Promoting Adolescent Health-related Fitness Knowledge Using *Five for Life®* Curriculum

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INTRODUCTION

Health-related fitness knowledge is an essential element for physical education in the pursuit of cultivating physically literate individuals (Corbin, 2003).

Health-related fitness knowledge (i.e., knowledge about an individuals' ability to perform physical activity and protect themselves from chronic disease) has emerged as an important area in need of improvement among adolescents to impact health-related behavior change (Demetriou, Sudeck, Thiel, & Honer, 2015 ; Keating et al., 2009).

The extant literature examining health-related fitness knowledge promotion in physical education contexts is sparse (Demetriou et al., 2015). Research examining the health-related fitness knowledge of adolescents (i.e., middle school-aged participants) has demonstrated that they tend to have misconceptions about fitness (e.g., equating being 'skinny' to being fit; Placek et al., 2001). This study examined adolescents' health-related fitness knowledge improvement over during middle school years as they learned *Five for Life® – Intermediate* curriculum (Focused Fitness, 2015; Spokane Valley, WA).

METHODS

Participants

Participants included 12,044 middle school students from 47 middle schools in a mid-Atlantic state, shown below.

Student level	Frequency	School level	M ± SD	Min	Max
Female/Male	48.9%/51.1%	FARM (%)	30.34 ± 20.84	4.21	81.56
Grade 6	36.9%	S/F-PE	204.55 ± 55.55	131.14	395.75
Grade 7	37.3%	SAP (%)	84.74 ± 10.26	58.25	96.50
Grade 8	25.8%	Score (%)	61.57 ± 12.46	25.00	84.10

Variables and Instruments

This study included variables at both participant/person and school/institution levels. Participant level variables included gender, grade, and health-related fitness knowledge test scores. Participant health-related fitness knowledge wass assessed by health-related fitness knowledge test that was designed specifically for *Five for Life® Curriculum – Intermediate*. We calculated the percentage score using the number of correct response divided by the total number of items to indicate student performance.

The school level variables included percentage of students receiving free and reduced meal (FARM), student faculty ratio for physical education (S/F-PE), and school academic performance (SAP). FARM and S/F-PE were collected from school district website and report data from state department of education. S/F-PE is calculated by dividing enrollment by the number of fulltime PE teachers. The SAP data were collected from the state department of education website. We computed the aggregated average passing rate for each school to indicate SAP.

Data Analysis

Because participant as well as school level data are encompassed in the study, we used hierarchical linear modeling (HLM) for data analysis (Raudenbush & Bryk, 2002). Since health-related fitness knowledge was measured at student level for multiple times, a three-level HLM is proper to model student knowledge change across the years in relation to individual and school level factors. Specifically, level 1 with an individual fitness knowledge growth model at time *t* of participant *i* in school *j* is specified:

$$Y_{tij} = \pi_{0ij} + \pi_{1ij}\,(\text{Year})_{tij} + e_{tij} \qquad [1]$$

At level 2, we specified the model:

$$\pi_{0ij} = \beta_{00j} + \beta_{01j}(\text{Gender})_{ij} + r_{0ij} \qquad [2a]$$

$$\pi_{1ij} = \beta_{10j} + \beta_{11j}(\text{Gender})_{ij} + r_{1ij} \qquad [2b]$$

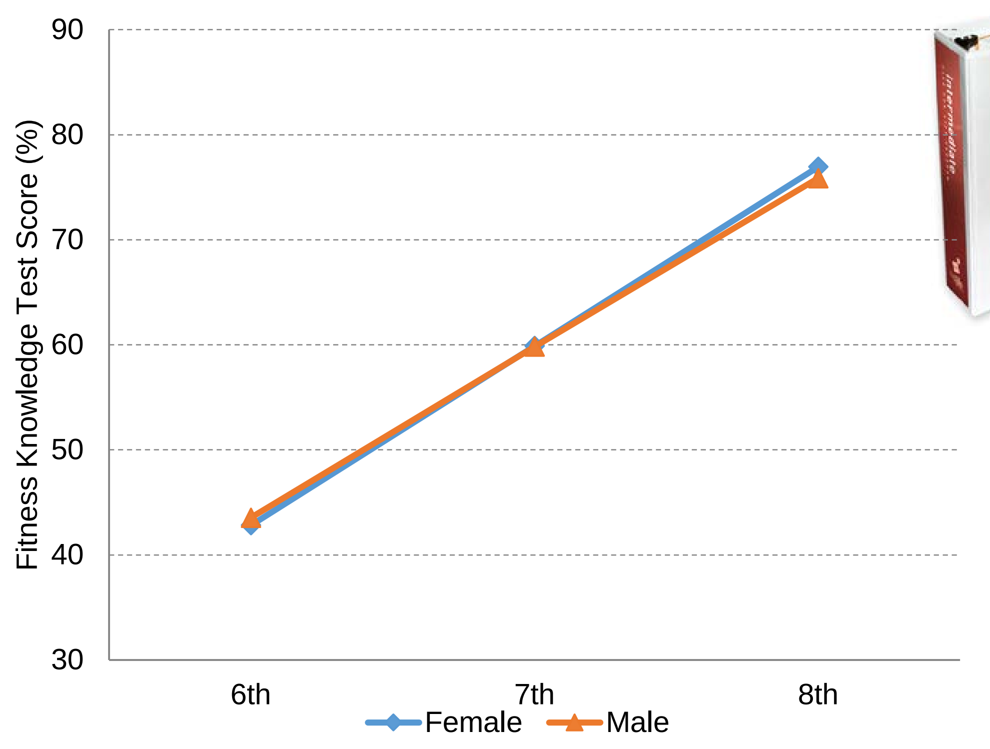
The level 3 model is presented below:

