

Systematic Literature Review of Randomized Control Trials Assessing the Effectiveness of Nutrition Interventions in Community-Dwelling Older Adults

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ABSTRACT

Objective: Nutrition interventions may play an important role in maintaining the health and quality of life in community-dwelling older adults. To the authors' knowledge, no systematic literature review has been conducted on the effectiveness of nutrition interventions in the community-dwelling older adult population.

Design: Systematic literature review followed by descriptive data extraction and critical appraisals for studies meeting inclusion criteria.

Setting: Medical Literature and Retrieval System Online (MEDLINE) and Cumulative Index to Nursing and Allied Health Literature (CINAHL) search for randomized controlled trials (RCTs) assessing nutrition interventions in community-dwelling older adults.

Participants: Fifteen RCTs involving nutrition-related outcomes in community-dwelling older adults.

Analysis: Descriptive data extraction and critical appraisals using the Jaded scale. Outcome measures included study blinding, allocation concealment, intention-to-treat analysis, and a priori calculations.

Results: Ten RCTs involved nutrition counseling, education, or dietary advice, whereas 5 involved nutrition supplements. Jaded scores ranged from 1 (n = 8) to 2 (n = 4) to 4 (n = 3). Ten RCTs reported positive results post-intervention.

Conclusions and Implications: Nutrition counseling interventions involving active participation and collaboration showed the most promise in affecting positive nutrition-related outcomes in community-dwelling older adults. Future research should determine which nutrition interventions will benefit community-dwelling older adults with less active participation and health perceptions, and lower educational attainment.

Key Words: older adults, community, nutrition, aged (*J Nutr Educ Behav.* 2011;43:251-262.)

INTRODUCTION

Older adults represent a growing proportion of the global population. Adults aged ≥ 60 years accounted for approximately 10% of the world's population in 2000, and this rate is projected to grow to 21%, or roughly 1 in 5 persons, by 2050.¹ Although older adults today have an increased life expectancy compared with previous generations,¹ many continue to be affected by chronic health conditions such as sarcopenia² and cognitive impairment.^{3,4} Given the growing trend toward a universally aging population,¹ re-

search to promote the health, longevity, and quality of life of older adults is both timely and warranted.

Nutrition is an integral component of health and health promotion throughout the life cycle. In later life, optimal nutrition can help older adults retain their independence, delay institutionalization, and improve overall quality of life.⁵⁻⁷ Factors associated with the aging process such as functional limitations, poor dentition, and declining dietary intake, however, increase the risk of malnutrition in this cohort.^{8,9} More recent studies have demonstrated an association

between nutrition-based interventions and positive health outcomes in community-dwelling older adults,¹⁰⁻¹² although the methodological quality and scientific merit of these studies have been limited. To the authors' knowledge, no recent comprehensive, systematic literature review has examined the effectiveness of nutrition-based interventions in the community-dwelling older adult population. To address this knowledge gap, this systematic literature review looked at randomized controlled trials (RCTs) evaluating nutrition interventions conducted in community-dwelling older adults. The scope of this review was limited to RCTs in an effort to focus on high-quality evidence of the effectiveness of such interventions.

METHODS

Study Selection Criteria

To focus the scope of this review, only studies conducted with community-

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dwelling older adults were assessed. To be selected for review, studies had to meet all of the following inclusion criteria: RCT with collection of original data; nutrition-based intervention including nutrition counseling or education pertaining directly to disease prevention in community-dwelling older adults; implementation of group (clustered) or individual interventions; measurement of at least 1 applied nutrition outcome in community-dwelling older adults; participants mean age ≥ 55 years of age; published as a full paper in the English language from a date of 1990 onward in a peer-reviewed source; and conducted in areas with broadly comparable health care systems, specifically Canada, the United States, Europe, Australia, or New Zealand. Studies assessing disease-focused nutrition interventions (eg, cardiovascular disease, diabetes, fractures), or older adults who dwell in settings such as nursing homes, long-term care facilities, or other institutionalized settings were excluded. Also excluded were studies conducted in the homebound older adult population, those lacking a separate nutrition intervention component, and those that did not meet the eligibility criteria for the RCT study design. Institutional Review Board approval was exempt for this systematic literature review.

