



COMPREHENSIVE SCHOOL PHYSICAL ACTIVITY PROGRAM (CSPAP)

Research to Practice
Literature Review

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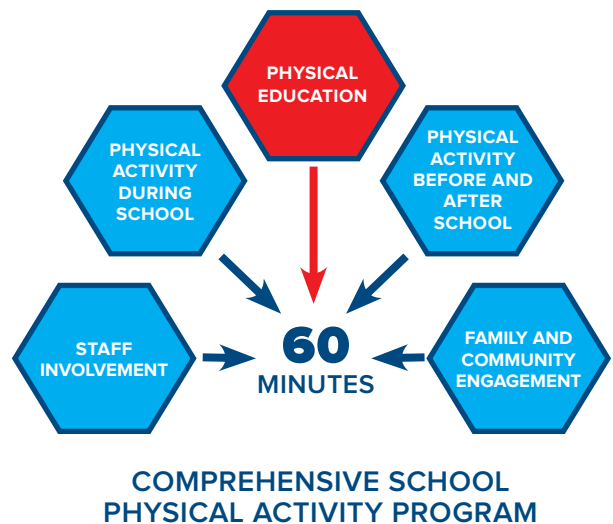
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REPORT OVERVIEW

Brief Background

A Comprehensive School Physical Activity Program (CSPAP) is a multi-component approach to providing physical activity opportunities in and around schools (see Figure 1). By integrating physical activity through multiple strategies, the goal of a CSPAP is to increase the likelihood that K-12 students: obtain the recommended 60 minutes of physical activity each day (U.S. Department of Health and Human Services, 2008), and develop physical literacy skills outside of physical education (Castelli, Centeio, Beighle, Carson, & Nicksic, 2014). CSPAP has been adopted as national framework for schoolwide physical activity (CDC, 2017) and is endorsed by many national organizations such as the Centers for Disease Control and Prevention (CDC, 2015), the Society of Health and Physical Educators of America (SHAPE America, 2015), and the Institute of Medicine (IOM, 2013). CSPAP also serves as the guiding framework for the Active Schools movement (www.activeschoolsus.org).

FIGURE 1. COMPREHENSIVE SCHOOL PHYSICAL ACTIVITY PROGRAM (CSPAP) MODEL.



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Purpose

The purpose of this report is to review and present a practical summary of the published research to date on multicomponent, school-based physical activity interventions through the lens of the CSPAP framework. Although similar literature reviews have been conducted on youth-based physical activity interventions (Metcalf, Henley, & Wilkin, 2012; Sharma, 2008), school-based physical activity interventions (De Bourdeaudhuij, et al., 2011; Demetriou & Höner, 2012; Kriemler et al. 2011; Trudeau & Shephard, 2008), or CSPAP-specific research (Chen & Gu, 2018; Erwin, Beighle, Carson, & Castelli, 2013; Hunt & Metzler, 2017), the unique contribution of this review is fourfold: a) a sole emphasis on multicomponent school interventions, b) guided by the CSPAP framework and its components (e.g., physical education +1 additional CSPAP component), c) identified multicomponent impacts on health and academic outcomes, and d) emphasis on the translation of research to practice. This review offers a CSPAP-focused follow-up guide for multicomponent youth physical activity strategies, and their associated outcomes, in school settings (USDHHS, 2012).

Intended Audiences & Applications

This report is intended for the following audiences:

- Active Schools Partners and their school-based partners
- School-based physical activity developers, facilitators, and supporters
- School-based physical activity researchers and evaluators

The information shared in this report can be utilized to:

- Review and access the latest published evidence regarding multicomponent approaches to schoolwide physical activity opportunities
- Identify next steps for multicomponent physical activity research

Additional applications of this report (with some further modifications):

- Identify school physical activity initiatives to be successfully implemented in comparable school settings
- Plan, implement, and align more than one physical activity opportunity in and around schools
- Identify and align assessment (or evaluation indicators) across multiple components of the CSPAP model

Method

A systematic review of peer-reviewed literature, published from 1987 (the beginning of coordinated models to school health) to July 2018 in English-language journals was conducted using five prominent databases in the fields of physical health, school wellness, and education: PubMed, Psych Info, Physical Education Index, Sport Discus, ERIC (1,620 unique searches). Search terms were created by three content categories using similar systematic review parameters and guiding definitions (Stoepker et al., 2018; CDC, 2014). A complete list of included search terms are presented in Table 1. One term per content category was entered per search field until all combinations of terms across the categories were exhausted.

TABLE 1. SEARCH TERMS BY CONTENT CATEGORIES

MULTICOMPONENT TERMS (CATEGORY 1)	SCHOOL PHYSICAL HEALTH TERMS (CATEGORY 2)	ACADEMIC TERMS (CATEGORY 3)
<ul style="list-style-type: none"> • school-wide • comprehensive • coordinated • multicomponent • whole-of-school • CSPAP 	<ul style="list-style-type: none"> • physical education • physical activity • physical education & physical activity 	<ul style="list-style-type: none"> • physical health • mental health • emotional health • academic achievement • academic performance <ul style="list-style-type: none"> > class grades > standardized tests > graduation rates • classroom behavior <ul style="list-style-type: none"> > attendance > absenteeism > dropout rates > behavioral problems • cognition <ul style="list-style-type: none"> > concentration > memory > fitness • BMI

Note. Example searches:

(1) school-wide + physical education + physical health

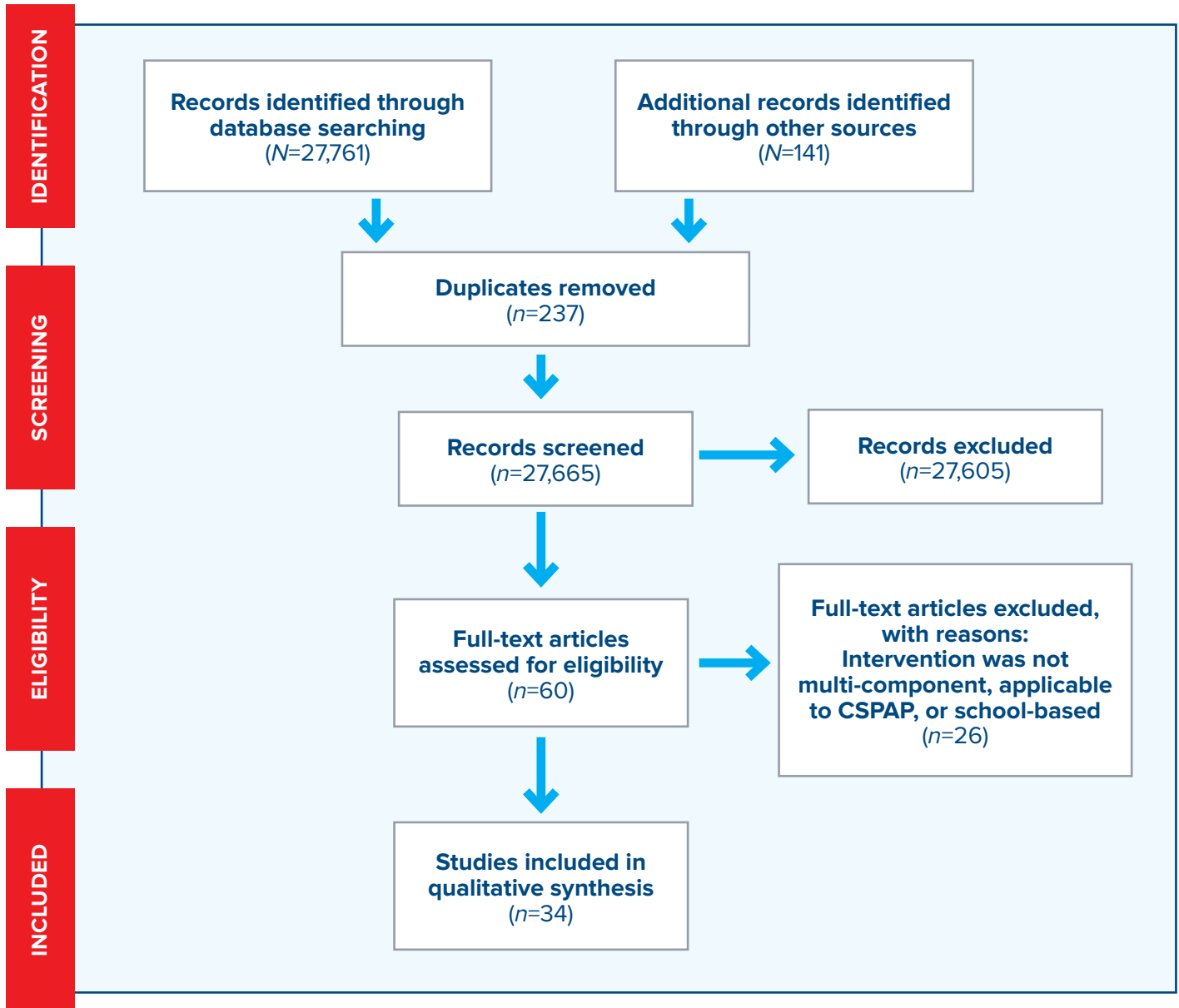
(2) school-wide + physical education + mental health

(3) school-wide + physical education + emotional health

Titles, abstracts, and full text articles were screened in a sequential manner by the research team to determine potential relevance using the inclusion criteria of multicomponent, school-based physical activity interventions that reflected components of the CSPAP model. Any article called into question was deliberated

by two reviewers until agreement was met, and later confirmed by content experts. All relevant articles that met the inclusion criteria were organized by number and type of CSPAP component in a spreadsheet and documented the following information: intervention characteristics, results, main conclusions, practical significance, and link to article /abstract if publicly available.

FIGURE 2. PRISMA DIAGRAM (MOHER ET AL., 2009) DEPICTING THE DIFFERENT PHASES OF THIS REVIEW.



Results

Results are organized in 11 sections by: (1) the number and combination of CSPAP components used in multicomponent interventions (e.g., PE +1) (2) systematic reviews that examined or included multicomponent interventions, (3) school level where multicomponent interventions occurred (i.e., elementary and secondary), and (4) primary outcomes of multicomponent interventions (i.e., health and academic outcomes). Interventions that included physical education are presented first to uphold the foundational importance of this subject and component area to the CSPAP model (CDC, 2015; SHAPE America, 2015). Interventions that involved multiple components, excluding physical education, appear second in a separate section.

On the following pages, each section includes a descriptive overview of the included interventions, a table displaying the intervention characteristics and outcomes, a brief synthesis of key findings and recommendations, and a detailed summary table of the published literature including a link to the complete references at the end of the report.

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SUMMARY OF FINDINGS

Multicomponent Interventions by Number of CSPAP Components

PE+1: Physical Education +1 Additional CSPAP Component

Twelve of the 34 articles reviewed (35%) included physical education and one additional CSPAP component intervention. Nearly all of the 12 articles (92%) included *physical activity during school* programming as the additional component. Most PE +1 multicomponent interventions were conducted in urban settings in the United States; all occurred in elementary schools. Health outcomes, in particular physical activity, were studied as the primary outcomes of PE +1 multicomponent interventions.

PE+1 CSPAP COMPONENT	12 TOTAL (35%)
Physical Activity During School	11 (92%)
Physical Activity Before/After School	1 (8%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	10 (83%)
• International	2 (17%)
School Setting	
• Urban	7 (58%)
• Rural	0 (0%)
• Not specified	5 (42%)
School Level	
• Elementary	12 (100%)
• Secondary	0 (0%)
Socioeconomic Status	
• Low	6 (50%)
• High	N/A
• Not specified	6 (50%)

PRIMARY OUTCOMES	
Health Outcomes	
• Physical Activity	7 (58%)
• Motor Skills	2 (17%)
• Weight/BMI	1 (8%)
Academic Outcomes	
• On-Task Behavior	2 (17%)

Key Findings and Recommendations

Implementing CSPAP interventions with a PE+1 approach resulted in positive student outcomes related to physical activity, motor skills, cardiovascular endurance, body mass index, and on-task behavior in elementary settings. Future research should examine PE+1 interventions in secondary schools and rural settings, and the impact of PE+1 interventions on other academic outcomes beyond on-task behavior in both elementary and secondary settings.

TABLE 2. DETAILED SUMMARY OF PE+1 PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Brusseau, T.A., Kulinna, P.H. (2015). An examination of four traditional school physical activity models on children's step counts and MVPA. <i>Research Quarterly for Exercise and Sport</i> , 86(1), 88-93.	PE: Taught 2 days per week for 50-minutes and employed Dynamic PE curriculum PA During School: Multiple Recesses (one unstructured)	Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: 4 schools with 5th grade children (average age 10.0)	Children accumulated the greatest physical activity on days they had PE and multiple recess opportunities. Children accumulated the least amount of physical activity on days with only 1 recess opportunity. Children accumulated an additional 1140 steps and 4.1 min of MVPA on PE days.	Recess and PE play important roles in children's daily PA accumulation.	5
Brusseau, T.A., Hannon, J., & Burns, R. (2016). The effect of a comprehensive school physical activity program on physical activity and health-related fitness in children from low-income families. <i>Journal of Physical Activity and Health</i> , 13(8), 888-894.	PE: Taught 1 day per week for 50-minutes and employed Dynamic PE curriculum PA During School: Recess led by PALs, daily classroom PA integration	Country: United States School Setting: Not Specified School Level: Elementary SES: schools in low-income neighborhoods Participants: 3 schools with an average age of 8.4 years old	There were significant but weak-to-moderate increases in step counts, and moderate physical activity at 12 weeks compared to baseline. There were also significant but moderate increases in Progressive Aerobic Cardiovascular Endurance Run laps at 12 weeks compared with baseline. Analyses revealed that there were 3.02 and 2.34 greater odds that a child would achieve step count and MVPA standards and 2.26 greater odds that a child would achieve aerobic fitness standards at 12 weeks compared with baseline.	Implementing a CSPAP for 12 weeks may significantly improve physical activity and health related fitness in children from low-income families.	6
Burns, R. D., Brusseau, T. A., & Hannon, J. C. (2015). Effect of a Comprehensive School Physical Activity Program on School Day Step Counts in Children. <i>Journal Of Physical Activity & Health</i> , 12(12), 1536-1542.	PE: Monthly in-service opportunities PA During School: Recess led by PALs, daily classroom PA integration	Country: United States School Setting: Not Specified School Level: Elementary SES: schools in low-income neighborhoods Participants: 4 schools with children aged 8-11 (grades 4-5)	Analyses revealed increases in school day step counts from the end of preintervention to the start of postintervention.	Implementing a CSPAP may positively influence children's school day physical activity by both increasing average school day step counts and buffering decreases in step counts.	7
Burns, R., Brusseau, T., Fu, Y., Myrer, R., & Hannon, J. (2016). Comprehensive school physical activity programming and classroom behavior. <i>American Journal of Health Behavior</i> , 40(1).	PE: In-service trainings twice per semester on quality PE PA During School: Daily 5-minute classroom energizer using Take 10! program	Country: United States School Setting: Not Specified School Level: Elementary SES: schools in low-income neighborhoods Participants: 3 schools with children aged 5-12 (grades k-6)	There were 7.49 greater odds of a classroom achieving 80% on-task behavior at 6 weeks compared to baseline and a 27.93 greater odds of a classroom achieving 80% on-task behavior compared to baseline.	Implementing a CSPAP may improve classroom behavior of children across all grade levels and among those from low-income areas.	8

