Predictors of Achievement in Home-Educated Children: Aptitude, Self-Concept, and Pedagogical Practices

Richard G. Medlin

Stetson University

Abstract

The relationship between home-educated children's academic achievement and their scholastic aptitude, their academic self-concept, and their parents' teaching practices was examined. Thirty-six home-schooled children (24 boys and 12 girls), representing grades three through six, and their parents participated in this study. The children completed three tests: The Stanford Achievement Test (SAT), the Otis-Lennon School Ability Test (OLSAT), and the Intellectual and School Status subscale of the Piers-Harris Children's Self-Concept Scale (PHCSCS). The parents provided information about their home school in a brief questionnaire. The mean scores, converted to percentile ranks, were 66 for the SAT, 58 for the OLSAT, and 72 for the PHCSCS. A multiple regression analysis indicated that OLSAT scores, fewer months per year of home school, PHCSCS scores, and a low level of direct instruction by parents were significant predictors of achievement.

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The rapid growth of home education has produced controversy and regulatory activity at all legislative levels (Lines, 1991; Van Galen & Pitman, 1991). It has also engendered substantial research activity (Ray 1988; Ray & Wartes, 1991). There have been two major themes to this research--academic achievement and social development of home-educated children.

Research on academic achievement has consistently affirmed that home-schooled children are not educationally disadvantaged--in fact, their achievement scores have often been found to be above average (Calvary, 1992; Frost & Morris, 1988; Rakestraw, 1988; Richman, Girten, & Snyder, 1990; Tipton, 1990; Wartes, 1988, 1990). For example, a nation-wide study compiled achievement scores for over 10,000 home-educated children from kindergarten through twelfth grade (National Center for Home Education, 1992). Average percentile rank scores for the complete battery of subtests ranged from a low of 65 to a high of 82 depending on the grade level--all well above the national average of 50. Other large-scale studies have produced similar results (Ray, 1990; Home School Legal Defense Association, 1991).

Research on social development has shown home-educated children as a group to have a positive self-concept and good social skills (Delahooke, 1986; Kelley, 1991; Reynolds, 1985; Taylor, 1986). Studies comparing the self-concept of home-educated children to that of children attending conventional schools have found either no difference between the two groups (Hedin, 1991; Stough, 1992; Shyers, 1992), or a better self-concept among home-schooled students (Kitchen, 1991). Comparative research focusing on social skills has generally favored home-schooled children (Smedley, 1992; Shyers, 1992).

Although research confirms above-average achievement among home-educated children, the reasons for this superior performance have not been clearly delineated. Two studies examining intellectual ability among home-educated children suggest that these children may represent a select, highly intelligent group. Delahooke (1986) found that a group of nine-year-olds who were being taught at home had above average IQ scores, and Quine and Marek (1988) reported higher levels of reasoning ability among home-educated students than might be expected for children of their age. Home-schooled children may simply be performing up to the level of their scholastic aptitude, which is itself exceptional.

It is also possible that the positive self-concept often observed among home-educated children predisposes them to superior academic achievement. For example, Collins (1982) showed that children's performance in solving difficult math problems was a function of both mathematical ability and self-efficacy (Bandura, 1986), or their perception of their own mathematical competence. Children who perceived themselves to be competent in math solved more problems and worked more efficiently and persistently than children who believed themselves to be less capable. Similarly, Piers has demonstrated that self-concept is correlated with academic achievement (Piers, 1965, 1973; Piers & Harris, 1964).

Two studies of home-educated children have reported measures of academic self-concept, or children's perception of their own intellectual and scholastic ability. Kelley (1991), who tested only home-schooled children, described their academic self-concept as high, at approximately the 68th percentile. Kitchen (1991) compared homeeducated children to children attending conventional schools and found academic self-concept to be significantly higher for the home-schooled group. It is possible,

therefore, that a positive self-concept among home-educated children promotes superior academic achievement.

Finally, the teaching methods and qualifications of home-schooling parents may produce superior achievement in their children (Mayberry, 1993). Research in this area has revealed little of substance (Rakestraw, 1988; Richman et al., 1991; Wartes, 1988, 1991), though Russell's (1994) recent work suggests that the parents' level of education and the amount of structure used in the home school may have measurable effects.

