Model 12 was determined as the final model based on best model fit (AIC = 11017.70) and significant main effects of Gender (p < .00), AMC (p = .02) and School (p = .02) (Refer to Table 8). PMC as a main effect was insignificant and removed from the final model. Age was not significant in any model tested and there was no significant difference in Physical Activity with Age over time, irrespective of Gender. School was also investigated as a random effect but this resulted in Model Errors (Models 8 and 9) and it was removed as a random effect but remained as a fixed effect. There were no significant interactions for the fixed effects of AMC*School (Model 12B), School*Gender (Model 12C), Gender*AMC (Model 12D) from the final model (Model 12) (Refer to Table 8).

Covariance structures are reported for Model 12 to determine the most appropriate covariance structure based on the most common 'goodness of fit' measures, AIC, Schwarz's Bayesian Criteria (BIC) and 2 restricted Log likelihood with results displayed in Table 9. Once the covariance structure is defined, this enables the estimation of parameters for the significant fixed effects (AMC, school, gender). The unstructured covariance structure reported the best model fit overall (Refer to Table 9).

Table 9

Covariance Structure Analysis and Goodness of Fit for Physical Activity basic

model.

Covariance Structure Type	2 Restricted Log	Akaike's	Schwarz's
	Likelihood	Information	Bayesian
		Criterion (AIC)	Criterion (BIC)
Unstructured UN*	10985.851	11005.851	11049.686
First-Order Autoregressive AR1	11076.269	11080.269	11089.036
Compound Symmetry CS	11035.233	11039.233	11048.000
Compound Symmetry Hetrogenous CSH	11006.586	11016.586	11038.504
Compound Symmetry Correlation Metric CSR	11035.233	11039.233	11048.000
Unstructured correlation metric UNR	10985.851	11005.851	11049.686
First-Order Ante-dependence AD1	11027.942	11041.942	11072.626
Hetrogeneous First-Order Autoregressive ARH1	11039.608	11049.608	11071.526
ARMA (1,1) (ERROR CONVERGENCE)	11035.233	11041.233	11054.384
Diagonal DIAG	11254.516	11262.516	11280.560
First-Order Factor Analytic FA1 (ERROR)	11271.369	11281.369	11303.286
Factor Analytic Hetrogeneous FAH1 (ERROR)	11254.528	11270.528	11305.596
Huynh-Feldt HF (ERROR)	11028.588	11038.588	11060.506
Scaled Identity ID	11271.369	11273.369	11277.752
Toeplitz TP	11027.859	11035.859	11053.393
ТРН	11000.242	11014.242	11044.926

*Best model overall fit

Normal Q-Q Plot of Residuals



Figure 7. Final linear model diagnostics.

Figure 7 revealed residual diagnostics for the final linear model (Model 12), for assumptions of normality and constant variance for the residuals based on the fit of Model 12. The residuals, based on Model 12, followed an approximately normal distribution with the majority of the points being on a near straight line (Refer to Figure 7). There was deviation from this line at the tails of the distribution, which suggested a long-distribution of the residuals (only the points at the tail ends of the distribution deviate from normality), with a series of very small (negative) and very large (positive) data points at the end of the tail. This deviation may be a result of covariates of physical activity that were not part of the study but may be impacting physical activity level in young children. Nevertheless, the overall model fit was shown to be good.

Therefore, the final linear mixed model (unstructured covariance) identified that at the first data collection (model intercept) there was a significantly higher physical activity step counts for males than females (2,292, p = .000) and that this was impacted by actual motor competence and the school attended. For an increase in one AMC score (one component of one skill), physical activity increased by 144 steps (p = .002). Schools one to nine all showed decreased physical activity, with only decreases over 2,253 average steps significant (Schools 1, 2, 5, 7, 8 and 9, p < .005), when compared to School 11. Only School 10 had reported an increased physical activity step count (60, p = .956) but this was not significantly different from School 11 (Refer Table 10).

The equation for the final linear model is:

$$Predicted PA = intercept + gender + school + AMC.$$

For example, using the estimates from Table 10, a female from School 1 would have a predicted average daily step count of 8,397 steps per day compared to males from the same school with a predicted average daily step count of 10,689.

Table 10

Parameter	Physical		
	Activity		
	Estimate	Standard Error	Significance
Intercept	13 479.42	1,055.67	.000
AMC	143.9433	46.27	.002
Gender - female	-2,291.77	439.21	.000
Gender – male	0	0	
School			.19
School 1	-2 933.81	1 045.26	.006
School 2	-2 253.44	772.72	.004
School 3	-1 249.64	765.89	.105
School 4	-1 590.43	824.61	.056
School 5	-2 477.16	753.87	.002
School 6	-1 889.62	1 128.91	.096
School 7	-2 465.91	1 186.33	.022
School 8	-2 430.88	834.71	.005
School 9	-2 649.75	1 060.47	.014
School 10	60.40	1 082.35	.956
School 11	0	0	

Final Physical Activity Linear Mixed Model (Model 12): Estimates of Fixed Effects for parameters.

Finally, predicted physical activity from Model 12 was plotted according to gender and separated into AMC tertiles of low, medium and high (Refer to Figure 8). Both boys and girls in the lowest tertile of AMC had consistently lower physical activity over the 18 months. Girls in both middle and lower AMC tertiles displayed greater variability in physical activity levels between DC 2 and DC 4, in comparison with girls in the highest AMC tertile whose physical activity level appeared relatively stable across the data collection cycles. For the boys in both the middle and lower tertiles, physical activity decreased slightly across the 18 months particularly in DC 3 and DC4, in comparison to boys in the highest AMC tertiles who showed increased physical activity levels in DC 3 and DC4.



Figure 8. Final linear mixed model of physical activity over time with significant effects of AMC, school and gender (DC = Data Collection).