RESEARCH
Review

Food Environment Interventions to Improve the Dietary Behavior of Young Adults in Tertiary Education Settings: A Systematic Literature Review

Rajshri Roy, APD*; Bridget Kelly, PhD, MPH, APD*; Anna Rangan, PhD, APD*; Margaret Allman-Farinelli, PhD, APD*, FDAA

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*APD=Accredited Practising Dietitian (certified in Australia).

ABSTRACT

The current obesity-promoting food environment, typified by highly accessible unhealthy foods and drinks, may lead to an increased risk of chronic disease, particularly within young adults. A number of university-based intervention trials have been conducted in the United States and Europe to improve the food environment in this setting. However, there are no systematic reviews focusing on these interventions conducted exclusively in tertiary education settings. Our objective was to conduct a systematic literature review evaluating food environment interventions targeting dietary behavior in young adults in college and university settings. Eight databases were searched for randomized controlled trials, pre- and postintervention studies, quasiexperimental studies, cross-sectional studies, and other nonexperimental studies from 1998 to December 2014 that were conducted in tertiary education settings (ie, colleges and universities). Studies that evaluated a food environment intervention and reported healthier food choices, reductions in unhealthy food choices, nutrition knowledge, and/or food and drink sales as primary outcomes were included. Fifteen studies of high (n=5), medium (n=7), and poor quality (n=3) met the inclusion criteria, 13 of which showed positive improvements in outcome measures. Information relating to healthy foods through signage and nutrition labels (n=10) showed improvements in outcomes of interest. Increasing the availability of healthy foods (n=1) and decreasing the portion size of unhealthy foods (n=2) improved dietary intake. Price incentives and increased availability of healthy foods combined with nutrition information to increase purchases of healthy foods (n=2) were identified as having a positive effect on nutrition-related outcomes. Potentially useful interventions in tertiary education settings were nutrition messages/nutrient labeling, providing healthy options, and portion size control of unhealthy foods. Price decreases for and the increased availability of healthy options combined with nutrition information resulted in improvements in dietary habits. Additional research comparing the long-term effectiveness of environmental and combinations of environmental interventions on improving health outcomes is warranted.
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PREVENTION OF OBESITY IS AN INTERNATIONAL public health priority, given the significant influence of obesity on well-being.[1] Food environment, which refers to the number, type, and accessibility of food outlets and the availability, cost, quality, and promotion of food and beverage products, has been identified as a major determinant of dietary intake.[2] The barriers and opportunities the environment offers for healthy food choices will influence diet-related outcomes such as weight gain and obesity.[3] In addition to nutrition interventions aimed at individuals, modifying the food environment is also important.

Young adults may be vulnerable to the features of the food environment such as the cost and portion size of food because they typically have lower disposable incomes and may seek perceived value for money.[4] Young adults also tend to have a higher intake of energy-dense, nutrient-poor foods and drinks, including sugar-sweetened drinks, fried potatoes (eg, french fries), pizza, potato chips, and confectionery items, compared with older adults.[5,6]

Settings provide a conduit for health promotion,[7] and colleges and universities provide opportunities to improve food environments young adults encounter. Young adults have been shown to be most vulnerable to weight gain,[8] and during their first year at college in the United States typically gain 1 to 3 kg of weight.[9,10] The latest available and comparable regional statistics show that during May 2014, 1.2 million students in Australia were enrolled in formal tertiary education study with, 689,200 people aged 20 to

24 years.[11] In the United States, in 2013, a record 21.8 million students attended American colleges and universities, constituting an increase of about 6.5 million since 2000.[12] The European Union had approximately 4,000 tertiary education institutions, with just more than 20 million students enrolled in 2011.[13] Thus, it is prudent to examine the food environments in tertiary education settings to inform the development of health promoting initiatives.

Seymour and colleagues[14] previously reviewed interventions to modify food environments at the point of purchase (POP) and reported that the tertiary education setting had potential for success.[14] However, they highlighted that those studies published between 1970 and 2003 had many limitations in study designs. A systematic literature review was conducted in 2010 that suggested environment changes in worksites may improve dietary behaviors.[15] However, it remains unclear what specific interventions may be most effective and whether these strategies can be successfully replicated in other settings such as universities/colleges targeting young adults.

