Health-promotion theories in nutritional interventions for community-dwelling older adults: a systematic review

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Abstract

Objective. To identify theories applied in interventions promoting healthy nutrition among community-dwelling older adults and determine the efficacy of theories in changing knowledge, attitudes, and behaviors.

Material and methods. The PubMed, PsycINFO, Embase, and ERIC databases were searched for English articles from January 1990 to December 2015. Mono or multicomponent randomized controlled trial studies were included, whereas research on nutritional interventions related to acute or chronic diseases were excluded.

Results. Eight articles satisfied the inclusion criteria. Only three articles referred explicitly to health promotion theories. Nutritional programs varied in terms of contents, outcomes, lengths of interventions and follow-up. Pooling the results and identifying the most effective theories were therefore impossible.

Conclusions. Although researchers and practitioners recognize the significance of theoretical models in guiding the health-promoting interventions, referring to a theoretical model for such interventions is still relatively recent.

INTRODUCTION

In industrialized countries, the increasing older population poses a number of challenges, including guaranteeing adequate health care services and promoting quality of life [1]. Among the factors that affect older adults’ health and quality of life, nutritional knowledge and dietary habits are accorded primary importance [2]. Because of the physiological changes that occur during the aging process, older adults are susceptible to deficiencies in protein, iron, calcium, fiber, vitamins, oligoelements, and liquid intake. The combination of such deficiencies with a high fat or hypocaloric diet can cause serious health problems [3]. Health promotion can play a key role in stimulating adequate and correct dietary habits to help older adults maintain healthy lifestyles. Health promotion theories guide educators in planning effective nutritional education programs [4]. A review by Sahyoun et al. found that better outcomes are achieved when nutritional messages are limited, simple and practical, and targeted to the specific needs of older adults [5]. The review, however, did not identify the theories used in the nutritional interventions. Two subsequent systematic literature reviews contained an analysis of the efficacy of nutritional interventions for community-dwelling older individuals and highlighted the wide range of nutritional interventions, outcomes evaluated, and nutritional effects [6, 7]. Nevertheless, these reviews were also silent regarding the theories used in designing the intervention programs.

To our knowledge, no literature review was carried out to identify the theories applied in health-promoting nutritional interventions for older adults and the effects of these theories on nutritional outcomes. To address this gap, the aim of this review was to: a) identify the theories used in nutritional interventions to encourage healthy eating among home-dwelling older people; and b) determine the efficacy of theories and strategies in changing the knowledge, attitudes, and behaviors related to the nutrition of older adults.

MATERIAL AND METHODS

The systematic review adhered to the recommendations of the Cochrane Handbook for Systematic Reviews of Interventions [8].

Type of participants. Participants included home-dwelling people aged 60 and older or with a mean age equal
to or higher than 65 years, in good health. Older adults living in institutions or residential homes were excluded because, in these settings, food is provided. We also excluded older people with chronic diseases, whose treatment can feature particular dietary restrictions.

**Type of interventions.** Health-promoting nutritional interventions conducted at the individual level. The interventions could be exclusively oriented toward nutrition (mono-component) or associated with other lifestyle changes (multi-component). Nutritional interventions for specific diseases were excluded because they are focused on the diseases and not on the aging process.

**Type of comparisons.** Educational interventions in other areas (i.e. physical exercise or healthy lifestyle) or no education intervention.

**Type of outcomes.** The primary outcomes were changes in knowledge and attitudes related to nutrition and diet, and self-reported food behaviors. In the studies in which different lifestyle changes were analyzed, only nutrition-related outcomes were examined. The secondary outcomes investigated were biochemical indicators (i.e. lipid or vitamin blood levels).

**Type of studies.** Randomized and non-randomized controlled clinical trials assessing the efficacy of educational interventions.

**Search methods**

The PubMed, PsycINFO, Embase, and ERIC electronic databases were searched for articles dated from January 1990 to December 2015. The search was limited to articles written in English, and the main key words combined among them were the following: elder, older people, aged, AND education, intervention, counseling, health promotion, AND community, home, primary care, AND nutrition, dietary habits (see the additional file Table 1S published online as Supplementary materials for a description of the search on PubMed). The reference lists of the retrieved studies were scrutinized to identify other additional studies. After eliminating duplicates, the titles and abstracts of the retrieved studies were independently screened by two reviewers. The full texts of articles were obtained and examined for satisfaction of the inclusion criteria. Differences in opinion between the two reviewers were reconciled through discussion.

**Data extraction**

Two reviewers independently extracted the following data from the studies: sample size and age; health promotion theory as specified by authors; educational intervention; comparisons; outcomes evaluated; duration of interventions and follow-up; and effects of the interventions. Any differences in opinion between the reviewers were resolved through discussion.