Literature Search Strategy

The following databases were searched: MEDLINE (1950 to December, week 4, 2008) and the Cumulative Index to Nursing and Allied Health (CINAHL) (1982 to December, week 4, 2008). Key search words included methodologic terms and broad terms such as "older adults," "seniors," "elderly," "community," and "nutrition." Additional studies were identified by hand searching bibliographies of key published papers, and by using the "Related Articles" feature of MEDLINE and CINAHL.

Data Analysis

One research assistant and 1 methodologist independently reviewed the identified studies and conducted a systematic assessment using predeveloped standardized forms to assess the

selection criteria. In cases in which inadequate information was provided in the abstract, the full paper was reviewed to determine inclusion eligibility.

The Jaded scale was used as 1 means of assessing the research methodology and scientific merit of each of the reviewed studies.¹³ The Jaded scale is a validated scale used to measure study quality by assigning a numeric score ranging from 1 (low quality) to 5 (high quality) based on methodologic indicators such as randomization, double blinding, and descriptions of participant dropout data. Jaded scores ranged from 1 ($n = 8$) to 2 ($n = 4$) to 4 ($n = 3$). Although all the studies were RCTs, the majority of the studies were not double-blinded owing to the nature of the interventions, which made doubleblinding impractical. Additional quality indicators, participant characteristics, and descriptions of interventions and main outcomes are summarized in [Tables 1 and 2](#).

RESULTS

The literature search identified 15 unique RCTs that met the selection criteria and were included in this review. Ten of these studies involved nutrition education and counseling interventions, and 5 involved nutrition supplement interventions in the community-dwelling older adult population. Characteristics of each study are displayed in [Tables 1 and 2](#). Indicators of scientific merit, including blinding, allocation concealment, and intervention duration are also noted in [Tables 1 and 2](#) for each selected study.

Studies Involving Nutrition Education or Counseling

Of the 10 studies involving nutrition education or counseling, 9 were conducted in a community setting,¹⁴⁻²² whereas 1 was conducted in a health care setting,²³ among community-dwelling older adults. The sample size in the studies ranged from 44¹⁸ to 3,693¹⁷ older adults who were in good health,^{14,15,22,23} affiliated with a health management organization,^{17,19,21} and participating in older adult community programs.^{16,18,20} The

follow-up rates from the majority of the reviewed studies were moderately high, ranging from 70%²⁰ to 100%.¹⁴

Four of the studies evaluated didactic nutrition education programs,^{15,16,20,21} and 6 studies assessed dietary advice and nutrition counseling interventions.^{14,17-19,22,23} Of the 4 studies providing didactic nutrition education programs, 2 provided no nutrition education to the control groups,^{16,21} 1 provided no additional peer support,¹⁵ and another provided physical activity modules only.²⁰ Of the 6 studies providing dietary advice or nutrition counseling, 3 provided study questionnaires to the control groups,^{17,18,22} whereas the others provided usual care only,¹⁹ dietary advice to maintain usual food intake,²³ or a structured exercise program.¹⁴

Of the 4 studies evaluating didactic nutrition education programs,^{15,16,20,21} 3 reported positive outcomes such as improved dietary intake,¹⁵ increased attention to the intake and effects of herbal and dietary supplements,²⁰ and improved nutrition knowledge and dietary stage of change.²¹ In contrast, 1 study reported no significant change in nutrition knowledge or dietary behavior post-intervention.¹⁶

Of the 6 studies involving dietary advice or nutrition counseling,^{14,17-19,22,23} 5 reported positive outcomes such as improved intake of fluid milk;²³ increased consumption of fruit, vegetables, and calcium-rich food;¹⁴ positive changes in specific nutrition behaviors;¹⁹ improved health habits;¹⁷ and improved physical and psychosocial function, as measured by the Short Form 36 and Center for Epidemiologic Studies Depression Rating Scale scores.²² In contrast, 1 study reported no significant change in dietary behavior post-intervention.¹⁸

Three of the 10 studies involving nutrition education and counseling included participants in the Older American Act Nutrition Program.^{16,18,20} A common feature among these studies included nutrition education interventions based on theoretical models, such as Mitic's Nutrition Instruction Model,¹⁶ the Health Belief Model and Model of Acceptance of Change,¹⁸ and Social Cognitive Theory of Behavior Change.²⁰ In contrast, these studies

