

BRIEF REPORT

The Daily Mile: The Impact of an Elementary School-Based Exercise Program on Pulmonary Function

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ABSTRACT

Background and Objectives: Implementing a structured activity to encourage exercise in children may be a strategy with benefits. We evaluated pulmonary function in elementary school children participating in a school-based exercise program called The Daily Mile.

Methods: During the fall semester, we implemented The Daily Mile program in one elementary school and compared pulmonary function in children in the intervention school pre- and postintervention to children in a control school in the same community. The primary outcomes were forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), and FEV1% (the FEV1/FVC ratio).

Results: The children in the control school showed no significant change in FEV1% during the semester ($P=.06$). On the other hand, children in the intervention school showed a significant improvement in FEV1% during the same semester ($P=.001$). This effect was consistent even when stratifying by asthma and sports participation.

Conclusions: The Daily Mile has benefits for pulmonary function in children. Although family physicians should continue to encourage their patients to have a healthy lifestyle, a more effective approach may be to encourage schools to adopt a program that teachers oversee and administer in a structured way.

INTRODUCTION

Evidence accumulated over the years supports the benefits of promoting regular physical activity as a strategy to enhance children's health.^{1,2} The Centers for Disease Control and Prevention (CDC) recommends daily exercise for children.³ Some of the health benefits include decreasing cardiovascular and diabetes risk factors as well as building strong bones and muscles, controlling weight, and reducing symptoms of anxiety and depression.^{4,5} When advising patients, primary care physicians recommend a healthy lifestyle. However, from a health policy perspective, a structured approach may be particularly effective.

The Daily Mile program, which originated in Scotland, was created to ensure that children develop healthy lifestyle habits by incorporating regular exercise into their life. The Daily Mile Foundation aims to groom children to live an active and healthy lifestyle through 15 minutes of daily physical activity during school. The Daily Mile is a fully inclusive activity where children run or jog, at their own pace, for 15 minutes every day. This activity does not replace physical education classes but rather serves as an adjunct. The Daily Mile Foundation has been successful in enlisting participation in the program in elementary schools in multiple countries.

A recent systematic review of The Daily Mile, including 13 studies, focused on the effect of the intervention on the health and well-being of children.⁶ None of the studies reported a significant change in body mass index or academic performance even though the Daily Mile can increase physical activity and physical fitness. Although a variety of measures have been assessed, one aspect of health that should be affected by the exercise intervention, pulmonary function, had not been evaluated as an outcome in previous studies of The Daily Mile. Consequently, to address this gap, we implemented a trial of The Daily Mile to assess pulmonary function in elementary school children in the United States.

METHODS

We conducted the trial in two elementary schools in Alachua County, Florida, during the fall semester 2022 (September–December). Both schools were public schools. One school implemented The Daily Mile program and the other school acted as a control group. We did physiological assessments at both schools in September (preintervention) and December (postintervention).

All students in the schools, first through fifth grade, participated in the exercise activity. No additional incentives

were used for participation in the exercise program or the assessments. Only students whose parents approved through the informed consent process were enrolled in the assessments. The project was approved by the University of Florida Institutional Review Board.

Exercise Program

In The Daily Mile program, children take a break during school each day to go outside and run or jog for 15 minutes. The Daily Mile was implemented in the intervention school in Florida according to the program's guidelines. Because students are required to have a certain number of minutes for different curricula exposure for the school to remain accredited, the school administration asked for one modification. The Daily Mile was implemented every morning just before the start of school rather than in the middle of the school day.

The investigators assessed the fidelity of the intervention by observing both the participating children on the designated running track and the teachers' oversight. The intervention school used a field with orange cones for the daily running activity. Some teachers participated by running along and interacting with students. This activity occurred 5 days a week. All children in the school participated and were encouraged by the teachers to run.

Pulmonary Function

Pulmonary function tests (PFT) were assessed using the MIR Spirobank II (Micro Direct) portable machine. This machine was connected to single-use pediatric spirometer mouthpieces for PFT measures. We computed forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁), and FEV₁% representing the FEV₁/FVC ratio.

The same member of the study team performed all the pulmonary function tests for every student in both groups at both the pre- and postintervention assessments. Consequently, we avoided any issue of interrater reliability.

DATA ANALYSIS

We measured participating students whose parents had completed the informed consent and who were present at both assessments. Specifically, because we measured children at both times, we examined the change in each child using paired *t* tests. All tests were two-tailed.

In addition to testing the primary hypothesis regarding the effect of the intervention, we also conducted some analyses stratifying the population by variables that may have affected the impact on changes in pulmonary function during the semester. Specifically, we stratified by self-reported asthma and sports participation.

