
Fights				
M	1.97	1.99	2.05	1.87
SD	1.03	1.00	1.19	1.03
Positive peer-directed behavior				
M	69.83	69.42	44.19	85.90
SD	28.90	29.45	36.81	22.98
Negative peer-directed behavior				
M	3.80	4.65	2.36	4.90
SD	8.17	9.00	9.38	9.93

precisely. In some cases, conceptually different variables were highly correlated, which would make them unfit to include into the equation. Therefore, adult:child ratio was preferred to staff consensus about teaching style. After reducing the number of predictor variables, 14 variables remained. The correlations among these 14 predictors never exceeded $\pm$ .36 ($N = 394$).

The contribution of the child's age and gender, together with the child's family background, was entered into the first equation. This conservative approach was used to remove the maximum variance attributed to differences in children's family background before examining the influence of length of enrollment and child care. Variables associated with the child's enrollment to out-of-home care were added in the second equation. In the third equation, regulatable and process-oriented components of child care quality were added. These models were computed separately for each assessment period and child assessment variable. In

Tables 5 and 6, the standardized regression coefficients (i.e., betas) and R^2s are listed. Numbers printed in bold represent changes in variance explained (ΔR^2).

The first equation, including the child's age, gender, and social background, accounted for between 19% and 40% of the variance of the cognitive and verbal measures in the autumn and for 27% to 52% in the spring. The same variables accounted for between 2% and 15% of the variance with respect to the social measures in the autumn and between 4% and 20% in the spring. The overall multiple R^2s in these regression analyses were all significant, except that concerning negative peer-directed behaviors in the autumn. Children's age was the most important predictor in association with the assessment variables. The significant models indicated that cognitive, verbal, and social achievements were higher in older children, regardless of assessment period. In addition to being rated as more belligerent and less cooperative, boys received more nominations that were negative on both assessment occasions. Immigrant children showed less positive peer-directed behaviors, regardless of assessment occasion, but were also rated high on cooperative and low on fighting behaviors in the spring. Immigrant children's vocabulary was lower in the autumn. Children from single-parent families were generally found to be less socially involved, received negative nominations more frequently, and performed poorer on the cognitive and vocabulary tests. When the parents had reported the importance of people outside the extended family in the fostering of their child, the child showed better verbal abilities in both the autumn and spring but was rated less sociable in the spring.

In the second equation, the variables associated with enrollment were added, which significantly increased the variance accounted for in two of the nine dependent measures in the autumn and in four of the nine measures in the spring. Different child care arrangements do not seem to impede child development. A variety of arrangements were associated with better vocabulary and positive peer-directed behaviors at both assessments and higher cognitive scores in the spring. The result of many hours spent each day in child care proved more complex. A greater number of hours in child care tended to increase the positive peer-directed behaviors and positive sociometric nominations, but also increased the negative peer-directed behaviors at both assessments. An early age at first entry out-of-home care seems to have largely positive consequences. This variable accounted for better cognitive achievement at both assessments and a better vocabulary in the spring; however, it also accounted for more fighting and less positive peer-directed behaviors in the spring.

The final equation constituted the five regulatable and process-oriented child care variables. As shown in Table 5, these variables provided a significant increase in the adjusted R^2 for three of nine dependent indicators in the autumn. In contrast to the second equation, the variance significantly increased in eight of nine dependent indicators in the spring assessment (Table 6). Thus, controlling for age, gender, family background, different enrollment variables, and regulatable and process child care variables all proved important for children's cognitive and social performance.

The major reason for the increase could be linked to age span. In classes with a larger age span, children's verbal and cognitive achievements were lower, the

Table 5. Hierarchical Regression of Children's Cognitive, Language and Social Assessments for Age, Gender, Family Background, Enrollment Variables, and Child Care Variables in the Autumn ($N = 394$)