Table 1. Nutrition Education and Counseling Random Control Trials Enrolling Community-Dwelling Older Adults (n = 10)

Study	Setting/Sample Size & Participant Characteristics/ Follow-up Rate	Intervention	Control	Jaded Score	Blinding	Additional Quality Measures	Duration of Intervention (I)/ Duration of Follow-up (F)	Main Outcomes
Barr et al. ²³ various cities and states, United States, 2000	Hospital/medical centers	Dietary advice to increase milk intake by 3 cups/day	Dietary advice to maintain usual dietary intake	1	Inv: U	AC: U	I: 12 weeks after an initial 4-week baseline period	Advice to increase milk intake decreased inadequate intake of micronutrients based on EAR values
	204 older adults in good health, consuming \leq 1.5 dairy product servings/day				Par: U	ITT: U	F: end of 12-week study period	Blood pressure decreased similarly in both groups; cholesterol values were unchanged; quality of life was high at baseline and stayed high throughout
	98% follow-up				OA: U	APC: N		
Bernstein et al. ¹⁴ greater Boston area, Massachusetts United States, 2002	Community/ home	Personalized nutrition program to increase fruit and vegetable intake to 5 servings/day and calcium-rich food to 3 servings/day	Workout program consisting of upper and lower body, and dynamic balance exercises	1	Inv: U	AC: U	I: 6 months consisting of 8 home visits, biweekly phone calls, and newsletters	Personal nutrition program increased self-reported dietary intake of fruit, vegetables, and dairy foods; high α - and β - carotene serum values correlated with increased intake of α and β - carotene-containing food
	70 older adults \geq 70 years; ambulatory, but with some physical impairment				Par: U	ITT: Y	F: every 5 weeks plus bi-weekly phone calls throughout study period	
	100% follow-up				OA: Y	APC: N		

(Continued)

Table 1. (Continued)

Study	Setting/Sample Size & Participant Characteristics/ Follow-up Rate	Intervention	Control	Jaded Score	Blinding	Additional Quality Measures	Duration of Intervention (I)/ Duration of Follow-up (F)	Main Outcomes
Haber and Lacey 1993 ¹⁵	Community	Didactic sessions covering exercise, stress management, diet and nutrition, and medication use and heart health followed by a peer-support group intervention	Didactic sessions according to intervention, but no peer support group intervention	1	Inv: U	AC: U	I: 10 weeks	Intervention group reported a statistically significant change in their fiber and sodium intakes post-intervention and noted positive trends in other nutrition and health related behaviors
	64 older adults with no current diagnosis of an unstable medical condition, and not enrolled in another health promotion program 89% follow-up							
Kupka-Schutt and Mitchell ¹⁶ Washington, United States, 1992	Community	Nutrition modules based on Mitic's Nutrition Instruction Model	Control A: Nutrition sessions covering 7 dietary lectures	1	Inv: U	AC: U	I: 4 1-hour nutrition module or lecture sessions	No statistically significant change based on dietary intake form scores; no correlation seen between dietary intake form scores and dietary allowance values for participants' diet at any time
	125 older adults attending a local seniors program 83.2% follow-up		Control B: No nutrition education intervention					
					OA: U	APC: N		

Leigh et al. ¹⁷ multiple counties and cities, California, United States, 1992	Community	Health habit questionnaires plus health-risk appraisals, personal recommendation letters, newsletters, self-management materials, and a health promotion booklet	Control A: Health habit questionnaires only	1	Inv:U	AC: U	I: 1 year	Intervention group reported statistically significant changes in health habits, health status, and economic variables; decreased health risk scores; and decreased insurance claim costs at 12-month follow-up
	3,693 Bank of America retirees, aged 68.4 to 69.8 years		Control B: Monitoring for health insurance claims only		Par: U	ITT: U	F: Questionnaires completed at baseline and at 6- month intervals during study period	Control A reported a 7.2% increase in health risk scores, and both control groups reported an increase in insurance claim costs at 12-month follow-up
	92% follow-up				OA: U	APC: N		
Mayeda and Anderson ¹⁸ Larimer County, Colorado, United States, 1993	Community, 9 congregate meal sites	Self-paced program to reduce heart disease risk factors including print material on heart disease risk factors and positive dietary changes to support heart health	Completion of food records, heart health questionnaires, and self-care program evaluations only	1	Inv: U	AC: U	I: 14 weeks	Change in dietary behavior between groups did not improve based on food records and Bertolli quiz scores
	44 community-living older adults, aged 60-90 years				Par: U	ITT: U	F: 1 month for intervention group, and again at 2 months for all participants	47.8% of participants reported choosing more low-fat food, and >39% reported choosing fewer food items associated with heart disease
	75.9% follow-up				OA: U	APC: N		

