Effect of Nutrition Interventions on Body Mass Index in Youth Attending After-School Programs: A Meta-analysis

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INTRODUCTION

From 1980 to 2012, the percentage of obese youth increased from 7% to 17.5% in children (6-11 years) and 5% to 20.5% in adolescents (12-19 years).[1] Obese children are more likely to have health risks linked with heart disease and type 2 diabetes, and are more likely to become obese adults.[2-4]

Schools can plan an important role in preventing childhood obesity since schools reach virtually all youth within a community. Schools face increasing pressure to improve students standardized test scores thereby limiting nutrition education time and opportunities during the school day.[5]

After-school settings have emerged as an alternative occasion for nutrition interventions. In 2014, it was estimated that 1 in 4 families had a child enrolled in an after-school program.[6] Even with growing enrollment, after-school programs can face barriers (e.g. funding, staffing, educational resources) to implement nutrition interventions. The effectiveness of nutrition interventions conducted solely in school-based, after-school programs warrants further investigation.

OBJECTIVES

The purpose of the study was to evaluate the effectiveness of school-based, after-school nutrition intervention programs in reducing Body Mass Index (BMI) in children and adolescents.

METHODS

Data Source: Studies were identified by searching online databases such as PubMed, PsycINFO, Web of Science, EBSCO, CINAHL, ERIC, Google Scholar and Pro-Quest from the first available year to September 2016. The following keywords were used: "Diet", "Nutrition", "BMI", "Body Mass Index", "After School" and "After School Program." Reference lists of the retrieved studies and review articles were examined to identify additional eligible studies. Studies identified through the search were imported into RefWorks™ and duplicate records were removed. Titles and abstracts of all identified articles were screened and relevant full-text articles were retrieved.

Study Selection: Studies were included if they met all of the following criteria: 1) written in English, 2) include both after-school and school-based locations 3) include a nutrition intervention, and 4) include BMI reported as an outcome. Studies were excluded if they dealt with eating disorders, disease states, or if students were taken off school grounds to other locations (e.g. clinics, community gardens, community centers) during the after-school program.

Data Extraction: After studies were identified, the following variables were extracted: age, sex, and population of participants, intervention strategy, parental involvement, and pre- and post-intervention BMI.

Effect sizes (ES) were computed as d indices and expressed the standardized difference in means of pre- and post-intervention BMI. When a study did not provide sufficient information to calculate an ES, the author of the study was contacted to obtain means and standard deviations to enable calculation of an ES.

METHODS (cont.)

Data Analysis: A random effects model was used to calculate an overall ES and 95% confidence interval (CI). Each ES was weighed by the inverse variance to give more weight to studies with larger samples.

Moderator analyses were conducted to evaluate the effects of parent involvement (yes/no) and type of intervention (nutrition only, nutrition + physical activity, nutrition + physical + other) on overall ES. Heterogeneity of ES was evaluated using Cochran's Q statistic.

ES calculation and moderator analyses were conducted using Comprehensive Meta Analysis (Version 2.2) software. Statistical significance was set at .05. Publication bias across the studies was evaluated with the Egger's test statistic.

RESULTS

The searches yielded 1,702 articles. After the initial screening of titles and abstracts, 111 potentially relevant studies were reviewed in full, 17 studies involving 1,716 participants were included, and 18 ESs were calculated in this meta-analysis (Figure 1).

Overall mean ES was small, but significant (ES = -0.156, 95% CI = -0.29, -0.02). This indicated that school-based, after-school nutrition intervention programs were effective in reducing BMI among youth (Figure 2). Moderator analyses indicated that the mean ES was influenced by the type of intervention $Q_{between}$ (Q_b) = 16.26, *df* = 2, *p* = <.001 and parental involvement Q_b = 4.56, *df* = 1, *p* = .033. The "nutrition only" intervention had a significant effect on reduction in BMI (ES = -0.37, 95% CI = -0.72, -0.02). The other two intervention groups were not effective significantly. In addition, when parents were involved in the intervention, the intervention was effective in reducing BMI (ES = -0.23, 95% CI = -0.44, -0.02). Lastly, the Egger's test was not significant (p = 0.445) indicating no evidence of publication bias in the meta-analysis.

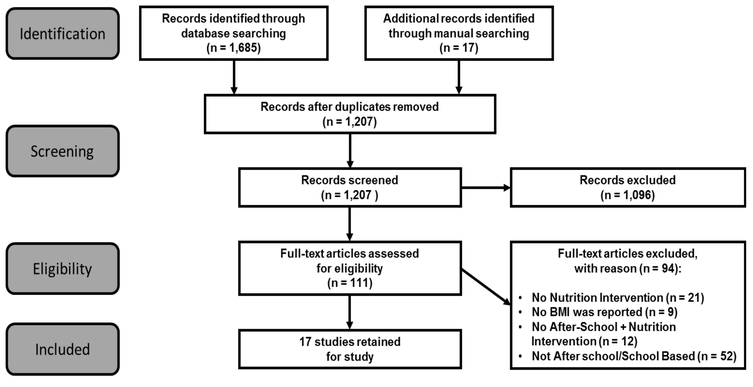

Figure 1. Flowchart for literature search[7]

RESULTS (cont.)

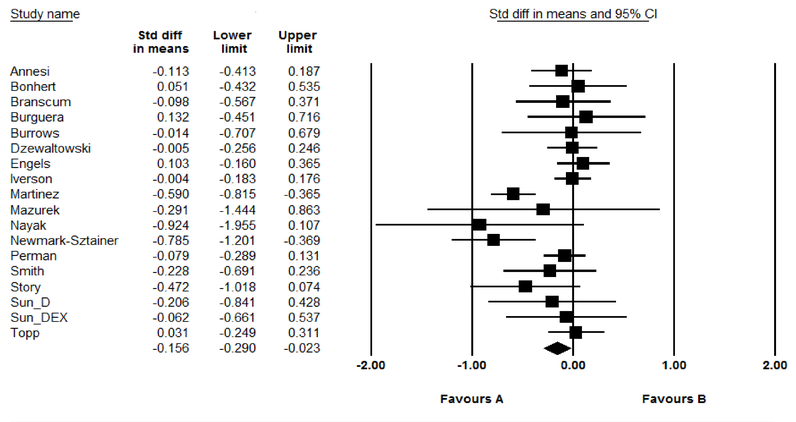

Figure 2. Forest plot: standardized mean difference and 95% confidence interval

CONCLUSIONS

Results from our meta-analysis indicate that nutrition interventions in school-based, after-school settings are effective in reducing BMI among youth.

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