In the present research, home-educated children's scholastic aptitude, educational self-concept, and their parents' teaching practices were examined to determine which combination of variables best predicted academic achievement. Specifically, it was hypothesized that both aptitude and self-concept would be significant predictors of achievement, and that achievement scores would be significantly higher than aptitude scores. Because previous research on parental characteristics has yielded equivocal results, several of these variables were examined in an exploratory fashion.

Method

Subjects

Thirty-six home-schooled children and their parents--27 families in all--participated in this study. A total of 24 boys and 12 girls representing grades three through six were included (see Table 1). Two brothers and their parents were African American; the rest of the participants were White. The group as a whole had spent an average of 3.35 years in home schools, 1.00 year in private schools, and 1.44 years in public schools.

The mean age of the parents was 38.31 years, and they had completed an average of 2.26 years of college education. Seven mothers were certified teachers. There was an average of 3.15 children per family.

Materials and Procedure

The children completed three tests. The Stanford Achievement Test (SAT), Eighth Edition (Psychological Corporation, 1992), measured academic achievement. The SAT, a norm-referenced, multilevel test battery, measures achievement in reading, mathematics, language, spelling, study skills, science, social science, and listening. Reliability has been tested using Kuder-Richardson, alternate forms, and test-retest methods. The reliability coefficients generated by these methods "cluster around .90" (Keyser & Sweetland, 1987, p. 540). Test validity is largely based on item development--items were derived from an extensive review of many of the most popular textbook series at each grade level and were thoroughly field-tested (Keyser & Sweetland, 1987).

The Otis-Lennon School Ability Test (OLSAT), Sixth Edition (Psychological Corporation, 1989), assessed scholastic aptitude. The OLSAT is a norm-referenced, multilevel test battery measuring abstract thinking and reasoning ability with verbal, pictorial, and quantitative stimuli. Internal reliability coefficients for the different levels of this test are all above .90; test-retest reliability coefficients range from .84 to .92 (Keyser & Sweetland, 1984). Validity has been established by significant correlations (from .40 to .60) between this test and school grades and achievement test scores (Keyser & Sweetland, 1984).

The Intellectual and School Status subscale of the Piers-Harris Children's Self-Concept Scale (PHCSCS) (Piers & Harris, 1969) measured academic self-concept. This self-report test of children's feelings about themselves includes 17 items dealing with academic issues. Internal reliability coefficients for the PHCSCS are .88 for boys and .93

for girls (Keyser & Sweetland, 1984). Test-retest reliability coefficients range from .62 to .96 depending on the interval between test administrations. Test validity is based both on item construction--items were developed from lists children generated of "what I like about myself" and "what I don't like about myself"--as well as correlations with peer ratings, involvement in friendships, classroom achievement, parental approval of the child, and other self-concept scales (Keyser & Sweetland, 1984).

Parents provided information about their home school in a brief questionnaire.

Results

For all analyses involving the SAT and OLSAT, Normal Curve Equivalent (NCE) scores were used. The NCE scale is an equal-interval scale with a mean of 50 and a standard deviation of 21.06. For the PHCSCS, raw scores were used. The mean SAT Complete Battery score for the group as a whole was 58.59 (SD=20.32), which corresponds to a percentile rank of 66. The mean OLSAT score was 54.43 (SD=16.94), which corresponds to a percentile rank of 58. The mean PHCSCS score was 14.20 (SD=2.69), which corresponds to a percentile rank of 72. SAT subtest scores for the group as a whole, converted to percentile ranks, ranged from a low of 56 for Spelling to a high of 78 for Reading Vocabulary. Mean scores for each test by grade are presented in Table 2.

According to the publisher of the SAT and OLSAT, the Psychological Corporation, these tests were standardized concurrently so that meaningful comparisons between achievement and aptitude could be made. Therefore, a Wilcoxon matched-pairs signed-ranks test was used to compare SAT and OLSAT scores to one another. This procedure produced a z of -2.33, p=.020, indicating that achievement scores were significantly higher than aptitude scores.

Correlations among achievement, aptitude, and self-concept scores were computed for each grade level. These analyses showed that aptitude scores were significantly correlated with achievement scores at each grade level; self-concept scores, however, were significantly correlated with achievement scores for sixth graders only (see Table 3). Aptitude and self-concept scores were not significantly correlated with one another at any grade level. Across all grades, the correlation between SAT and OLSAT scores was .85 ($p<.001$), while the correlation between SAT and PHCSCS scores was .28 ($p=.052$). The correlation between OLSAT and PHCSCS scores was .16 ($p=.174$).