RESULTS

Table 1 shows the demographic characteristics of the students in the two schools. These were two public schools with a high proportion of non-Hispanic Black students. The impact of The Daily Mile intervention on pulmonary function is featured in Table 2. The children in the control school showed no

significant change in FEV₁% during the semester ($P=.06$). On the other hand, children in the intervention school showed a significant improvement in FEV₁% during the semester ($P=.001$).

TABLE 1. Demographic Characteristics of the Students in the Two Schools

Variable	Control	Intervention
	N=38	N=66
Age (in years, mean + SD)	8.4±1.3	8.5±1.3
Gender (n[%])		
Male	23 (60)	33 (50)
Female	15 (40)	33 (50)
Race/ethnicity (n[%])		
Non-Hispanic White	21 (55)	0 (0)
Non-Hispanic Black	11 (29)	62 (94)
Hispanic	5 (13)	4 (6)
Don't know	1 (3)	0 (0)
Play sports (n[%])		
Yes	17 (45)	26 (39)
Asthma (n[%])		
Yes	6 (16)	11 (17)

Abbreviations: SD, standard deviation

In analyses excluding children with asthma, the results were similar to those of the total sample of children. After excluding children with asthma, we found no significant change in FEV₁% in the children in the control group ($P=0.95$), while we found significantly improved FEV₁% in the intervention group ($P=.001$). The impact of the exercise intervention was reinforced after stratifying by sports participation. Among students who participated in sports, the children in the control school showed no significant improvement in FEV₁% ($P=0.31$), while those in the intervention school showed a significant improvement ($P=.003$). Similarly, among students who did not report sports participation, the children in the control school showed no significant improvement in FEV₁% ($P=0.40$), while a significant improvement remained in the children in the intervention school ($P=.001$).

CONCLUSIONS

Our findings in this study suggest that having elementary school-aged children do even moderate levels of exercise yields benefits in pulmonary function in just one semester. We found this effect even in children who reported participating in organized sports. Family physicians need to continue to recommend physical activity to their patient population and perhaps encourage their local schools to adopt a program like The Daily Mile. These results suggest the value of a potential partnership between family physicians desiring to further help their patients and local schools in their communities to develop such programs.

Our finding of improved pulmonary function documents an additional benefit of The Daily Mile. Other benefits of The

TABLE 2. Change in Pulmonary Function in Children After 4 Months Participating in The Daily Mile Exercise Intervention

	Control		Intervention	
	Mean ± standard deviation	Paired <i>t</i> test value	Mean ± standard deviation	Paired <i>t</i> test value
FVC pre (L)	1.61 ± 0.43	<i>P</i> =.12	1.83 ± 0.51	<i>P</i> =.724
FVC post (L)	1.76 ± 0.54		1.85 ± 0.48	
FEV1 pre (L)	1.48 ± 0.38	<i>P</i> =.04	1.43 ± 0.38	<i>P</i> <.001
FEV1 post (L)	1.60 ± 0.45		1.71 ± 0.43	
FEV1% pre	92.44 ± 8.17	<i>P</i> =.06	79.93 ± 12.52	<i>P</i> <.001
FEV1% post	92.71 ± 11.44		92.83 ± 4.33	

Abbreviations: FVC, forced vital capacity; FEV1, forced expiratory volume in one second; FEV1%, the FEV1/FVC ratio

Daily Mile have been shown previously, but this study shows the value of an underinvestigated marker with substantial health implications, especially for vulnerable children. This finding is particularly important considering the elevated prevalence of asthma in children and adults in the non-Hispanic Black community.⁷ The intervention school in this study had a large proportion of its students identifying as non-Hispanic Black (94%). Longer-term studies evaluating The Daily Mile and the stability of any improvement are lacking, but several trials with long-term follow-up are underway.⁶

The study had several limitations. First, the study was limited to two schools, and the schools and children were not randomized for the exercise intervention. Further, even if the children had some issues performing the pulmonary function tests, the same technician and machine was used at all four data collection sessions. Also, we performed paired *t* tests that linked the children measured initially to their measurement the second time, allowing a direct evaluation of each child's change. Second, The Daily Mile encourages exercise in the program but is not a rigorous running group. Thus, that the analyses showed a consistent benefit of the intervention is even more impressive. Third, evaluated students in the participating schools had demographic differences. However, as mentioned earlier, we used a paired *t* test so that each student had a pair of measurements, in this case a pre- and a postintervention assessment. Accordingly, the baseline pulmonary function test of student #3 in school B was directly linked to the follow-up pulmonary function test of student #3 in group B. That allowed us to directly evaluate the improvement of each student even if the characteristics and maturation differed across groups. Fourth, this was a short-term intervention with a clear benefit. Long-term effects of the intervention are unknown.

In sum, The Daily Mile has benefits for pulmonary function in children. Family physicians should encourage their patients

to have a healthy lifestyle, but encouraging schools to adopt a program that teachers oversee and administer in a structured way may be even more useful.

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