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Physical activity and positive youth development: Impact of a school-based program

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Abstract

Objective—Protective factors associated with positive youth development predict health and education outcomes. We sought to explore trends in these protective factors and in physical activity among low-income students, and to determine the impact of a school-based youth development program on these trends.

Methods—Quasi-experimental time series design including data from 158 low-income schools from 2001 to 2007. 94 schools had exposure to a school-based program promoting physical activity and youth development through structured play; 64 schools served as controls. Primary outcomes were 5th grade student scores (n=13,109) on a California statewide survey for physical activity (1–6 scale) and measures of protective factors including: problem solving skills, meaningful participation in school, and caring adults (1–4 scales). Predictors were time (year) and school's number of years of exposure to the program.

Results—Overall, significant annual declines were seen in protective factors, including students' report of feeling safe (−0.03, 95% CI [−0.03, −0.01]), caring adults at school (−0.03 [−0.05, −0.02]), and problem solving skills (−0.03 [−0.04, −0.02]). Cumulative declines over 6 years were equivalent to a drop of 1 school-level SD. Each additional year of exposure to the program predicted greater meaningful participation (0.02 [0.001, 0.5]), problem solving skills (0.03 [0.0001, 0.06]), and increased physical activity (0.06 [0.01, 0.10]); exposure throughout elementary school (6 years) increased scores by 1 school-level SD.

Conclusions—Low-income students report a significant decline in protective factors since 2001. School partnerships with youth development programs promoting physical activity may ameliorate declines in emotional wellbeing and increase physical activity.

Background

Race and income too often predict health and education outcomes for youth. Youth in low-income communities and youth of color have higher rates of obesity,[1] lower levels of physical activity,[2] and poorer emotional wellbeing – including greater exposure to violence,[3, 4] lower feelings of safety,[5] and less social cohesion[6] – than youth from higher-income families. These acute problems are linked to long-term disparities in diverse outcomes such as graduation rates and job success,[7] rates of incarceration,[8] and cardiovascular disease.[9]

Decades of research have identified critical factors associated with maintaining a positive developmental trajectory despite adverse circumstances, a concept known as resiliency.[10, 11] Consistent protective factors include social and emotional competencies such as problem-solving skills, relationships with caring adults, and meaningful participation in school.[11]

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Youth who possess greater assets associated with resiliency tend to perform well across a spectrum of developmental arenas, including academic achievement and occupational success;[11] maintaining physical activity;[12] and avoiding violent and risk behaviors.[13] Schools are a critical venue in which to promote positive youth development[14, 15]; however, there is a dearth of controlled studies on school-based interventions promoting positive social, emotional, and cognitive development in youth.[16, 17]

One approach to increasing youth resiliency involves using physical activity as a vehicle to promote the development of critical internal and external assets. Physical activity improves emotional wellbeing[18, 19] and protects against obesity and cardiovascular disease;[20] simultaneously, it can create natural opportunities for social interaction that strengthen resiliency. Many programs that promote physical activity using a framework of youth development exist, and many serve low-income youth, but few have been evaluated. Existing programs that have demonstrated their ability both to engage youth and to expand their program to multiple sites could translate readily into policy to support at-risk youth.

Using data from a California statewide survey, we sought to describe overall trends in the presence of protective factors and physical activity in elementary school children in low-income communities over the last decade. We also sought to examine the impact of a national school-based program, Playworks, on youth development and physical activity. Playworks aims to promote positive youth development through a framework of structured play. Based on Playworks' logic model, we hypothesized that the program would increase children's physical activity levels, problem solving skills, meaningful participation in school, and perception of caring adults at school.

Methods

This study employed a quasi-experimental time series design with an untreated control group.[21] The time series design allows for analysis of repeated measures over time from a single constituent (in this case, the constituent is the school and the repeated measure are 5th grade student survey results from 2001 to 2007) to examine the impact of a time-varying covariate (in this case, exposure to Playworks). In the time series design, schools never exposed to Playworks serve as controls (and allow for identification of secular trends) and schools with varying exposure over time also act as their own controls: student scores in years with lesser exposure are compared to scores in years with greater exposure.

