



The Link Between Obesity and Academics: School Psychologists' Role in Collaborative Prevention

Scott R. McCarthy

Lindsay M. Fallon

Lisa M. Hagermoser Sanetti

University of Connecticut

ABSTRACT: Childhood obesity is linked to an increased risk for negative physical, social, emotional, and academic outcomes. Because obesity affects one in every six school-age children and may negatively affect academic achievement, schools are perhaps the setting best suited to offer collaborative services aimed at preventing and/or reducing the childhood obesity epidemic and associated negative outcomes. School psychologists have the relevant skills to coordinate obesity prevention, screening, and intervention efforts and are thus called upon to begin addressing this epidemic through coordinated efforts among school personnel. An overview of the current state of childhood overweight and obesity is provided, along with a review of evidence-based screening, assessment, prevention, and intervention practices for school settings. In addition, strategies and resources are provided to inform practitioners how they can best coordinate efforts in their districts. Implications for school-based practice are discussed.

The National Center for Health Statistics (2004) reports that the rate of childhood obesity has more than tripled between 1976–1980 and 1999–2000. Currently, one in five children are obese and an even greater number are overweight (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Although debate exists regarding the definitions of overweight and obesity in childhood, the Centers for Disease Control and Prevention (CDC, 2009) defines weight ranges using body mass index (BMI). BMI is a measure of weight for height, and is calculated by dividing a child's weight in kilograms by the square of the child's height in meters. More specifically, the CDC defines *normal weight* as having a BMI between the 5th and 85th percentile, *overweight* as having a BMI between the 85th and 95th percentile, and *obese* as having a BMI over the 95th percentile of the BMI-for-age 2000 CDC Growth Chart, which represents percentiles based on ideal BMIs for children across age and sex. This chart was developed by the CDC and the National Center for Health Statistics through a complex process using survey sampling, statistical predictions, and expert opinion (Kuczmarski, Ogden, & Guo, 2000). Children who are obese or overweight are more likely to acquire Type II diabetes, high blood pressure, high cholesterol, heart disease, stroke, sleep apnea, bone and joint problems, and some types of cancers (U.S. Surgeon General, 2009). In addition to the health risks associated with obesity, recent research links childhood obesity to negative social and emotional outcomes (e.g., low self-esteem, depression, social

Correspondence concerning this manuscript should be directed to Lisa M. Hagermoser Sanetti, University of Connecticut, Department of Educational Psychology, 249 Glenbrook Road Unit 2064, Storrs, CT 06269-2064; lisa.sanetti@uconn.edu.

isolation, stigmatization; Latner & Stunkard, 2003; Zimetkin, Zoon, Klein, & Munson, 2004) as well as negative academic outcomes (e.g., poor achievement; Tomporowski, Davis, Miller, & Naglieri, 2008).

There has been a great deal of attention paid to the link between childhood overweight and obesity and social, emotional, and health outcomes in both scholarly publications and the popular media (CDC, 2008; Strauss, 2000; U.S. Surgeon General, 2009). Less attention has been paid to the link between children's weight and their academic outcomes (Datar & Sturm, 2006). The emerging evidence for this link is so convincing that experts in the area are suggesting that schools may be required to provide intervention services to students who are overweight or obese (Clark, Slate, & Viglietti, 2009). Thus, it is increasingly likely that schools will become centers for coordinating service delivery models for this population. School psychologists have expertise in assessment and prevention/intervention across social, emotional, and academic functioning and act as liaisons among school personnel, medical professionals, families, and the community (National Association of School Psychologists, 2009). Thus, school psychologists are likely to be called upon to support these efforts. The purpose of this paper is to provide an overview of (a) the current state of childhood obesity, (b) research on the relationship between weight and academic outcomes, (c) best practices in school-based obesity assessment and prevention/intervention, and (d) implications for practitioners.