(Continued)

Table 1. (Continued)

Study	Setting/Sample Size & Participant Characteristics/ Follow-up Rate	Intervention	Control	Jaded Score	Blinding	Additional Quality Measures	Duration of Intervention (I)/ Duration of Follow-up (F)	Main Outcomes
Mayer et al. ¹⁹ San Diego, California, United States, 1994	Community 1,800 older adults affiliated with a health management organization 72% follow-up	Preventative care services including clinical tests and immunizations, health risk appraisals, personal counseling, and health promotion sessions	Usual care	1	Inv: U Par: U OA: U	AC: U ITT: U APC: N	I: 2 years F: Health risk appraisals measured at months 1 (baseline), 12, 24, 36, and 48	Intervention group showed a statistically significant positive change in activity levels and selected nutrition behaviors at 12 month follow-up Report
Mitchell et al. ²⁰ various counties, North Carolina, United States, 2006	Community, congregate nutrition sites 1,006 older adults ≥ 60 years old from 34 randomized counties 69.9% follow-up	5 didactic sessions guided by nutrient/supplement teaching modules (n = 17 counties)	5 didactic sessions guided by physical activity and body weight modules (n = 17 counties)	2	Inv: U Par: U OA: U	AC: U ITT: U APC: N	I: 5 weeks F: 4 weeks	Intervention group improved self-reported attention to dietary supplements and discussed multivitamin use more with a health care provider

Taylor-Davis et al. ²¹ Danville, Pennsylvania United States, 2000	Community/home	Intervention A: Theory-based nutrition newsletters plus telephone interviews	Completion of pre and post-intervention questionnaires only	1	Inv: U	AC: U	I: 12 weeks	Intervention A scored higher in nutrition knowledge than intervention B; intervention B scored better than controls in the “avoid fat foods” behavior
	480 older adults, aged 60-74 years old and Medicare recipients	Intervention B: Theory-based nutrition newsletters only			Par: U	ITT: U	F: End of 12-week study period only	Both intervention groups scored higher for dietary stage of change compared to controls
	80.4% follow-up				OA: U	APC: Y		
Wallace et al. ²² Seattle, Washington, United States, 1998	Community	Tailored health promotion plan consisting of alcohol, smoking, and nutrition education interventions plus a group exercise program	Completion of study questionnaires at scheduled follow-up points only	2	Inv: U	AC: U	I: 6 months	Interventions had improved outcomes in 7 of 8 Short-Form 36 and Center for Epidemiologic Studies Depression Rating Scale measurements
	100 older adults in good health and able to participate in study according to family and study physicians				Par: U	ITT: U	F: 2 and 6 months, plus telephone contact during weeks 2, 4, and 16 of study period	
	90% follow-up				OA: U	APC: N		
AC indicates allocation concealment; APC, a priori calculation; F, follow-up; I, intervention; Inv, investigator; ITT, intention to treat; N: no; OA: outcome assessor; Par, participant; U, unclear; Y, yes.								

Table 2. Nutrition Supplement Random Control Trials Enrolling Community-Dwelling Older Adults (n = 5)