Playworks provided a list of all elementary schools, grades Kindergarten through 5th or 6th, in which they operated full-time between 1996 and 2007 (n=119) in 11 school districts in the San Francisco Bay Area. All other elementary schools with at least 50% of students eligible for free or reduced price meals in the same 11 school districts (n=80) were selected to serve as controls.

Youth Development Program

Playworks (formerly Sports4Kids) is a non-profit based in the San Francisco Bay Area. Founded in 1996, Playworks has expanded to serve over 65,000 children nationally each year in schools where at least 50% of students are eligible for free/reduced-price meals. Playworks provides trained, full-time coaches (typically recent college graduates) who: teach and coordinate a variety of schoolyard sports and games during recess and lunch; work with classroom teachers to reintroduce physical activity into the school curriculum; implement a youth leadership program at each school; and employ play as a tool for generating community and family involvement. Playwork's goals are to decrease conflicts, increase positive relationships among students, and create better focus in class, through

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structured and engaging physical activity. An important next step is to evaluate the program's effect on children's physical activity and emotional wellbeing.

Measures

Primary predictor - Playworks exposure—Cumulative exposure to Playworks in each year was calculated as the total number of years a school had Playworks from 1997 up to and including the given year. If a school did not have Playworks for 2 consecutive years, the cumulative exposure variable was reset to 0.

Primary outcomes – from the California Healthy Kids Survey Resilience and Youth Development Module—The California Department of Education (CDE) mandates that all public schools administer the California Healthy Kids Survey (CHKS) at least every other school year in fall or spring to all 5th, 7th, 9th, and 11th grade students. The CHKS was developed by WestEd (San Francisco, CA), a research, development and service organization. The Resilience and Youth Development Module was based on a youth development framework that was informed by an extensive review of research findings[22] and is aligned with a subset of the Search Institute's Developmental Assets.[23] Measures are an average of 2 or more questions, generally with 1–4 Likert-scale responses ranging from "No, never" to "Yes, all of the time," as shown in Table 1. Responses were recoded as necessary so higher scores would reflect positive outcomes. For the concept of goals and aspirations, WestEd's convention of assigning a value of 1.5 to a "No" response and 3.5 to a "Yes" response was observed to allow for easier comparisons of effect sizes across measures.

CHKS data were available from the California Department of Education (CDE) for 94 of 119 schools (79%) in which Playworks operated, and for 64 of 80 control schools (80%). Data were provided anonymously at the individual level for 13,109 5th grade students (7,799 from Playworks schools and 5,310 from control schools). 70 schools (47%) had more than 2 years of CHKS data, 35 (23%) had 2 years of data, and 44 (30%) contributed only 1 year of data.

School characteristics—Data on the proportion of students eligible for free/reduced-price meals (FRPM) and the racial/ethnic mix of students in each school were obtained from the CDE website (http://www.cde.ca.gov/ds/sd/). Because fewer schools recorded FRPM data prior to 2003, baseline data came from the 2002–03 school year.

Analyses

Mixed effects linear regression (xtmixed command in Stata) using individual-level data was chosen to account for repeated measures within schools, which allows for random effects for school and time. For each outcome, primary predictors were time (year) and cumulative exposure to Playworks, adjusting for baseline FRPM eligibility. Because Playworks exposure was not randomly allocated (and early adopters might have been different from late adopters and controls), each school's mean cumulative exposure to Playworks across all years was also included as a covariate in regression models, as a way of accounting for potential selection bias and other unmeasured confounders at the school level. Because CHKS responses were not normally distributed, bootstrapping was used to calculate confidence intervals. To compare differences between schools at baseline, data from the first year available for each school was used.

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Results

School characteristics were similar at baseline (2002–03 school year) by intervention status (Table 2), except that intervention schools had a higher proportion of African-American students. Students in intervention schools reported poorer initial scores on questions related to safety and weapons (mean report of freedom from exposure to weapons was 1.86 among intervention vs. 1.89 among control students, $p<0.01$) than did students in control schools (based on averages from the first year each school had survey data available). Average initial scores for the CHKS safety and violence subscales (Table 2) reflect: 73% of students felt safe most or all the time; 67% of students were free from harassment most or all the time; 79% of students were not exposed to weapons in the prior year. Average scores reflected high external assets (> 3) for all but meaningful participation in school, and high internal assets (>3) for all but empathy and problem solving.