TABLE 2. DETAILED SUMMARY OF PE+1 PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Burns, R. D., Brusseau, T. A., & Fu, Y. (2017). Influence of Goal Setting on Physical Activity and Cardiorespiratory Endurance in Low-Income Children Enrolled in CSPAP Schools. <i>American Journal Of Health Education</i> , 48(1), 32-40.	PE: Monthly in-service opportunities PA During School: Recess led by PALs, daily classroom PA integration	Country: United States School Setting: Urban School Level: Elementary SES: schools in low-income neighborhoods Participants: 5 schools with children aged 5-12 (grades k-6)	6th grade children enrolled in schools where PALs employed goal setting displayed greater increases in school day step counts (+665 steps) compared to schools where PALs did not employ goal setting. In third-grade children in schools where PALs employed goal setting, there was a decrease in step counts from baseline to follow up (-832).	Goal setting within school physical activity program could combat physical activity declines as children get older	9
Burns, R., Fu, Y., Fang, Y., Hannon, J., & Brusseau, T. (2017). Effect of a 12-week physical activity program on gross motor skills in children. <i>Perceptual and Motor Skills</i> , 124(6).	PE: Monthly in-service opportunities PA During School: Recess led by PALs, daily classroom PA integration	Country: United States School Setting: Not Specified School Level: Elementary SES: schools in low-income neighborhoods Participants: 3 schools with children aged 5-12 (grades k-6)	Results indicate motor skills improved by approx. 10% following 12-weeks of CSPAP among children. TGMD-1 percent scores improved from 72.6% at baseline to 82.4% at follow-up. Students aged 7, 8, and 9 displayed a greater TGMD-2 percent change from baseline compared to children aged 10, 11, and 12 years. However, children aged 7 to 12 years displayed greater TGMD-2 percent change from baseline compared with children who were aged 6 years.	Implementing a multi-component school-based intervention like a CSPAP can increase child gross motor skills	10
Burns, R., Fu, Y., Hannon, J., & Brusseau, T. (2017). School physical activity programming and gross motor skills in children. <i>American Journal of Health Behavior</i> , 41(5).	PE: Classes focused on motor skill development PA During School: Recess led by PALs, daily classroom PA integration	Country: United States School Setting: Urban School Level: Elementary SES: schools in low-income neighborhoods Participants: 5 schools with children aged 5-12 (grades 1-6)	Children scores on the overall gross motor skills scores showed statistically significant increases over the intervention period. Significant improvements were also seen for locomotor skills and ball skills sub-test scores.	Implementation of a CSPAP can led to signifcant improvements in child gross motor skills	11
Cradock, A. L., Barrett, J. L., Carter, J., McHugh, A., Sproul, J., Russo, E. T., Gortmaker S. L. (2014). Impact of the Boston active school day policy to promote physical activity among children. <i>American Journal of Health Promotion</i> , 28(3_suppl), S64. https://doi.org/10.4278/ajhp.130430-QUAN-204 .	PE: Promotion of 150 minutes of quality PE PA During School: Integration of classroom PA and recess	Country: United States School Setting: Urban School Level: Elementary SES: Not Specified Participants: 6 schools with children in grades 4-5	During school time, intervention schools demonstrated greater increases in minutes per day of MVPA and vigorous PA and greater decreases in minutes per day of sedentary time.	The implementation of a policy on increasing opportunities for movement can have positive effects on child physical activity levels	15
Jansen, W., Borsboom, G., Meima, A., Zwanenburg, E.J., Mackenbach, J.P., Raat, H., & Brug, J. (2011). Effectiveness of a primary school-based intervention to reduce overweight. <i>International Journal of Pediatric Obesity</i> , 6(2-2).	PE: 3 PE lessons per week PA Before/After School: Additional sport & play activities	Country: Netherlands School Setting: Inner-city/urban School Level: Elementary SES: schools in low-income neighborhoods Participants: 20 schools with children aged 6-12 years (grades 3-8)	Significant positive intervention effects were found for percentage overweight children, waist circumference, and 20 m shuttle run among pupils of grades 3-5. The prevalence of overweight in grades 3-5 increased by 4.3% in the control group and by 1.3% in the intervention group.	A multicomponent physical activity intervention including PE and before/after school physical activity opportunities may be effective in reducing childhood obesity.	20

TABLE 2. DETAILED SUMMARY OF PE+1 PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Magnusson, K.T., Sigurgeirsson, I., Sveinsson, T., & Johannsson, E. (2011). Assessment of a two-year school-based physical activity intervention among 7-9 year-old children. <i>International Journal of Nutrition and Physical Activity</i>, 8, 138.</p>	<p>PE: One day on-site counseling PA During School: Teachers provided with PA promoting materials</p>	<p>Country: Iceland School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: 6 schools with children in the second grade</p>	<p>Children in the intervention schools were more physically active at moderate to vigorous intensities compared to those in control schools after one year of the intervention. Analyses revealed a significantly greater increase in physical activity among boys in the intervention schools compared to girls. No different in physical activity was detected between the study groups at the end of the study period after two years of intervention.</p>	<p>A multicomponent physical activity intervention including PE and during school physical activity opportunities implemented by trained teachers may increase student physical activity after one year of implementation. However, schools should consider that boys may respond better to school-based interventions than girls and that the success of the intervention may depend on the training and motivation of the general teachers.</p>	25
<p>Myrer, R. S., Brusseau, T. A., Burns, R. D., Fu, Y., & Hannon, J. C. (2016). Effect of a CSPAP on classroom behavior in at-risk children. <i>Research Quarterly for Exercise and Sport</i>, 87, A103-A104. Retrieved from https://unco.idm.oclc.org/login?url=https://search.proquest.com/docview/1817494453?accountid=12832</p>	<p>PE: 3 45-minute PE lessons per week PA During School: Extracurricular PA for overweight & obese students during school breaks</p>	<p>Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: three schools with children aged 5-12 (grades k-6)</p>	<p>At baseline, 32% of classrooms demonstrated optimal on-task behavior at baseline. The prevalence of on-task behavior increased to 70% of the classrooms at the 6-week follow-up and to 84% of the classrooms at the 12-week follow up. Analyses revealed 6.42 times greater odds of a classroom achieving at least 80% on-task behavior at the 6 week follow up compared with baseline and a 17.18 times greater odds of a classroom achieving at least 80% on-task behavior at the 12 week follow-up compared with baseline.</p>	<p>CSPAPs may be used a behavioral interventions that may improve the on-task behavior of at-risk elementary school students, which may positively affect academic performance over time.</p>	27
<p>Weaver, R. G., Webster, C. A., Egan, C. A., Campos, C. M. C., Michael, R. D., Vazou, S.(2018). Partnerships for Active Children in Elementary Schools: Outcomes of a two-year pilot study to increase physical activity during the school day. <i>American Journal of Health Promotion</i>, 32(3), 621-630.</p>	<p>PE: Teacher training on PA integration PA During School: Classroom PA integration</p>	<p>Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: Three schools</p>	<p>Percentage of boys & girls in the intervention school meeting the 30 min/day of MVPA increased by 18.5% to 32.2%. Boys and girls in intervention schools increased their MVPA during school hours 8.8% more than students in the control school. During general education classroom time, boys and girls increased their MVPA 6.4% and 2.4% more than their counterparts in the control school. Boys decreased their sedentary time 1.7% compared to students in the control school. During PE boys & girls increased their MVPA 11.5% and 8.4% more than students in the control school and decreased in sedentary time 10.3% and 2.2% more than students in the control school.</p>	<p>A multicomponent intervention facilitated through school and university partnerships is an effective strategy when trying to increase physical activity levels among children.</p>	34

PE+2: Physical Education +2 Additional CSPAP Components

Eight of the 34 articles reviewed (24%) included physical education and two additional CSPAP component interventions. Of the seven articles, five (62%) included the combination of *physical activity during school* and *family and community engagement* programming, and three (38%) combined *physical activity during school* and *physical activity before and after school* programming. The majority of PE +2 multicomponent interventions were conducted in urban settings in the United States; all occurred in elementary schools. Only health outcomes were studied as the primary outcomes of the PE +2 multicomponent interventions.

PE+2 CSPAP COMPONENTS	7 TOTAL (21%)
Physical Activity During School + Family & Community Engagement	5 (62%)
Physical Activity During School + Physical Activity Before/After School	3 (38%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	0 (0%)
• International	8 (100%)
School Setting	
• Urban	1 (12.5%)
• Rural	1 (12.5%)
• Urban & Rural	2 (25%)
• Not specified	4 (50%)
School Level	
• Elementary	6 (75%)
• Secondary	2 (25%)
Socioeconomic Status	
• Low	2 (25%)
• High	0 (0%)
• Not specified	6 (75%)

PRIMARY OUTCOMES	
Health Outcomes	
• Physical Activity	4 (50%)
• Aerobic Fitness	2 (25%)
• Weight/BMI	1 (12.5%)
• Muscular Fitness	1 (12.5%)
Academic Outcomes	0 (0%)

Key Findings and Recommendations

Implementing CSPAP interventions with a PE+2 approach resulted in positive student outcomes related to physical activity, aerobic fitness, weight/BMI, and muscular fitness in elementary and secondary international settings. Further research should examine PE+2 interventions in secondary schools as well as within both urban and rural settings in the U.S. A worthy area of inquiry is the impact of PE+2 interventions on academic outcomes in both elementary and secondary settings.

TABLE 3. DETAILED SUMMARY OF PE+2 PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Arto, G. (2015). Children's segment specific light physical activity across two years of school-based program. <i>Journal of Physical Education and Sport</i> , 15(1), 88-95. doi:http://dx.doi.org/10.7752/jpes.2015.01015	<p>PE: Teacher training to increase child motivation and PE enjoyment</p> <p>PA During School: Integration of classroom PA</p> <p>PA Before/After School: Active transportation to school/integration of afterschool programs</p>	<p>Country: Finland</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 2 schools with children aged 10-13</p>	The findings highlighted that children's total light physical activity remained stable through two years of program. However, the segments of before-school, after-school, short break, and girls' class time showed declining patterns across the period. Both girls and boys accumulated the majority of their weekly light physical activity during the weekdays and out-of- school periods compared to weekends and in-school time. The program seemed to be effective to prohibit declining levels of children's light physical activity .	Implementing a school-based multicomponent PA program may help to sustain children's light physical activity levels, which may improve their physical activity levels in the future.	1
Eather, N., Morgan, P. J., & Lubans, D. R. (2013). Feasibility and preliminary efficacy of the Fit4Fun intervention for improving physical fitness in a sample of primary school children: a pilot study. <i>Physical Education & Sport Pedagogy</i> , 18(4), 389-411.	<p>PE: 8-Week, 60-Min PE program</p> <p>PA During School: Activity Task Cards</p> <p>Family & Community Engagement: Children, and family members were given an 8-week home activity program</p>	<p>Country: Australia</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 2 schools with children aged 9-11</p>	A significant group x time effect was exhibited for the sit and reach test, the seven-stage sit-up test, and the wall squat test. Large within group effects were found for the intervention group for flexibility, and muscular fitness , and seven-stage sit up and a medium to large effect was found for muscular fitness using the basketball throw test. No significant group x time effects were found in the beep test, basketball throw test or PA levels. No significant improvements were found for the control group in any measure	This intervention demonstrated that integrating an 8-week program that include 8-60 minute health and Pe lessons, recess and lunch activity, and a home fitness program is feasible and an effective strategy for improving child health	17
Grydeland, M., Bergh, I.H., Bjelland, M., Lien, N., Andersen, L.F., Ommundsen, Y., Knut-Inge, K., & Anderssen, S.A. (2013). Intervention effects on physical activity: The HEIA study - a cluster randomized controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i> , 10(17), 1-13.	<p>PE: Teachers integrated SPARK program</p> <p>PA During School: Once a week 10-min classroom PA</p> <p>PA Before/After School: Active Commute to school campaigns</p>	<p>Country: Norway</p> <p>School Setting: Largest towns/ municipalities in SE Norway</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 37 schools with children aged 11-12 (grade 6)</p>	The intervention group showed a net effect of 50 counts per minute increase from baseline to post in overall physical activity. Subgroup analyses showed that the effect appeared to be more profound among girls and participants in the low activity group as compared to boys and high activity group participants. The intervention affected physical activity among the normal weight group more positively than the overweight, and participants with parents having 13-16 years of education more positively than participants with parents having either a lower or higher number of years of education. The intervention succeeded in reducing time spent sedentary among girls but not among boys.	Implementing a multicomponent physical activity program may increase physical activity of adolescents and may have a profound effect on girls and low-active adolescents in particular.	18

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Hollis, J.L., Sutherland, R., Campbell, L., Morgan, P.J., Lubans, D.R., Nathan, N., Wolfenden, L., Wiggers, J. (2016). Effects of a “school-based” physical activity intervention on adiposity in adolescents from economically disadvantaged communities: Secondary outcomes in the Physical Activity 4 Everyone” RCT. <i>International Journal of Obesity</i>, 40(10), 1486-1493.</p>	<p>PE: Teachers received 2 professional learning workshops that focused on increasing MVPA & motivation</p> <p>PA During School: PA breaks at least 2 days per week</p> <p>Family & Community Engagement: Take home health materials distributed</p>	<p>Country: Australia</p> <p>School Setting: Rural</p> <p>School Level: Secondary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: schools with children aged 12-13 (grade 7)</p>	<p>There were group by time effects for weight and BMI in favor of intervention group. These findings were consistent for weight and BMI at 24 months with group by time effects also found for BMI favoring the intervention group.</p>	<p>Implementing a multicomponent physical activity intervention may improve adolescent's adiposity and prevent unhealthy weight gain.</p>	19
<p>Kriemler, S., Zahner, L., Schindler, C., Meyer, U., Hartmann, T., Hebestreit, H., Brunner-La R.H.P., (2010). Effect of school based physical activity programme (KISS) on fitness and adiposity in primary schoolchildren: Cluster randomized controlled trial. <i>British Medicine Journal</i>, 23, 340.</p>	<p>PE: PE 3 times per week</p> <p>PA During School: 3-5 daily PA breaks (2-5 mins)</p> <p>Family & Community Engagement: PA homework</p>	<p>Country: Switzerland</p> <p>School Setting: Rural and urban locations</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 95 schools with children aged 6-12 (grades 1-5)</p>	<p>Children in the intervention group showed more negative changes in skinfolds, but improved in aerobic fitness & physical activity.</p>	<p>A multicomponent physical activity intervention may improve student physical activity, fitness, and adiposity.</p>	21
<p>Meyer, U., Schindler, C., Zahner, L., Ernst, D., Hebestreit, H., van Mechelen, W., Brunner-La, R.H.P., Kriemler, S. (2014). Long-term effect of a school-based physical activity program (KISS) on fitness and adiposity in children: A cluster-randomized controlled trial. <i>PLoS One</i>, 9(2).</p>	<p>PE: 3 45-minute PE lessons per week</p> <p>PA During School: Extracurricular PA for overweight & obese students during school breaks</p> <p>Family & Community Engagement: PA homework</p>	<p>Country: Switzerland</p> <p>School Setting: Rural and urban locations</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 15 schools with children aged 6-12 (grades 1-5)</p>	<p>Children in the intervention group had a significantly higher average level of aerobic fitness at follow-up while the immediate beneficial effects on the other primary outcomes were not sustained. Reported time spent in sports club during the follow-up period was higher in the intervention group.</p>	<p>Implementing a multicomponent physical activity intervention may lead to long-term benefits to aerobic fitness.</p>	26
<p>Sutherland, R., Campbell, E., Lubans, D. R., Morgan, P. J., Okely, A. D., Nathan, N., Wiggers, J. (2016). ‘Physical activity 4 everyone’ school-based intervention to prevent decline in adolescent physical activity levels: 12 month (mid-intervention) report on a cluster randomised trial. <i>British Journal of Sports Medicine</i>, 50(8), 488. doi:http://dx.doi.org/10.1136/bjsports-2014-094523</p>	<p>PE: Teacher training to maximize PA in PE</p> <p>PA During School: PA during school breaks (lunch/recess) twice per week</p> <p>Family & Community Engagement: Newsletter distributed</p>	<p>Country: Australia</p> <p>School Setting: Not Specified</p> <p>School Level: Secondary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 10 schools with children aged 12-13 (grade 7)</p>	<p>The analysis revealed that the intervention group performed significantly more vigorous physical activity, equating to 27 min more MVPA per week.</p>	<p>Implementing a multicomponent physical activity intervention may result in small, but clinically significant effects after 1 year.</p>	31

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Verstraete, S.J., Cardon, G.M., De Clercq, D.L., & De Bourdeaudhuij, I.M. (2007). A comprehensive physical activity promotion programme at elementary school: The effects on physical activity, physical fitness, and psychosocial correlates of physical activity. <i>Public Health Nutrition</i>, 10(5), 477-484.</p>	<p>PE: Integration of SPARK</p> <p>PA During School: Lunch/Recess equipment was provided</p> <p>Before/After School PA: Extracurricular activities were provided to students led by PE teacher</p>	<p>Country: Belgium</p> <p>School Setting: Not specified</p> <p>School Level: Elementary</p> <p>SES: Not specified</p> <p>Participants: 5th and 6th graders, mean age = 9.7</p>	<p>Children's moderate physical activity and MVPA decreased less in intervention schools. Children in intervention schools reported significantly more moderate physical activity in leisure time than the control group. No improvements in physical fitness or psychosocial variables were found.</p>	<p>This intervention is not expensive and can be implemented within existing schools by the schools themselves. Additionally, it may be useful to provide education on PA promotion to teachers to enable them to implement PA in their classrooms.</p>	<p>33</p>

PE+3: Physical Education +3 Additional CSPAP Components

Six of the 34 interventions reviewed (18%) included physical education and three additional CSPAP component interventions. All PE+3 multicomponent interventions included *physical activity during school* programming as one of the additional components. Half of the PE+3 interventions included the combination of *physical activity during school, physical activity before and after school, and family and community engagement* as additional components to physical education. PE+3 multicomponent interventions have been conducted in varied settings, as indicated by no consistent school setting characteristics among the articles. Health outcomes were studied as the primary outcomes (83%) of PE+3 multicomponent interventions.

