



Effect of Physical Activity Interventions for Girls on Objectively Measured Outcomes: A Systematic Review of Randomized Controlled Trials

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ABSTRACT

Introduction: Most girls are not meeting physical activity (PA) guidelines, and 30% are overweight or obese. The purpose of this systematic review was to evaluate the evidence for PA intervention effects on accelerometer-measured PA, body mass index (BMI), and percent body fat (% BF) among girls.

Methods: The Cumulative Index of Nursing and Allied Health Literature, PubMed, PsychInfo, and SportDISCUS databases

were searched for randomized controlled trials published from 1985-2014. Studies with a PA intervention and outcomes of accelerometer-measured PA, BMI, or % BF were included.

Results: Fifteen studies were reviewed. PA, BMI, and % BF were measured in 5, 15, and 10 studies, respectively. Effect sizes (ES) were highly variable. In one intervention, PA increased (ES = -0.17 to 0.08); in two interventions, BMI was reduced (ES = -0.11 to 0.62); and in five interventions, % BF was lowered (ES = 0.12 to 0.93).

Discussion: Future research should involve preadolescent girls, improve methods for handling missing data, include objective measures of PA, and increase intervention attendance rates. *J Pediatr Health Care.* (2017) 31, 75-87.

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Conflicts of interest: None to report.

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KEY WORDS

Girls, interventions, physical activity, systematic review, weight

Despite the health benefits of physical activity (PA), including increased physical fitness and lower risk of chronic disease (Bailey, Hillman, Arent, & Petitpas, 2012; Janssen & Leblanc, 2010), most youth are not meeting PA guidelines (Morrow et al., 2013) calling for 60 minutes of moderate to vigorous PA (MVPA) on most days (U.S. Department of Health and Human Services, 2008; World Health Organization, 2011). Physical inactivity is more prevalent among girls than boys (Fakhouri et al., 2014; Troiano et al., 2008).

Dumith, Gigante, Domingues, and Kohl (2011) report a 7% decline in PA per year from 10 to 19 years of age among youth, with greater declines per year for girls. By the time girls reach adolescence, 80% have insufficient levels of PA (de Moraes, Guerra, & Menezes, 2013).

Physical inactivity also contributes to the high prevalence of overweight and obesity among girls. Globally, more than 20% of girls are overweight or obese (Ng et al., 2014). In the United States, the prevalence is higher, with more than 30% of girls 6 to 19 years of age being overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). Helping girls attain adequate PA is critical for decreasing their risk for the development of obesity-related conditions, including cardiovascular disease and diabetes (Andersen, Riddoch, Kriemler, & Hills, 2011).

Reversing these disconcerting trends requires interventions based on evidence supporting their efficacy in increasing PA and improving weight-related outcomes among girls. To evaluate the evidence regarding interventions, several systematic reviews have been conducted (Barr-Anderson, Adams-Wynn, DiSantis, & Kumanyika, 2013; Brown, 2009; Camacho-Minano, LaVoi, & Barr-Anderson, 2011; Clemmens & Hayman, 2004; Kesten, Griffiths, & Cameron, 2011; Sharma, 2008). However, limitations of these reviews include (a) lack of quality appraisal of studies (Brown, 2009; Clemmens & Hayman, 2004; Sharma, 2008); (b) inclusion of studies with no control group (Barr-Anderson et al., 2013; Kesten et al., 2011); and (c) evidence based primarily on self-reported PA as an outcome (Barr-Anderson et al., 2013; Brown, 2009; Clemmens & Hayman, 2004; Kesten et al., 2011). When self-report is used, measurement error becomes an issue because of difficulty with accurately recalling PA, particularly among youth (Biddle, Gorely, Pearson, & Bull, 2011; Chinapaw, Lidwine, van Poppel, van Mechelen, & Terwee, 2010; LeBlanc & Janssen, 2010). It is also worth noting that none of the reviews included both a broad age range and a combination of PA and weight-related outcomes. These limitations hinder the ability to draw definitive conclusions regarding the efficacy of PA interventions for girls.

To overcome gaps in the literature and extend the current state of knowledge, an updated review of PA interventions targeting girls that includes accelerometer-measured PA and/or weight-related outcomes is needed. The primary purpose of this systematic review was to evaluate the effect of PA interventions on accelerometer-measured PA of girls (elementary through high school) participating in randomized controlled trials (RCTs). A secondary aim was to evaluate the effect of PA interventions on two measures of body composition: body mass index (BMI) and percent body fat (% BF). The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement guided the review (Liberati et al., 2009).

METHODS

Search Strategy

A search of the Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, PsychInfo, and SportDISCUS databases was undertaken for research published from 1985 to 2014. The time frame for the search process was based on two important factors related to the main outcomes of the review: (a) the earliest published literature using accelerometers to measure PA in children began appearing in 1985 (Rowlands, 2007), and (b) the steady rise in childhood obesity began in the early 1980s. MeSH headings and key words used in the search process were organized in the following categories: overall review subject, participant characteristics including sex and age, objectively measured outcomes, setting, and type of study. Table 1 provides an example of the search process for one database.

The search was limited to peer-reviewed studies published in English. RCTs designed to test an intervention having a PA component with girls ranging in age from 6 to 18 years were included. Studies were excluded based on the following criteria: (a) the sample included boys; (b) the setting was a laboratory or clinic; (c) the participants were athletes; and (d) the outcome was self-reported. If a study included objectively

TABLE 1. Search process for PubMed database

Search category	Headings and key words
Overall review subject	("Exercise"[Mesh] OR "motor activity"[Mesh] OR "physical fitness"[Mesh] OR "physical activity" OR "exercise" OR "physical fitness" OR "motor activity") AND
Participant characteristic: girls	("Female"[Mesh] OR "Women"[Mesh] OR "women" OR "woman" OR "female*" OR "girl*") AND
Participant characteristic: age	("Adolescent"[Mesh] OR "Child"[Mesh] OR "teen*" OR "youth" OR "child*" OR "adolescent*") AND
Objectively measured outcomes	("Acceleromet*" OR "actigraph*" OR "actical*" OR "activity monitor") OR "body mass index"[Mesh] OR "body mass index" OR "BMI" OR "weight status" OR "body fat and measures" [Mesh] OR "percent body fat" OR "body fat" AND
Setting and type of study	("communit*" OR "school*" OR "church*" OR "program*" OR "intervention*")

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