**Assessment of the risk of bias in the reviewed studies**

The methodological quality of the studies was evaluated using the quality assessment tool for health promotion studies developed by the Effective Public Health Practice Project (EPHPP) [9], which considers the risk of bias in six domains: selection bias, design, confounders, blinding, data collection methods, withdrawals, and dropouts. Two reviewers independently scored the studies and rated these globally as strong, moderate, or weak. Differences in scores between reviewers were solved through discussion.

**Data analysis**

Given the heterogeneity among the included studies in terms of population age, educational interventions, duration of education program and follow-up, and outcomes, a meta-analysis of the results was not performed. A qualitative synthesis of the results was instead crafted.

**RESULTS**

Among the 2696 records identified after elimination of duplicates, eight studies satisfied the inclusion criteria (Figure 1). The studies were conducted in the USA (5), France (1), Thailand (1), and Iran (1). A total of

![Flow diagram of the study selection process.](image)
3662 older adults completed the educational programs. Study sample size varied from 21 to 1786 participants. The participant ages ranged from 60 to 85 years. Six studies were mono-component educational programs, whereas two associated nutrition with other healthy lifestyle behaviors education [10, 11]. The length of the nutritional programs ranged from one day [11, 12] to 12 months [10]. The duration of follow-up varied from two weeks [11] to 12 months [10, 13] (Table 1). All the studies were randomized control trials (RCTs). In four

![Table 1](https://example.com/table1.png)

Table 1 Description of the included studies

<table>
<thead>
<tr>
<th>Authors, year, country</th>
<th>Sample/age</th>
<th>Health promotion theory</th>
<th>Type of intervention</th>
<th>Outcomes</th>
<th>Intervention (I)/Follow-up (F) length</th>
<th>Results</th>
<th>EPHPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leigh et al., 1992 USA</td>
<td>EG = 919, CG = 867</td>
<td></td>
<td>Provision of educational printed material on dietary habits</td>
<td>Self-reported intakes of fat, salt, cereals, FV, fiber, red meat, eggs, cheese and butter, calcium</td>
<td>I: 12 months F: 12 months</td>
<td>Mean change in serving/week of:*</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Mean age: 68 (range: ns)</td>
<td></td>
<td>Multi-component</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taylor-Davis et al., 2000 USA</td>
<td>EG1 = 127, EG2 = 127, CG = 132</td>
<td></td>
<td>Provision of printed materials on nutrition (newsletters) (EG1) or newsletters and phone interviews for education evaluation (EG2)</td>
<td>Nutrition knowledge Nutrition attitudes Fat and fiber intake behaviors</td>
<td>I: 10 weeks F: 12 weeks</td>
<td>Mean change in: Nutrition knowledge score: EG1 = 12.5±1.8; EG2 = 20.2±1.8; CG = 2.0±1.8 (p = 0.05)</td>
<td>Weak</td>
</tr>
<tr>
<td></td>
<td>Mean age: 69 (range: 60-74)</td>
<td></td>
<td>Mono-component</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bernstein et al., 2002 USA</td>
<td>EG = 38, CG = 32</td>
<td></td>
<td>Nutrition program on FV and calcium-rich food with home visits, phone calls and printed materials</td>
<td>Intakes of FV and dairy food Biochemical markers</td>
<td>I: 6 months F: 6 months</td>
<td>Mean change in serving/day of: Fruits: EG = 1.1±0.21 vs CG 0.1±0.19 (p = 0.01) Vegetables: EG 1.1±0.19 vs CG 0.1±0.18 (p = 0.01) Dairy: EG 0.9±0.2 vs CG 0±0.26 (p = 0.001) Mean total carotenoids blood concentration: EG = 1.2±4.35 (p = 0.01) vs CG = 0.3±5.04 (p = 0.30)</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>Mean age: 78 (range: ns)</td>
<td></td>
<td>Mono-component</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continues
studies, the methodological quality was rated as weak due to the presence of selection bias and differences between groups (Table 1). All the studies were included in the qualitative synthesis.