PE+3 CSPAP COMPONENTS	6 TOTAL (18%)
Physical Activity During School + Physical Activity Before/After School + Family & Community Engagement	3 (50%)
Physical Activity During School + Physical Activity Before/After School + Staff Involvement	2 (33%)
Physical Activity During School+ Staff Involvement + Family & Community Engagement	1 (17%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	4 (67%)
• International	2 (33%)
School Setting	
• Urban	2 (33%)
• Suburban	1 (17%)
• Rural	0 (0%)
• Not Specified	3 (50%)
School Level	
• Elementary	3 (50%)
• Secondary	2 (33%)
• Elementary & Secondary	1 (17%)
Socioeconomic Status	
• Low	2 (33%)
• High	0 (0%)
• Not Specified	4 (67%)

PRIMARY OUTCOMES	
Health Outcomes	
• Weight/BMI	3 (50%)
• Physical Activity	2 (33%)
Academic Outcomes	
• Improvements in math & reading	1 (17%)

Key Findings and Recommendations

Implementing PE+3 multicomponent interventions resulted in positive student physical health outcomes related to weight/BMI and physical activity in both elementary and secondary settings. More research is needed to examine PE+3 multicomponent interventions in elementary and low SES settings. One PE+3 multicomponent intervention was related to improvements in academic outcomes. Further investigations of the impact of PE+3 multicomponent interventions on academic outcomes in all settings (i.e., elementary, secondary, urban, and rural) is warranted.

TABLE 4. DETAILED SUMMARY OF PE+3 PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Bergh, I. H., Bjelland, M., Grydeland, M., Lien, N., Andersen, L. F., Klepp, K., . Ommundsen, Y. (2012). Mid-way and post-intervention effects on potential determinants of physical activity and sedentary behavior, results of the HEIA study - a multi-component school-based randomized trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i>, 9, 63. doi:http://dx.doi.org/10.1186/1479-5868-9-63</p>	<p>PE: Teachers integrated SPARK program</p> <p>PA During School: Integration of classroom PA</p> <p>PA Before/After School: Active transportation to school</p> <p>Family Engagement: Fact sheets handed out to parents</p>	<p>Country: Norway</p> <p>School Setting: Towns/Municipalities</p> <p>School Level: Secondary</p> <p>SES: Not Specified</p> <p>Participants: schools with children aged 11-12 (gra)</p>	<p>At mid-way, enjoyment, perceived social support from teachers, and self-efficacy were higher in the intervention group. Weight status moderated the effect on self-efficacy with a positive effect observed among the normal weight only. At post intervention, results were sustained for social support from teachers, while a negative effect was found for self-efficacy. Weight status moderated the effect on enjoyment, with reduced enjoyment observed among overweight. Moderations effects for parental education level were detected for perceived social support from parents and teachers. Finally positive effects on several determinants were observed among those receiving a high as opposed to a low intervention dose.</p>	<p>When implementing a multicomponent PA intervention, social support from teachers may be important for adolescent PA change, and overweight adolescents may need specially targeted interventions to avoid reducing their enjoyment of PA.</p>	3
<p>Centeio, E. E., McCaughy, N., Gutuskey, L., Garn, A. C., Somers, C., Shen, B., . . . Kulik, N. L. (2014). Physical activity change through comprehensive school physical activity programs in urban elementary schools. <i>Journal of Teaching in Physical Education</i>, 33(4), 573-591. Retrieved from https://unco.idm.oclc.org/login?url=https://search.proquest.com/docview/1697498433?accountid=12832</p>	<p>PE: Teachers received evidence-based curriculum EPEC</p> <p>Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online</p> <p>PA During School: Active recess, classroom PA integration</p> <p>PA Before/After School: Healthy Kids Club program was integrated</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 20 schools with children aged 8-10 (grade 4)</p>	<p>Analyses revealed significant pre-post increases in minutes of student MVPA. Students increased MVPA during school an average of almost 4.5 minutes per day. Overall significant differences were found from pre to post time spent in MVPA in PE, lunch, recess and classroom time. Parents significantly increased physical activity and although educators' reported change in PA, it was not statistically significant.</p>	<p>Implementing a CSPAP that incorporates three components (PE, during school PA, after school PA,) may have a positive effect on no only students, but also on educators and parents.</p>	12

TABLE 4. DETAILED SUMMARY OF PE+3 PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Centeio, E.E., McCaughtry, N., Moore, E.W.G., Kulik, N., Garn, A., Martin, J., Fahlman, M. (2018). Building healthy communities: A comprehensive school health program to prevent obesity in elementary schools. <i>Preventive Medicine</i>, 111, 210-215. https://doi.org/10.1016/j.ypmed.2018.03.00</p>	<p>PE: Teachers received evidence-based curriculum EPEC</p> <p>Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online</p> <p>PA During School: Active recess, classroom PA integration</p> <p>PA Before/After School: Healthy Kids Club program was integrated</p>	<p>Country: United States</p> <p>School Setting: Not specified</p> <p>School Level: Elementary</p> <p>SES: Not specified</p> <p>Participants: 628 fifth grade children</p>	<p>Analyses revealed a significant difference in waist to height ratio among treatment and control groups at time two with no significant differences based on age, sex, and race. Additionally, the analysis for BMI revealed a marginally significant lower BMI among the treatment than comparison group students.</p>	<p>The implementation of a comprehensive school PA program that measured student health outcomes such as weight and BMI through quality PE, staff involvement with teachers and principals, during school PA, and an after school program can positively impact student obesity levels.</p>	13
<p>Centeio, E.E., Somers, C., Moore, E.W., Kulik, N., Garn, A., Martin, J., & McCaughtry, N. (2018). Relationship between academic achievement and healthy school transformations in urban elementary schools in the United States. <i>Physical Education and Sport Pedagogy</i>, 23(4), 402-417. https://doi.org/10.1080/17408989.2018.1441395</p>	<p>PE: Teachers received evidence-based curriculum EPEC</p> <p>Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online</p> <p>PA During School: Active recess, classroom PA integration</p> <p>PA Before/After School: Healthy Kids Club program was integrated</p>	<p>Country: United States</p> <p>School Setting: Not specified</p> <p>School Level: Elementary</p> <p>SES: Not specified</p> <p>Participants: 378 fourth grade students</p>	<p>Program fidelity was a significant predictor of students' reading comprehension rates of improvement, while students' aerobic fitness level and time two physical activity levels were all significant contributors to rates of improvement in math.</p>	<p>Implementing a four-component CSPAP may have positive effects on students academic achievement outcomes, particularly their rates of improvement in reading and math.</p>	14
<p>Li, X-H., Lin, S., Guo, H., Huang, Y., Wu, L., Zhang, Z., Ma, J., & Wang, H-J. (2014). Effectiveness of a school-based physical activity intervention on obesity in school children: A nonrandomized controlled trial. <i>BMC Public Health</i>, 14, 1282.</p>	<p>PE: 3 45-minute PE lessons per week</p> <p>PA During School: Extracurricular PA for overweight & obese students during school breaks</p> <p>PA Before/After school: After school physical activity program</p> <p>Family & Community Engagement: PA homework</p>	<p>Country: China</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary & Secondary</p> <p>SES: Not Specified</p> <p>Participants: Schools with children aged 7 to 15 years old (grades 2-5 elementary and 1 & 2 middle school)</p>	<p>The reduction of BMI was statistically significant in intervention group compared with increase of BMI in control group. The decrease of triceps, subscapular, abdominal skinfold thickness and fasting glucose were also significant in intervention group compared to control. The increase in duration of MVPA in intervention group was significantly different from that in control group.</p>	<p>A multicomponent physical activity intervention was an effective and feasible way to reduce adiposity and improve the health of students.</p>	23
<p>Pate, R. R., Ward, D. S., Saunders, R. P., Felton, G., Dishman, R. K., & Dowda, M.(2005). Promotion of physical activity among high-school girls: A randomized controlled trial. <i>American Journal of Public Health</i>, 95(9), 1582–1587. https://doi.org/10.2105/AJPH.2004.045807</p>	<p>PE: LEAP curriculum integrated</p> <p>PA During School: Increase MVPA levels</p> <p>Staff Involvement: Staff role modeling</p> <p>Family & Community Engagement: Not specified</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Secondary</p> <p>SES: Not Specified</p> <p>Participants: 24 schools with children aged 13-14 (grade 9)</p>	<p>At follow-up, 45% of girls in the intervention schools and 36% of girls in the control schools reported vigorous physical activity during an average of 1 or more 30-minute time blocks per day over a 3-day period.</p>	<p>The implementation of a comprehensive school physical activity program that targets physical activity through PE, staff involvement and family and community engagement may result in increased regular participation in vigorous intensity physical activity.</p>	28

Full CSPAP: Physical Education +4 Additional CSPAP Components

One of the 34 articles reviewed (3%) included interventions pertaining to all five CSPAP components: *physical education, physical activity during school, before/after school physical activity, staff involvement, and family and community engagement*. The intervention took place in a low SES elementary school setting and studied the health outcome of physical activity.

PE+4 CSPAP COMPONENTS	1 TOTAL (3%)
Full CSPAP Integration	1 (100%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	1 (100%)
• International	0 (0%)
School Setting	
• Urban	0 (0%)
• Rural	0 (0%)
• Not Specified	1 (100%)
School Level	
• Elementary	1 (100%)
• Secondary	0 (0%)
Socioeconomic Status	
• Low	1 (100%)
• High	0 (0%)

PRIMARY OUTCOMES	
Health Outcomes	
• Physical Activity	1 (100%)
Academic Outcomes	0 (0%)

Key Findings and Recommendations

Implementing a full CSPAP intervention resulted in a positive student health outcome: increased physical activity levels. There is a need for more research examining the effect of implementing all five CSPAP components related to student health and academic outcomes. Future research should examine a full CSPAP in both elementary and secondary schools, as well as in rural, urban, and suburban settings.

TABLE 5. DETAILED SUMMARY OF FULL CSPAP PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Braun, H. A., Kay, C. M., Cheung, P., Weiss, P. S., & Gazmararian, J. A. (2017). Impact Of an elementary school-based intervention on physical activity time and aerobic capacity, Georgia, 2013-2014. <i>Public Health Reports</i>, 132(2_suppl), 32S. https://doi.org/10.1177/0033354917719701</p>	<p>PE: Teachers trained to integrate more MVPA into lessons</p> <p>PA During School: Integration of classroom PA, school-wide PA morning announcements</p> <p>PA Before/After School: BOKS program integrated</p> <p>Family & Community Engagement: Take home health materials distributed</p> <p>Staff Involvement: Pedometer 30-day staff member challenge</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 39 schools with children in the 4th grade</p>	<p>The weekly estimated teacher-reported time in physical activity increased by 39 minutes from pre- to post-intervention: 21 minutes for recess, 17 minutes for classroom, and 1 minute for physical education. The mean number of student PACER laps increased by 3 laps from pre- to post-intervention, and 1515 of 2342 (65%) students increased the number of PACER laps completed. There was a positive association between school-level changes in school-based physical activity time and school-level changes in PACER laps</p>	<p>Implementing a CSPAP with all five components for students in geographically diverse, socioeconomically challenged elementary schools may improve school-based physical activity and student aerobic capacity.</p>	<p>4</p>

Two Multicomponent Interventions (without PE)

One of the 34 articles reviewed (3%) was a multicomponent intervention study that included two CSPAP components (i.e., *physical activity during school, and family and community involvement*) and no physical education component. The intervention took place in four elementary schools in the U.S. and involved classroom physical activity integration by teachers and physical activity homework with parents. The primary health outcome was physical activity levels.

2 CSPAP COMPONENTS	1 TOTAL (3%)
Physical Activity During School + Family & Community Engagement	1 (100%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	1 (100%)
• International	0 (0%)
School Setting	
• Urban	1 (100%)
• Rural	0 (0%)
School Level	
• Elementary	0 (0%)
• Secondary	1 (100%)
Socioeconomic Status	
• Low	0 (0%)
• High	0 (0%)
• Not Specified	1 (100%)

PRIMARY OUTCOMES	
Health Outcomes	
• Physical Activity	1 (100%)
Academic Outcomes	0 (0%)

Key Findings and Recommendations

Implementing CSPAP interventions with two non-PE CSPAP components resulted in positive student outcomes related to physical activity in an urban elementary setting. Although CSPAP implementation without quality physical education as the cornerstone is **not** recommended, future research could examine the effect that two non-PE interventions have on other student health outcomes in elementary and rural settings. Researchers could also study how two multicomponent interventions impact student academic outcomes in both the elementary and secondary settings.

TABLE 6. DETAILED SUMMARY OF TWO MULTICOMPONENT (WITHOUT PE) PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Barr-Anderson, D. J., Laska, M. N., Veblen-Mortenson, S., Farbakhsh, K., Dudovitz, B. & Story, M. (2012). A school-based, peer leadership physical activity intervention for 6th Graders: Feasibility and Results of a Pilot Study. <i>Journal of Physical Activity & Health</i> , 9(4), 492–499.	PA During School: Peer & Teacher led Classroom PA integration Family & Community Engagement: PA & Healthy Eating Homework	Country: United States School Setting: Urban School Level: Secondary SES: Not Specified Participants: 4 schools with children in the 6th grade	Compared with the control group, the intervention was successful in increasing moderate physical activity in all students and moderate and hard physical activity among girls. Teachers and students reported a high level of satisfaction and receptivity with the intervention. All teachers thought the DVDs were well-received and 87% of students reported that they would recommend the enhanced program to peers.	Including peer leadership and physical activity promoting DVDs in a multicomponent PA program may be an effective way to increase youth physical activity.	2

Three Multicomponent Interventions (without PE)

One of the 34 articles reviewed (3%) included three CSPAP components without PE as the intervention (i.e., *physical activity during school, staff involvement, and family involvement*). The three component intervention involved teacher professional learning about physical activity integration, physical activity integration by teachers, lunchtime physical activity sessions led by students, and newsletters distributed to parents about strategies to reduce recreational screen time. Health outcomes of student weight/BMI were the studied outcomes.

3 CSPAP COMPONENTS	1 TOTAL (3%)
Physical Activity During School+ Staff Involvement + Family & Community Engagement	1 (100%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	0 (0%)
• International	1 (100%)
School Setting	
• Urban	0 (0%)
• Rural	0 (0%)
• Not Specified	1 (100%)
School Level	
• Elementary	0 (0%)
• Secondary	1 (100%)
Socioeconomic Status	
• Low	1 (100%)
• High	0 (0%)

PRIMARY OUTCOMES	
Health Outcomes	
• Weight/BMI	1 (100%)
Academic Outcomes	
• On-Task Behavior	0 (0%)

Key Findings and Recommendations

Implementing a three component CSPAP intervention without physical education led to no effect on student health outcomes. Although CSPAP implementation without quality physical education as the cornerstone is **not** recommended, future research could explore changes in the combination of three non-PE component interventions and the impacts on student health outcomes. Future research could also explore how three multicomponent interventions (without PE) influence student academic outcomes in varied settings (i.e., elementary, urban, and rural).

TABLE 7. DETAILED SUMMARY OF THREE MULTICOMPONENT (WITHOUT PE) PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Lubans, D. R., Smith, J. J., Plotnikoff, R. C., Dally, K. A., Okely, A. D., Salmon, J., & Morgan, P. J. (2016). Assessing the sustained impact of a school-based obesity prevention program for adolescent boys: the ATLAS cluster randomized controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i> , 13(1), 92. https://doi.org/10.1186/s12966-016-0420-8	<p>Staff Involvement: Teacher professional learning</p> <p>PA During School: Lunchtime PA run by students, PA sessions led by teachers</p> <p>Family & Community Engagement: Newsletter on reducing screen time</p>	<p>Country: Australia</p> <p>School Setting: Not Specified</p> <p>School Level: Secondary</p> <p>SES: Schools in low-income neighborhoods</p> <p>Participants: 14 schools with children aged 12-14</p>	After 18 months, there were no effects found for BMI or waist circumference. Sustained effects were found for screen-time, resistance training skill competency, and motivational regulations for school sport.	Implementing a multicomponent PA intervention may have positive long-term effects on screen time, resistance training skill competency, and motivational regulations for sport.	24

Systematic Reviews of Multicomponent Interventions

Systematic Reviews

Five of the 34 articles reviewed (15%) were systematic reviews regarding physical activity interventions in schools. All reviews examined multicomponent interventions in elementary and secondary schools and only measured health outcomes such as physical activity and fitness.

CSPAP COMPONENTS REVIEWED	5 TOTAL (15%)
Physical Education	5 (100%)
Physical Activity During School	5 (100%)
Family and Community Engagement	4 (80%)
Staff Involvement	2 (40%)
Physical Activity Before/After School	1 (20%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	0 (0%)
• International	5 (100%)
School Setting	
• Urban	0 (0%)
• Rural	0 (0%)
• Not specified	5 (100%)
School Level	
• Elementary	0 (%)
• Secondary	0 (0%)
• Elementary & Secondary	5 (100%)
Socioeconomic Status	
• Low	0 (0%)
• High	0 (0%)
• Not specified	5 (100%)

PRIMARY OUTCOMES	
Health Outcomes	
• Health & fitness	1 (20%)
• Physical activity	4 (80%)
Academic Outcomes	
• On-Task Behavior	0 (0%)

Key Findings and Recommendations

Implementing multicomponent school-based physical activity interventions can improve student physical activity levels. It would be useful to examine the impact of multicomponent interventions on other health and academic outcomes in both elementary and secondary schools as well as in urban and rural settings.