	CPM[e]	Voc	Report	PosNom	NegNom	Coop	Aggr	PosObs	NegObs
I. Age, gender, and family background:									
1. Child's age	.40****	.57****	.35****	.24****	.15**	.22****	−.01	.14**	−.06
2. Child's sex	.03	.06	.04	−.17***	.26****	−.18***	.34****	.07	.08
3. Immigrant family	.08	−.15***	.05	.05	.11*	.03	−.02	−.11*	.01
4. Family type	−.07	−.01	−.18***	.01	.12*	.04	.02	.22****	.10*
5. SES	−.08	−.08	.17***	.05	.00	−.01	.06	.07	.04
6. Formal network important	.08	.10**	.14**	−.08	.21****	−.02	.08	−.09	.01
R^2	.19****	.40****	.22****	.09****	.15****	.08****	.13****	.08****	.02
II. Enrollment variables:									
1. Number of child care arrangements	.01	.14**	−.03	−.04	.01	−.02	.07	.17***	.04
2. Hours spent each day in child care	.00	−.04	−.02	.11*	.01	−.02	.10*	.05	.13*
3. Age at first entry into child care	−.10*	−.04	−.02	.05	−.07	−.08	−.03	−.07	.02
R^2	.20****	.42****	.22****	.10****	.15****	.08****	.15****	.12****	.04**
ΔR^2	**.01**	**.02**	**.00**	**.01**	**.00**	**.00**	**.02**	**.04*****	**.02***
III. Child care variables:									
1. Age span in class	.04	−.09*	−.12*	.09	.10*	.08	−.07	−.03	.11*
2. Observed age difference to play mates	.06	.00	.17***	−.08	−.07	.00	−.02	−.21****	−.10
3. Number of teachers among staff	.01	.04	−.05	−.04	−.01	.09	−.03	.04	.16**
4. Instructional index	−.08	.08*	.01	.02	−.03	−.09	.03	−.19****	−.03
5. Staff:child ratio	−.07	.02	.09	−.03	−.09	.00	.16**	−.17**	−.08
R^2	.22****	.43****	.25****	.11****	.17****	.12****	.17****	.22****	.10****
ΔR^2	**.02**	**.02**	**.03****	**.01**	**.02**	**.02**	**.02**	**.11******	**.05*****

Notes: $*p < .05$
$**p < .01$
$***p < .001$
$****p < .0001$
CPM[e] = Colored Progressive Matrices; Voc = Vocabulary; Report = Capacity to report; PosNom = Positive sociometric nominations; NegNom = Negative sociometric nominations; Coop = Social behavior (teacher ratings); Aggr = Aggressive behavior (teacher ratings); PosObs = Positive peer-directed behavior; NegObs = Negative peer-directed behavior

Table 6. Hierarchical Regression of Children's Cognitive, Language and Social Assessments for Age, Gender, Family Background, Enrollment Variables, and Child Care Variables in the Spring (N = 394)

	CPM[e]	Voc	Report	PosNom	NegNom	Coop	Aggr	PosObs	NegObs
I. Age, gender, and family background:									
1. Child's age	.50****	.64****	.49****	.21****	.05	.24****	−.07	−.03	−.10*
2. Child's sex	.09	−.06	.00	−.04	.35****	−.16***	.43****	.04	.12*
3. Immigrant family	−.02	−.07	.01	.02	−.02	.11*	−.14**	−.11*	−.04
4. Family type	−.19****	−.17****	.09	−.03	.12*	−.06	.09	−.24****	.15**
5. SES	−.05	−.12***	.03	.06	.00	.03	.03	−.13*	.07
6. Formal network important	.19****	.21****	.16***	−.11*	.06	−.12*	.11**	.02	.02
R^2	.37****	.52****	.27****	.06***	.14****	.10****	.20****	.07****	.04**
II. Enrollment variables:									
1. Number of child care arrangements	.13**	.20****	−.08	−.10	.06	.02	.08	.20****	.04
2. Hours spent each day in child care	.06	−.09	−.00	.11*	.04	−.07	.08	.09*	.10*
3. Age at first entry into child care	−.13**	−.10**	−.04	.06	−.09	−.01	−.11*	−.12*	.03
R^2	.40****	.59****	.28****	.08****	.15****	.11****	.22****	.14****	.06**
ΔR^2	**.03***	**.07****	**.01**	**.02****	**.01**	**.01**	**.02**	**.07****	**.02**
III. Child care variables:									
1. Age span in class	−.13**	−.16****	−.21****	.23****	.16**	−.01	−.02	.20****	.22****
2. Observed age difference to play mates	−.08	.01	.01	−.15**	−.10*	.05	−.06	−.04	.03
3. Number of teachers among staff	.04	.04	−.02	−.04	−.03	.09	.05	.19***	−.04
4. Instructional index	−.11**	.06	.00	−.03	−.08	−.12*	.08	.04	−.01
5. Staff:child ratio	−.02	−.03	.13**	−.08	−.02	.14**	−.01	−.09	.16**
R^2	.44****	.61****	.32****	.14****	.18****	.15****	.23****	.19****	.10****
ΔR^2	**.04*****	**.02*****	**.04*****	**.06*****	**.03****	**.04****	**.01**	**.05******	**.04****