CURRENT STATE OF CHILDHOOD OBESITY

The rate of childhood obesity has remained relatively consistent over the past 10 years, with about 32% of children considered overweight (above 85th percentile for BMI), 16.9% of children obese (above 95th percentile for BMI), and 11.9% of children considered extremely obese (above 97th percentile for BMI) in 2006 (Ogden et al., 2010). Because the rate of childhood obesity is about the same as it was 10 years ago, it appears that that rate of childhood obesity is stabilizing. Yet, overall obesity rates remain triple what they were 35 years ago (i.e., from 1976 to 1980; Ogden, Carroll, & Flegal, 2008). The prevalence of obesity in children ages 2–5 years, 6–11 years, and 12–17 years has increased from 5.0% to 10.4%, 4.0% to 19.6%, and 6.1% to 18.1% from 1974 to 2008, respectively (Ogden et al., 2010). Obesity rates have risen to such proportions both in the United States and abroad that the World Health Organization (2003) considers obesity an epidemic, as worldwide over 1 billion individuals are overweight and more than 300 million individuals are obese. With one in six school-aged children classified as obese in the United States, and one in three classified as overweight (Ogden et al., 2008), it is essential that professionals who work with children understand common sequelae and how best to screen, assess, prevent, and intervene.

RELATIONSHIP BETWEEN WEIGHT AND ACADEMIC OUTCOMES

Beyond the association with negative health and psychosocial outcomes, childhood overweight and obesity are related to general academic functioning (Datar & Sturm, 2006). We provide a discussion of (a) academic functioning of youth who are overweight or obese, (b) academic outcomes resulting from weight interventions, and (c) variables mediating the relationship between weight and academic outcomes.

Academic Functioning of Overweight or Obese Students

Compared to their typical-weight peers, Clark et al. (2009) found that elementary school children who were obese not only performed worse in all academic areas (i.e., mathematics, reading, science, language, and social studies) on the Texas Assessment of Knowledge and Skill (TAKS), but also received lower conduct grades. As the weight of children in the sample increased from typical weight, to overweight, to obese, their teacher-assigned grades and scores on the TAKS decreased, even after controlling for socioeconomic status (SES) and conduct grades.

This inverse relationship between weight and academic performance is found on standardized measures of achievement. Datar, Sturm, and Magnabosco (2004) analyzed a nationally representative set of 11,192 children and found that children who were overweight had significantly lower math and reading scores than children who were not overweight at the beginning of kindergarten and at the end of first grade after controlling for SES, parent–child interaction, birth weight, physical activity, and television watching. This relationship has also been detected in adolescents. Crosnoe and Muller (2004) found that adolescents' self-reported grades in school were significantly lower for children who are overweight or obese. Bagully (2006) expanded on these results by using objective measures of academic achievement with adolescents. Results from BMI scores of 1,626 adolescents age 13–14 from the National Longitudinal Survey Year 97 suggest that adolescents who were obese had significantly lower achievement in math (as measured by the mathematics measure on the Peabody Individual Achievement Test) than their peers who were not obese.

Academic Outcomes Resulting From Weight Interventions

Particularly relevant for school psychologists involved in advocating for the adoption or implementation of weight-based interventions in their schools, research studies investigating the effects of weight-based interventions have found that the academic achievement of participants improves during the course of the study (Donnelly et al., 2009; Hollar et al., 2010). For example, in a large-scale 3-year cluster randomized controlled trial investigating whether increasing physical activity in schools would decrease obesity rates and increase academic achievement, Donnelly et al. (2009) found that although obesity rates did not decrease, they stabilized, and participants' academic functioning, as measured by the Wechsler Individual Achievement Test 2nd edition (Wechsler, 2001), increased in reading, mathematics, and spelling. Similarly, in a study of four schools with primarily low-income students and an increasing obesity rate, a multicomponent intervention that included teacher-directed physical exercise within the classroom was successful in stabilizing the obesity rate as compared to a control school (Hollar et al., 2010). Intervention schools also had significantly higher mathematics scores (as measured by the Florida Comprehensive Achievement Test) than control schools post intervention. Thus, it may be possible for schools to improve academic outcomes by improving healthy weight behaviors.