TABLE 8. DETAILED SUMMARY OF SYSTEMATIC REVIEWS

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Dobbins, M., DeCorby, K., Robeson, P., Husson, H., & Tirilis, D. (2009). School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. <i>Cochrane database of systematic reviews</i> , (1).	<p>PE: increase time spent in physical activity</p> <p>PA During School: changes in school routine for students to be active and provision of equipment</p> <p>Staff Involvement: trainings in physical activity integration for teachers</p> <p>Family & Community Engagement: educational materials for parents and community-based strategies</p>	The purpose of this review was to assess, analyze, and draw conclusions about the effectiveness of school-based interventions in promoting physical activity and fitness in school-attending children and adolescents aged 6 to 18 year.	Interventions in the review had a positive impact on duration of physical activity (mostly for physical activity during school time) and on aerobic fitness measured by VO2max, but there was no evidence that school-based trials also affected out-of-school physical activity positively.	Implementing multicomponent physical activity interventions for longer periods of time can improve child physical activity levels.	16
Kriemler, S., Meyer, U., Martin, E., Sluijjs, E. van Andersen, L. B., & Martin, B. W. (2011). Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. <i>British Journal of Sports Medicine</i> , 45(11), 923–930. https://doi.org/10.1136/bjsports-2011-090186 .	<p>PE: increased class time</p> <p>PA During School: activity breaks</p> <p>Family & Community Engagement: involving family, written advice to families or physical activity workshops for families</p>	The basis of this review was the collection of recent systematic reviews published after 2006 that summarized the evidence on PA promotion in children and adolescents.	47-65% of trials that were reviewed between 2007-2010 were found to be effective. The effect was mostly seen in school related physical activity rather than other health outcomes. The school-based application of multicomponent intervention strategies was the most consistent promising intervention strategy.	Implementing a whole-of-school approach is an effective strategy for increasing PA and health among children.	22
Russ, L., Webster, C.A., Beets, M.W., & Phillips, D. (2015). Systematic review and meta-analysis of multicomponent interventions through schools to increase physical activity. <i>Journal of Physical Activity and Health</i> , 12(10), 1436-1446.	<p>PE: increase physical activity during PE</p> <p>PA During School: recess, classroom PA, drop-in sessions; PA Before/After School: environmental and policy changes</p> <p>Staff Involvement: limited details</p> <p>Family & Community Engagement: sending newsletters to families, physical activity homework</p>	Systematic review and meta-analysis examined all components of a CSPAP. Included studies reflected two or more CSPAP components.	Overall the intervention impact was small. Across all studies and by studies reporting gender and specific activity outcomes, as the number of CSPAP components increased, the effect size associated with the change in daily physical activity also increased. Studies that included during school physical activity, before/after school physical activity, and staff wellness were associated with larger effect sizes than studies that did not include these components.	A whole-of-school approach is recommended for increasing physical activity opportunities of students, however, multidisciplinary teams consisting of research scholars and community partners with related backgrounds are recommended to coordinate these collaborative approaches to further increase CSPAP's effectiveness.	29

TABLE 8. DETAILED SUMMARY OF SYSTEMATIC REVIEWS

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Salmon J, Booth ML, Phongsavan P, et al. Promoting physical activity participation among children and adolescents. <i>Epidemiol Rev.</i> 2007;29:144-59.</p>	<p>PE: higher proportion of PE time spent in physical activity PA During School: playground activities</p>	<p>The aim of this narrative review is to summarize the evidence of the effectiveness of interventions that report physical activity outcomes in children aged 4–12 years and adolescents aged 13–19 years.</p>	<p>Across the two studies that implemented whole-of-school approaches, one intervention showed no effect on children’s physical activity. The second intervention resulted in a significantly higher prevalence of participation in physical activity.</p>	<p>Interventions delivered in the school setting that focus on increasing physical activity during physical education lessons, as well as incorporating curriculum and/or environmental changes (e.g., playground activities) are effective at increasing student physical activity levels.</p>	<p>30</p>
<p>van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. <i>BMJ.</i> 2007;335(7622):703.</p>	<p>PE: changing content and structure of PE PA During School: increased activity choices during leisure periods, supervision, and equipment available Family & Community Engagement: family workshop on physical activity, physical activity homework, newsletters on physical activity</p>	<p>The aim of this article is to review the evidence on the promotion of physical activity in children and adolescents.</p>	<p>Ten studies evaluated multicomponent interventions in children, including three large high quality randomized controlled trials. Only one of these high-quality trials reported a significant positive effect on physical activity, equating to inconclusive evidence of effectiveness. Six studies evaluated multicomponent interventions in adolescents. Three were large high quality randomized controlled trials, which all showed significant positive results in physical activity, providing strong evidence of an effect of multicomponent interventions.</p>	<p>Implementing multicomponent physical activity interventions in school settings with family and community engagement can increase adolescent physical activity.</p>	<p>32</p>

Multicomponent Interventions by School Level

Elementary School Interventions

Twenty-eight of the 34 articles reviewed (82%) included interventions in elementary settings. Eleven of the interventions involved a physical education component and one other CSPAP component, while 11 interventions utilized a physical education component and either two or three other CSPAP components. Only one intervention utilized all five CSPAP components and five other articles were systematic reviews regarding multicomponent approaches. Health outcomes were primarily the focus of multicomponent elementary school interventions.

CSPAP COMPONENTS	28 TOTAL (82%)
Physical Education +1 CSPAP Component	11 (39%)
Physical Education +2 CSPAP Components	5 (18%)
Physical Education +3 CSPAP Components	6 (21%)
Full CSPAP Integration	1 (4%)
Systematic Reviews	5 (18%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	13 (46%)
• International	14 (50%)
• Not Specified	1 (4%)
School Setting	
• Urban	7 (25%)
• Suburban	1 (4%)
• Rural	0 (0%)
• Urban and Rural	2 (7%)
• Not Specified	18 (64%)
School Level	
• Elementary	28 (100%)
• Secondary	0 (0%)
Socioeconomic Status	
• Low	9 (35%)
• High	0 (0%)
• Not Specified	19 (67%)

PRIMARY OUTCOMES	
Health Outcomes	
• Physical Activity	18 (64%)
• Weight/BMI	4 (14%)
• Fitness	2 (7%)
• Motor Skills	2 (7%)
Academic Outcomes	
• Improvements in math and reading	1 (4%)
• On-task behavior	1 (4%)

Key Findings and Recommendations

CSPAP interventions in elementary settings can have positive effects on students' health and academic outcomes. Most interventions improved student physical activity levels among other health outcomes (e.g., BMI). Two interventions assessed academic outcomes and found students that engaged in the CSPAP intervention showed improvements in on-task behavior, and rates of improvement in math and reading. Future research should examine CSPAP implementation outcomes beyond physical health and explore the impact that CSPAP has on elementary school students in rural and suburban areas.

TABLE 9. DETAILED SUMMARY OF ELEMENTARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Arto, G. (2015). Children's segment specific light physical activity across two years of school-based program. <i>Journal of Physical Education and Sport</i> , 15(1), 88-95. doi: http://dx.doi.org/10.7752/jpes.2015.01015	PE: Teacher training to increase child motivation and PE enjoyment PA During School: Integration of classroom PA PA Before/After: Active transportation to school/ integration of afterschool programs	Country: Finland School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: 2 schools with children aged 10-13	The findings highlighted that children's total light physical activity remained stable through two years of program. However, the segments of before-school, after-school, short break, and girls' class time showed declining patterns across the period. Both girls and boys accumulated the majority of their weekly light physical activity during the weekdays and out-of-school periods compared to weekends and in-school time. The program seemed to be effective to prohibit declining levels of children's light physical activity .	Implementing a school-based multicomponent PA program may help to sustain children's light physical activity levels, which may improve their physical activity levels in the future.	1
Bergh, I. H., Bjelland, M., Grydeland, M., Lien, N., Andersen, L. F., Klepp, K., . . . Ommundsen, Y. (2012). Mid-way and post-intervention effects on potential determinants of physical activity and sedentary behavior, results of the HEIA study - a multicomponent school-based randomized trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i> , 9, 63. doi: http://dx.doi.org/10.1186/1479-5868-9-63	PE: Teachers integrated SPARK program PA During School: Integration of classroom PA PA Before/After School: Active transportation to school Family & Community Engagement: Fact sheets handed out to parents	Country: Norway School Setting: Towns/Municipalities School Level: Secondary SES: Not Specified Participants: schools with children aged 11-12 (gra)	At mid-way, enjoyment, perceived social support from teachers, and self-efficacy were higher in the intervention group. Weight status moderated the effect on self-efficacy with a positive effect observed among the normal weight only. At post intervention, results were sustained for social support from teachers, while a negative effect was found for self-efficacy. Weight status moderated the effect on enjoyment, with reduced enjoyment observed among overweight. Moderations effects for parental education level were detected for perceived social support from parents and teachers. Finally positive effects on several determinants were observed among those receiving a high as opposed to a low intervention dose.	When implementing a multicomponent PA intervention, social support from teachers may be important for adolescent PA change, and overweight adolescents may need specially targeted interventions to avoid reducing their enjoyment of PA.	3
Braun, H. A., Kay, C. M., Cheung, P., Weiss, P. S., & Gazmararian, J. A. (2017). Impact Of an elementary school-based intervention on physical activity time and aerobic capacity, Georgia, 2013-2014. <i>Public Health Reports</i> , 132(2_suppl), 32S. https://doi.org/10.1177/0033354917719701	PE: Teachers trained to integrate more MVPA into lessons PA During School: Integration of classroom PA, school-wide PA morning announcements PA Before/After School: BOKS program integrated Family & Community Engagement: Take home health materials distributed Staff Involvement: Pedometer 30-day staff member challenge	Country: United States School Setting: Not Specified School Level: Elementary SES: schools in low-income neighborhoods Participants: 39 schools with children in the 4th grade	The weekly estimated teacher-reported time in physical activity increased by 39 minutes from pre- to post-intervention: 21 minutes for recess, 17 minutes for classroom, and 1 minute for physical education. The mean number of student PACER laps increased by 3 laps from pre- to post-intervention, and 1515 of 2342 (65%) students increased the number of PACER laps completed. There was a positive association between school-level changes in school-based physical activity time and school-level changes in PACER laps	Implementing a CSPAP with all five components for students in geographically diverse, socioeconomically challenged elementary schools may improve school-based physical activity and student aerobic capacity.	4

TABLE 9. DETAILED SUMMARY OF ELEMENTARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Brusseau, T.A., Kulinna, P.H. (2015). An examination of four traditional school physical activity models on children's step counts and MVPA. <i>Research Quarterly for Exercise and Sport</i>, 86(1), 88-93.</p>	<p>PE: Taught 2 days per week for 50-minutes and employed Dynamic PE curriculum</p> <p>PA During School: Multiple Recesses (one unstructured)</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 4 schools with 5th grade children (average age 10.0)</p>	<p>Children accumulated the greatest physical activity on days they had PE and multiple recess opportunities. Children accumulated the least amount of physical activity on days with only 1 recess opportunity. Children accumulated an additional 1140 steps and 4.1 min of MVPA on PE days.</p>	<p>Recess and PE play important roles in children's daily PA accumulation.</p>	<p>5</p>
<p>Brusseau, T.A., Hannon, J., & Burns, R. (2016). The effect of a comprehensive school physical activity program on physical activity and health-related fitness in children from low-income families. <i>Journal of Physical Activity and Health</i>, 13(8), 888-894.</p>	<p>PE: Taught 1 day per week for 50-minutes and employed Dynamic PE curriculum</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 3 schools with an average age of 8.4 years old</p>	<p>There were significant but weak-to-moderate increases in step counts, and moderate physical activity at 12 weeks compared to baseline. There were also significant but moderate increases in Progressive Aerobic Cardiovascular Endurance Run laps at 12 weeks compared with baseline. Analyses revealed that there were 3.02 and 2.34 greater odds that a child would achieve step count and MVPA standards and 2.26 greater odds that a child would achieve aerobic fitness standards at 12 weeks compared with baseline.</p>	<p>Implementing a CSPAP for 12 weeks may significantly improve physical activity and health related fitness in children from low-income families.</p>	<p>6</p>
<p>Burns, R. D., Brusseau, T. A., & Hannon, J. C. (2015). Effect of a Comprehensive School Physical Activity Program on School Day Step Counts in Children. <i>Journal Of Physical Activity & Health</i>, 12(12), 1536-1542.</p>	<p>PE: Monthly in-service opportunities</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 4 schools with children aged 8-11 (grades 4-5)</p>	<p>Analyses revealed increases in school day step counts from the end of preintervention to the start of postintervention.</p>	<p>Implementing a CSPAP may positively influence children's school day physical activity by both increasing average school day step counts and buffering decreases in step counts.</p>	<p>7</p>
<p>Burns, R. D., Brusseau, T. A., & Fu, Y. (2017). Influence of Goal Setting on Physical Activity and Cardiorespiratory Endurance in Low-Income Children Enrolled in CSPAP Schools. <i>American Journal Of Health Education</i>, 48(1), 32-40.</p>	<p>PE: Monthly in-service opportunities</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 5 schools with children aged 5-12 (grades k-6)</p>	<p>6th grade children enrolled in schools where PALs employed goal setting displayed greater increases in school day step counts (+665 steps) compared to schools where PALs did not employ goal setting. In third-grade children in schools where PALs employed goal setting, there was a decrease in step counts from baseline to follow up (-832).</p>	<p>Goal setting within school physical activity program could combat physical activity declines as children get older</p>	<p>9</p>

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FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Burns, R., Fu, Y., Fang, Y., Hannon, J., & Brusseau, T. (2017). Effect of a 12-week physical activity program on gross motor skills in children. <i>Perceptual and Motor Skills</i>, 124(6).</p>	<p>PE: Monthly in-service opportunities PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States School Setting: Not Specified School Level: Elementary SES: schools in low-income neighborhoods Participants: 3 schools with children aged 5-12 (grades k-6)</p>	<p>Results indicate motor skills improved by approx. 10% following 12-weeks of CSPAP among children. TGMD-1 percent scores improved from 72.6% at baseline to 82.4% at follow-up. Students aged 7, 8, and 9 displayed a greater TGMD-2 percent change from baseline compared to children aged 10, 11, and 12 years. However, children aged 7 to 12 years displayed greater TGMD-2 percent change from baseline compared with children who were aged 6 years.</p>	<p>Implementing a multicomponent school-based intervention like a CSPAP can increase child gross motor skills</p>	<p>10</p>
<p>Burns, R., Fu, Y., Hannon, J., & Brusseau, T. (2017). School physical activity programming and gross motor skills in children. <i>American Journal of Health Behavior</i>, 41(5).</p>	<p>PE: Classes focused on motor skill development PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States School Setting: Urban School Level: Elementary SES: schools in low-income neighborhoods Participants: 5 schools with children aged 5-12 (grades 1-6)</p>	<p>Children scores on the overall gross motor skills scores showed statistically significant increases over the intervention period. Significant improvements were also seen for locomotor skills and ball skills sub-test scores.</p>	<p>Implementation of a CSPAP can led to significant improvements in child gross motor skills</p>	<p>11</p>
<p>Centeio, E. E., McCaughtry, N., Gutuskey, L., Garn, A. C., Somers, C., Shen, B., . . . Kulik, N. L. (2014). Physical activity change through comprehensive school physical activity programs in urban elementary schools. <i>Journal of Teaching in Physical Education</i>, 33(4), 573-591. Retrieved from https://unco.idm.oclc.org/login?url=https://search.proquest.com/docview/1697498433?accountid=12832</p>	<p>PE: Teachers received evidence-based curriculum EPEC Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online PA During School: Active recess, classroom PA integration PA After School: Healthy Kids Club program was integrated</p>	<p>Country: United States School Setting: Urban School Level: Elementary SES: schools in low-income neighborhoods Participants: 20 schools with children aged 8-10 (grade 4)</p>	<p>Analyses revealed significant pre-post increases in minutes of student MVPA. Students increased MVPA during school an average of almost 4.5 minutes per day. Overall significant differences were found from pre to post time spent in MVPA in PE, lunch, recess and classroom time. Parents significantly increased physical activity and although educators' reported change in PA, it was not statistically significant.</p>	<p>Implementing a CSPAP that incorporates three components (PE, during school PA, after school PA,) may have a positive effect on no only students, but also on educators and parents.</p>	<p>12</p>
<p>Centeio, E.E., McCaughtry, N., Moore, E.W.G., Kulik, N., Garn, A., Martin, J., . . . Fahlman, M. (2018). Building healthy communities: A comprehensive school health program to prevent obesity in elementary schools. <i>Preventive Medicine</i>, 111, 210-215. https://doi.org/10.1016/j.ypmed.2018.03.005</p>	<p>PE: Teachers received evidence-based curriculum EPEC Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online PA During School: Active recess, classroom PA integration PA After School: Healthy Kids Club program was integrated</p>	<p>Participants: 628 fifth grade children</p>	<p>Analyses revealed a significant difference in waist to height ratio among treatment and control groups at time two with no significant differences based on age, sex, and race. Additionally, the analysis for BMI revealed a marginally significant lower BMI among the treatment than comparison group students.</p>	<p>The implementation of a comprehensive school PA program that measured student health outcomes such as weight and BMI through quality PE, staff involvement with teachers and principals, during school PA, and an after school program can positively impact student obesity levels.</p>	<p>13</p>