The aim of this review was to identify and assess the effectiveness of intervention strategies that have been conducted to improve the dietary behavior of young adults through food environment changes in university/college settings.

METHODS

A literature search was conducted to identify evidence on university/college-based environmental interventions to improve dietary behaviors in young adults. The electronic databases searched included CINAHL, EMBASE, Medline, PubMed, Psych-Info, Science Direct, and EBM reviews databases (ie, Cochrane and Trials Register). Public health efforts seeking to understand and change the environment-related factors responsible for the increasing prevalence of obesity in the population officially started since 1997 when the World Health Organization formally recognized obesity as a global epidemic.[16] Databases were therefore searched from 1998 until December 2014. The search terms used were: *food environment* AND (*nutrition* OR *dietary*), AND *intervention*, (*university* OR *educational institutions* OR *colleges*) IN young adults with one of the following: *point-of-purchase*, *point-of-choice*, *point-of-selection*, and *availability*, *access*, *cost incentives*, *promotion*, and *nutrient labeling* or *portion control*. We collected additional articles by examining the reference lists of the original research articles and reviews of health promotion or environment research to search for any missing studies. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement was used as a basis for reporting this systematic review of evaluations of interventions. An example of the review search strategy for MEDLINE is shown in Figure 1 (available online at www.andjrnl.org).

Inclusion and Exclusion Criteria

Online searches were performed for articles using the following inclusion criteria: randomized controlled trials (RCTs), pre- and postintervention studies, quasiexperimental studies, cross-sectional studies, and other nonexperimental studies; interventions should include environmental modifications; primary outcomes must include changes to healthier food choices, reductions in unhealthy food choices, nutrition knowledge, and/or food/drink sales; be conducted within tertiary educational institutions such as colleges and/or universities; and be targeted toward young adults attending university/college. The inclusion criteria are detailed in full in Figure 2. Exclusion criteria included interventions that did not focus on food environment-related interventions in a real-world setting (eg, laboratory), any physical activity interventions, and interventions conducted in settings other than universities/colleges such as other workplaces/worksites and schools because they do not generally target young adults.

Selection Process

Figure 3 shows a flow diagram of the article selection process. After each database was searched, duplicates were removed, and relevant titles and abstracts were retrieved and reviewed. Two independent researchers reviewed the abstracts and selected articles for inclusion based on the criteria. The two independent reviewers assessed the studies using a process of data extraction and conducted a critical appraisal of the quality of the studies. Both reviewers concluded similar results and any disagreements were resolved by a third independent reviewer.

Synthesis

The studies evaluated in this review were from different countries and used varied intervention types, study designs, and methods of measuring outcomes. This resulted in significant heterogeneity and thus pooling the findings was not possible. Findings have been summarized in a narrative form, using text and tables, and have been organized by type of intervention, setting of intervention (eg, university/college cafeteria, canteens, dining hall, and vending machines), and outcomes assessed.

Assessment of quality was conducted using the assessment tool for primary studies from the Evidence Analysis Manual created by the Academy of Nutrition and Dietetics.[17] This assessment tool has 10 components that consider the clarity of the study question, comparability of groups, selection bias, measurement bias, blinding, confounders, statistical analysis, withdrawals, validity of conclusions, and sponsorship bias, and rates studies as positive, negative, or neutral. Positive or high-quality studies must be free from bias, include comparable controls, and have the intervention clearly stated, whereas confounders should be described and be free from measurement bias with valid reliable study design, outcome measures, and statistical analysis. If the answers to validity criteria indicate that the study has some risk of bias, the report is designated neutral or medium quality. In the case that a study fails on most (ie, six or more of the domains) of these essential validity criteria, the study is designated negative or poor quality.

RESULTS

Overview of Studies

In total, 297 abstracts were identified through the initial search. From these abstracts, 93 studies of potential relevance were identified and on further review 15 met the selection criteria (Figure 3). The studies selected included RCTs (n=2), a randomized 2-period crossover study (n=1), pre- and postintervention studies (n=2), nonrandomized quasiexperimental studies (n=6), and other cross-sectional studies (n=4).