Variables Mediating the Relationship Between Weight and Academic Outcomes

As noted above, there is considerable evidence that childhood overweight and obesity can lead to increased risk of coronary heart disease (Freedman, Dietz, Srinivasan, & Berenson, 1999) and adult obesity (CDC, 2008), which contribute to heart attacks, angina (chest pain), heart failure, and arrhythmias (CDC, 2009). In addition, results from a variety of research studies lend support to the conclusion that being obese negatively affects children's social and emotional functioning (Krukowski et al., 2009). There is considerable evidence that youth who are overweight or obese are more likely to (a) have lower self-esteem; (b) feel lonesome, depressed, or anxious; (c) smoke and drink; and (d) have disordered eating and a distorted body image (Crow, Eisenberg, Story, & Neumark-Sztainer, 2006; Eaton, Lowry, Brener, Galuska, & Crosby, 2005; Strauss, 2000). Many mediating variables for the relationships between weight and health and psychosocial outcomes have been identified. For example, weight-based teasing is frequently cited and widely accepted as a significant mediating variable in the relationship between weight and negative psychosocial outcomes (Krukowski et al., 2009).

Researchers investigating the connection between weight and academic outcomes have yet to conclude which mediating variables are responsible for affecting academic performance for students who are overweight or obese, though a range of variables have been suggested (Bagully, 2006). Some of the suggested variables include (a) stigmatization stemming from the school environment (Crosnoe & Muller, 2004), (b) depression (Bagully, 2006), and (c) cognitive developmental deficits resulting from reduced physical activity (Chaddock et al., 2010) or poor nutrition (Pyle, Hyder, Haddock, & Carlos, 2009). Thus, although additional research is needed to determine *how* obesity and academic functioning are related, it

is clear that they are related, making it ever more important for school psychologists to understand how best to intervene.

BEST PRACTICES IN SCHOOL-BASED OBESITY ASSESSMENT AND INTERVENTION/PREVENTION

As the role of the school psychologist continues to expand, opportunities to affect change and improve outcomes in various areas of student functioning emerge (National Association of School Psychologists, 2009). Currently, the 2001 No Child Left Behind Act requires schools to evaluate the performance of specified subgroups of students annually. With an increasing number of studies linking weight and academic achievement, some researchers have suggested that schools may need to consider students who are overweight or obese as a subgroup for which intervention is not only warranted but required (Clark et al., 2009). Below, a summary of the role that school psychologists can play in the screening, assessment, prevention, and intervention of childhood overweight and obesity is provided.

School-Based Screening and Assessment

As a range of school-wide weight profiles is possible, it is first necessary for schools to screen all students' weight statuses and determine the specific characteristics of their population. This is necessary both for determining the school-wide weight profile and for identifying individual students who may need intervention. Although the most accurate measure of a child's weight status is percentage of body fat (Flegal, Tabak, & Ogden, 2006), measuring body fat can be time intensive and difficult. Therefore, the CDC (2009) recommends that screening for overweight and obesity be completed through the use of BMI, which is a good predictor of percentage of body fat (Coles & Gilbert, 2005). To determine if a child's BMI is within normal limits, his or her BMI is compared to reference population data (2000 CDC growth charts) based on sex and age (CDC, 2009).

To implement a BMI screening procedure, school psychologists would coordinate with school nurses, health and physical education teachers, administrators, and any other individuals responsible for scheduling efforts within the building (e.g., school counselors). Only nine states (Arkansas, Florida, Illinois, Maine, Missouri, Ohio, Pennsylvania, Tennessee, and West Virginia) require BMI screening in schools (American Academy of Pediatrics, 2009) and thus it may be necessary, depending on state and local laws, to notify parents or obtain parental consent before beginning screening students. School administrators should be involved in approving screening procedures, and school nurses should either be directly involved in taking students' height and weight or should train the designated individuals (e.g., health and physical education teachers) as to how to ascertain valid height and weight measurements.

The development of the Children's BMI Tool for Schools has made assessing results from weight measurements significantly easier for educators. The tool is a free Excel spreadsheet available on the CDC's website (www.cdc.gov; see Appendix B for use by educators who wish to compute the BMI of up to 2,000 children quickly and accurately). The tool requires entry of each child's height, weight, sex, date of birth, and the date of measurement. Along with the tool, educators can download user-friendly directions, information about the use of BMI as a screener, and information on how to interpret results. After entering child statistics, the BMI Tool for Schools provides educators with information useful at both the individual child and whole school level, including individual child BMIs, group summaries of children's BMI-for-age categories, graphs of the prevalence of overweight and obesity at the school level, and the prevalence of overweight and obesity by sex.