Notes: *$p < .05$
**$p < .01$
***$p < .001$
****$p < .0001$
CPM[e] = Colored Progressive Matrices; Voc = Vocabulary; Report = Capacity to report; PosNom = Positive sociometric nominations; NegNom = Negative sociometric nominations; Coop = Social behavior (teacher ratings); Aggr = Aggressive behavior (teacher ratings); PosObs = Positive peer-directed behavior; NegObs = Negative peer-directed behavior

children showed negative peer-directed behaviors with greater frequency, and they received more negative peer nominations. In the spring assessments, a large age span was found associated with an increase in the occurrence of positive peer nominations and positive peer-directed behaviors. However, age span was not strongly related to the rate of age-homogenous play (Table 2); nor did the observed age difference to playmates explain the children's cognitive, verbal, or social assessments coherently.

The staff-to-child ratio was important in two of the measures in the autumn and for three of the measures in the spring. In two of these measures the relationship indicated that a higher adult:child ratio was less favorable since it increased the likelihood of fighting behavior in the autumn and negative peer-directed behaviors in the spring.

The teaching index was a significant predictor in two of the measures in the autumn and in two of the measures in the spring. In the autumn, direct teaching predicted increased vocabulary and decreased positive peer-directed behaviors, while the spring assessments indicated that indirect teaching increased cognitive achievement and the cooperative behaviors.

The number of teachers among the staff proved to be of no importance in predicting children's achievements.

Although the overall multiple regression coefficients for these analyses were highly significant, they were not large in absolute terms for the indicators of children's social development. The full model accounted for between 22% of the cognitive and 43% of the verbal measures in the autumn and 32% of the cognitive and 61% of the verbal measures in the spring. The corresponding figures for the six social indicators were from 11% to 22% in the autumn and from 10% to 23% in the spring. The variances accounted for by the spring models were higher than the autumn models in seven of nine dependent measures. The age, gender, and family background variables were largely responsible for the increased explanatory power.

DISCUSSION

This study examined how the adult-to-child ratio, age composition in child care classes, and instructional style were related to children's achievements in non-experimental, profit and nonprofit child care. The child variables assessed included cognitive, verbal, and social competence. These child assessment variables were measured twice, five months apart, revealing comparably stable relationships. It was demonstrated that program auspice (profit and nonprofit) and different ratios of staff to children (1:4.6—1:8.7) were not systematically related to children's social and cognitive achievements. The children's cognitive, verbal, and social achievements were best predicted by age, sex, social background, and the age span of the class. These findings confirm earlier studies, suggesting that the ratio of caregiver to children (Broberg et al., 1989; Deater-Deckard et al., 1996; Palmérus & Hägglund, 1987; Russel, 1990; Scarr & Eisenberg, 1993; Scarr et al., 1994) and program auspice (Cost, Quality & Child Outcome Study Team,

1995; Kagan, 1991; Penn, 1995) are not related to either instructional style or children's development. Although the data are purely associative, the findings suggest that, at least in Sweden, program auspice (profit vs. nonprofit) and adult:child ratios neither significantly enhance nor obstruct children's social or cognitive development.