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FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Centeio, E.E., Somers, C., Moore, E.W., Kulik, N., Garn, A., Martin, J., & McCaughtry, N. (2018). Relationship between academic achievement and healthy school transformations in urban elementary schools in the United States. <i>Physical Education and Sport Pedagogy</i>, 23(4), 402-417. https://doi.org/10.1080/17408989.2018.1441395</p>	<p>PE: Teachers received evidence-based curriculum EPEC</p> <p>Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online</p> <p>PA During School: Active recess, classroom PA integration</p> <p>PA After School: Healthy Kids Club program was integrated</p>	<p>378 fourth grade students</p>	<p>In the final model, program fidelity was a significant predictor of students' reading comprehension rates of improvement, while students' aerobic fitness level and time two physical activity levels were all significant contributors to rates of improvement in math.</p>	<p>Implementing a four-component CSPAP may have positive effects on students academic achievement outcomes, particularly their rates of improvement in reading and math.</p>	<p>14</p>
<p>Cradock, A. L., Barrett, J. L., Carter, J., McHugh, A., Sproul, J., Russo, E. T., Gortmaker S. L. (2014). Impact of the Boston active school day policy to promote physical activity among children. <i>American Journal of Health Promotion</i>, 28(3_suppl), S64. https://doi.org/10.4278/ajhp.130430-QUAN-204.</p>	<p>PE: Promotion of 150 minutes of quality PE</p> <p>PA During School: Integration of classroom PA and recess</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 6 schools with children in grades 4-5</p>	<p>During school time, intervention schools demonstrated greater increases in minutes per day of MVPA and vigorous PA and greater decreases in minutes per day of sedentary time.</p>	<p>The implementation of a policy on increasing opportunities for movement can have positive effects on child physical activity levels</p>	<p>15</p>
<p>Dobbins M, De Corby K, Robeson P, et al. Schoolbased physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. <i>Cochrane Database Syst Rev</i>. 2009(1):CD007651.</p>	<p>PE: increase time spent in physical activity</p> <p>PA During School: changes in school routine for students to be active and provision of equipment</p> <p>Staff involvement: trainings in physical activity integration for teacher</p> <p>Family & Community Engagement: educational materials for parents and community-based strategies</p>	<p>The purpose of this review was to assess, analyze, and draw conclusions about the effectiveness of school-based interventions in promoting physical activity and fitness in school-attending children and adolescents aged 6 to 18 year.</p>	<p>Interventions in the review had a positive impact on duration of physical activity (mostly for physical activity during school time) and on aerobic fitness measured by VO2max, but there was no evidence that school-based trials also affected out-of-school physical activity positively.</p>	<p>Implementing multicomponent physical activity interventions for longer periods of time can improve child physical activity levels.</p>	<p>16</p>
<p>Eather, N., Morgan, P. J., & Lubans, D. R. (2013). Feasibility and preliminary efficacy of the Fit4Fun intervention for improving physical fitness in a sample of primary school children: a pilot study. <i>Physical Education & Sport Pedagogy</i>, 18(4), 389-411.</p>	<p>PE: 8-Week, 60-Min PE program</p> <p>PA During School: Activity Task Cards</p> <p>PA Before/After: BOKS program integrated</p> <p>Family & Community Engagement: Children, and family members were given an 8-week home activity program</p>	<p>Country: Australia</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 2 schools with children aged 9-11</p>	<p>A significant group x time effect was exhibited for the sit and reach test, the seven-stage sit-up test, and the wall squat test. Large within group effects were found for the intervention group for flexibility, and muscular fitness, and seven-stage sit up and a medium to large effect was found for muscular fitness using the basketball throw test. No significant group x time effects were found in the beep test, basketball throw test or PA levels. No significant improvements were found for the control group in any measure</p>	<p>This intervention demonstrated that integrating an 8-week program that include 8-60 minute health and PE lessons, recess and lunch activity, and a home fitness program is feasible and an effective strategy for improving child health</p>	<p>17</p>

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<p>Grydeland, M., Bergh, I.H., Bjelland, M., Lien, N., Andersen, L.F., Ommundsen, Y., Knut-Inge, K., & Anderssen, S.A. (2013). Intervention effects on physical activity: The HEIA study - a cluster randomized controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i>, 10(17), 1-13.</p>	<p>PE: Teachers integrated SPARK program PA During School: Once a week 10-min classroom PA PA Before/After: Active Commute to school campaigns Family & Community Engagement: Take home health materials distributed</p>	<p>Country: Norway School Setting: Largest towns/ municipalities in SE Norway School Level: Elementary SES: Not Specified Participants: 37 schools with children aged 11-12 (grade 6)</p>	<p>The intervention group showed a net effect of 50 counts per minute increase from baseline to post in overall physical activity. Subgroup analyses showed that the effect appeared to be more profound among girls and participants in the low activity group as compared to boys and high activity group participants. The intervention affected physical activity among the normal weight group more positively than the overweight, and participants with parents having 13-16 years of education more positively than participants with parents having either a lower or higher number of years of education. The intervention succeeded in reducing time spent sedentary among girls but not among boys.</p>	<p>Implementing a multicomponent physical activity program may increase physical activity of adolescents and may have a profound effect on girls and low-active adolescents in particular.</p>	<p>18</p>
<p>Jansen, W., Borsboom, G., Meima, A., Zwanenburg, E.J., Mackenbach, J.P., Raat, H., & Brug, J. (2011). Effectiveness of a primary school-based intervention to reduce overweight. <i>International Journal of Pediatric Obesity</i>, 6(2-2).</p>	<p>PE: 3 PE lessons per week Before/After School PA: Additional sport & play activities</p>	<p>Country: Netherlands School Setting: Inner-city/urban School Level: Elementary SES: schools in low-income neighborhoods Participants: 20 schools with children aged 6-12 years (grades 3-8)</p>	<p>Significant positive intervention effects were found for percentage overweight children, waist circumference, and 20 m shuttle run among pupils of grades 3-5. The prevalence of overweight in grades 3-5 increased by 4.3% in the control group and by 1.3% in the intervention group.</p>	<p>A multicomponent physical activity intervention including PE and before/after school physical activity opportunities may be effective in reducing childhood obesity.</p>	<p>20</p>
<p>Kriemler, S., Zahner, L., Schindler, C., Meyer, U., Hartmann, T., Hebestreit, H., Brunner-La R.H.P., . . . (2010). Effect of school based physical activity programme (KISS) on fitness and adiposity in primary schoolchildren: Cluster randomized controlled trial. <i>British Medicine Journal</i>, 23, 340.</p>	<p>PE: PE 3 times per week PA During School: 3-5 daily PA breaks (2-5 mins) Family & Community Engagement: PA homework</p>	<p>Country: Switzerland School Setting: Rural and urban locations School Level: Elementary SES: Not Specified Participants: 95 schools with children aged 6-12 (grades 1-5)</p>	<p>Children in the intervention group showed more negative changes in skinfolds, but improved in aerobic fitness & physical activity.</p>	<p>A multicomponent physical activity intervention may improve student physical activity, fitness, and adiposity.</p>	<p>21</p>
<p>Kriemler, S., Meyer, U., Martin, E., Sluijs, E. van Andersen, L. B., & Martin, B. W. (2011). Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. <i>British Journal of Sports Medicine</i>, 45(11), 923–930. https://doi.org/10.1136/bjsports-2011-090186.</p>	<p>PE: increased class time PA During School: activity breaks Family & Community Engagement: involving family, written advice to families or physical activity workshops for families</p>	<p>The basis of this review was the collection of recent systematic reviews published after 2006 that summarized the evidence on PA promotion in children and adolescents.</p>	<p>47-65% of trials that were reviewed between 2007-2010 were found to be effective. The effect was mostly seen in school related physical activity rather than other health outcomes. The school-based application of multicomponent intervention strategies was the most consistent promising intervention strategy.</p>	<p>Implementing a whole-of-school approach is an effective strategy for increasing PA and health among children.</p>	<p>22</p>

TABLE 9. DETAILED SUMMARY OF ELEMENTARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Li, X-H., Lin, S., Guo, H., Huang, Y., Wu, L., Zhang, Z., Ma, J., & Wang, H-J. (2014). Effectiveness of a school-based physical activity intervention on obesity in school children: A nonrandomized controlled trial. <i>BMC Public Health</i>, 14, 1282.</p>	<p>PE: 3 45-minute PE lessons per week PA During School: Extracurricular PA for overweight & obese students during school breaks Family & Community Engagement: PA homework</p>	<p>Country: China School Setting: Not Specified School Level: Elementary & Secondary SES: Not Specified Participants: Schools with children aged 7 to 15 years old (grades 2-5 elementary and 1 & 2 middle school)</p>	<p>The reduction of BMI was statistically significant in intervention group compared with increase of BMI in control group. The decrease of triceps, subscapular, abdominal skinfold thickness and fasting glucose were also significant in intervention group compared to control. The increase in duration of MVPA in intervention group was significantly different from that in control group.</p>	<p>A multicomponent physical activity intervention was an effective and feasible way to reduce adiposity and improve the health of students.</p>	23
<p>Magnusson, K.T., Sigurgeirsson, I., Sveinsson, T., & Johannsson, E. (2011). Assessment of a two-year school-based physical activity intervention among 7-9 year-old children. <i>International Journal of Nutrition and Physical Activity</i>, 8, 138.</p>	<p>PE: One day on-site counseling PA During School: Teachers provided with PA promoting materials</p>	<p>Country: Iceland School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: 6 schools with children in the second grade</p>	<p>Children in the intervention schools were more physically active at moderate to vigorous intensities compared to those in control schools after one year of the intervention. Analyses revealed a significantly greater increase in physical activity among boys in the intervention schools compared to girls. No difference in physical activity was detected between the study groups at the end of the study period after two years of intervention.</p>	<p>A multicomponent physical activity intervention including PE and during school physical activity opportunities implemented by trained teachers may increase student physical activity after one year of implementation. However, schools should consider that boys may respond better to school-based interventions than girls and that the success of the intervention may depend on the training and motivation of the general teachers.</p>	25
<p>Meyer, U., Schindler, C., Zahner, L., Ernst, D., Hebestreit, H., van Mechelen, W., Brunner-La, R.H.P., . . . Kriemler, S. (2014). Long-term effect of a school-based physical activity program (KISS) on fitness and adiposity in children: A cluster-randomized controlled trial. <i>PLoS One</i>, 9(2).</p>	<p>PE: 3 45-minute PE lessons per week PA During School: Extracurricular PA for overweight & obese students during school breaks Family & Community Engagement: PA homework</p>	<p>Country: Switzerland School Setting: Rural and urban locations School Level: Elementary SES: Not Specified Participants: 15 schools with children aged 6-12 (grades 1-5)</p>	<p>Children in the intervention group had a significantly higher average level of aerobic fitness at follow-up while the immediate beneficial effects on the other primary outcomes were not sustained. Reported time spent in sports club during the follow-up period was higher in the intervention group.</p>	<p>Implementing a multicomponent physical activity intervention may lead to long-term benefits to aerobic fitness.</p>	26
<p>Myrer, R. S., Brusseau, T. A., Burns, R. D., Fu, Y., & Hannon, J. C. (2016). Effect of a CSPAP on classroom behavior in at-risk children. <i>Research Quarterly for Exercise and Sport</i>, 87, A103-A104. Retrieved from https://unco.idm.oclc.org/login?url=https://search.proquest.com/docview/1817494453?accountid=12832</p>	<p>PE: PE teacher training to improve PE practice PA During School: Classroom PA and Active Recess integration</p>	<p>Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: Children in K-6 school setting</p>	<p>At baseline, 32% of classrooms demonstrated optimal on-task behavior at baseline. The prevalence of on-task behavior increased to 70% of the classrooms at the 6-week follow-up and to 84% of the classrooms at the 12-week follow up. Analyses revealed 6.42 times greater odds of a classroom achieving at least 80% on-task behavior at the 6 week follow up compared with baseline and a 17.18 times greater odds of a classroom achieving at least 80% on-task behavior at the 12 week follow-up compared with baseline.</p>	<p>CSPAPs may be used as a behavioral interventions to improve the on-task behavior of at-risk elementary school students, which may positively affect academic performance over time.</p>	27

TABLE 9. DETAILED SUMMARY OF ELEMENTARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Russ, L., Webster, C.A., Beets, M.W., & Phillips, D. (2015). Systematic review and meta-analysis of multicomponent interventions through schools to increase physical activity. <i>Journal of Physical Activity and Health</i>, 12(10), 1436-1446.</p>	<p>PE: increase physical activity during PE PA During School: recess, classroom PA, drop-in sessions Before & After School PA: environmental and policy changes Staff Involvement: limited details; Family and Community Engagement: sending newsletters to families, physical activity homework</p>	<p>Systematic review and meta-analysis examined all components of a CSPAP. Included studies reflected two or more CSPAP components.</p>	<p>Overall the intervention impact was small. Across all studies and by studies reporting gender and specific activity outcomes, as the number of CSPAP components increased, the effect size associated with the change in daily physical activity also increased. Studies that included during school physical activity, before/after school physical activity, and staff wellness were associated with larger effect sizes than studies that did not include these components.</p>	<p>A whole-of-school approach is recommended for increasing physical activity opportunities of students, however, multidisciplinary teams consisting of research scholars and community partners with related backgrounds are recommended to coordinate these collaborative approaches to further increase CSPAP's effectiveness.</p>	29
<p>Salmon J, Booth ML, Phongsavan P, et al. Promoting physical activity participation among children and adolescents. <i>Epidemiol Rev</i>. 2007;29:144-59.</p>	<p>PE: higher proportion of PE time spent in physical activity; PA During School: playground activities</p>	<p>The aim of this narrative review is to summarize the evidence of the effectiveness of interventions that report physical activity outcomes in children aged 4–12 years and adolescents aged 13–19 years.</p>	<p>Across the two studies that implemented whole-of-school approaches, one intervention showed no effect on children's physical activity. The second intervention resulted in a significantly higher prevalence of participation in physical activity.</p>	<p>Interventions delivered in the school setting that focus on increasing physical activity during physical education lessons, as well as incorporating curriculum and/or environmental changes (e.g., playground activities) are effective at increasing student physical activity levels.</p>	30
<p>van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. <i>BMJ</i>. 2007;335(7622):703.</p>	<p>PE: changing content and structure of PE PA During School: increased activity choices during leisure periods, supervision, and equipment available Family & Community Engagement: family workshop on physical activity, physical activity homework, newsletters on physical activity</p>	<p>The aim of this article is to review the evidence on the promotion of physical activity in children and adolescents.</p>	<p>Ten studies evaluated multicomponent interventions in children, including three large high quality randomized controlled trials. Only one of these high-quality trials reported a significant positive effect on physical activity, equating to inconclusive evidence of effectiveness. Six studies evaluated multicomponent interventions in adolescents. Three were large high quality randomized controlled trials, which all showed significant positive results in physical activity, providing strong evidence of an effect of multicomponent interventions.</p>	<p>Implementing multicomponent physical activity interventions in school settings with family and community engagement can increase adolescent physical activity.</p>	32
<p>Verstraete, S.J., Cardon, G.M., De Clercq, D.L., & De Bourdeaudhuij, I.M. (2007). A comprehensive physical activity promotion programme at elementary school: The effects on physical activity, physical fitness, and psychosocial correlates of physical activity. <i>Public Health Nutrition</i>, 10(5), 477-484.</p>	<p>PE: Integration of SPARK PA During School: Lunch/ Recess equipment was provided Before/After School PA: Extracurricular activities were provided to students led by PE teacher</p>	<p>Country: Belgium School Setting: Not specified School Level: Elementary SES: Not specified Participants: 5th and 6th graders, mean age = 9.7</p>	<p>Children's moderate physical activity and MVPA decreased less in intervention schools. Children in intervention schools reported significantly more moderate physical activity in leisure time than the control group. No improvements in physical fitness or psychosocial variables were found.</p>	<p>This intervention is not expensive and can be implemented within existing schools by the schools themselves. Additionally, it may be useful to provide education on PA promotion to teachers to enable them to implement PA in their classrooms.</p>	33

TABLE 9. DETAILED SUMMARY OF ELEMENTARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Weaver, R. G., Webster, C. A., Egan, C. A., Campos, C. M. C., Michael, R. D., Vazou, S.(2018). Partnerships for Active Children in Elementary Schools: Outcomes of a two-year pilot study to increase physical activity during the school day. <i>American Journal of Health Promotion</i>, 32(3), 621-630.</p>	<p>PE: Teacher training on PA integration PA During School: Classroom PA integration</p>	<p>Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: Three schools</p>	<p>Percentage of boys & girls in the intervention school meeting the 30 min/day of MVPA increased by 18.5% to 32.2%. Boys and girls in intervention schools increased their MVPA during school hours 8.8% more than students in the control school. During general education classroom time, boys and girls increased their MVPA 6.4% and 2.4% more than their counterparts in the control school. Boys decreased their sedentary time 1.7% compared to students in the control school. During PE boys & girls increased their MVPA 11.5% and 8.4% more than students in the control school and decreased in sedentary time 10.3% and 2.2% more than students in the control school.</p>	<p>A multicomponent intervention facilitated through school and university partnerships is an effective strategy when trying to increase physical activity levels among children.</p>	<p>34</p>

Secondary School Interventions

Eleven of the 34 articles reviewed (32%) targeted secondary school settings. Of the 11 articles, three included PE+2 CSPAP component areas, two included PE+3 CSPAP components areas, one intervention was a multicomponent intervention without PE (i.e., PA during school and family & community engagement), and five were systematic reviews that examined multicomponent interventions. A majority of interventions were conducted outside the United States and assessed health outcomes.