School psychologists are ideal candidates to coordinate screening efforts as using results from BMI screening requires (a) significant collaboration among various school personnel, families, and administrators; (b) knowledge of screening and assessment science; (c) an ability to influence system change based on screening results; and (d) an understanding of progress monitoring and evaluation techniques. Once a school-wide profile of BMI is established, school psychologists can play an integral

role in evaluating the data at the school level and determining whether school-wide intervention is warranted. School psychologists can also collaborate with school nurses and other school mental health professionals to determine which individual students screen positive (i.e., over the 85th percentile) and require a second-tier assessment.

Expert committees suggest that children who screen positive for overweight or obese by BMI should be given a second-tier assessment that considers family history, blood pressure, cholesterol, and the rate of weight gain associated with their BMI (Flegal et al., 2006). Although there is not data to support a direct relationship between these factors and academic performance, considering these factors is important to (a) ensure that BMI measures accurately identified the child's weight status, (b) gain more detailed information about the problem for intervention design, and (c) identify children accurately who are at risk for or are already incurring negative health outcomes associated with their weight and who need intervention. Depending on the resources and training available to school nurses or health professionals in the building, it may be important to coordinate second-tier assessments with health professionals outside of the school setting.

School-Based Prevention

Once schools have identified their school-wide BMI profile, school psychologists can help assess and design prevention programs that are both contextually and culturally relevant to their schools. Only 27 states have enacted laws that address school-based nutrition or school-based physical activity (American Academy of Pediatrics, 2009), and fewer than 5% of high schools in the United States mandate daily physical education (Coles & Gilbert, 2005). Based on the importance of nutrition, physical activity, and exercise in preventing childhood overweight and obesity, it appears likely that many Tier 1 prevention initiatives are in need of strengthening and development.

Best practices in obesity prevention programs suggest that initiatives (a) focus on diet and exercise; (b) are implemented long term; (c) are multifaceted and comprehensive; (d) use BMI data for screening and progress monitoring; (e) focus on reducing sedentary behaviors; (f) incorporate nutritional education that goes beyond stressing intake reduction; (g) involve parents and communities; and (h) include behavioral counseling using strategies such as self-monitoring, stimulus control, cognitive restructuring, social support, stress management, and relapse prevention support (Coles & Gilbert, 2005).

Promoting Universal Longevity via School–Family Ecologies (PULSE), developed by Anderson and Phelps (2009), provides an example of a multitiered school-based prevention model (see Appendix A). Within PULSE, BMI data are used to evaluate effectiveness at each of the three tiers. Universal practices in PULSE include token systems, school stores, and cafeteria veggie votes, in addition to parent involvement programs and education (Anderson & Phelps, 2009). The five essential components of PULSE are (a) ensuring the accessibility of healthful food while restricting access to food that is not nutritious, (b) incorporation of an effective health curriculum that includes self-managed goal setting of food consumption, (c) mandated physical activity 60 minutes per day, (d) extracurricular activities being accessible to students, and (e) providing access to parent education (Anderson & Phelps, 2009). Similar to response-to-intervention models, individuals who do not respond to these prevention initiatives receive increasingly intensive intervention (e.g., secondary practices include parent programs and after-school groups; tertiary practices include individualized interventions). Although additional evaluation of the effectiveness and feasibility of PULSE is needed, it provides a model for how overweight and obesity prevention can be structured in schools.

Having such a best-practice model is important as Anderson and Phelps (2009) suggest that a major reason for the recalcitrant nature of childhood obesity is the lack of collaborative prevention programs in the schools that teach and advocate for healthy weight behaviors at a young age. School psychologists have the knowledge, skills, and competence in school-wide practices, provision of preventive services, data-based decision making, collaboration, and consultation to facilitate prevention programs to stem

the tide of childhood overweight and obesity. More specifically, school psychologists can (a) help advocate for more healthful food options and more stringent physical activity policies; (b) evaluate health curricula and provide behavioral support to self-management programs; and (c) facilitate parental education programs that stress increasing physical activity, reducing the amount of time spent in sedentary activities, and providing access to nutritious food within the home (Anderson & Phelps, 2009).