Study	Setting/Sample Size & Participant Characteristics/ Follow-up Rate	Intervention	Control	Jaded Score	Blinding	Additional Quality Measures	Duration of Intervention (I)/ Duration of Follow-up (F)	Main Outcomes
Chandra ²⁴ St. John's, Newfoundland, Canada, 2001	Community/home	Multivitamin and mineral supplement	Comparative placebo containing only calcium and magnesium	4	Inv: Y	AC: U	I: 1 year	Intervention group showed improved cognitive test scores, except for long-term memory recall
	96 older adults aged 66-86 years, with no current diagnosis of a chronic or mental illness, and not using any nutrition supplements within a 3-month pre-study period				Par: Y	ITT: U	F: End of 1 year study period only	Blood nutrient levels below reference standards were associated with low test scores, but no statistically significant correlation was seen between specific nutrients and test scores
Durga et al. ²⁵ Gelderland region, Netherlands, 2007	Home	Micronutrient supplement containing 800 µg folic acid	Comparative placebo	4	Inv: Y	AC: U	I: 3 years	Serum folate increased and plasma total homocysteine decreased in the intervention group
	819 older adults, mean age 60 years (SD ± 5-6) with elevated homocysteine levels and self-reporting > 80% placebo compliance during a 6-week pre-study period				Par: Y	ITT: Y	F: Study compliance assessed at 12-week intervals during study period	Compared to controls, intervention group had better 3-year change in memory, information processing speed, and sensorimotor speed
	89.6% follow-up				OA: U	APC: N		
	99.9% follow-up				OA: Y	APC: Y		

Gray-Donald et al. ²⁶ Sherbrooke, Quebec, Canada, 1995	Community	2-235 mL cans of a commercial liquid nutrient formula	No nutrition supplement; suggestions and encouragement to improve diet quality only	2	Inv: U	AC: U	I: 12 weeks	No difference was seen in functional measures between groups, except for a lower number of falls in the intervention group
	50 community- dwelling, nutrition- risk older adults				Par: U	ITT: Y	F: Compliance assessed at weekly intervals during study period	
	96% follow-up				OA: Y	APC: N		
McNeill et al. ²⁸ Grampian, Scotland, 2007	Hospital, 6 health care centers	Multivitamin and mineral supplement	Comparative placebo	4	Inv: Y	AC: U	I: 1 year	No statistically significant change in tests results within or between groups; and no change was observed in digit- span forward or verbal fluency scores between groups Supplement compliance for all participants was over 78% for entire study period
	910 community- dwelling older adults not using any nutrient supplements within a 3-month pre- study period				Par: Y	ITT: Y	F: Compliance assessed in monthly intervals during study period	
	85.4% follow-up				OA: U	APC: N		

(Continued)

Table 2. (Continued)

Study	Setting/Sample Size & Participant Characteristics/ Follow-up Rate	Intervention	Control	Jaded Score	Blinding	Additional Quality Measures	Duration of Intervention (I)/ Duration of Follow-up (F)	Main Outcomes
Payette et al. ²⁷ Sherbrooke, Quebec, Canada, 2002	Community	2-235 mL cans per day of a nutrient-dense, protein-energy liquid supplement	No nutrient supplement, encouragement to improve dietary intake only	2	Inv: U	AC: U	I: 16 weeks	No statistically significant, between-group difference in anthropometric indices, muscle strength, or functional variables post-intervention
	89 community-dwelling, nutritional risk older adults from 7 local community centers				Par: U	ITT: Y	F: Compliance assessed at monthly intervals during study period	Beneficial effects were seen in emotional role-functioning and number of days spent in bed
	99% follow-up				OA: U	APC: Y		

AC indicates allocation concealment; APC, a priori calculation; F, follow-up; I, intervention; Inv, investigator; ITT, intention to treat; N, no; OA, outcome assessor; Par, participant; U, unclear; Y, yes.

varied in their interventions, which ranged from self-directed print materials¹⁸ to small group education sessions.^{16,20} The measurement tools similarly varied and included heart health quizzes,¹⁸ health questionnaires,^{18,20} or self-reported food records^{16,18} and were applied at different times during the study and follow-up periods.

Of the 3 studies involving participants in the Older American Act Nutrition Program,^{16,18,20} 1 study reported positive, significant post-intervention changes in dietary behaviors, such as increased self-reported attention to the side effects of herbal and dietary supplements and more frequent discussions with health care providers regarding herbal and dietary supplement use.²⁰ It should be noted, however, that the sample size in this study was much larger than the other 2 studies^{16,18} and that the intervention was delivered just prior to provision of lunch in the congregate nutrition sites. Additionally, the nutrition educators in this study were given a comprehensive, 2-day training session to ensure adherence to the intervention and prescribed protocols, in contrast to other studies in which the intervention was delivered by 1 researcher¹⁶ or was a self-directed nutrition education program.¹⁸