Time trends

For all students combined, scores decreased significantly from 2001 to 2007 for the majority of protective factors. Figure 1 depicts unadjusted mean scores (with 95% CI) over time for a subset of variables, with trend lines representing the unadjusted slope over time. To provide context for change, the vertical axes in Figure 1 represent school-level mean baseline score ± 2 SDs. The greatest declines over time were seen for student report of caring adults, problem solving skills, empathy, and feelings of safety (Table 3 - coefficients for Year represent annual declines in protective factors, adjusting for exposure to Playworks and FRPM eligibility). Because the coefficients shown represent annual changes, the models allow cumulative effects to be estimated. E.g., the annual decline of 0.03 for problem solving skills equates to a cumulative decline of 0.21 points over the 7 years from 2001 to 2007. While the import of the effect sizes is difficult to assess from the scales alone, declines can be viewed in terms of standard deviations (SDs). Given a SD across schools at baseline of 0.2 for problem solving skills (Table 2), the cumulative drop of 0.21 points over 7 years represents a decline equivalent to 1 standard deviation, a clinically meaningful effect. Effect sizes were identical for declines in student report of caring adults and empathy, and annual declines represent about a 1 SD decline in scores over a 7-year period.

Playworks' impact

Figure 2 depicts unadjusted mean scores for a subset of CHKS variables by the number of years of exposure to Playworks a student would have had by 5^{th} grade (maximum exposure of 6 years, when Playworks had been in a child's school from kindergarten through 5^{th} grade). As in Figure 1, the range on the vertical axis represents mean baseline score ± 2 SDs for each variable. In Table 3, coefficients for Playworks' impact reflect the change in protective factors predicted by each additional year of exposure to the program, adjusting for year and FRPM. With each additional year of exposure to Playworks, students reported significantly ($p<0.05$) higher scores in physical activity, meaningful participation in school, problem solving skills, and goals and aspirations. Because coefficients reflect annual changes, the overall effect size is greater with more years of exposure. For example, the coefficient for problem solving skills of 0.028 means that after 6 years of exposure to Playworks, a student's problem solving skills would be expected to increase by almost 0.2, which is equivalent to 1 SD increase (Table 2).

Discussion

This study takes advantage of data from California's statewide survey to examine trends in youth development and physical activity among students in low-income communities and determine the impact of an existing school-based program on these factors. These results

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reflect a large, controlled study, capturing both within-school changes and secular trends over time with consistent measures. To our knowledge, this is the first report demonstrating significant declines in protective factors over the last decade. The downward trends demonstrated herein are of significant concern as these factors have been linked repeatedly to educational and health outcomes, including truancy, delinquency, and health-risk behaviors.[11, 24] The measures of high expectations, caring adults and meaningful participation assessed by the CHKS survey have specifically been shown to predict greater increases in test scores as well.[25] Thus, declines demonstrated could portend poor health and educational outcomes for the youth in these low-income schools and perpetuate disparities in these areas. While this analysis was limited to Bay Area schools and might not reflect trends over a larger geographic area, Los Angeles county (which contains the second largest school district in the nation) also experienced downward trends in CHKS survey measures from the 2004–2006 reporting period[26] to the 2006–2008 reporting period.[27] Further work is needed to explore these trends in other settings and among older adolescents.

There are several possible explanations for these downward trends. As has been reported in the press,[28] standardized test scores have increased since No Child Left Behind was enacted in 2001. However, the need to improve test scores could force schools to pay less attention to important factors such as physical activity and emotional wellbeing, particularly in under-performing schools. In fact, elementary school districts report decreasing time allotted for recess, physical education, art, and music by 32% since NCLB.[29] While working to improve academics is critical, focusing on only one aspect of a child's development could have unintended consequences. Conversely, working towards increased connectedness and emotional wellbeing may improve test scores, as reports suggest that greater levels of emotional wellbeing predict higher standardized test scores and grades,[25] particularly among minority youth.[30]

Other factors could also be implicated in the overall declines demonstrated herein. Dramatic increases in use of electronic media, including cell phones and social networks,[31, 32] may increase youth's sense of social isolation, despite giving the appearance of greater "connection." [33] Play and physical activity, where children must interact in person, may be critical pieces in keeping students emotionally intact.[34]