School-Based Intervention

In recent years, a number of studies have evaluated the efficacy of school-based obesity intervention programs (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2002; Cook-Cottone et al., 2009). These programs typically include increasing physical activity, reducing sedentary behaviors, and a nutrition education component (Cook-Cottone et al., 2009). A variety of school-based intervention efforts have been successful in reducing children's weight, and integrate a range of implementation models (see Appendix A).

Baranowski and colleagues (2002) evaluated 20 published school-based obesity intervention studies and found that seven (Botvin, Cantlon, Carter, & Williams, 1979; Dwyer, Coonan, Leitch, Hetzel, & Baghurst, 1983; Flores, 1995; Gortmaker et al., 1999; Killen et al., 1988; Lionis et al., 1991; Robinson, 1999) demonstrated significant effects on weight status. Three characteristics were common across these effective intervention programs: (a) program implementers were not classroom teachers, (b) the children were in middle or high school, and (c) the interventions promoted the reduction of sedentary behaviors. Building upon these findings, Cook-Cottone and colleagues (2009) conducted a meta-analysis of 66 school-based obesity intervention studies published between 1997 and 2008. Results suggest that intensity and level of collaboration are important for producing meaningful results and, more specifically, interventions that (a) were implemented in multiple contexts ($r = .12$), (b) focused on nutrition modification ($r = .13$), and (c) stressed reducing sedentary activities (e.g., watching TV; $r = .15$) were relatively more effective (Cook-Cottone et al., 2009). Overall, available evidence suggests that interventions designed to be comprehensive and collaborative among children, parents, school staff, and other stakeholders have resulted in greater outcomes (Cook-Cottone et al., 2009; Story, 1999).

BMI data can be analyzed to determine the specific needs of individual schools, which will inform selection of one of the available obesity intervention programs. Anderson and Phelps (2009) suggest that schools should develop and have available a continuum of supports for students with various needs, from school-wide health curriculums (Tier 1) to students at risk for obesity (Tier 2) to individualized medical nutrition therapy (Tier 3). School psychologists can help their schools adopt and design evidence-based interventions across this continuum in conjunction with health professionals in their schools, administrators, and other mental health professionals in the building (e.g., social workers, school counselors).

IMPLICATIONS FOR SCHOOL PSYCHOLOGISTS

Many school-age children are affected by the obesity epidemic. Research indicates that relationships exist among weight and physical health, mental health, and academic outcomes. These relationships demand action on behalf of states, districts, schools, and individual educators to curb the number of children who are obese and overweight. The link between weight and academic achievement combined with increased accountability to raise academic achievement provides a rationale for educators, not just health professionals, to take a role in prevention and intervention efforts. School psychologists possess the skills and expertise to advocate for systemic change and to coordinate collaborative prevention and intervention efforts in educational settings. By taking an active role, school psychologists can help improve outcomes for students at risk for or affected by obesity, which may result in long-lasting change that affects the course of students' lives.

Toward this end, additional resources have been provided in Appendix B for practitioners, families, children, and school systems seeking more information about obesity prevention and intervention programs. Armed with resources and expertise in intervention implementation, assessment, and family-school-community collaboration, school psychologists can provide leadership in the selection, adoption, implementation, and evaluation of school-based obesity prevention and intervention programs (Menon, 2007). School psychologists are encouraged to advocate for systems change and to help coordinate school-based screening, assessment, prevention and intervention efforts to ensure that all children are given the services they need to achieve their best physically, psychosocially, and academically (Menon, 2007).