CSPAP COMPONENTS	11 TOTAL (32%)
Physical Education +2 CSPAP Components	3 (28%)
Physical Education +3 CSPAP Components	2 (18%)
Multicomponent without PE	1 (9%)
Systematic Reviews	5 (45%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	2 (18%)
• International	9 (82%)
School Setting	
• Urban	1 (9%)
• Rural	1 (9%)
• Not specified	9 (82%)
School Level	
• Elementary	0 (0%)
• Secondary	11 (100%)
Socioeconomic Status	
• Low	2 (18%)
• High	N/A
• Not specified	9 (82%)

PRIMARY OUTCOMES	
Health Outcomes Assessed	
• Physical Activity	7 (64%)
• Body Mass Index	3 (27%)
• Fitness	1 (9%)
Academic Outcomes Assessed	
• Academic Achievement	0 (0%)

Key Findings and Recommendations

CSPAP interventions at the secondary level can positively influence student physical activity and other health outcomes. Similar to the elementary setting, future research should examine CSPAP outcomes beyond physical health. There is also a need for further examination of CSPAP at the secondary level in low SES urban and rural areas.

TABLE 10. DETAILED SUMMARY OF SECONDARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Barr-Anderson, D. J., Laska, M. N., Veblen-Mortenson, S., Farbaksh, K., Dudovitz, B. & Story, M. (2012). A school-based, peer leadership physical activity intervention for 6th Graders: Feasibility and Results of a Pilot Study. <i>Journal of Physical Activity & Health</i> , 9(4), 492–499.,	PA During School: Peer & Teacher led Classroom PA integration Family & Community Engagement: PA & Healthy Eating Homework	Country: United States School Setting: Urban School Level: Secondary SES: Not Specified Participants: 4 schools with children in the 6th grade	Compared with the control group, the intervention was successful in increasing moderate physical activity in all students and moderate and hard physical activity among girls. Teachers and students reported a high level of satisfaction and receptivity with the intervention. All teachers thought the DVDs were well-received and 87% of students reported that they would recommend the enhanced program to peers.	Including peer leadership and physical activity promoting DVDs in a multicomponent PA program may be an effective way to increase youth physical activity.	2
Dobbins M, De Corby K, Robeson P, et al. Schoolbased physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. <i>Cochrane Database Syst Rev</i> . 2009(1):CD007651.	PE: increase time spent in physical activity PA During School: changes in school routine for students to be active and provision of equipment Staff Involvement: trainings in physical activity integration for teachers Family & Community Engagement: educational materials for parents and community-based strategies	The purpose of this review was to assess, analyze, and draw conclusions about the effectiveness of school-based interventions in promoting physical activity and fitness in school-attending children and adolescents aged 6 to 18 year.	Interventions in the review had a positive impact on duration of physical activity (mostly for physical activity during school time) and on aerobic fitness measured by VO2max, but there was no evidence that school-based trials also affected out-of-school physical activity positively.	Implementing multicomponent physical activity interventions for longer periods of time can improve child physical activity levels.	16
Hollis, J.L., Sutherland, R., Campbell, L., Morgan, P.J., Lubans, D.R., Nathan, N., Wolfenden, L., . . . Wiggers, J. (2016). Effects of a “school-based” physical activity intervention on adiposity in adolescents from economically disadvantaged communities: Secondary outcomes in the Physical Activity 4 Everyone” RCT. <i>International Journal of Obesity</i> , 40(10), 1486-1493.	PE: Teachers received 2 professional learning workshops that focused on increasing MVPA & motivation PA During School: PA breaks at least 2 days per week Family & Community Engagement: Take home health materials distributed	Country: Australia School Setting: Rural School Level: Secondary SES: schools in low-income neighborhoods Participants: schools with children aged 12-13 (grade 7)	There were group by time effects for weight and BMI in favor of intervention group. These findings were consistent for weight and BMI at 24 months with group by time effects also found for BMI favoring the intervention group.	Implementing a multicomponent physical activity intervention may improve adolescent's adiposity and prevent unhealthy weight gain.	19

TABLE 10. DETAILED SUMMARY OF SECONDARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Kriemler, S., Meyer, U., Martin, E., Sluijs, E. van Andersen, L. B., & Martin, B. W. (2011). Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. <i>British Journal of Sports Medicine</i>, 45(11), 923–930. https://doi.org/10.1136/bjsports-2011-090186.</p>	<p>PE: increased class time PA During School: activity breaks Family & Community Engagement: involving family, written advice to families or physical activity workshops for families</p>	<p>The basis of this review was the collection of recent systematic reviews published after 2006 that summarized the evidence on PA promotion in children and adolescents.</p>	<p>47-65% of trials that were reviewed between 2007-2010 were found to be effective. The effect was mostly seen in school related physical activity rather than other health outcomes. The school-based application of multicomponent intervention strategies was the most consistent promising intervention strategy.</p>	<p>Implementing a whole-of-school approach is an effective strategy for increasing PA and health among children.</p>	22
<p>Li, X-H., Lin, S., Guo, H., Huang, Y., Wu, L., Zhang, Z., Ma, J., & Wang, H-J. (2014). Effectiveness of a school-based physical activity intervention on obesity in school children: A nonrandomized controlled trial. <i>BMC Public Health</i>, 14, 1282.</p>	<p>PE: 3 45-minute PE lessons per week PA During School: Extracurricular PA for overweight & obese students during school breaks Family & Community Engagement: PA homework</p>	<p>Country: China School Setting: Not Specified School Level: Elementary & Secondary SES: Not Specified Participants: Schools with children aged 7 to 15 years old (grades 2-5 elementary and 1 & 2 middle school)</p>	<p>The reduction of BMI was statistically significant in intervention group compared with increase of BMI in control group. The decrease of triceps, subscapular, abdominal skinfold thickness and fasting glucose were also significant in intervention group compared to control. The increase in duration of MVPA in intervention group was significantly different from that in control group.</p>	<p>A multicomponent physical activity intervention was an effective and feasible way to reduce adiposity and improve the health of students.</p>	23
<p>Lubans, D. R., Smith, J. J., Plotnikoff, R. C., Dally, K. A., Okely, A. D., Salmon, J., & Morgan, P. J. (2016). Assessing the sustained impact of a school-based obesity prevention program for adolescent boys: the ATLAS cluster randomized controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i>, 13(1), 92. https://doi.org/10.1186/s12966-016-0420-8</p>	<p>Staff Involvement: Teacher professional learning PA During School: Lunchtime PA run by students, PA sessions led by teachers Family & Community Engagement: Newsletter on reducing screen time</p>	<p>Country: Australia School Setting: Not Specified School Level: Secondary SES: Schools in low-income neighborhoods Participants: 14 schools with children aged 12-14</p>	<p>After 18 months, there were no effects found for BMI or waist circumference. Sustained effects were found for screen-time, resistance training skill competency, and motivational regulations for school sport.</p>	<p>Implementing a multicomponent PA intervention may have positive long-term effects on screen time, resistance training skill competency, and motivational regulations for sport.</p>	24
<p>Pate, R. R., Ward, D. S., Saunders, R. P., Felton, G., Dishman, R. K., & Dowda, M.(2005). Promotion of physical activity among high-school girls: A randomized controlled trial. <i>American Journal of Public Health</i>, 95(9), 1582–1587. https://doi.org/10.2105/AJPH.2004.045807</p>	<p>PE: LEAP curriculum integrated PA During School: Increase MVPA levels Staff Involvement: Staff role modeling Family & Community Engagement: Not specified</p>	<p>Country: United States School Setting: Not Specified School Level: Secondary SES: Not Specified Participants: 24 schools with children aged 13-14 (grade 9)</p>	<p>At follow-up, 45% of girls in the intervention schools and 36% of girls in the control schools reported vigorous physical activity during an average of 1 or more 30-minute time blocks per day over a 3-day period.</p>	<p>The implementation of a comprehensive school physical activity program that targets physical activity through PE, staff involvement and family and community engagement may result in increased regular participation in vigorous intensity physical activity.</p>	28

TABLE 10. DETAILED SUMMARY OF SECONDARY SCHOOL PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Russ, L., Webster, C.A., Beets, M.W., & Phillips, D. (2015). Systematic review and meta-analysis of multicomponent interventions through schools to increase physical activity. <i>Journal of Physical Activity and Health</i>, 12(10), 1436-1446.</p>	<p>PE: increase physical activity during PE</p> <p>PA During School: recess, classroom PA, drop-in sessions; PA Before/After School: environmental and policy changes Staff Involvement: limited details</p> <p>Family & Community Engagement: sending newsletters to families, physical activity homework</p>	<p>Systematic review and meta-analysis examined all components of a CSPAP. Included studies reflected two or more CSPAP components.</p>	<p>Overall the intervention impact was small. Across all studies and by studies reporting gender and specific activity outcomes, as the number of CSPAP components increased, the effect size associated with the change in daily physical activity also increased. Studies that included during school physical activity, before/after school physical activity, and staff wellness were associated with larger effect sizes than studies that did not include these components.</p>	<p>A whole-of-school approach is recommended for increasing physical activity opportunities of students, however, multidisciplinary teams consisting of research scholars and community partners with related backgrounds are recommended to coordinate these collaborative approaches to further increase CSPAP's effectiveness.</p>	<p>29</p>
<p>Salmon J, Booth ML, Phongsavan P, et al. Promoting physical activity participation among children and adolescents. <i>Epidemiol Rev.</i> 2007;29:144-59.</p>	<p>PE: higher proportion of PE time spent in physical activity</p> <p>PA during School: playground activities</p>	<p>The aim of this narrative review is to summarize the evidence of the effectiveness of interventions that report physical activity outcomes in children aged 4–12 years and adolescents aged 13–19 years.</p>	<p>Across the two studies that implemented whole-of-school approaches, one intervention showed no effect on children's physical activity. The second intervention resulted in a significantly higher prevalence of participation in physical activity.</p>	<p>Interventions delivered in the school setting that focus on increasing physical activity during physical education lessons, as well as incorporating curriculum and/or environmental changes (e.g., playground activities) are effective at increasing student physical activity levels.</p>	<p>30</p>
<p>Sutherland, R., Campbell, E., Lubans, D. R., Morgan, P. J., Okely, A. D., Nathan, N., . . . Wiggers, J. (2016). 'Physical activity 4 everyone' school-based intervention to prevent decline in adolescent physical activity levels: 12 month (mid-intervention) report on a cluster randomised trial. <i>British Journal of Sports Medicine</i>, 50(8), 488. doi:http://dx.doi.org/10.1136/bjsports-2014-094523</p>	<p>PE: Teacher training to maximize PA in PE</p> <p>PA During School: PA during school breaks (lunch/recess) twice per week</p> <p>Family & Community Engagement: Newsletter distributed</p>	<p>Country: Australia</p> <p>School Setting: Not Specified</p> <p>School Level: Secondary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 10 schools with children aged 12-13 (grade 7)</p>	<p>The analysis revealed that the intervention group performed significantly more vigorous physical activity, equating to 27 min more MVPA per week.</p>	<p>Implementing a multicomponent physical activity intervention may result in small, but clinically significant effects after 1 year.</p>	<p>31</p>
<p>van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. <i>BMJ.</i> 2007;335(7622):703.</p>	<p>PE: changing content and structure of PE</p> <p>PA During School: increased activity choices during leisure periods, supervision, and equipment available</p> <p>Family & Community Engagement: family workshop on physical activity, physical activity homework, newsletters on physical activity</p>	<p>The aim of this article is to review the evidence on the promotion of physical activity in children and adolescents.</p>	<p>Ten studies evaluated multicomponent interventions in children, including three large high quality randomized controlled trials. Only one of these high-quality trials reported a significant positive effect on physical activity, equating to inconclusive evidence of effectiveness. Six studies evaluated multicomponent interventions in adolescents. Three were large high quality randomized controlled trials, which all showed significant positive results in physical activity, providing strong evidence of an effect of multicomponent interventions.</p>	<p>Implementing multicomponent physical activity interventions in school settings with family and community engagement can increase adolescent physical activity.</p>	<p>32</p>

Multicomponent Intervention Outcomes

Health Outcomes

Thirty-one of the 34 articles reviewed (91%) included interventions that measured health outcomes. Twenty-five of the interventions included PE in addition to one, two, three, or four CSPAP components areas. One of the interventions was a multicomponent intervention without PE and five of the articles were systematic reviews.

CSPAP COMPONENTS + HEALTH	31 TOTAL (91%)
PE +1 CSPAP Component	11 (36%)
PE +2 CSPAP Components	7 (23%)
PE +3 CSPAP Components	6 (19%)
Full CSPAP Integration (PE +4)	1 (3%)
Multicomponent without PE	1 (3%)
Systematic Reviews	5 (16%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	13 (42%)
• International	18 (58%)
School Setting	
• Urban	7 (23%)
• Rural	1 (3%)
• Rural and Urban	2 (6%)
• Not Specified	21 (68%)
School Level	
• Elementary	19 (61%)
• Secondary	6 (19%)
• Elementary and Secondary	6 (19%)
Socioeconomic Status	
• Low	11 (35%)
• High	0 (0%)
• Not specified	20 (65%)

PRIMARY HEALTH OUTCOMES	
Physical Activity	19 (62%)
Weight/BMI	6 (19%)
Fitness	4 (13%)
Motor skills	2 (6%)

Key Findings and Recommendations

The majority of the CSPAP interventions led to increases in student physical activity levels and improved weight/BMI. Future research should examine CSPAP implementation in secondary settings and additional health outcomes beyond physical activity. Further, research should also examine the impact of CSPAP implementation on health outcomes in more rural and urban areas.