The multiple regressions for the fall and spring data yield somewhat different patterns of child care predictors concerning child outcomes. This is not surprising given the comparably weak statistical relations for all predictors except age. Such weak relations increase the importance of the lower cut-off level of statistical significance (i.e., .05). Several of the differences between fall and spring consist of one relationship just below the critical border (normally fall) and one just above (normally spring). The variance accounted for by the child care quality variables exceeded 10% only once, and was mostly in the range 2%—5%. However, this moderate range is in accordance with earlier research on child care (e.g., Broberg, Wessels, Lamb, & Hwang, 1997; Deater-Deckard et al., 1996; NICHD Early Child Care Research Network, 1998) and school instruction (e.g., Gustafsson, 1998; Scheerens & Bosker, 1997). Although the child care predictors differ in some degree between fall and spring, for the most part they uniformly increased the variance explained in children's social and cognitive achievements variance. These variables provided a significant increase in the adjusted R^2 for three of nine dependent variables in the fall assessment and for eight of nine dependent variables in the spring assessment. The stronger association between children's achievements and the child care quality variables in the spring is consistent with the results of an earlier Swedish study (Sundell, 1988). In that study, the child care quality variables increased accountability from fall to spring in five of seven cognitive and social achievement measures. These results indicate the presence of a time lag before the child care quality is manifested in children's achievements. The concept of a main effect of child care quality on children's achievements, however, is complicated because child care teaching in Sweden undergoes significant changes during the school year. In the fall, the staff expends considerably more energy to establish a social structure in the child care center, a structure that provides latitude for teacher-led activities during the late fall and early spring. In the beginning of summer the structure is normally relaxed, with teacher-led activities occurring less frequently and where a sizable amount of time is reserved for outdoor activities.

Although the present results do not support the assumption (e.g., Kagan, 1991) that nonprofit is superior to profit child care, one must bear in mind that the current conditions in Stockholm favor small differences between nonprofit and profit child care. First, if the activities of profit child care centers comply with government-regulated demands for quality (e.g., hire trained teachers, yearly evaluation and planning, open for disabled and at-risk children), then they get approximately the same subsidies as do public centers. Second, 13 out of 16 profit-center directors had worked earlier in public centers. Their motive to start such a center was to realize instructional goals that they believed were difficult, if not impossible, to attain in a public center. No director raised the prospect of earning more money as an important motive. Evidence indicates that none of the

companies had made a significant profit during 1994 (Sundell & Ståhle, 1996). Third, most staff (87%) were either trained nursery school teachers or assistant teachers, a variable found to correlate with high-quality care and children's well-being (e.g., Clarke-Stewart et al., 1994). Thus, it is reasonable to suggest that our results might have been different if (a) the profit centers had been operated by directors without child care experience, (b) monetary profit was a primary motive, and (c) staff personnel lacked adequate training in childhood education.

One interpretation that could account for the lack of a significant relationship between degrees of adult:child ratios and children's achievements is that the relationship is nonlinear. In this view, the adult:child ratio makes little difference within a moderate range (e.g., 4–8 children per caregiver) but extreme ratios are more likely to affect children's development. Although the adult:child ratio ranged from 1:4.6 to 1:8.7, with 29 of 32 groups having ratios of less than 1:8, these ratios are higher compared with, for example, the Federal Interagency Day Care Requirements for preschool children (cf. Howes et al., 1992). Hence, these relatively high ratios could explain the lack of linearity between adult:child ratios and children's achievements. A second explanation is that the consensus among the teachers and teacher aides concerning specific goals and the ways to accomplish these goals compensated for a decreased adult:child ratio. The present results tend to support this latter explanation. Thus, because the staff agreed on the teaching practice, a change in ratio of about one or two children per adult may have had little or no impact on the instructional work. This conclusion is supported by the findings of Palmérus and Hägglund (1987) and Russel (1990). These authors found that the majority of recorded child behaviors changed little, if at all, with an increase in ratio. A third explanation, suggested by Andersson (1989, 1992), is that the effects of the adult:child ratio are detectable first after several years.

In this study, teaching was measured using the dimension direct vs. indirect. The results indicate that teaching style was of limited importance for children's performance. Nonetheless, it should be noted that the average time devoted to teacher-planned and teacher-led activities was 11% (range 3% to 27%), with free play occurring about 50% of the time. The remaining time was spent performing caregiving activities (e.g., meals, rest, and toilet-related activities). The staff rarely took part in free-play activity (only 3% of the time). The low frequency of teacher-led activities could also explain the lack of relationships between the teaching index and children's cognitive and social achievements. The fact that the teaching index changed little with the adult:child ratio indicates that the same type of instructional practice was given to children under each ratio; that is, the same type of activities were made available (i.e., mainly free activities) to children, and staff maintained a similar teaching style across ratios.