REFERENCES

- American Academy of Pediatrics. (2009). *State government affairs: State legislation report*. Retrieved from http://www.aap.org/en-us/advocacy-and-policy/state-advocacy/Documents/Obesity_SLR.pdf
- Anderson, L., & Phelps, L. (2009). School-wide healthy weight behaviors: Promoting universal longevity via school-family ecologies (PULSE). *Psychology in the Schools, 46*, 748–755. doi:10.1002/pits.20413
- Baranowski, T., Cullen, K. W., Nicklas, T., Thompson, D., & Baranowski, J. (2002). School-based obesity prevention: A blueprint for taming the epidemic. *American Journal of Health Behaviors, 26*, 486–493. doi:10.5993/AJHB.26.6.9
- Bagully, M. (2006). *The impact of childhood obesity on academic performance*. Retrieved from http://aladinrc.wrlc.org/bitstream/1961/3590/1/etd_mdb57.pdf
- Botvin, G. J., Cantlon, A., Carter, B. J., & Williams, C. L. (1979). Reducing adolescent obesity through a school health program. *Journal of Pediatrics, 95*, 1060–1062. doi:10.1016/S0022-3476(79)80312-1
- Centers for Disease Control and Prevention (2008). *Make a difference at your school!* Retrieved from <http://www.cdc.gov/HealthyYouth/keystrategies/pdf/make-a-difference.pdf>
- Centers for Disease Control and Prevention (2009). *Coronary artery disease*. Retrieved from http://www.cdc.gov/heartdisease/coronary_ad.htm
- Chaddock, L., Erickson, K. I., Prakash, R. S., VanPatter, M., Voss, M. W., Pontifex, M. B., ... Kramer, A. F. (2010). Basal ganglia volume is associated with aerobic fitness in preadolescent children. *Developmental Neuroscience, 32*, 249–256. doi:10.1159/000316648
- Clark, D., Slate, J. R., & Viglietti, G. C. (2009). Children's weight and academic performance in elementary school: Cause for concern? *Analyses of Social Issues and Public Policy, 9*, 185–204. doi:10.1111/j.1530-2415.2009.01186.x
- Coles, M., & Gilbert, W. (2005). *Best practices in the prevention and treatment of childhood obesity*. Fresno, CA: Department of Kinesiology California State University.
- Cook-Cottone, C., Casey, C. M., Feeley, T. H., & Baran, J. (2009). A meta-analytic review of obesity prevention in the schools: 1997–2008. *Psychology in the Schools, 46*, 695–719. doi:10.1002/pits.20409
- Crosnoe, R., & Muller, C. (2004). Body mass index, academic achievement, and school context: Examining the educational experiences of adolescents at risk of obesity. *Journal of Health and Social Behavior, 45*, 393–407. doi:10.1177/002214650404500403
- Crow, S., Eisenberg, M. E., Story, M., & Neumark-Sztainer, D. (2006). Psychosocial and behavioral correlates of dieting among overweight and non-overweight adolescents. *Journal of Adolescent Health, 38*, 569–574. doi:10.1016/j.jadohealth.2005.05.019
- Datar, A., & Sturm, R. (2006). Childhood overweight and elementary school outcomes. *International Journal of Obesity, 30*, 1449–1460. doi:10.1038/sj.ijo.0803311
- Datar, A., Sturm, R., & Magnabosco, J. L. (2004). Childhood overweight and academic performance: National study of kindergartners and first graders. *Obesity Research, 12*, 58–68. doi:10.1038/oby.2004.9
- Donnelly, J. E., Greene, J. L., Gibson, C. A., Smith, B. K., Washburn, R. A., Sullivan, D. K., ... Williams, S. L. (2009). Physical Activity Across the Curriculum (PAAC): A randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children. *Preventative Medicine, 49*, 336–341. doi:10.1016/j.ypmed.2009.07.022

