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# The Influence of Peers on Diet and Exercise Among Adolescents: A Systematic Review

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ABSTRACT

Adolescents' diet and exercise are modifiable factors contributing to high rates of adolescent obesity. Diverse contextual factors, including family, social environment, and peers, affect adolescents' diet and exercise behaviors. Because peer influence increases during adolescence, peers' contributions to adolescents' diet and exercise behaviors should be examined as potential targets for intervention to reduce the prevalence of adolescent obesity. The purpose of this systematic review is to identify research examining the contribution of peers to diet and exercise of adolescents. The electronic databases PubMed, CINAHL, Web of Science, and SCOPUS were searched. A total of 24 unique articles were included: seven examined diet only, fourteen studied exercise only, and three explored diet and exercise. This review provided evidence that diet and exercise of adolescents were significantly associated with those of their peers. However, these associations differed depending on gender, the type of diet and exercise, and closeness of friends. Findings from this review suggest that peers could be possible targets for interventions to promote healthier diet and exercise among adolescents; however, more studies are needed to identify specific peer influences and develop tailored interventions.



## Introduction

Globally, adolescent obesity is a significant public health problem, with increasing prevalence in developed countries from 1980 (Ng et al., 2014). Adolescent obesity can negatively influence current and future physical (Falkstedt, Hemmingsson, Rasmussen, & Lundberg, 2007; Ford, Nonnemaker, & Wirth, 2008; Shah et al., 2013; Tirosh et al., 2011) and psychological health (Mond, van den Berg, Boutelle, Hannan, & Neumark-Sztainer, 2011; Puhl, Luedicke, & Heuer, 2011), while also increasing medical costs (Estabrooks & Shetterly, 2007; Hampl, Carroll, Simon, & Sharma, 2007; Hlaing, Sarah, Lipshultz, & Ludwig, 2011). To prevent or mitigate the severity of these negative consequences, it is important to intervene early to either prevent adolescent obesity or reduce its prevalence and related health issues.

In order to reduce obesity rates in adolescents, the World Health Organization (WHO, 2015) issued recommendations for diet and exercise, designed to support a proper balance between calorie intake and expenditure. The WHO provides guidelines for physical activity and recommends increasing whole grain, fruit and vegetable intake and restricting total fat consumption. Interventions including healthy diets and adequate exercise are effective for controlling weight during adolescence (Berkowitz et al., 2013; Epstein, Paluch, Roemmich, & Beecher, 2007; Savoye et al., 2011).

Many countries have developed national polices to support adolescents' healthier diet and exercise behaviors in accordance with the WHO guidelines. In the United States, the Healthy People 2020 initiative highlights behavioral interventions and dietary guidelines to reduce the prevalence of obesity in adolescents aged 12 to 19 years (Office of Disease Prevention and Health Promotion, 2015). Similarly, in the United Kingdom, the National Child Measurement Programme (NCMP) has been established to monitor the prevalence of obesity and provide information about healthy lifestyles and weight control (Public Health England, 2015). In Korea, the prevalence of adolescent obesity is lower than in North America or Europe, but is steadily increasing (Korean Centers for Disease Control and Prevention, 2014). Early interventions to prevent further growth in rates of adolescent obesity, through increased physical activity and modified eating behaviors, have become a governmental and educational priority in Korea (Noh, 2013). A first step in improving diet and exercise behaviors of all adolescents is to understand what factors influence those behaviors; this could be helpful in developing interventions to prompt healthier behaviors among adolescents with the goal of stemming the rise in rates of adolescent obesity.

Studies in many countries have identified diverse factors for diet and exercise among adolescents, although most have focused on the roles of

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parents and schools. Developmentally, relationships between adolescents and their parents evolve from those established in childhood, with adolescents becoming more independent from their parents over time. However, parents continue to influence perspectives and behaviors of adolescents (Laursen & Collins, 2009). Parental diet and exercise (Arcan et al., 2007; Salvy, Elmo, Nitecki, Kluczynski, & Roemmich, 2011), monitoring behaviors (Ornelas, Perreira, & Ayala, 2007; Stewart & Menning, 2009), and support (Bauer, Neumark-Sztainer, Hannan, Fulkerson, & Story, 2011; Dowda, Dishman, Pfeiffer, & Pate, 2007; Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007) are found to be associated with adolescent diet and exercise behaviors.

School factors are also associated with adolescents' diet and exercise behaviors (Story, Nanney, & Schwartz, 2009). Studies have examined the availability of specific foods in schools, school breakfast and lunch programs, and school physical education programs as contributing factors to adolescents' diet and exercise (Bauer et al., 2011; Fox, Dodd, Wilson, & Gleason, 2009; Story et al., 2009). The availability of certain food items at school is associated with increasing intake of these foods among adolescents (Bigornia et al., 2015; Minaker et al., 2011; Rovner, Nansel, Wang, & Iannotti, 2011). Provision of any physical activity facilities was positively associated with improvement in adolescents' exercise behaviors in some studies (Durant et al., 2009; Haug, Torsheim, Sallis, & Samdal, 2010), but not others (Kirby, Levin, & Inchley, 2012; Scott et al., 2007).