Of the regulatable child care quality variables, age span within the class was the strongest predictor of children's social and cognitive achievements. This finding concurs with earlier studies (Sundell, 1994a, 1994b), indicating that larger age spans (e.g., 50 months between the oldest and youngest child), in which the nursery school class comprises toddlers and preschool children, are primarily inferior to smaller age spans (e.g., 25 months), where toddlers and preschool

children are allocated to separate classes. This is contrary to the beliefs expressed in Swedish official documents (Swedish Government Official Reports, 1981), which assume that a large age span is beneficial to children's social, cognitive, and verbal development. The question remains whether the smaller age spans in this study are superior to an age-homogenous group. Comparisons of age span of two years or less (e.g., Brownell, 1990; French, Waas, Stright, & Baker, 1986; Goldman, 1981; Lougee, Grueneich, & Hartup, 1977; Stright & French, 1988) indicate that somewhat larger age spans are beneficial to children's development. The exact reason for the disadvantages of age-mixed classes is not clear. According to earlier Swedish research (Sundell, 1994b), a large age span is inferior because teaching becomes more complicated to both plan and actualize in the mixed-age class. There is, for instance, in mixed-age classes a larger cognitive demand on the teacher to retain knowledge of several age groups current at the same time. Moreover, additional time for blueprinting instruction is needed because there involves planning for more age groups. Furthermore, in the mixed-age class, toddlers' special needs, such as changing diapers, often interrupt the teacher-planned activities for older children. However, this study indicated only a weak relationship between the age span of the class and the teaching index, possibly because of the low number of teacher-led activities. It is also possible that a qualitative approach would have clarified the control of age span on instruction.

Another explanation of the results is that mixed-age classes provide fewer opportunities for advanced interaction among playmates. In theory, the mixed-age class provides better opportunities for children to learn from each other and to enhance their knowledge. The relationship between collaboration and learning seems to be more complex than is suggested by this theory, however. In our data, there was no substantial relationship between the observed average ages of the playmates or the average ages of the preferred playmates in the positive sociometric nominations and in the children's achievements. Furthermore, the children in this study seem to favor same-aged playmates, irrespective of the age composition of the class. The average age difference of the playmates was only six months, a surprisingly low figure given that the average number of playmates that was at most six months older or younger was 5 out of 16. It is noteworthy that the relationship between the age span in the child group and the age difference of playmates was not significant, a finding in accord with the findings in other studies (Goldman, 1981; Ellis, Rogoff, & Cromer, 1981). It is also possible that some of the assumptions about the mixed-age groups are correct, but that the mixed-age groups have other, more negative, consequences that transcend the positive ones. For example, it is reasonable that older pupils' instruction of younger peers in mixed-age classes affects their verbal and cognitive development and social competence (Devin-Sheehan, Feldman, & Allen, 1976). At the same time, the problems associated with planning teacher-led activities result in a slower presentation of new information, which inadvertently creates a disadvantage specific to children in mixed-age classes. Finally, mixed-age classes might be an advantage for younger but not for older children (Bailey, Burchinal, & McWilliam, 1993; Howes & Farver, 1987). Accordingly, mixed-age classes are initially

beneficial to younger children but this advantage is reversed as the children become older. These alternative interpretations require further study.

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REFERENCES

Andersson, B.-E. (1989). Effects of public day care: A longitudinal study. *Child Development, 60*, 857–866.

Andersson, B.-E. (1992). Effects of day care on cognitive and social-emotional competence of thirteen year old Swedish school children. *Child Development, 63*, 20–36.

Bailey, D. B., Burchinal, M. R., & McWilliam, R. A. (1993). Age of peers and early childhood development. *Child Development, 64*, 848–862.

Bierman, K. L., Smoot, D. L., & Aumiller, K. (1993). Characteristics of aggressive-rejected, aggressive (nonrejected), and rejected (nonaggressive) boys. *Child Development, 64*, 139–151.

Broberg, A., Hwang, C. P., Lamb, M., & Ketterlinus, R. D. (1989). Child care effects on socioemotional and intellectual competence in Swedish preschoolers. In J. S. Lande, S. Scarr, & N. Grunzenhauser (Eds.), *Caring for children: Challenge for America* (pp. 49–75). Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Broberg, A. G, Wessels, H., Lamb, M. E. & Hwang, C. P. (1997). Effects of day care on the development of cognitive abilities in 8-year-olds: A longitudinal study. *Developmental Psychology, 33*, 62–69.

Brownell, C. A. (1990). Peer social skills in toddlers: Competencies and constraints illustrated by same-age and mixed-age interaction. *Child Development, 61*, 838–848.

