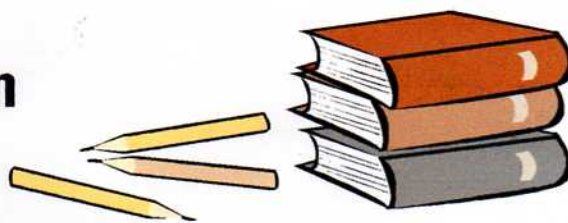


THE EARLY YEARS

Evaluating Montessori Education

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An analysis of students' academic and social scores compares a Montessori school with other elementary school education programs.

Montessori education is a 100-year-old method of schooling that was first used with impoverished preschool children in Rome. The program continues to grow in popularity. Estimates indicate that more than 5000 schools in the United States—including 300 public schools and some high schools—use the Montessori program. Montessori education is characterized by multi-age classrooms, a special set of educational materials, student-chosen work in long time blocks, collaboration, the absence of grades and tests, and individual and small group instruction in both academic and social skills (1). The effectiveness of some of these elements is supported by research on human learning (2).

We evaluated the social and academic impact of Montessori education. Children were studied near the end of the two most widely implemented levels of Montessori education: primary (3- to 6-year-olds) and elementary (6- to 12-year-olds). The Montessori school we studied [located in Milwaukee, Wisconsin (3)], which served mainly urban minority children, was in its ninth year of operation and was recognized by the U.S. branch of the Association Montessori Internationale (AMI/USA) for its good implementation of Montessori principles (4).

Because it was not feasible to randomly assign children to experimental and control educational groups, we designed our study around the school lottery already in place. Both the experimental and the control group had entered the Montessori school lottery; those who were accepted were assigned to the experimental (Montessori) group, and those who were not accepted were assigned to the control (other education systems) group. This strategy addressed the concern that parents who seek to enroll their child in a Montessori school are different from parents who do not. It is crucial to control for

this potential source of bias, because parents are the dominant influence on child outcomes (5).

Recruitment

We contacted parents of children who had entered the Montessori school lottery in 1997 and 2003 and invited them to be in the study. All families were offered \$100 for participation.

Because the lottery, which was conducted by the school district, was random, the Montessori and control groups should contain similar children. Ninety percent of consenting parents filled out a demographic survey. Parents from the Montessori and control groups had similar average incomes (\$20,000 to \$50,000 per year) at each student age level. This addressed a concern with a retrospective lottery loser design that the final samples might be different for reasons other than the treatment. Another variable, ethnicity, was not surveyed because parent income contributes more to child outcomes than does ethnicity (6). We were also concerned that requesting ethnicity data would reduce participation in this racially divided city.

Overall, 53 control and 59 Montessori students were studied (table S1). The 5-year-old group included 25 control and 30 Montessori children, and the 12-year-old group included 28 control and 29 Montessori children. Gender balance was imperfect, but gender

did not contribute significantly to any of the differences reported here. Children at the Montessori school were drawn from all six classrooms at the primary level and all four at the upper elementary level. The control children were at non-Montessori schools: 27 public inner city schools (40 children) and 12 suburban public, private/voucher, or charter schools (13 children). Many of the public schools had enacted special programs, such as gifted and talented curricula, language immersion, arts, and discovery learning.

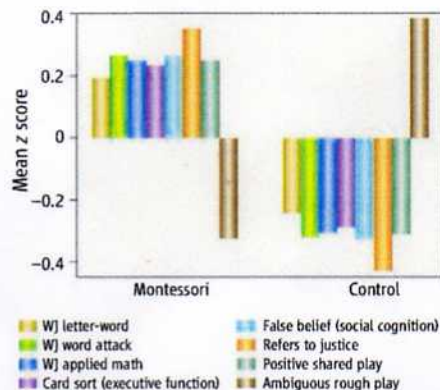
Children in both groups were tested for cognitive/academic and social/behavioral skills that were selected for importance in life, not to examine specific expected effects of Montessori education. Our results revealed significant advantages for the Montessori group over the control group for both age groups.

Results: 5-Year-Olds

Cognitive/Academic Measures. Seven scales were administered from the Woodcock-Johnson (WJ III) Test Battery (7). Significant differences favoring Montessori 5-year-olds were found on three WJ tests measuring academic skills related to school readiness: Letter-Word Identification, Word Attack (phonological decoding ability), and Applied Problems (math skills) (see chart, left). No difference was expected or found on the Picture Vocabulary test (basic vocabulary) because vocabulary is highly related to family background variables (8). Two WJ tests of basic thinking skills—Spatial Reasoning and Concept Formation—also showed no difference.

Five-year-olds were also tested on executive function, thought to be important to success in school. On one such test, children were asked to sort cards by one rule, switch to a new rule, and (if they did well) then switch to a compound rule. Montessori children performed significantly better on this test. A test of children's ability to delay gratification (a treat) did not indicate statistically significant differences.

Social/Behavioral Measures. Children were given five stories about social problems, such as another child hoarding a swing, and were asked how they would solve each problem (9).



Results for 5-year-olds. Montessori students achieved higher scores [converted to average z scores (18)] for both academic and behavioral tests.

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