TABLE 11. DETAILED SUMMARY OF HEALTH OUTCOMES PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Arto, G. (2015). Children's segment specific light physical activity across two years of school-based program. <i>Journal of Physical Education and Sport</i> , 15(1), 88-95. doi:http://dx.doi.org/10.7752/jpes.2015.01015	<p>PE: Teacher training to increase child motivation and PE enjoyment</p> <p>PA During School: Integration of classroom PA</p> <p>PA Before/After: Active transportation to school/ integration of afterschool programs</p>	<p>Country: Finland</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 2 schools with children aged 10-13</p>	The findings highlighted that children's total light physical activity remained stable through two years of program. However, the segments of before-school, after-school, short break, and girls' class time showed declining patterns across the period. Both girls and boys accumulated the majority of their weekly light physical activity during the weekdays and out-of- school periods compared to weekends and in-school time. The program seemed to be effective to prohibit declining levels of children's light physical activity .	Implementing a school-based multicomponent PA program may help to sustain children's light physical activity levels, which may improve their physical activity levels in the future.	1
Barr-Anderson, D. J., Laska, M. N., Veblen-Mortenson, S., Farbakhs, K., Dudovitz, B. & Story, M. (2012). A school-based, peer leadership physical activity intervention for 6th Graders: Feasibility and Results of a Pilot Study. <i>Journal of Physical Activity & Health</i> , 9(4), 492-499.	<p>PA During School: Peer & Teacher led Classroom PA integration</p> <p>Family & Community Engagement: PA & Healthy Eating Homework</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Secondary</p> <p>SES: Not Specified</p> <p>Participants: 4 schools with children in the 6th grade</p>	Compared with the control group, the intervention was successful in increasing moderate physical activity in all students and moderate and hard physical activity among girls. Teachers and students reported a high level of satisfaction and receptivity with the intervention. All teachers thought the DVDs were well-received and 87% of students reported that they would recommend the enhanced program to peers.	Including peer leadership and physical activity promoting DVDs in a multicomponent PA program may be an effective way to increase youth physical activity.	2
Bergh, I. H., Bjelland, M., Grydeland, M., Lien, N., Andersen, L. F., Klepp, K., Ommundsen, Y. (2012). Mid-way and post-intervention effects on potential determinants of physical activity and sedentary behavior, results of the HEIA study - a multi-component school-based randomized trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i> , 9, 63. doi:http://dx.doi.org/10.1186/1479-5868-9-63	<p>PE: Teachers integrated SPARK program</p> <p>PA During School: Integration of classroom PA</p> <p>PA Before/After: Active transportation to school</p> <p>Family & Community Engagement: Fact sheets handed out to parents</p>	<p>Country: Norway</p> <p>School Setting: Not specified</p> <p>School Level: Secondary</p> <p>SES: Not Specified</p> <p>Participants: schools with children aged 11-12 (gra)</p>	At mid-way, enjoyment, perceived social support from teachers, and self-efficacy were higher in the intervention group. Weight status moderated the effect on self-efficacy with a positive effect observed among the normal weight only. At post intervention, results were sustained for social support from teachers, while a negative effect was found for self-efficacy. Weight status moderated the effect on enjoyment, with reduced enjoyment observed among overweight. Moderations effects for parental education level were detected for perceived social support from parents and teachers. Finally positive effects on several determinants were observed among those receiving a high as opposed to a low intervention dose.	When implementing a multicomponent PA intervention, social support from teachers may be important for adolescent PA change, and overweight adolescents may need specially targeted interventions to avoid reducing their enjoyment of PA.	3

TABLE 11. DETAILED SUMMARY OF HEALTH OUTCOMES PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Braun, H. A., Kay, C. M., Cheung, P., Weiss, P. S., & Gazmararian, J. A. (2017). Impact Of an elementary school-based intervention on physical activity time and aerobic capacity, Georgia, 2013-2014. <i>Public Health Reports</i>, 132(2_suppl), 32S. https://doi.org/10.1177/0033354917719701</p>	<p>PE: Teachers trained to integrate more MVPA into lessons</p> <p>PA During School: Integration of classroom PA, school-wide PA morning announcements</p> <p>PA Before/After: BOKS program integrated</p> <p>Family & Community Engagement: Take home health materials distributed</p> <p>Staff Involvement: Pedometer 30-day staff member challenge</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 39 schools with children in the 4th grade</p>	<p>The weekly estimated teacher-reported time in physical activity increased by 39 minutes from pre- to post-intervention: 21 minutes for recess, 17 minutes for classroom, and 1 minute for physical education. The mean number of student PACER laps increased by 3 laps from pre- to post-intervention, and 1515 of 2342 (65%) students increased the number of PACER laps completed. There was a positive association between school-level changes in school-based physical activity time and school-level changes in PACER laps</p>	<p>Implementing a CSPAP with all five components for students in geographically diverse, socioeconomically challenged elementary schools may improve school-based physical activity and student aerobic capacity.</p>	4
<p>Brusseau, T.A., Kulinna, P.H. (2015). An examination of four traditional school physical activity models on children's step counts and MVPA. <i>Research Quarterly for Exercise and Sport</i>, 86(1), 88-93.</p>	<p>PE: Taught 2 days per week for 50-minutes and employed Dynamic PE curriculum</p> <p>PA During School: Multiple Recesses (one unstructured)</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 4 schools with 5th grade children (average age 10.0)</p>	<p>Children accumulated the greatest physical activity on days they had PE and multiple recess opportunities. Children accumulated the least amount of physical activity on days with only 1 recess opportunity. Children accumulated an additional 1140 steps and 4.1 min of MVPA on PE days.</p>	<p>Recess and PE play important roles in children's daily PA accumulation.</p>	5
<p>Brusseau, T.A., Hannon, J., & Burns, R. (2016). The effect of a comprehensive school physical activity program on physical activity and health-related fitness in children from low-income families. <i>Journal of Physical Activity and Health</i>, 13(8), 888-894.</p>	<p>PE: Taught 1 day per week for 50-minutes and employed Dynamic PE curriculum</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 3 schools with an average age of 8.4 years old</p>	<p>There were significant but weak-to-moderate increases in step counts, and moderate physical activity at 12 weeks compared to baseline. There were also significant but moderate increases in Progressive Aerobic Cardiovascular Endurance Run laps at 12 weeks compared with baseline. Analyses revealed that there were 3.02 and 2.34 greater odds that a child would achieve step count and MVPA standards and 2.26 greater odds that a child would achieve aerobic fitness standards at 12 weeks compared with baseline.</p>	<p>Implementing a CSPAP for 12 weeks may significantly improve physical activity and health related fitness in children from low-income families.</p>	6
<p>Burns, R. D., Brusseau, T. A., & Hannon, J. C. (2015). Effect of a Comprehensive School Physical Activity Program on School Day Step Counts in Children. <i>Journal Of Physical Activity & Health</i>, 12(12), 1536-1542.</p>	<p>PE: Monthly in-service opportunities</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 4 schools with children aged 8-11 (grades 4-5)</p>	<p>Analyses revealed increases in school day step counts from the end of preintervention to the start of postintervention.</p>	<p>Implementing a CSPAP may positively influence children's school day physical activity by both increasing average school day step counts and buffering decreases in step counts.</p>	7

TABLE 11. DETAILED SUMMARY OF HEALTH OUTCOMES PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Burns, R. D., Brusseau, T. A., & Fu, Y. (2017). Influence of Goal Setting on Physical Activity and Cardiorespiratory Endurance in Low-Income Children Enrolled in CSPAP Schools. <i>American Journal Of Health Education</i> , 48(1), 32-40.	<p>PE: Monthly in-service opportunities</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 5 schools with children aged 5-12 (grades k-6)</p>	6th grade children enrolled in schools where PALs employed goal setting displayed greater increases in school day step counts (+665 steps) compared to schools where PALs did not employ goal setting. In third-grade children in schools where PALs employed goal setting, there was a decrease in step counts from baseline to follow up (-832).	Goal setting within school physical activity program could combat physical activity declines as children get older	9
Burns, R., Fu, Y., Fang, Y., Hannon, J., & Brusseau, T. (2017). Effect of a 12-week physical activity program on gross motor skills in children. <i>Perceptual and Motor Skills</i> , 124(6).	<p>PE: Monthly in-service opportunities</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 3 schools with children aged 5-12 (grades k-6)</p>	Results indicate motor skills improved by approx. 10% following 12-weeks of CSPAP among children. TGMD-1 percent scores improved from 72.6% at baseline to 82.4% at follow-up. Students aged 7, 8, and 9 displayed a greater TGMD-2 percent change from baseline compared to children aged 10, 11, and 12 years. However, children aged 7 to 12 years displayed greater TGMD-2 percent change from baseline compared with children who were aged 6 years.	Implementing a multi-component school-based intervention like a CSPAP can increase child gross motor skills	10
Burns, R., Fu, Y., Hannon, J., & Brusseau, T. (2017). School physical activity programming and gross motor skills in children. <i>American Journal of Health Behavior</i> , 41(5).	<p>PE: Classes focused on motor skill development</p> <p>PA During School: Recess led by PALs, daily classroom PA integration</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 5 schools with children aged 5-12 (grades 1-6)</p>	Children scores on the overall gross motor skills scores showed statistically significant increases over the intervention period. Significant improvements were also seen for locomotor skills and ball skills sub-test scores.	Implementation of a CSPAP can led to significant improvements in child gross motor skills	11
Centeio, E. E., McCaughy, N., Gutuskey, L., Garn, A. C., Somers, C., Shen, B., Kulik, N. L. (2014). Physical activity change through comprehensive school physical activity programs in urban elementary schools. <i>Journal of Teaching in Physical Education</i> , 33(4), 573-591. Retrieved from https://unco.idm.oclc.org/login?url=https://search.proquest.com/docview/1697498433?accountid=12832	<p>PE: Teachers received evidence-based curriculum EPEC</p> <p>Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online</p> <p>PA During School: Active recess, classroom PA integration</p> <p>PA After School: Healthy Kids Club program was integrated</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Elementary</p> <p>SES: schools in low-income neighborhoods</p> <p>Participants: 20 schools with children aged 8-10 (grade 4)</p>	Analyses revealed significant pre-post increases in minutes of student MVPA . Students increased MVPA during school an average of almost 4.5 minutes per day. Overall significant differences were found from pre to post time spent in MVPA in PE, lunch, recess and classroom time. Parents significantly increased physical activity and although educators' reported change in PA, it was not statistically significant.	Implementing a CSPAP that incorporates three components (PE, during school PA, after school PA,) may have a positive effect on no only students, but also on educators and parents.	12

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FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Centeio, E.E., McCaughtry, N., Moore, E.W.G., Kulik, N., Garn, A., Martin, J., . . . Fahlman, M. (2018). Building healthy communities: A comprehensive school health program to prevent obesity in elementary schools. <i>Preventive Medicine</i>, 111, 210-215. https://doi.org/10.1016/j.ypmed.2018.03.005</p>	<p>PE: Teachers received evidence-based curriculum EPEC</p> <p>Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online</p> <p>PA During School: Active recess, classroom PA integration</p> <p>PA After School: Healthy Kids Club program was integrated</p>	<p>Country: United States</p> <p>School Setting: Not specified</p> <p>School Level: Elementary</p> <p>SES: Not specified</p> <p>Participants: 628 fifth grade children</p>	<p>Analyses revealed a significant difference in waist to height ratio among treatment and control groups at time two with no significant differences based on age, sex, and race. Additionally, the analysis for BMI revealed a marginally significant lower BMI among the treatment than comparison group students.</p>	<p>The implementation of a comprehensive school PA program that measured student health outcomes such as weight and BMI through quality PE, staff involvement with teachers and principals, during school PA, and an after school program can positively impact student obesity levels.</p>	<p>13</p>
<p>Cradock, A. L., Barrett, J. L., Carter, J., McHugh, A., Sproul, J., Russo, E. T., GortmakerS. L. (2014). Impact of the Boston active school day policy to promote physical activity among children. <i>American Journal of Health Promotion</i>, 28(3_suppl), S64. https://doi.org/10.4278/ajhp.130430-QUAN-204.</p>	<p>PE: Promotion of 150 minutes of quality PE</p> <p>PA During School: Integration of classroom PA and recess</p>	<p>Country: United States</p> <p>School Setting: Urban</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 6 schools with children in grades 4-5</p>	<p>During school time, intervention schools demonstrated greater increases in minutes per day of MVPA and vigorous PA and greater decreases in minutes per day of sedentary time.</p>	<p>The implementation of a policy on increasing opportunities for movement can have positive effects on child physical activity levels.</p>	<p>15</p>
<p>Dobbins M, De Corby K, Robeson P, et al. Schoolbased physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. <i>Cochrane Database Syst Rev</i>. 2009(1):CD007651.</p>	<p>PE: increase time spent in physical activity;</p> <p>PA During School: changes in school routine for students to be active and provision of equipment; Staff involvement: trainings in physical activity integration for teachers;</p> <p>Family & Community Engagement: educational materials for parents and community-based strategies</p>	<p>The purpose of this review was to assess, analyze, and draw conclusions about the effectiveness of school-based interventions in promoting physical activity and fitness in school-attending children and adolescents aged 6 to 18 year.</p>	<p>Interventions in the review had a positive impact on duration of physical activity (mostly for physical activity during school time) and on aerobic fitness measured by VO2max, but there was no evidence that school-based trials also affected out-of-school physical activity positively.</p>	<p>Implementing multicomponent physical activity interventions for longer periods of time can improve child physical activity levels.</p>	<p>16</p>
<p>Eather, N., Morgan, P. J., & Lubans, D. R. (2013). Feasibility and preliminary efficacy of the Fit4Fun intervention for improving physical fitness in a sample of primary school children: a pilot study. <i>Physical Education & Sport Pedagogy</i>, 18(4), 389-411.</p>	<p>PE: 8-Week, 60-Min PE program</p> <p>PA During School: Activity Task Cards</p> <p>PA Before/After: BOKS program integrated</p> <p>Family & Community Engagement: Children, and family members were given an 8-week home activity program</p>	<p>Country: Australia</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 2 schools with children aged 9-11</p>	<p>A significant group x time effect was exhibited for the sit and reach test, the seven-stage sit-up test, and the wall squat test. Large within group effects were found for the intervention group for flexibility, and muscular fitness, and seven-stage sit up and a medium to large effect was found for muscular fitness using the basketball throw test. No significant group x time effects were found in the beep test, basketball throw test or PA levels. No significant improvements were found for the control group in any measure</p>	<p>This intervention demonstrated that integrating an 8-week program that include 8-60 minute health and Pe lessons, recess and lunch activity, and a home fitness program is feasible and an effective strategy for improving child health</p>	<p>17</p>

TABLE 11. DETAILED SUMMARY OF HEALTH OUTCOMES PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Grydeland, M., Bergh, I.H., Bjelland, M., Lien, N., Andersen, L.F., Ommundsen, Y., Knut-Inge, K., & Anderssen, S.A. (2013). Intervention effects on physical activity: The HEIA study - a cluster randomized controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i>, 10(17), 1-13.</p>	<p>PE: Teachers integrated SPARK program PA During School: Once a week 10-min classroom PA PA Before/After: Active Commute to school campaigns Family & Community Engagement: Take home health materials distributed</p>	<p>Country: Norway School Setting: Urban School Level: Elementary SES: Not Specified Participants: 37 schools with children aged 11-12 (grade 6)</p>	<p>The intervention group showed a net effect of 50 counts per minute increase from baseline to post in overall physical activity. Subgroup analyses showed that the effect appeared to be more profound among girls and participants in the low activity group as compared to boys and high activity group participants. The intervention affected physical activity among the normal weight group more positively than the overweight, and participants with parents having 13-16 years of education more positively than participants with parents having either a lower or higher number of years of education. The intervention succeeded in reducing time spent sedentary among girls but not among boys.</p>	<p>Implementing a multicomponent physical activity program may increase physical activity of adolescents and may have a profound effect on girls and low-active adolescents in particular.</p>	<p>18</p>
<p>Hollis, J.L., Sutherland, R., Campbell, L., Morgan, P.J., Lubans, D.R., Nathan, N., Wolfenden, L., Wiggers, J. (2016). Effects of a “school-based” physical activity intervention on adiposity in adolescents from economically disadvantaged communities: Secondary outcomes in the Physical Activity 4 Everyone” RCT. <i>International Journal of Obesity</i>, 40(10), 1486-1493.</p>	<p>PE: Teachers received 2 professional learning workshops that focused on increasing MVPA & motivation PA During School: PA breaks at least 2 days per week Family & Community Engagement: Take home health materials distributed</p>	<p>Country: Australia School Setting: Rural School Level: Secondary SES: schools in low-income neighborhoods Participants: schools with children aged 12-13 (grade 7)</p>	<p>There were group by time effects for weight and BMI in favor of intervention group. These findings were consistent for weight and BMI at 24 months with group by time effects also found for BMI favoring the intervention group.</p>	<p>Implementing a multicomponent physical activity intervention may improve adolescent’s adiposity and prevent unhealthy weight gain.</p>	<p>19</p>
<p>Jansen, W., Borsboom, G., Meima, A., Zwanenburg, E.J., Mackenbach, J.P., Raat, H., & Brug, J. (2011). Effectiveness of a primary school-based intervention to reduce overweight. <i>International Journal of Pediatric Obesity</i>, 6(2-2).</p>	<p>PE: 3 PE lessons per week Before/After School PA: Additional sport & play activities</p>	<p>Country: Netherlands School Setting: Inner-city/urban School Level: Elementary SES: schools in low-income neighborhoods Participants: 20 schools with children aged 6-12 years (grades 3-8)</p>	<p>Significant positive intervention effects were found for percentage overweight children, waist circumference, and 20 m shuttle run among pupils of grades 3-5. The prevalence of overweight in grades 3-5 increased by 4.3% in the control group and by 1.3% in the intervention group.</p>	<p>A multicomponent physical activity intervention including PE and before/after school physical activity opportunities may be effective in reducing childhood obesity.</p>	<p>20</p>
<p>Kriemler, S., Zahner, L., Schindler, C., Meyer, U., Hartmann, T., Hebestreit, H., Brunner-La R.H.P., (2010). Effect of school based physical activity programme (KISS) on fitness and adiposity in primary schoolchildren: Cluster randomized controlled trial. <i>British Medicine Journal</i>, 23, 340.</p>	<p>PE: PE 3 times per week PA During School: 3-5 daily PA breaks (2-5 mins) Family & Community Engagement: PA homework</p>	<p>Country: Switzerland School Setting: Rural and urban locations School Level: Elementary SES: Not Specified Participants: 95 schools with children aged 6-12 (grades 1-5)</p>	<p>Children in the intervention group showed more negative changes in skinfolds, but improved in aerobic fitness & physical activity.</p>	<p>A multicomponent physical activity intervention may improve student physical activity, fitness, and adiposity.</p>	<p>21</p>