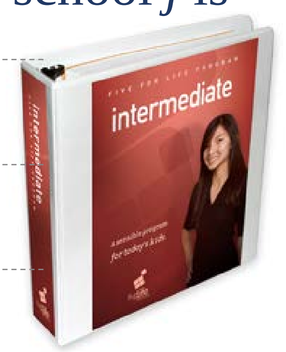
$$\beta_{00j} = \gamma_{000} + \gamma_{001}(\text{FARM})_j + \gamma_{002}(\text{S/F-PE})_j + \gamma_{003}(\text{SAP})_j + u_{00j} \qquad [3a]$$

$$\beta_{01j} = \gamma_{010} \qquad [3b]$$

$$\beta_{10j} = \gamma_{100} + \gamma_{101}(\text{FARM})_j + \gamma_{102}(\text{S/F-PE})_j + \gamma_{103}(\text{SAP})_j + u_{10j} \qquad [3c]$$

$$\beta_{11j} = \gamma_{110} \qquad [3d]$$





where Y_{tij} is the health-related fitness test score at time t for participant i in school j; $(\text{Year})_{tij}$ is 0 for grade 6, 1 for grade 7, and 2 for grade 8. π_{0ij} is the initial health-related fitness knowledge test score for child ij at grade 6. π_{1ij} is the growth rate for participant ij during the academic year; and e_{tij} is the level 1 random effect.

RESULTS

As shown in Table 1, the average S/F-PE is 204.55 ± 55.55. The overall mean for health-related fitness knowledge percentage score is 61.57 ± 12.46 across three grade levels. The composite average for SAP is 84.74 ± 10.26% passing the state test. The full unconditional model shows that intra-correlation coefficient $\rho = 88.46/(473.66+88.46) = .16$, suggesting that a significant portion of the variance in student test score can be explained at school level. The final model (Table 2) shows that the predicted average health-related fitness score at sixth grade for females is 42.81 ± 1.32, holding other factors constant. For males, the predicted score for sixth grade is .73 point higher, though not significantly, than females ($p > .05$). FARM is a significant negative predictor for student scores; one standard deviation increase in FARM is associated with a 14.68 point decrease in predicted test score ($p < .05$). S/F-PE is not significant predictor for student health-related fitness score. SAP is positively associated with student test scores, with a borderline statistical significance ($p = .051$). One standard deviation increase in SAP is likely to predict a 11.90 point increase in predicted health-related fitness knowledge score.

As shown in Table 2, the predicted middle student health-related fitness knowledge growth is 17.06 ± 1.02% per year, holding other factors constant. FARM, SAP, and S/F-PE are not significantly associated with the health-related fitness knowledge growth rate ($p > .05$). Gender is significantly associated with student growth rate ($p < .05$). Specifically, males have a significantly lower growth rate than females during the middle school years. As illustrated in Figure 1, this growth rate difference yields males a lower test score by 8th grade, even though they started with a slightly higher score than females in 6th grade, holding other factors constant.

Table 2. Predicting Middle School Student Health-related Fitness Knowledge Growth

Fixed Effect	Coefficient	se	t ratio	df	*P*
Model for test score, π_{0ij}					
Predicting, β_{00j}					
Intercept, γ_{000}	42.81	2.08	20.59	43	.00
FARM, γ_{001}	-14.68	6.27	-2.34	43	.02
S/F-PE, γ_{002}	4.04	2.14	1.88	43	.07
SAP, γ_{003}	11.90	5.92	-2.01	43	.05
Predicting β_{01j}					
Intercept gender, γ_{010}	.73	.45	1.60	12042	.11
Model for growth rate, π_{1ij}					
Predicting, β_{10j}					
Intercept, γ_{100}	17.06	1.02	16.69	43	.00
FARM, γ_{101}	4.10	3.09	1.32	43	.19
S/F-PE, γ_{102}	-1.16	1.02	-1.14	43	.26
SAP, γ_{103}	5.06	2.91	1.74	43	.09
Predicting β_{11j}					
Intercept gender, γ_{110}	-.78	.34	-2.28	12042	.02

DISCUSSION & CONCLUSIONS

The findings of this study add to the existing literature in that a well-focused curriculum is able to increase student health-related knowledge as evidenced in this and other studies (Chen et al., 2007; Leonetti et al., 2016; Sun et al., 2012). The data suggest that student health-related fitness knowledge growth in middle school years is linear, not quadratic as in other disciplinary area such as vocabulary growth (Huttenlocher et al., 1991).

The results provide evidence that school level FARM and SAP are positively related to student health-related fitness knowledge score.

Limitations

One limitation of the study is that it lacks a comparison group, thereby limiting its ability to generalize a relative effectiveness of the curriculum in fitness knowledge growth.

Conclusion

The result is evident that students on average were able to achieve 17.06% growth rate a year when *Five for Life* curriculum was implemented, which is a unique contribution in one particular curriculum context.

Females tend to have a higher growth rate in health-related fitness knowledge than males during middle school year.

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