- Dwyer, T., Coonan, W., Leitch, D., Hetzel, B., & Baghurst, R. (1983). An investigation on the health of primary school students in South Australia. *International Journal of Epidemiology*, *12*, 308–313. doi:10.1093/ije/12.3.308
- Eaton, D. K., Lowry, R., Brener, N. D., Galuska, D. A., & Crosby, A. E. (2005). Associations of body mass index and perceived weight with suicide ideation and suicide attempts among U.S. high school students. *Archives Pediatric Adolescent Medicine*, *159*, 513–519. doi:10.1001/archpedi.159.6.513
- Flegal, K. M., Tabak, C. J., & Ogden, C. L. (2006). Overweight in children: Definitions and interpretations. *Health Education Research*, *21*, 755–760. doi:10.1093/her/cyl128
- Flores, R. (1995). *Dance for health: Improving fitness in African American and Hispanic adolescents*. *Public Health Reports*, *110*, 189–193. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1382101/pdf/pubhealthrep00055-0079.pdf>
- Freedman, D. S., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa heart study. *Pediatrics*, *103*, 1175–1182. doi:10.1542/peds.103.6.1175
- Gortmaker, S. L., Peterson, K., Wiecha, J., Sobol, A. M., Dixit, S., Fox, M. K., & Laird, N. (1999). Reducing obesity via a school-based interdisciplinary intervention among youth: Planet health. *Archives of Pediatric Adolescent Medicine*, *153*, 409–418. doi:10.1001/archpedi.153.4.409
- Hollar, D., Messiah, S. E., Lopez-Mitnik, G., Hollar, T. L., Almon, M., & Agatston, A. S. (2010). Effect of a two-year obesity prevention intervention on percentile changes in body mass index and academic performance in low-income elementary school children. *American Journal of Public Health*, *100*, 646–653. doi:10.2105/AJPH.2009.165746
- Killen, J. D., Telch, M. J., Robinson, T. N., Maccoby, N., Taylor, C. B., & Farquhar, J. W. (1988). Cardiovascular disease risk reduction for tenth graders: A multiple-factor school-based approach. *Journal of the American Medical Association*, *260*, 1728–1733. doi:10.1001/jama.1988.03410120074030
- Krukowski, R. A., West, D. S., Perez, A. P., Bursac, Z., Phillips, M. M., & Raczynski, J. M. (2009). Overweight children, weight-based teasing, and academic performance. *International Journal of Pediatric Obesity*, *4*, 274–280. doi:10.3109/17477160902846203
- Kuczmarski, R. J., Ogden, C. L., & Guo, S. S. (2002). *2000 CDC growth charts for the United States: Methods and development* [data file]. Retrieved from <http://www.cdc.gov/growthcharts/2000growthchart-us.pdf>
- Latner, J. D., & Stunkard, A. (2003). Getting worse: Stigmatization of obese children. *Obesity Research*, *11*, 452–456. doi:10.1038/oby.2003.61
- Lionis, C., Kafatos, A., Vlachonikolis, J., Vakaki, M., Tzortzi, M., & Petraki, A. (1991). The effects of a health education intervention program among Cretan adolescents. *Prevention Medicine*, *20*, 685–699. doi:10.1016/0091-7435(91)90064-B
- Menon, V. (2007). School-based interventions for childhood obesity. *Communiqué*, *36*(2), 10–11. Retrieved from <http://www.nasponline.org/publications/cq/index.aspx?vol=36&issue=2>
- National Association of School Psychologists. (2009). *Appropriate behavioral, social, and emotional supports to meet the needs of all students* (position statement). Bethesda, MD: Author.
- National Center for Health Statistics. (2004). *Health, United States, 2004* [data file]. Retrieved from <http://www.cdc.gov/nchs/data/hus/hus04trend.pdf#070>
- Ogden, C. L., Carroll, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. (2010). Prevalence of high body mass index in U.S. children and adolescents, 2007–2008. *Journal of the American Medical Association*, *303*, 242–249. doi:10.1001/jama.2009.2012
- Ogden, C. L., Carroll, M. D., & Flegal, K. M. (2008). High body mass index for age among U.S. children and adolescents, 2003–2006. *Journal of the American Medical Association*, *299*, 2401–2405. doi:10.1001/jama.299.20.2401
- Pyle, S. A., Hyder, M. L., Haddock, K. C., & Carlos, P. W. (2009). Nutrition: The foundation of health, happiness, and academic success. In R. Gilman & S. Hubnes (Eds.), *Handbook of positive psychology in schools* (pp. 423–432). New York, NY: Routledge/Taylor & Francis Group.
- Resnick, E. A., Bishop, M., O'Connell, A., Hugo, B., Isem, G., Timm, A., ... Geller, A. C. (2009). The CHEER study to reduce BMI in elementary school student: A school-based, parent-directed study in Framingham, Massachusetts. *The Journal of School Nursing*, *25*, 361–372. doi:10.1177/1059840509339194