**Efficacy of educational interventions**

The nutritional interventions exerted positive effects in all the studies, with the exception of Geller et al. [11], in which a single day educational session had no effect
on increasing servings of fruits and vegetables (FV) per day (experimental group (EG) -0.74 vs control group (CG) = 0.27) (Table 1). Leigh et al. [10] reported an increased number of fruit servings per week (EG = 0.3 vs CG = 0.0, p = 0.02), vegetables (EG = 0.2 vs CG = -0.2, p = 0.02), and fiber (EG = 1.4 vs CG = -0.1 p = 0.001) in the intervention group, but no effects on rich-calci- um food (EG = -0 vs CG = -2, p = 0.48) and red meat (EG = -0.4 vs CG = -0.2 p = 0.06). Taylor-Davis et al. [17] reported the following results from two education programs (1 and 2): a substantial effect in increasing nutritional knowledge, measured through a multiple-choice test, (EG1 = 12.5±1.8, EG2 = 19.0±1.8 vs CG = 2.0±1.8 p = 0.05); a moderate effect in modifying nutrition attitudes, assessed by a self-reported scale (EG1 = 0.2±0.1, EG2 = 0.4±0.1 vs CG = 0.1±0.1 p = 0.05); and a small effect on avoiding dietary fat (EG1 = -0.1±0, EG2 = -0.2±0 vs CG = -0.1±0.0, p = 0.05) and increasing fiber intake (EG1 = -0.1±0.0, EG2 = -0.1±0 vs CG = 0±0, p = 0.05), evaluated through a self-reported food behavior instrument. Rousset et al. [12] described an increased protein intake (grams/day) in the intervention group (EG = 6.1±2.3 vs CG = 6.0±2.3, p 0.001) and improved general nutrition knowledge, which was as- sessed through a questionnaire. Increased FV servings a day was reported by Greene et al. [13] at the 24-month follow-up (EG = 1.01±0.08 vs CG = 0.78±0.09 p 0.018) and by Salehi et al. [15] (EG = 1.3±0.15 vs CG = 0±0.01, p 0.001). The educational intervention in Meethien et al. [16] improved self-reported behaviors, which were measured by a healthy eating scale, related to food selection (EG = 11.14, p 0.000 vs CG = 1.15, p 0.083), preparation (EG = 3.96, p 0.000 vs CG = 1.03, p 0.469), and consumption (EG = 12.16, p 0.000 vs CG = 0.45, p 1). Changes in biological markers were assessed only by Bernstein et al., who identified an increased carotene blood level in the intervention group (EG = 1.2±4.35, p = 0.01 vs CG = 0.36±5.04, p = 0.30) [14].

Theories in nutrition programs

The authors explicitly specified the theories used in the health promotion programs in only three studies: Greene et al. [13] and Salehi et al. applied the transtheoretical model of behavior change [15]; and Meethien et al. used the health promotion model by Pender and colleagues [16].

Geller et al. [11] designed a decisional balance sheet to evaluate older adults' attitudes toward specific health behaviors, which, although the authors did not explicitly state it, was inspired by the transtheoretical model. Taylor-Davis et al. [17] neglected to specify the theory they adopted, although they claimed to use principles derived from the communication model and adult learning theory. The remaining studies contained no mention of a theoretical model, but the educational programs in these studies were basically directed toward activating cognitive processes.

DISCUSSION

Our review shows that, in the last decades, eight RCTs have been conducted to assess the efficacy of health promotion interventions in improving nutrition among home-dwelling older adults. The identified studies differed with respect to sample characteristics, aims of educational interventions, methodologies, measures, and evaluated outcomes. Moreover, theory was used in only three out of the eight identified studies for developing nutritional programs. This vari- ability makes it difficult to compare the efficacy of the nutrition educational programs and assess the contribu- tions of theory to the success of those programs. However, our results indicate that educational programs are more effective when they entail a specific nutritional intervention rather than generic interven- tions (e.g., increasing FV intake vs improvement of general nutritional status), or involve more educational sessions (one-day session vs multiple educational ses- sions). Most of the studies reviewed were conducted on small samples, thus limiting the researchers' ability to evaluate intervention effects and generalize find- ings. Furthermore, according to our review, only the most recent studies applied theoretical frameworks, and such application suggests an increasing attention to the theoretical aspects of educational processes. Referring to a theory in health promoting interventions is important; a theory provides guidance on how to design the educational intervention and identify the most effective educational strategies [18].

Limitations

This review presents a few limitations. Some relevant studies may have been missed, such as those written in languages other than English or indexed in other data- bases. A number of studies in which the sample compr- ised adults under the age of 60 were also excluded, as the inclusion of studies with younger adults would have prevented generalizability of the results to older popula- tions. In fact, the nutritional needs of older adults differ from those of younger adults and are influenced by changes in physical, psychological, cognitive, social, and economic conditions. For these reasons, health promotion programs addressed to the general adult pop- ulation may not be suitable for older adults.

CONCLUSION

Although theories have been extensively applied in a number of health care fields, the use of theoretical models in nutritional interventions for older adults is a recent practice. The theoretical models applied to health promotion interventions are important sources of guidance for educators in planning, imple- menting, and evaluating the outcomes of educational programs.

Conflict of interest statement

There are no potential conflicts of interest or any fi- nancial or personal relationships with other people or organizations that could inappropriately bias conduct and findings of this study.

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