Peers are another contributing factor to adolescents' diet and exercise. As adolescents become more independent from their parents, they spend more time with their friends (Brown & Larson, 2009). The importance of peer relationships increases during adolescence, compared to childhood and preadolescence (Collins & Steinberg, 2008; Papalia, Olds, & Feldman, 2008), with peers' influence peakings (Brown & Larson, 2009; Collins & Steinberg, 2008). Therefore, peers could also play an important role in diet and exercise of adolescents, in addition to parental and school factors. Specifically, behaviors of close friends could influence adolescents' behaviors or could be shared by adolescents. However, the impact of the behaviors of the broader peer group, as well as the effect of close friends' behaviors, on adolescents' diet and exercise behaviors has been studied less than that of parents and school. Given the increasing importance of peer relationships during adolescence, and their potential for influencing diet and exercise behaviors, it is important to identify what is currently known about these influences in order to develop appropriate interventions that support healthy diet and exercise.

Therefore, the purpose of this systematic review was to examine the research to date on the contribution of peers to diet and exercise behaviors of adolescents. The review identifies which peer factors and diet and exercise behaviors were assessed, and whether any relationships among diet, exercise, and peer factors were found. This review was conducted and reported according to the PRISMA guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009).

## Method

### *Information Sources and Search Strategy*

With the assistance of the librarian from the University of Iowa, the following keywords were used to search the electronic databases PubMed and CINAHL in October 2016: [Adolescent] AND [Obesity] AND [Friends OR Peer network OR peer]. MeSH terms for PubMed and subject terms for CINAHL were also applied. Once the initial list of articles from PubMed and CINAHL was created, Web of Science and SCOPUS were searched in October 2016 to identify additional studies that cited or were related to articles from the initial list.

### *Inclusion and Exclusion Criteria*

Articles included were those that (1) were published in English, (2) were published between 2004 and 2016, (3) included a sample aged 13–19 years, and (4) examined any kinds of diet or exercise behaviors (e.g. having breakfast, drinking soda, participating in a sport club, having time for muscle-strengthening exercise) or both. Articles excluded were (1) review articles, commentaries, books, or book chapters, (2) animal studies, (3) examinations of medical effects, such as outcomes from surgery, and (4) evaluation of specific interventions (e.g., peer-mentoring programs for health promotion or web-based interventions for the behaviors).

### *Data Extraction*

The data extraction process is summarized in Fig. 1. Studies under consideration were evaluated according to the inclusion and exclusion criteria. The initial search strategy identified 465 unique articles after duplicates were removed. Titles and abstracts of these studies were screened by one reviewer (SJC). The second independent reviewer (ALE) then performed a second screening using titles and abstracts to establish agreement on eligibility for inclusion. After 421 articles were excluded, 44 full text articles were reviewed. This identified an additional 9 articles that did not meet inclusion criteria, yielding a list of 35 complete articles from the initial database search. The first reviewer (SJC) then used Web of Science and SCOPUS to identify articles that cited or were related to these 35 articles. This search identified 86 articles, 10 of which were unique and met the inclusion criteria. Including the 35 articles identified in the initial search, and the 10 identified in the search for citing and related articles, 45 articles were then reviewed in depth. After this final review, 13 articles were excluded for not meeting inclusion or exclusion criteria; reasons included being a review article ($n = 1$), not focusing on diet or exercise ($n = 8$), not including adolescents ($n = 2$), and not measuring peer-related components ($n = 2$). Finally, 32 articles were included in this systematic review. Study elements analyzed descriptively included: author/year published/country, method, study design, sample, variables of interest (specifically, friendship, diet and exercise), as well as findings and limitations.

### *Risk of Bias Assessment*

Article quality was assessed using the Risk of Bias Assessment tool for Non-randomized Studies (RoBANS) (Kim et al., 2013). Because most of included studies were descriptive, except one (Salvy, Howard, Read, & Mele, 2009), applying RoBANS was considered more appropriate for assessing quality of studies. RoBANS contains six dimensions: selection of participants, confounding variables, the measurement of exposure, the blinding of the outcome, incomplete outcome data, and selective outcome reporting. With RoBANS, each study could be evaluated as high, low risk, or unclear.

## Results

The 32 studies included in this systematic review examined peer factors and their relationship to diet and exercise in adolescents. However, the studies differed in their focus: eleven studied diet only, seventeen examined exercise only, and four focused on both diet and exercise. In addition, the review highlighted another important differences among studies: while friendship and relations were of particular interest, studies differed in how they defined vs. peers, as well as the groups from which data were collected. Descriptive analysis identified two broad categories of groups from which data were collected: adolescents without peers ($n = 17$), and participants with their peers ($n = 15$). An overview of all articles reviewed is available in Table 1; detailed study information for each group of articles (diet only, exercise only, diet & exercise) is available in Tables 2, 3, and 4.

Risk of the bias was assessed using RoBANS. More than half of the 32 studies were evaluated as low risk of bias in selection of participants, confounding variables, and incomplete outcome data. Because data were collected by self-reported questionnaires in the most of the