We found that greater exposure to Playworks was associated with significantly higher levels of physical activity, problem solving skills, meaningful participation in school, and goals and aspirations. Using physical activity as a vehicle for conveying supportive services has particular advantages. Play and sports, which introduce problems to be solved, such as what to play, who plays, and how to play, provide the opportunity to learn skills in cooperation and conflict resolution and promote connectedness.[35] Furthermore, physical activity has the added advantage of reducing cardiovascular risk and addressing obesity, which disproportionately affect low-income youth.[36] School-based programs such as Playworks that link physical activity to positive youth development may address multiple issues that impact at-risk youth.

These findings extend the limited reports to date on controlled trials of school-based programs promoting resiliency and emotional wellbeing,[17, 37] particularly those promoting physical activity.[16] Studies altering the school's curriculum to promote pro-social behaviors in elementary students[37] and increase social inclusion among 8th grade students[17] have demonstrated reduced aggressive and disruptive behaviors[37] and reductions in risk behaviors.[17] Additionally, a study of a teacher-led curriculum to increase physical activity among high school students demonstrated improvements in anxiety and self-esteem, as well as improved fitness.[16] Approaches that alter the curriculum are important and may be sustainable, but present challenges for overburdened teachers. These findings stand apart in

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demonstrating the efficacy of a community program, operating in the school setting, to positively impact emotional wellbeing and physical health in youth.

In addition to the research linking emotional wellbeing to improved test scores, [25, 30, 38] there is a growing body of evidence linking higher levels of physical activity to improved academic performance.[39] While this study did not examine educational outcomes, it is possible that Playworks and other youth development interventions focused on physical activity might support improved academic performance as well. Playworks supports quality recess periods, and a recent study found that children who exposed to more recess periods had improved classroom behavior.[40] Further research examining the impact of youth development programs on academic success is needed.

Limitations

Several limitations merit comment. Playworks was not randomly assigned to schools and significant differences existed at baseline between Playworks and control schools in some protective factors. Principals who invite and retain Playworks may place a greater priority on emotional wellbeing and physical activity than other principals, and may put in place other supports throughout the school day. However, using cumulative exposure to Playworks as the main predictor allowed schools to act as their own controls, and including mean cumulative exposure in the model lessens the import of differences at baseline. The evidence of a dose-response effect further reduces the likelihood that effects are due to confounding. Additionally, the positive impacts demonstrated were not robust, as the 95% confidence intervals for the coefficients narrowly exclude zero; thus results related to Playworks' impact should be interpreted with caution. Further, Playworks' effects were of small magnitude yearly; nonetheless, the potential cumulative effects are clinically meaningful. A 1 SD increase is equivalent, for example, to a school's mean score moving from the 50th percentile to the 85th percentile. Randomized, longitudinal studies of Playworks and similar programs will do much to identify best practices related to sustaining the whole child.

CHKS data, while mandated every 2 years, were not available for 20% of schools, likely because there are no accountability measures in place related to CHKS. Nonetheless, the proportion of schools missing data was similar for control and intervention schools. CHKS data are self-report and while children's perceptions reflect their reality, they are subject to bias. The reliability of answers from 5th graders depends on question complexity and time frame. While data from individual schools were available in multiple years, subjects were not followed longitudinally, nor did we have data on any respondent's gender, race/ethnicity, or family socioeconomics to further explore potential confounding. Additionally, Playworks exposure was defined at the school level; individual students may have had more or less exposure. Finally, no measures of physical health such as BMI or fitness were available to corroborate increases in physical activity.

Conclusions

The overall health of and immediate risks to children in low-income communities are likely strongly linked to the presence of critical protective factors. Therefore, declines in these factors must be addressed. Programs such as Playworks that promote positive youth development through physical activity appear to ameliorate declines in protective factors and are worthy of implementation and further evaluation, particularly in the most disadvantaged schools.

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Implications for School Health

As schools balance multiple competing demands, identifying outside resources to support student development is one approach to addressing the needs of the whole child. As the links between emotional wellbeing and academic performance become more clear, greater efforts may be merited to focus on positive youth development within the ecology of the school. The present study suggests that Playworks may support schools in their efforts to improve emotional wellbeing in youth. These findings may assist school administrators as they aim to enact strategies to improve student health, increase youth resiliency, and improve educational outcomes.