The questionnaire revealed that 61% of the parents characterized their home school as "traditional," which was described as resembling the schooling often experienced in conventional schools, with a different book for each subject, lessons planned and presented by the teacher, and reading and answering questions about the content of that reading accounting for much of each day's activity. Another 19% reported following the educational philosophy of Charlotte Mason, a 19th century British educator (Mason, 1954). Mason's approach is characterized by a great respect for children and efforts to involve children in "real life" through a careful balance of work and play, of discipline and freedom. A relaxed atmosphere is created which promotes exploration, individuality, and creativity. Few parents selected the four other types of home schools offered in the questionnaire (unit studies, principle, classical, and "unschooling" approaches). A one-way analysis of variance (ANOVA) with type of home school as the factor and SAT scores as the dependent variable showed that the type of home school had no significant effect on achievement scores.

Most parents took a structured approach to their home school. Eighty-eight percent rated their school day as "moderately structured" to "highly structured." On the average, these home schools operated for 5.03 hours each day and 9.69 months each

year. Parents reported spending 37% of their school day in direct instruction. Fifty percent of the parents reported giving their children grades for their schoolwork, but most (79.4%) did not use rewards with more than moderate frequency to motivate their children to do their schoolwork.

Less intensive home school programs seemed to be related to higher achievement, as the amount of direct instruction provided by the parents (r=-.43, p=.006) and the months per year of school (r=-.38, p=.015) were significantly negatively correlated with achievement. Giving grades for assignments (r=-.30, p=.046) and the frequent use of rewards for schoolwork (r=-.36, p=.018) were also significantly negatively related to SAT scores.

Parents were committed to and satisfied with home education, particularly those with more intensive programs. For example, conducting home school more hours per day (r=.51, p=.002) and more months per year (r=.35, p=.030) were significantly correlated with parents' satisfaction, as was giving grades for children's work (r=.54, p=.001). Overall, 94% of the parents stated that they were "moderately satisfied" to "very satisfied" with their home school, and 68% said that they would be "not at all likely" to place their children in a good conventional school if one were available. However, parental satisfaction was not reliably related to children's achievement scores.

The majority of home instruction (93%) was by mothers rather than fathers, and the mothers' level of education was significantly related to children's achievement scores (r=.42, p=.007) and aptitude scores (r=.34, p=.025). The fathers' level of education was also significantly correlated with both achievement (r=.37, p=.016) and aptitude (r=.33, p=.027). A series of t-tests indicated that the seven children whose mothers were certified teachers scored significantly higher in both academic achievement, $t(32)$=-2.06,

p=.047, and scholastic aptitude, $t(32)$=-2.26, p=.031, than children of mothers who were not certified.

Because an ANOVA determined no significant effects of grade or gender on SAT scores, data were combined across these variables for a stepwise multiple regression procedure to see which combination of measures best predicted achievement scores. The analysis selected, in order, OLSAT scores, fewer months per year of home school, PHCSCS scores, and a low level of direct instruction by parents as reliable predictors in the equation (see Table 4). The regression equation which included these four variables (Y'=-4.80+.94X_1-5.21X_2+1.65X_3-.19X_4) was significant, $F(4,24)$=37.37, p<.001, and accounted for 86% of the variance in SAT scores.

Discussion

Academic achievement was best predicted by scholastic aptitude, and the relationship between these two variables was quite strong. However, achievement scores were higher than aptitude scores, indicating that ability alone could not explain the level of achievement observed. These results suggest that the superior achievement often found among home-schooled children is not due simply to higher native intelligence within that group (cf. Delahooke, 1986).

Educational self-concept was high and was also a predictor of achievement, particularly for older children. Interestingly, the children's academic self-concept was not related to their scholastic aptitude scores--a relationship that has been observed among children attending conventional schools (e.g. Eastman, 1965). Whether this result is due simply to the small sample size or to some real difference between home-schooled and conventionally schooled children is unclear.

Less direct instruction, a shorter school year, and less frequent use of rewards and grades for schoolwork were also related to higher achievement scores (cf. Richman

et al., 1990; Russell, 1994; Wartes, 1988, 1990), perhaps because higher-achieving students need less intensive programs and less external motivation than students who are struggling with their schoolwork, and perhaps because a less structured approach may encourage higher achievement, as some home-schooling advocates maintain (e.g. Holt, 1982). Clearly further research is needed on this issue.

