Table 1
Baseline demographics by grade, gender, and intervention group (University of Kansas, 2003–2006).

			Control	PAAC
BMI (kg/m^2)	Grade 2	Female	17.4 (3.0)	17.7 (3.0)
		Male	17.5 (3.1)	17.7 (3.0)
	Grade 3	Female	18.7 (3.8)	18.4 (3.4)
		Male	18.6 (4.0)	18.1 (3.4)
Age (years)	Grade 2	Female	7.8 (0.4)	7.7 (0.3)
		Male	7.8 (0.3)	7.7 (0.4)
	Grade 3	Female	8.7 (0.4)	8.7 (0.4)
		Male	8.8 (0.4)	8.7 (0.3)
Height (cm)	Grade 2	Female	126.6 (5.6)	125.6 (5.6)
		Male	127.3 (6.4)	127.3 (6.2)
	Grade 3	Female	132.1 (6.5)	131.9 (6.2)
		Male	132.9 (6.2)	132.4 (6.4)
Weight (kg)	Grade 2	Female	28.2 (6.5)	28.3 (6.5)
		Male	28.6 (7.3)	28.9 (6.8)
	Grade 3	Female	33.0 (9.5)	32.2 (7.6)
		Male	33.1 (9.1)	32.1 (8.3)

Values are mean (SD). There were no significant differences between PAAC and control.

PAAC was powered with the assumptions of (1) a moderate ICC of 0.1; (2) a two-unit increase in BMI for control children with a standard deviation of 1.5; and (3) a 1.5-unit increase in BMI for intervention children with a standard deviation of 1.5 across 3 years. The power to detect these differences was >0.80.

Statistical analysis

An adjusted *t*-test (Donner and Klar, 2000), which accounts for the intraclass correlation, was used to assess change in BMI from baseline to 3 years. Change in BMI was also analyzed longitudinally, using a linear mixed model with an autoregressive type 1 covariance structure for the longitudinal measurements over time and compound symmetric covariance structure for the intraclass correlation within schools, also adjusting for gender. SOFIT data were compared between treatment groups using a mixed linear model adjusting for grade, semester, and gender. The effects of teacher modeling on SOFIT scores were analyzed using ANOVA. Demographic data were summarized descriptively, using means and standard deviations for continuous data and frequencies and percentages for categorical data. Change from baseline to end of study was analyzed using an adjusted *t*-test (Donner and Klar, 2000) and a linear mixed model was used to analyze longitudinal data over time. Data in the sub-sample were analyzed in a similar fashion to the main outcome. All quantitative analyses were done using SAS version 9.1 (SAS Institute, Inc., Cary, NC, USA).

Results

Participants

Twenty-six elementary schools were initially randomly assigned to PAAC or control. Two schools (8%) discontinued participation; one due to closing of the school and one refused randomization to control. Twenty-four schools completed the study; 14 PAAC and ten control. At baseline, there were 1527 participants, 814 in PAAC schools and 713 in control schools. Boys comprised 48.8% and girls 51.7% of participants. At year three, there were 1490 participants for attrition rate of 2.5%. Participants were 77.4% Caucasian, 6.2% African American, 10.1% Hispanic, 1.6% Native American, 1.2% Asian, and 3.6% Multi-Ethnic. Forty three percent of participants qualified for free or reduced lunch.

Table 2
BMI change from baseline (University of Kansas, 2003–2006).

Semester	Control	*n*	PAAC	*n*	*p*-value
Fall 2003	18.0 (3.7)	713	17.9 (3.1)	814	
Spring 2006	20.0 (4.6)	698	19.9 (4.1)	792	
Change from baseline	2.0 (1.9)		2.0 (1.9)		0.83

Values are mean (SD).

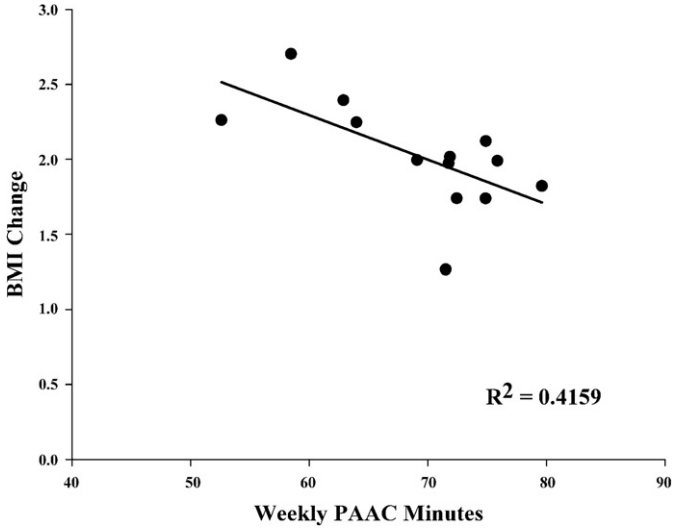

Fig 1. Correlation between BMI change and the average weekly PAAC minutes reported by each elementary school in northeast Kansas (2003–2006).

Baseline BMI for the PAAC schools was 17.9 ± 3.1 and 18.0 ± 3.7 for control schools (NS). Age, height, weight, and BMI at baseline are shown by grade and gender in Table 1. The sub-sample ($N = 454$) for outcomes shown in this paper was comprised of 195 (42.9%) boys and 259 (57.1%) girls, of which 15.3% were from ethnic groups.

Primary outcome (BMI)

There were no significant differences for change in BMI or BMI percentile (baseline to year three) for PAAC vs. control and this finding was not influenced by gender (Table 2). However, change in BMI from baseline to 3 years was significantly influenced by exposure to PAAC. As minutes of exposure increased, the change in BMI decreased (Fig. 1). Schools ($N = 9$) with ≥75 min of PAAC/wk showed significantly less increase in BMI at 3 years compared to schools ($N = 5$) with <75 min of PAAC/wk (1.8 ± 1.8 vs. 2.4 ± 2.0; $p = 0.02$).

We examined shifts in BMI percentiles from baseline to year three. In children at risk for obesity at baseline (BMI ≥ 85th percentile), 21.8% moved to normal BMI (BMI < 85th percentile) in the PAAC group compared to 16.8% in the control group (NS), and 22.6% in the PAAC group compared to 31.1% in the control group moved to overweight (BMI ≥ 95th percentile; NS). For children who were overweight at baseline, 17.1% of the PAAC group compared to 8.3% of the control group moved to at risk ($p = 0.08$).

Secondary outcomes (sub-sample)

There were no significant differences at baseline between PAAC and control in the sub-sample for any variable.

Table 3
Mean accelerometer counts/min (University of Kansas, 2003–2006).

Accelerometer Periods	Control ($n = 90$)	PAAC ($n = 77$)	p[a]
4-day average	744 (183)	851 (233)	0.007
Weekday	738 (192)	800 (222)	NS
Weekend day	750 (219)	901 (279)	0.001
During school (8 AM–2:59 PM)	606 (205)	688 (199)	0.01
After school (3 PM–5:59 PM)	946 (332)	1017 (365)	NS
Evening (6 PM–11 PM)	812 (349)	891 (361)	NS
Minutes of MVPA (≥4 METs)	72 (36.5)	98 (42.7)	0.001

Values are means (SD) taken from 4-day averages. NS, non-significant. MVPA, moderate-vigorous physical activity. MET, metabolic equivalent.
[a] Controlling for gender, race, ethnicity, and cohort.