- Robinson, T. N. (1999). Reducing children's television viewing to prevent obesity: A randomized controlled trial. *Journal of the American Medical Association*, *282*, 1561–1567. doi:10.1001/jama.282.16.1561
- Story, M. (1999). School-based approaches for preventing and treating obesity. *International Journal of Obesity*, *23*, 43–51. doi:10.1038/sj.ijo.0800859
- Strauss, R. S. (2000). Childhood obesity and self-esteem. *Pediatrics*, *105*, 1–5. doi:10.1542/peds.105.1.e15
- Taylor, R. W., McAuley, K. A., Barbezat, W., Strong, A., Williams, S. M., & Mann, J. I. (2007). Two-year findings of a community-based obesity prevention program in primary school-age children: The APPLE project. *American Journal of Clinical Nutrition*, *86*, 735–742. Retrieved from <http://www.ajcn.org/content/88/5/1371.full.pdf+html>
- Tompsonowski, P. D., Davis, C. L., Miller, P. H., & Naglieri, J. A. (2008). Exercise and children's intelligence, cognition, and academic achievement. *Educational Psychology Review*, *20*, 111–131. doi:10.1007/s10648-007-9057-0
- U.S. Surgeon General. (2009). *Overweight and obesity: Health consequences*. Retrieved from http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_consequences.html
- Wechsler, D. (2001). *WIAT-II-A: Wechsler Individual Achievement Test-second edition*. San Antonio, TX: The Psychological Corporation.
- World Health Organization. (2003). *Obesity and overweight*. Geneva, Switzerland: Author.
- Yin, Z., Gutin, B., Johnson, M. H., Hanes, J., Moore, J. B., Cavnar, M., ... Barbeau, P. (2005). An environmental approach to obesity prevention in children: Medical college of Georgia Fitkid project year 1 results. *Obesity Research*, *13*, 2153–2161. doi:10.1038/oby.2005.267
- Zametkin, A. J., Zoon, C. K., Klein, H. W., & Munson, S. M. (2004). Psychiatric aspects of child and adolescent obesity: A review of the past 10 years. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 134–150. doi:10.1097/00004583-200402000-00008

APPENDIX A. SELECTED EFFECTIVE PROGRAMS AND MODELS

| Citation | Program | Components |
|--|---|---|
| Anderson and Phelps (2009) | PULSE model | A comprehensive school-wide universal obesity prevention model developed from evidence-based literature that stresses proactive interventions with tiered intensity similar to that of school-wide positive behavior support systems. |
| Gortmaker et al. (1999) | Planet Health | Program implemented within the curriculum to increase physical activity, improve nutritive intake, and reduce sedentary behaviors. |
| Resnick et al. (2009) | CHEER | A family intervention provided in the form of nutrition education packets that are sent home once per month over 6 months. |
| Robinson (1999) | (unnamed) | Intervention focused on reducing participants' use of media, including not eating while watching TV. |
| Taylor, McAuley, Barbezat, Strong, Williams, and Mann (2007) | APPLE | A community-based intervention including nutrition education and increasing opportunities for physical activity within the community through activity coordinators. |
| Yin et al. (2005) | The Medical College of Georgia FitKid Project | An after school program providing homework help, a nutritious snack, and rigorous physical activity for participants. |

APPENDIX B: ADDITIONAL RESOURCES

| Resource | Description | Website |
|--|---|--|
| CDC School Resources | Outlines key strategies to promote healthy nutrition and physical activity in schools. | http://www.cdc.gov/HealthyYouth/ |
| The Obesity Society | Facts, statistics, advocacy, and research publications on childhood obesity. Tips and resources are available for families and caregivers. | http://www.obesity.org/ |
| Kids Health | User-friendly information for parents, teens, and children about healthful weight and dieting behaviors. | http://kidshealth.org |
| Princeton University Center for Health and Wellbeing Research Brief Preventing Childhood Obesity: A School Health Policy Guide | Information to practitioners about current school-based research findings on obesity. Comprehensive review of current findings and practices that have been found effective in the prevention of childhood obesity. | http://futureofchildren.org/futureofchildren/publications/docs/16_01_PolicyBrief.pdf http://www.rwjf.org/files/research/20090506nasbeguide.pdf |
| Alliance for a Healthier Generation | Alliance formed by the American Heart Association to provide strategies in schools and communities. | http://www.healthiergeneration.org/about.aspx |