Achievement and aptitude scores were related to both the fathers' and the mothers' level of education, and to the mothers' certification as a teacher. Although other research with much larger sample sizes has rather consistently found that neither parental education nor certification is related to achievement (Rakestraw, 1988; Richman et al. 1990; Wartes, 1988, 1990), Russell (1994) also identified parental education as a predictor of children's achievement scores.

Parents tended to be most satisfied with their home school when it was more intensive, but parental satisfaction was not related to children's achievement. In fact, some of the same variables which were positively correlated with parental satisfaction (months per year of home school, giving grades for schoolwork) were negatively correlated with children's achievement. In spite of the opportunities home-schooling would seem to afford for creative educational approaches, parents tended to describe their home school as traditional. However, the type of home school, whether traditional or not, was unrelated to children's achievement.

Overall, this research demonstrated that although the scholastic aptitude of home-schooled children was near average, they performed better than average in achievement and had a healthy academic self-concept. Academic achievement was reliably predicted by children's scholastic aptitude and self-concept, and by less intensive teaching practices in the children's home school.

References

Bandura, A. (1986). *Social foundations of thought and action.* Englewood Cliffs, NJ: Prentice-Hall.

Calvary, R. (1992, November). *The difference in achievement between home schooled and public schooled students for grades four, seven, and ten in Arkansas.* Paper presented at the meeting of the Mid-South Educational Research Association, Knoxville, TN.

Collins, J. L. (1982, March). *Self-efficacy and ability in achievement behavior.* Paper presented at the annual meeting of the American Educational Research Association, New York.

Delahooke, M. M. (1986). *Home educated children's social/emotional adjustment and academic achievement: A comparative study.* Unpublished doctoral dissertation, California School of Professional Psychology, Los Angeles.

Eastman, E. (1965). *The relationship between self-concept and intelligence in children.* Unpublished research paper, Whitworth College, Spokane, WA.

Frost, E. A., & Morris, R. C. (1988). Does home schooling work? Some insights for academic success. *Contemporary Education, 59*, 223-227.

Hedin, N. S. (1991) Self-concept of Baptist children in three educational settings. *Home School Researcher, 7*(3), 1-5.

Holt, J. (1982). *Teach your own: A hopeful path for education*. New York: Delacorte Press.

Home School Legal Defense Association. (1991, October/November). Home schoolers beat national averages on achievement tests. *Teaching Home,* p. 19.

Kelley, S. W. (1991). Socialization of home schooled children: A self-concept study. *Home School Researcher, 7*(4), 1-12.

Keyser, D. J. & Sweetland, R. C. (1984). *Test critiques* (Vol. 1). Kansas City, MO: Test Corporation of America.

Keyser, D. J. & Sweetland, R. C. (1987). *Test critiques* (Vol. 6). Kansas City, MO: Test Corporation of America.

Kitchen, P. (1991). Socialization of home school children versus conventional school children. *Home School Researcher, 7*(3), 7-13.

Lines, P. (1991). Home instruction: The size and growth of the movement. In J. Van Galen & M. A. Pitman (Eds.), *Home schooling: Political, historical, and pedagogical perspectives* (pp. 1-5). Norwood, NJ: Ablex.

Mason, C. (1954). *An essay towards a philosophy of education* (3rd ed.). London: J. M. Dent and Sons, Ltd.

Mayberry, M. (1993). Effective learning environments in action: The case of home schools. *School Community Journal, 3*, 61-68.

National Center for Home Education. (1992, October/November). Research on home education continues to give good reports. *Teaching Home,* p. 26.

Piers, E. V. (1965). *Children's self-rating and rating by others*. Unpublished manuscript.

Piers, E. V. (1973). Unpublished data for the Piers-Harris children's self-concept scale.

Piers, E. V., & Harris, D. B. (1964). Age and other correlates of self-concept in children. *Journal of Educational Psychology, 55,* 91-95.

Piers, E. V., & Harris, D. B. (1969). *Piers-Harris Children's Self-Concept Scale.* Los Angeles: Western Psychological Services.

Psychological Corporation. (1992). *Stanford Achievement Test* (8th ed.). San Antonio, Texas: Author.

