

Montessori children were significantly more likely (43% versus 18% of responses) to use a higher level of reasoning by referring to justice or fairness to convince the other child to relinquish the object. Observations at the playground during recess indicated Montessori children were significantly more likely to be involved in positive shared peer play and significantly less likely to be involved in rough play that was ambiguous in intent (such as wrestling without smiling).

The False Belief task was administered to examine children's understanding of the mind (10). Recognition that people represent the world in subjective as well as objective ways is a landmark achievement in social cognition (11). Social negotiation and discussion about mental states leads to this advance in children (12). Whereas 80% (significantly more than chance) of the Montessori 5-year-olds passed, the control children were at chance, with 50% passing.

Results: 12-Year-Olds

Cognitive/Academic Measures. Twelve-year-olds were given 5 minutes to complete a story beginning “___ had the best/worst day at school.” The Montessori students' essays were rated as significantly more creative and as using significantly more sophisticated sentence structures (see chart, below). Control and Montessori essays were similar in spelling, punctuation, and grammar. Unlike the 5-year-olds, the 12-year-olds did not perform differently on the WJ tests. This is surprising, because early reading skills normally predict later reading (13). Either the control group had “caught up” by age 12 to the Montessori children, or the 12-year-old Montessori children were not more advanced in these early reading skills when they were 5. If the latter, one possible explanation is that the 12-year-olds started at the school when it was in its third year. The Montessori method relies on peer teaching and modeling, so those who are in the early classes of a new school lack some advantages relative to those who begin later.

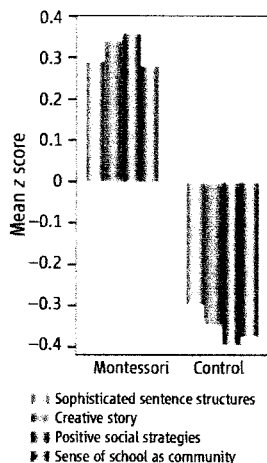
Social/Behavioral Measures. As a social skills test, 12-year-olds read six stories about social problems (such as not being asked to a party) and were asked to choose among four responses. Montessori 12-year-olds were significantly more likely to choose the posi-

tive assertive response (for example, verbally expressing one's hurt feelings to the host). On a questionnaire regarding their feelings about school, Montessori children indicated having a greater sense of community, responding more positively to items such as, “Students in my class really care about each other” and “Students in this class treat each other with respect.”

Benefits of Montessori Education

On several dimensions, children at a public inner city Montessori school had superior outcomes relative to a sample of Montessori applicants who, because of a random lottery, attended other schools. By the end of kindergarten, the Montessori children performed better on standardized tests of reading and math, engaged in more positive interaction on the playground, and showed more advanced social cognition and executive control. They also showed more concern for fairness and justice. At the end of elementary school, Montessori children wrote more creative essays with more complex sentence structures, selected more positive responses to social dilemmas, and reported feeling more of a sense of community at their school.

These findings were obtained with a lottery loser design that provides control for parental influence. Normally parental influence (both genetic and environmental) dominates over influences such as current or past school and day-care environments. For example, in the large National Institute of Child Health and Human Development (NICHD) study of early child care, correlations between parenting quality and WJ early academic tests had effect sizes comparable to those seen here, whereas school effects were much smaller (5). An evaluation of *Success for All*, considered a highly successful reading intervention, reported a quarter of a standard deviation as its largest effect size (for Word Attack) in a randomized field trial, and stated that it was equal to a 4.69-month advance in reading skills (14). Stronger effects are often found in the first years of pilot programs when researchers are involved in implementation of their own programs (15), termed the “super-realization effect” (16). In our study, the school did not anticipate an evaluation. Especially remarkable outcomes of the Montessori education are the



Results for 12-year-olds. Students in the Montessori program wrote more sophisticated and creative stories and showed a more developed sense of community and social skills. Scores were converted to average z scores (18).

social effects, which are generally dominated by the home environment (17).

Future research could improve on the research design here by following lottery participants prospectively and by tracking those who drop out and examining their reasons. It would be useful to replicate these findings in different Montessori schools, which can vary widely. The school involved here was affiliated with AMI/USA, which has a traditional and relatively strict implementation. It would also be useful to know whether certain components of Montessori (e.g., the materials or the opportunities for collaborative work) are associated with particular outcomes.

Montessori education has a fundamentally different structure from traditional education. At least when strictly implemented, Montessori education fosters social and academic skills that are equal or superior to those fostered by a pool of other types of schools.

References and Notes

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18. The z-score conversion was used for the graph to give all tests the same metric. A z score sets the mean (in this case of the entire sample) at 0, one standard deviation above the mean at 1.68, and one standard deviation below the mean at -1.68.
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