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FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Kriemler, S., Meyer, U., Martin, E., Sluijs, E. van Andersen, L. B., & Martin, B. W. (2011). Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. <i>British Journal of Sports Medicine</i>, 45(11), 923–930. https://doi.org/10.1136/bjsports-2011-090186.</p>	<p>PE: Physical activity during the school day: activity breaks;</p> <p>Family & Community Engagement: involving family written advice to families or physical activity workshops for families</p>	<p>The basis of this review was the collection of recent systematic reviews published after 2006 that summarized the evidence on PA promotion in children and adolescents.</p>	<p>47-65% of trials that were reviewed between 2007-2010 were found to be effective. The effect was mostly seen in school related physical activity rather than other health outcomes. The school-based application of multicomponent intervention strategies was the most consistent promising intervention strategy.</p>	<p>Implementing a whole-of-school approach is an effective strategy for increasing PA and health among children.</p>	22
<p>Li, X-H., Lin, S., Guo, H., Huang, Y., Wu, L., Zhang, Z., Ma, J., & Wang, H-J. (2014). Effectiveness of a school-based physical activity intervention on obesity in school children: A nonrandomized controlled trial. <i>BMC Public Health</i>, 14, 1282.</p>	<p>PE: 3 45-minute PE lessons per week</p> <p>PA During School: Extracurricular PA for overweight & obese students during school breaks</p> <p>Family & Community Engagement: PA homework</p>	<p>Country: China</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary & Secondary</p> <p>SES: Not Specified</p> <p>Participants: Schools with children aged 7 to 15 years old (grades 2-5 elementary and 1 & 2 middle school)</p>	<p>The reduction of BMI was statistically significant in intervention group compared with increase of BMI in control group. The decrease of triceps, subscapular, abdominal skinfold thickness and fasting glucose were also significant in intervention group compared to control. The increase in duration of MVPA in intervention group was significantly different from that in control group.</p>	<p>A multicomponent physical activity intervention was an effective and feasible way to reduce adiposity and improve the health of students.</p>	23
<p>Lubans, D. R., Smith, J. J., Plotnikoff, R. C., Dally, K. A., Okely, A. D., Salmon, J., & Morgan, P. J. (2016). Assessing the sustained impact of a school-based obesity prevention program for adolescent boys: the ATLAS cluster randomized controlled trial. <i>International Journal of Behavioral Nutrition and Physical Activity</i>, 13(1), 92. https://doi.org/10.1186/s12966-016-0420-8</p>	<p>Staff Involvement: Teacher professional learning</p> <p>PA During School: Lunchtime PA run by students, PA sessions led by teachers</p> <p>Family & Community Engagement: Newsletter on reducing screen time</p>	<p>Country: Australia</p> <p>School Setting: Not Specified</p> <p>School Level: Secondary</p> <p>SES: Schools in low-income neighborhoods</p> <p>Participants: 14 schools with children aged 12-14</p>	<p>After 18 months, there were no effects found for BMI or waist circumference. Sustained effects were found for screen-time, resistance training skill competency, and motivational regulations for school sport.</p>	<p>Implementing a multicomponent PA intervention may have positive long-term effects on screen time, resistance training skill competency, and motivational regulations for sport.</p>	24
<p>Magnusson, K.T., Sigurgeirsson, I., Sveinsson, T., & Johannsson, E. (2011). Assessment of a two-year school-based physical activity intervention among 7-9 year-old children. <i>International Journal of Nutrition and Physical Activity</i>, 8, 138.</p>	<p>PE: One day on-site counseling</p> <p>PA During School: Teachers provided with PA promoting materials</p>	<p>Country: Iceland</p> <p>School Setting: Not Specified</p> <p>School Level: Elementary</p> <p>SES: Not Specified</p> <p>Participants: 6 schools with children in the second grade</p>	<p>Children in the intervention schools were more physically active at moderate to vigorous intensities compared to those in control schools after one year of the intervention. Analyses revealed a significantly greater increase in physical activity among boys in the intervention schools compared to girls. No difference in physical activity was detected between the study groups at the end of the study period after two years of intervention.</p>	<p>A multicomponent physical activity intervention including PE and during school physical activity opportunities implemented by trained teachers may increase student physical activity after one year of implementation. However, schools should consider that boys may respond better to school-based interventions than girls and that the success of the intervention may depend on the training and motivation of the general teachers.</p>	25

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FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
<p>Meyer, U., Schindler, C., Zahner, L., Ernst, D., Hebestreit, H., van Mechelen, W., Brunner-La, R.H.P., Kriemler, S. (2014). Long-term effect of a school-based physical activity program (KISS) on fitness and adiposity in children: A cluster-randomized controlled trial. <i>PLoS One</i>, 9(2).</p>	<p>PE: 3 45-minute PE lessons per week PA During School: Extracurricular PA for overweight & obese students during school breaks Family and Community engagement: PA homework</p>	<p>Country: Switzerland School Setting: Rural and urban locations School Level: Elementary SES: Not Specified Participants: 15 schools with children aged 6-12 (grades 1-5)</p>	<p>Children in the intervention group had a significantly higher average level of aerobic fitness at follow-up while the immediate beneficial effects on the other primary outcomes were not sustained. Reported time spent in sports club during the follow-up period was higher in the intervention group.</p>	<p>Implementing a multicomponent physical activity intervention may lead to long-term benefits to aerobic fitness.</p>	<p>26</p>
<p>Pate, R. R., Ward, D. S., Saunders, R. P., Felton, G., Dishman, R. K., & Dowda, M.(2005). Promotion of physical activity among high-school girls: A randomized controlled trial. <i>American Journal of Public Health</i>, 95(9), 1582–1587. https://doi.org/10.2105/AJPH.2004.045807</p>	<p>PE: LEAP curriculum integrated PA During School: Increase MVPA levels Staff Involvement: Staff role modeling Family & Community Engagement: Not specified</p>	<p>Country: United States School Setting: Not Specified School Level: Secondary SES: Not Specified Participants: 24 schools with children aged 13-14 (grade 9)</p>	<p>At follow-up, 45% of girls in the intervention schools and 36% of girls in the control schools reported vigorous physical activity during an average of 1 or more 30-minute time blocks per day over a 3-day period.</p>	<p>The implementation of a comprehensive school physical activity program that targets physical activity through PE, staff involvement and family and community engagement may result in increased regular participation in vigorous intensity physical activity.</p>	<p>28</p>
<p>Russ, L., Webster, C.A., Beets, M.W., & Phillips, D. (2015). Systematic review and meta-analysis of multicomponent interventions through schools to increase physical activity. <i>Journal of Physical Activity and Health</i>, 12(10), 1436-1446.</p>	<p>PE: increase physical activity during PE; PA During School: recess, classroom PA, drop-in sessions; Before & After School PA: environmental and policy changes; Staff Involvement: limited details; Family and Community Engagement: sending newsletters to families, physical activity homework</p>	<p>Systematic review and meta-analysis examined all components of a CSPAP. Included studies reflected two or more CSPAP components.</p>	<p>Overall the intervention impact was small. Across all studies and by studies reporting gender and specific activity outcomes, as the number of CSPAP components increased, the effect size associated with the change in daily physical activity also increased. Studies that included during school physical activity, before/after school physical activity, and staff wellness were associated with larger effect sizes than studies that did not include these components.</p>	<p>A whole-of-school approach is recommended for increasing physical activity opportunities of students, however, multi-disciplinary teams consisting of research scholars and community partners with related backgrounds are recommended to coordinate these collaborative approaches to further increase CSPAP's effectiveness.</p>	<p>29</p>
<p>Salmon J, Booth ML, Phongsavan P, et al. Promoting physical activity participation among children and adolescents. <i>Epidemiol Rev</i>. 2007;29:144-59.</p>	<p>PE: higher proportion of PE time spent in physical activity; PA During School: playground activities</p>	<p>The aim of this narrative review is to summarize the evidence of the effectiveness of interventions that report physical activity outcomes in children aged 4–12 years and adolescents aged 13–19 years.</p>	<p>Across the two studies that implemented whole-of-school approaches, one intervention showed no effect on children's physical activity. The second intervention resulted in a significantly higher prevalence of participation in physical activity.</p>	<p>Interventions delivered in the school setting that focus on increasing physical activity during physical education lessons, as well as incorporating curriculum and/or environmental changes (e.g., playground activities) are effective at increasing student physical activity levels.</p>	<p>30</p>

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<p>Sutherland, R., Campbell, E., Lubans, D. R., Morgan, P. J., Okely, A. D., Nathan, N., Wiggers, J. (2016). 'Physical activity 4 everyone' school-based intervention to prevent decline in adolescent physical activity levels: 12 month (mid-intervention) report on a cluster randomised trial. <i>British Journal of Sports Medicine</i>, 50(8), 488. doi:http://dx.doi.org/10.1136/bjsports-2014-094523</p>	<p>PE: Teacher training to maximize PA in PE PA During School: PA during school breaks (lunch/recess) twice per week Family & Community Engagement: Newsletter distributed</p>	<p>Country: Australia School Setting: Not Specified School Level: Secondary SES: schools in low-income neighborhoods Participants: 10 schools with children aged 12-13 (grade 7)</p>	<p>The analysis revealed that the intervention group performed significantly more vigorous physical activity, equating to 27 min more MVPA per week.</p>	<p>Implementing a multicomponent physical activity intervention may result in small, but clinically significant effects after 1 year.</p>	31
<p>van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. <i>BMJ</i>. 2007;335(7622):703.</p>	<p>PE: changing content and structure of PE; PA During School: increased activity choices during leisure periods, supervision, and equipment available; Family & Community Engagement: family workshop on physical activity, physical activity homework, newsletters on physical activity</p>	<p>The aim of this article is to review the evidence on the promotion of physical activity in children and adolescents.</p>	<p>Ten studies evaluated multicomponent interventions in children, including three large high quality randomized controlled trials. Only one of these high-quality trials reported a significant positive effect on physical activity, equating to inconclusive evidence of effectiveness. Six studies evaluated multicomponent interventions in adolescents. Three were large high quality randomized controlled trials, which all showed significant positive results in physical activity, providing strong evidence of an effect of multicomponent interventions.</p>	<p>Implementing multicomponent physical activity interventions in school settings with family and community engagement can increase adolescent physical activity.</p>	32
<p>Verstraete, S.J., Cardon, G.M., De Clercq, D.L., & De Bourdeaudhuij, I.M. (2007). A comprehensive physical activity promotion programme at elementary school: The effects on physical activity, physical fitness, and psychosocial correlates of physical activity. <i>Public Health Nutrition</i>, 10(5), 477-484.</p>	<p>PE: Integration of SPARK PA During School: Lunch/Recess equipment was provided Before/After School PA: Extracurricular activities were provided to students led by PE teacher</p>	<p>Country: Belgium School Setting: Not specified School Level: Elementary SES: Not specified Participants: 5th and 6th graders, mean age = 9.7</p>	<p>Children's moderate physical activity and MVPA decreased less in intervention schools. Children in intervention schools reported significantly more moderate physical activity in leisure time than the control group. No improvements in physical fitness or psychosocial variables were found.</p>	<p>This intervention is not expensive and can be implemented within existing schools by the schools themselves. Additionally, it may be useful to provide education on PA promotion to teachers to enable them to implement PA in their classrooms.</p>	33
<p>Weaver, R. G., Webster, C. A., Egan, C. A., Campos, C. M. C., Michael, R. D., Vazou, S.(2018). Partnerships for Active Children in Elementary Schools: Outcomes of a two-year pilot study to increase physical activity during the school day. <i>American Journal of Health Promotion</i>, 32(3), 621-630.</p>	<p>PE: Teacher training on PA integration PA During School: Classroom PA integration</p>	<p>Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: Three schools</p>	<p>Percentage of boys & girls in the intervention school meeting the 30 min/day of MVPA increased by 18.5% to 32.2%. Boys and girls in intervention schools increased their MVPA during school hours 8.8% more than students in the control school. During general education classroom time, boys and girls increased their MVPA 6.4% and 2.4% more than their counterparts in the control school. Boys decreased their sedentary time 1.7% compared to students in the control school. During PE boys & girls increased their MVPA 11.5% and 8.4% more than students in the control school and decreased in sedentary time 10.3% and 2.2% more than students in the control school.</p>	<p>A multi-component intervention facilitated through school and university partnerships is an effective strategy when trying to increase physical activity levels among children.</p>	34

Academic Outcomes

Three of the 34 articles reviewed (9%) focused on measuring academic outcomes related to CSPAP. Of the three articles, two (66%) included *physical activity during school* combined with PE, and one (34%) included PE, *physical activity before/after school programming, staff involvement, and PA during school*. All of the academic-focused, multicomponent interventions were conducted in elementary schools in the United States.

CSPAP COMPONENTS + ACADEMICS	3 TOTAL (9%)
Physical Education + Physical Activity During School	3 (66%)
Physical Education + Physical Activity Before/After School + Staff Involvement + Physical Activity During School	1 (34%)

SCHOOL SETTING CHARACTERISTICS	
Country	
• United States	3 (100%)
• International	0 (0%)
School Setting	
• Urban	0 (0%)
• Rural	0 (0%)
• Not Specified	3 (100%)
School Level	
• Elementary	3 (100%)
• Secondary	0 (0%)
Socioeconomic Status	
• Low	0 (0%)
• High	0 (0%)
• Not Specified	3 (100%)

PRIMARY ACADEMIC OUTCOMES	
On-Task Behavior	2 (66%)
Academic Achievement	1 (34%)

Key Findings and Recommendations

One intervention resulted in greater odds of achieving 80% on-task behavior, while the other study that focused on student on-task behavior resulted in an increase overall on-task behavior. The third study assessing academic achievement suggested the multicomponent intervention was a significant predictor of students' reading comprehension rates. Implementing CSPAP interventions in elementary schools can result in increased student on-task behavior as well as reading comprehension. Future research should examine how CSPAP implementation can impact student academic outcomes in secondary settings and in other countries.

TABLE 12. DETAILED SUMMARY OF ACADEMIC OUTCOMES PUBLISHED LITERATURE

FULL REFERENCE	CSPAP COMPONENTS DESCRIPTION	INTERVENTION CHARACTERISTICS	PRIMARY OUTCOMES	PRACTICAL SIGNIFICANCE	REF #
Burns, R., Brusseau, T., Fu, Y., Myrer, R., & Hannon, J. (2016). Comprehensive school physical activity programming and classroom behavior. <i>American Journal of Health Behavior</i> , 40(1).	PE: In-service trainings twice per semester on quality PE PA During School: Daily 5-minute classroom energizer using Take 10! program	Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: 3 schools with children aged 5-12	There were 7.49 greater odds of a classroom achieving 80% on-task behavior at 6 weeks compared to baseline and 27.93 greater odds of a classroom achieving 80% on-task behavior compared to baseline.	Implementing a CSPAP may improve classroom behavior of children across all multiple grade levels and among those from low-income areas.	8
Centeio, E.E., Somers, C., Moore, E.W., Kulik, N., Garn, A., Martin, J., & McCaughy, N. (2018). Relationship between academic achievement and healthy school transformations in urban elementary schools in the United States. <i>Physical Education and Sport Pedagogy</i> , 23(4), 402-417. https://doi.org/10.1080/17408989.2018.1441395	PE: Teachers received evidence-based curriculum EPEC Staff Involvement: School personnel read healthy tips of the day, distributed healthy living newsletter, & posted health messaging throughout school and online PA During School: Active recess, classroom PA integration PA After School: Healthy Kids Club program was integrated	Country: United States School Setting: Not specified School Level: Elementary SES: Not Specified Participants: 378 fourth grade students	In the final model, program fidelity was a significant predictor of students' reading comprehension rates of improvement , while students' aerobic fitness level and time two physical activity levels were all significant contributors to rates of improvement in math .	Implementing a four-component CSPAP may have positive effects on students academic achievement outcomes, particularly their rates of improvement in reading and math.	14
Myrer, R. S., Brusseau, T. A., Burns, R. D., Fu, Y., & Hannon, J. C. (2016). Effect of a CSPAP on classroom behavior in at-risk children. <i>Research Quarterly for Exercise and Sport</i> , 87, A103-A104. Retrieved from https://unco.idm.oclc.org/login?url=https://search.proquest.com/docview/1817494453?accountid=12832	PE: PE teacher training to improve PE practice PA During School: Classroom PA and Active Recess integration	Country: United States School Setting: Not Specified School Level: Elementary SES: Not Specified Participants: Children in K-6 school setting	At baseline, 32% of classrooms demonstrated optimal on-task behavior at baseline. The prevalence of on-task behavior increased to 70% of the classrooms at the 6-week follow-up and to 84% of the classrooms at the 12-week follow up. Analyses revealed 6.42 times greater odds of a classroom achieving at least 80% on-task behavior at the 6 week follow up compared with baseline and a 17.18 times greater odds of a classroom achieving at least 80% on-task behavior at the 12 week follow-up compared with baseline.	CSPAPs may be used as a behavioral interventions to improve the on-task behavior of at-risk elementary school students, which may positively affect academic performance over time.	27

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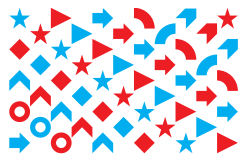
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