Clarke-Stewart, K. A., Gruber, C. P., & Fitzgerald, L. M. (1994). *Children at home and in day care*. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Cohen, J., & Cohen, P. (1975). *Applied multiple/correlational analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Coie, J. D., & Dodge, K. A. (1983). Continuities and changes in children's sociometric status: A five-year longitudinal study. *Merrill-Palmer Quarterly, 29*, 261–282.

Coie, J. D., & Dodge, K. A. (1988). Multiple sources of data on social behavior and social status in the school: A cross-age comparison. *Child Development, 59*, 815–829.

Cost, Quality & Child Outcome Study Team. (1995). *Cost, quality, and child outcomes in child care centers, executive summary, second edition*. Denver: University of Colorado at Denver, Economics Department.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrica, 16*, 297–334.

De Vellis, R. F. (1991). *Scale development: Theory and applications*. Beverly Hills, CA: Sage.

Deater-Deckard, K., Pinkerton, R., & Scarr, S. (1996). Child care quality and children's behavioral adjustment: A four-year longitudinal study. *Journal of Child Psychology and Psychiatry, 37*, 937–948.

Devin-Sheehan, L., Feldman, R., & Allen, V. (1976) Research on children tutoring children: A critical review. *Review of Educational Research Journal, 46*, 355–385.

Ekholm, B., & Hedin, A. (1991). Sitter det i väggarna? En beskrivning av daghemsklimat och barns beteende. [Is it built into the walls? A description of climate in child care centers and children's behavior.] *Linköping studies in Education, 32*, Linköping.

Ellis, S., Rogoff, B., & Cromer, C. (1981). Age segregation in children's social interactions. *Developmental Psychology*, *17*, 399–407.

Feagans, L. V., & Farran, D. C. (1981). How demonstrated comprehension can get muddled in production. *Developmental Psychology*, *17*, 718–727.

Feagans, L. V., & Farran, D. C. (1994). The effects of daycare intervention in the preschool years on the narrative skills of poverty children in kindergarten. *International Journal of Behavioral Development*, *17*, 503–524.

French, D. C., Waas, G. A., Stright, A. L., & Baker, J. A. (1986). Leadership asymmetries in mixed-age children's groups. *Child Development*, *57*, 1277–1283.

Goldman, J. (1981). Social participation of preschool children in same- versus mixed-age groups. *Child Development*, *52*, 644–650.

Gustafsson, J.-E. (1998). Social background and teaching factors as determinants of reading achievement at classroom and individual levels. *Nordisk Pedagogik*, *18*, 241–250.

Holloway, S. D., & Reichart-Erickson, M. (1988). The relationship of day care quality to children's free-play behavior and social problem-solving skills. *Early Childhood Research Quarterly*, *3*, 39–53.

Howes, C., Rodning, C., Galluzzo, D. C., & Myers, L. (1988). Attachment and child care: Relationships with mother and caregiver. *Early Childhood Research Quarterly*, *3*, 403–416.

Howes, C., & Farver, J. (1987). Social pretend play in 2-year-olds: Effects of age of partner. *Early Childhood Research Quarterly*, *2*, 305–314.

Howes, C., Phillips, D. A., & Whitebook, M. (1992). Thresholds of quality: Implications for the social development of children in center-based child care. *Child Development*, *63*, 449–460.

Howes, C., Rodning, C., Galluzzo, D. C., & Myers, L. (1988). Attachment and child care: Relationships with mother and caregiver. *Early Childhood Research Quarterly*, *3*, 403–416.

Kagan, S. L. (1991). Examining profit and nonprofit child care: An odyssey of quality and auspices. *Journal of Social Issues*, *47*, 87–104.

Lamb, M. E., Hwang, C.-P., Bookstein, F. L., Broberg, A., Hult, G., & Frodi, M. (1988). Determinants of social competence in Swedish preschoolers. *Developmental Psychology*, *24*, 58–70.

Lidholt, B., & Norrman, M. (1994). *Changes in the society—changes in some daycare-settings in Göteborg and Uppsala*. Paper presented at the fourth annual conference of the EECERA on the quality of Early Childhood Education, Gothenburg, Sweden.

Ljungblad, T. (1989). *Höstproven*. (Fall test of school readiness). Stockholm: Psykologiförlaget (Original work published 1967).