Psychological Corporation. (1989). *Otis-Lennon School Ability Test* (6th ed.). San Antonio, Texas: Author.

Quine, D. N., & Marek, E. A. (1988). Reasoning abilities of home-educated children. *Home School Researcher, 4*(3), 1-6.

Rakestraw, J. F. (1988). Home schooling in Alabama. *Home School Researcher, 4*(4), 1-6.

Ray, B. D. (1988). Home schools: A synthesis of research on characteristics and learner outcomes. *Education and Urban Society, 21*, 16-31.

Ray, B. D. (1990). *A nationwide study of home education: Family characteristics, legal matters, and student achievement.* Salem, OR: National Home Education Research Institute.

Ray, B. D., & Wartes, J. (1991). The academic achievement and affective development of home-schooled children. In J. Van Galen & M. A. Pitman (Eds.), *Home schooling: Political, historical, and pedagogical perspectives* (pp. 43-62). Norwood, NJ: Ablex.

Reynolds, P. L. (1985). *How home school families operate on a day-today basis: Three case studies.* Unpublished doctoral dissertation, Brigham Young University, Provo, UT.

Richman, H. B., Girten, W., & Snyder, J. (1990). Academic achievement and its relation to selected variables among Pennsylvania homeschoolers. *Home School Researcher, 6*(4), 9-16.

Russell, T. J. (1994). Cross-validation of a multivariate path analysis of predictors of home school student academic achievement. *Home School Researcher, 10*(1), 1-13.

Shyers, L. E. (1992). A comparison of social adjustment between home and traditionally schooled students. *Home School Researcher, 8*(3), 1-8.

Smedley, T. C. (1992). Socialization of home school children. *Home School Researcher, 8*(3), 9-16.

Stough, L. (1992). *Social and emotional status of home schooled children and conventionally schooled children in West Virginia.* Unpublished master's thesis, University of West Virginia, Morgantown, WV.

Taylor, J. W., V. (1986). Self-concept in home-schooling children. *Home School Researcher, 2*(2), 1-3.

Tipton, M. (1990). *An analysis of home schooled children's CTBS results and demographic characteristics of their families.* Unpublished master's thesis, Antioch University, Yellow Springs, OH.

Van Galen, J., & Pitman, M. A. (1991). Introduction. In J. Van Galen & M. A. Pitman (Eds.), *Home schooling: Political, historical, and pedagogical perspectives* (pp. 1-5). Norwood, NJ: Ablex.

Wartes, J. (1988). Summary of two reports from the Washington Homeschool Research Project, 1987. *Home School Researcher, 4*(2), 1-4.

Wartes, J. (1990). Recent results from the Washington Homeschool Research Project. *Home School Researcher, 6*(4), 1-7.

Table 1

Characteristics of Participating Children

Grade	Males	Females	Total	Mean Age
3	5	2	7	9.45
4	10	2	12	10.15
5	2	4	6	11.65
6	7	4	11	12.15

Table 2

Mean Scores, Converted to Percentile Ranks, for the Stanford Achievement Test (SAT), Otis-Lennon School Ability Test (OLSAT), and the Intellectual and School Status Subscale of the Piers-Harris Children's Self Concept Scale (PHCSCS) by Grade

Grade	SAT	OLSAT	PHCSCS
3	52	38	73
4	67	66	62
5	47	48	72
6	81	67	82

Table 3

Correlations of Stanford Achievement Test (SAT) Scores with Otis-Lennon School Ability Test (OLSAT) Scores and Scores on the Intellectual and School Status Subscale of the Piers-Harris Children's Self Concept Scale (PHCSCS) by Grade

	SAT with:	
Grade	OLSAT	PHCSCS
3	.96** *	.05
4	.85** *	.08
5	.97**	.76
6	.82**	.61*

*p<.05 **p<.01 ***p<.001

Table 4

Regression Equations Examining the Prediction of SAT Scores from Children's Aptitude and Self-Concept Scores and from Parental Characteristics

Variable	R^2	R^2 Change	F for R^2 Change
OLSAT scores	.7426	.7426	77.91***
months per year of home school	.7966	.0540	6.90*
PHCSCS scores	.8347	.0381	5.76*
amount of direct instruction	.8616	.0269	4.67*

*p<.05 **p<.01 ***p<.001

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