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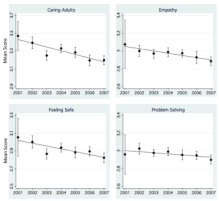

FIGURE 1. Trends over time in protective factors

Unadjusted mean school scores by year with 95% CI and best fit trend lines. Range for vertical axis reflects mean initial score ± 2 SDs for each of the four variables shown.

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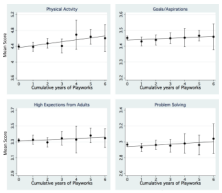

FIGURE 2. Trends in physical activity and protective factors with each additional year of exposure to Playworks

Unadjusted mean school scores with 95% CI by number of years a 5th grade student would have been exposed to Playworks, with best fit trend lines. Range for vertical axis reflects mean initial score ± 2 SDs for each of the four variables shown.

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Table 1

California Healthy Kids Survey questions

Violence and Safety

Perceived safety (1–4 scale)

Do you feel safe at school?

Do you feel safe outside of school?

Victimization/harassment (1–4 scale)

During the past year, how many times have you hit or pushed other kids at school when you were not playing around? [*Responses: 1=3 or more times; 2=2 times; 3=1 time; 4=0 times]*[*]

During the past year, how many times have you spread mean rumors or lies about other kids at school? [*Responses: 1=3 or more times; 2=2 times; 3=1 time; 4=0 times*][*]

Do other kids hit or push you at school when they are not just playing around? *[1=Yes, all of the time; 2=Yes, most of the time; 3=Yes, some of the time; 4=No, never]*[*]

Do other kids at school spread mean rumors or lies about you? *[1=Yes, all of the time; 2=Yes, most of the time; 3=Yes, some of the time; 4=No, never]*[*]

Weapons at school (1–2 scale)

During the past year, did you ever bring a gun or knife to school? [*1=Yes; 2=No*][*]

During the past year, have you ever seen another kid with a gun or knife at school? [*1=Yes; 2=No*][*]

Physical Activity (0–6 scale)

How many days each week do you exercise, dance, or play sports? [*0=0 d/wk; … 6=6–7 d/wk*]

External Assets

School connectedness (1–4 scale)

Do you feel close to people at school?

Are you happy to be at this school?

Do you feel like you are part of this school?

Do teachers treat students fairly at school?

Caring adults (1–4 scale)

Do the teachers and other grown-ups at school care about you?

Do the teachers and other grown-ups at school listen when you have something to say?

High expectations (1–4 scale)

Do the teachers and other grown-ups at school tell you when you do a good job?

Do the teachers and other grown-ups at school believe that you can do a good job?

Meaningful participation (1–4 scale)

Do you help make class rules or choose things to do at school?

Do you do things to be helpful at school?

Pro-social peers (1–4 scale)

Do your best friends get into trouble?[*]

Do your best friends try to do the right thing?

Internal Assets

Empathy (1–4 scale)

Do you try to understand how other people feel?

Do you feel bad when someone else gets their feelings hurt?

Problem solving (1–4 scale)

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Do you know where to go for help with a problem?

Do you try to work out your problems by talking or writing about them?

Goals/Aspirations (1.3–3.7 scale)

Do you try to do your best?

Do you have goals and plans for the future? [1.5=No/3.5=Yes]

Do you plan to go to college or some other school after high school? [*1.5=No/3.5=Yes*]

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* Asterisked items have been reverse coded so higher scores reflect more positive outcomes.