Lougee, M. D. R., Grueneich, R., & Hartup, W. W. (1977) Social interaction in same- and mixed-age dyads of preschool children. *Child Development*, *48*, 1353–1361.

McCartney, K., & Jordan, E. (1991). Parallels between research on child care and research on school effects. *Educational Researcher*, *19*, 21–22.

Newcombe, A. F., Bukowski, W. H., & Pattee, L. (1993). Children's peer relations: A meta-analytic review of popular, rejected, neglected, controversial and average sociometric status. *Psychological Bulletin*, *113*, 99–128.

NICHD Early Child Care Research Network. (1998). Early child care and self-control, compliance, and problem behavior at twenty-four and thirty-six months. *Child Development*, *69*, 1145–1170.

Palmérus, K., & Hägglund, S. (1987). Hur många vuxna behövs på dagis? En studie av personaltäthet, socialt samspel och aktiviteter på sex daghemsavdelningar. (How many adults are needed in child care? A study of caregiver-child ratio, social interaction and activities in six child care classes). *Rapport 1987:04*. Sweden: Göteborg University, Department of Education and Educational Research.

Pearson, P. D., & Leys, M. (1985). Teaching comprehension. In T. H. Harris & E. J. Cooper (Eds.), *Reading, thinking, and concept development: Strategies for the classroom*. New York, NY: The College Board.

Pedhazur, E. J. (1982). *Multiple regression in behavior research. Explanation and prediction* (2nd ed.). New York, NY: Holt, Rinehart & Winston.

Penn, H. (1995). The relationship of private daycare and nursery education in the UK. *European Early Childhood Education Research Journal*, *3*, 29–42.

Raven, J. C., Court, J. H., & Raven, J. (1995). *Colored progressive matrices* (1995 edition). Oxford: Oxford Psychologists Press.

Russel, A. (1990). The effects of child:staff ratio on staff and child behavior in preschools: An experimental study. *Journal of Research in Childhood Education*, *4*, 77–90.

Scarr, S., & Eisenberg, M. (1993). Child care research: Issues, perspectives, and results. *Annual Review of Psychology*, *44*, 613–644.

Scarr, S., Eisenberg, M., & Deater-Deckard, K. (1994). Measurement of quality in child care centers. *Early Childhood Research Quarterly*, *9*, 131–151.

Scheerens, J., & Bosker, R. (1997). *The foundations of educational effectiveness*. Oxford: Pergamon.

Statistics Sweden. (1982). Socioekonomisk indelning. Meddelanden i samordningsfrågor. (Socioeconomical classification. Announcement in questions of coordination). 1982:4.

Statistics Sweden. (1994). Förskolor, fritidshem och familjedaghem de 31 december 1993. (Preschools, after-school hour centers, child care in private homes on December 31, 1993). *Örebro*: SCB-distribution.

Stipek, D., Feiler, R., Daniels, D., & Milburn, S. (1995). Effects of different instructional approaches on young children's achievement and motivation. *Child Development*, *66*, 209–223.

Stright, A. L., & French, D. C. (1988). Leadership in mixed-age children's groups. *International Journal of Behavioral Development*, *11*, 507–515.

Sundell, K. (1988). Day care and children's development. The relations among direct teaching, communicative speech, cognitive performance, and social participation. Acta universitatis upsaliensis. *Studia psychologica Upsaliensia*, *13*, Uppsala.

Sundell, K. (1994a). Instructional style, age span in child group and children's speech, cognitive, and socioemotional status. In F. Laevers (Ed.), *Defining and assessing quality in early childhood education* (pp. 27–38). Leuven: Leuven University Press.

Sundell, K. (1994b). Comparative research on mixed-age groups in Swedish nursery and compulsory schools. *European Early Childhood Education Research Journal*, *2*, 49–62.

Sundell, K., & Ståhle, Y. (1996). På vinst och förlust. Hur fungerar vinstdrivna förskolor? (Profit and loss. How does pro-profit child care work?) *FoU-rapport 1996:5*. Stockholms socialförvaltning: FoU-byrån.

Swedish Government Official Reports. (1981). Bra daghem för små barn. Betänkande från familjestödsutredningen. (Good day care for small children. Report from the Family Aid Commission). Stockholm: Gotab.