Unless otherwise noted, the response scale for each item was a 1–4 Likert scale: *1=No, never; 2=Yes, some of the time; 3=Yes, most of the time; 4=Yes, all of the time*

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TABLE 2

School-level characteristics and protective factor scores

	All Schools N = 158	Schools Exposed to Playworks N = 94	Unexposed Schools N = 64
		mean ± SD	
Cumulative exposure to Sport4Kids (years)*	2.2 ± 2.4 [0, 9]	3.6 ± 2.1 [1, 9]	0 ± 0
Years of CHKS data	2.3 ± 1.1 [1, 5]	2.2 ± 1.0 [1, 5]	2.4 ± 1.1 [1, 5]
Baseline School Characteristics			
Students/school	457 ± 196	473 ± 209	435 ± 177
% Eligible for free/reduced-price meals	73% ± 17.3%	73% ± 19.2%	73% ± 14.2%
% Latino	37% ± 24%	37% ± 24.4%	37% ± 23.4%
% African American*	28 ± 22.0%	32% ± 23.0%	24% ± 19.3%
% Asian	17% ± 22%	15% ± 16.4%	20% ± 23.4%
% Caucasian	10% ± 12%	10% ± 14.1%	10% ± 8%
Initial CHKS Scores**			
Safety and Violence			
Perceived safety*	2.9 ± 0.2	2.9 ± 0.2	3.0 ± 0.2
Victimization/harassment	3.2 ± 0.2	3.2 ± 0.2	3.2 ± 0.2
Weapons at school*	1.9 ± 0.1	1.9 ± 0.1	1.9 ± 0.1
Physical Activity			
Exercise (0–6 scale)	4.5 ± 0.4	4.5 ± 0.4	4.5 ± 0.5
External Assets			
School connectedness	3.1 ± 0.2	3.1 ± 0.2	3.0 ± 0.2
Caring adults	3.3 ± 0.2	3.3 ± 0.2	3.3 ± 0.2
High expectations	3.3 ± 0.2	3.3 ± 0.2	3.3 ± 0.2
Meaningful participation	2.5 ± 0.2	2.5 ± 0.2	2.5 ± 0.2
Pro-social peers	3.1 ± 0.2	3.1 ± 0.2	3.1 ± 0.2
Internal Assets			
Empathy	3.0 ± 0.2	3.0 ± 0.2	3.0 ± 0.2

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	All Schools N = 158	Schools Exposed to Playworks N = 94	Unexposed Schools N = 64
		mean ± SD	
Problem solving	3.0 ± 0.2	3.0 ± 0.2	3.0 ± 0.2
Goals	3.4 ± 0.1	3.4 ± 0.1	3.4 ± 0.1

* Difference between Playworks and control school significant ($p<0.05$) in t-test

** Initial scores reflect CHKS data from each school's earliest year available.

All measures except Weapons (1–2 scale) and Exercise (0–6 scale) are on 1–4 scales. For each measure of Internal and External Assets, a score >3 reflects high assets, 2 to 3 reflects moderate assets, and scores <2 reflect low assets.[26]

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TABLE 3

Regression model coefficients for time trends and impact of Playworks (within-school)

	Coefficients [95% CI]			
	Impact of time, per year		Impact of Playworks, per year of exposure	
Violence and Safety				
Perceived safety	**−0.025**	**[−0.034, −0.012]**	0.014	[−0.010, 0.035]
Victimization/harassment	−0.004	[−0.016, 0.009]	0.002	[−0.020, 0.023]
Weapons at school (1–2 scale)	**−0.011**	**[−0.015, −0.006]**	−0.001	[−0.010, 0.010]
Physical Health				
Exercise (0–6 scale)	−0.016	[−0.038, 0.013]	**0.055**	**[0.004, 0.088]**
External Assets				
School connectedness	0.000	[−0.055, 0.050]	0.000	[−0.035, 0.065]
Caring adults	**−0.032**	**[−0.047, −0.019]**	0.015	[−0.014, 0.051]
High expectations	**−0.013**	**[−0.027, −0.004]**	0.015	[−0.005, 0.037]
Meaningful participation	0.003	[−0.010, 0.016]	**0.024**	**[0.001, 0.051]**
Pro-social peers	**−0.011**	**[−0.020, −0.001]**	0.002	[−0.018, 0.021]
Internal Assets				
Empathy	**−0.026**	**[−0.041, −0.018]**	−0.001	[−0.024, 0.024]
Problem solving	**−0.029**	**[−0.041, −0.018]**	**0.028**	**[0.0001, 0.056]**
Goals and aspirations	−0.001	[−0.007, 0.004]	**0.007**	**[0.001, 0.018]**

Significant associations ($p < 0.05$) are shown in bold.

Items are on a 1–4 scale unless otherwise noted.