Studies Involving Nutrition Supplements

Of the 5 studies involving nutrition supplements,²⁴⁻²⁸ 4 were conducted in a community setting,²⁴⁻²⁷ whereas 1 was conducted in a health care setting with community-dwelling older adults.²⁸ The sample size in these studies ranged from 50²⁶ to 910²⁸ older adults aged ≥ 55 years, with demonstrated nutritional risk^{26,27} and not taking any nutrition supplements within a defined pre-study period.^{24,28} The overall follow-up rates from these studies were high, ranging from 85.4%²⁸ to 99.9%.²⁵

Three of the 5 studies evaluated broad-spectrum micronutrient interventions,^{24,25,28} and 2 studies evaluated liquid nutrient supplements.^{26,27} In the 3 studies assessing micronutrient

supplements,^{24,25,28} comparative placebos were provided to the control groups, whereas the 2 studies evaluating liquid nutrient supplements provided nutrition counseling to the control groups.^{26,27}

Of the 3 studies evaluating micronutrient supplements,^{24,25,28} 2 reported positive outcomes such as improved cognitive test scores²⁴ and increased serum folate followed by decreased plasma total homocysteine values.²⁵ In contrast, 1 study did not report any statistically significant finding post-intervention.²⁸ The 2 studies evaluating liquid nutrient supplements similarly reported no statistically significant findings in any of their defined functional outcomes,^{26,27} but noted trends in other outcomes such as a decreased number of falls,²⁶ decreased number of days spent in bed, and improved emotional role functioning.²⁷

DISCUSSION

The authors systematically reviewed the published literature on the effectiveness of nutrition interventions in community-dwelling older adults. A rigorous approach to reviewing the literature was used, whereby the authors performed a thorough literature search and extracted data on predefined study elements using standardized data extraction forms.

In general, the authors found that comprehensive nutrition counseling interventions involving active participation in developing a personalized health plan, goal setting, and self-efficacy showed the most promise in affecting positive outcomes in the nutrition status or nutrition-related outcomes in community-dwelling older adults. Many of these studies were also collaborative and included elements such as group learning sessions, peer support, and scheduled follow-up meetings. These elements were also apparent in studies involving participants in the Older American Act Nutrition Program. Common characteristics of nutrition supplement studies also reporting positive outcomes were inclusion of participants most likely to benefit from nutrition supplements, and use of a broad range of sensitive cognitive function tests. These findings are con-

sistent with those described in a review of nutrition education interventions,²⁹ which identified goal setting, motivation, and interaction with health care providers as some of the common features of effective nutrition education interventions among older adult participants. In a recent study on the health of older Canadians, Kaplan similarly identified high self-esteem and self-rated health perceptions among the features of older adults who maintained optimal health in later life.³⁰

On the contrary, characteristics of nutrition counseling interventions that were not effective in changing dietary behaviors included interventions that were not tailored to individual learning needs and limited personal contact with study participants. Nutrition supplement studies in which participants consumed inadequate intakes of the supplement, or in which a limited number of cognitive function tests were performed, were found to be similarly ineffective in improving the nutrition status or nutrition-related outcomes of the study participants. These findings are consistent with those described by Sahyoun,²⁹ who attributed limited contact with study participants and poor evaluation tools as common elements of nutrition education studies that reported no significant intervention effects.

Although this systematic literature review was highly focused and applied rigorous systematic literature review methodology, there are a few limitations to note. This review was limited to peer-reviewed studies accessed through main databases via key word searches, and as a consequence, RCTs meeting the inclusion criteria may potentially have been missed. To address this concern, the secondary reference list of each RCT included in this review was hand searched for other potentially eligible RCTs, and the main online biomedical bibliographic databases were reviewed frequently using a broad range of key search terms. The focus of this search was also limited to developed nations with broadly comparable health care systems (Canada, United States, Europe, Australia, and New Zealand) to further enhance the generalizability of this review to a North American context. Although many of the stud-

ies included in this review reported significant, positive post-intervention findings, the majority of these studies were conducted with highly motivated, well-educated, community-dwelling older adults who perceived their self-reported health as moderately high.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The aim of this paper was to meet an existing knowledge gap by providing a recent comprehensive, systematic literature review of high-quality evidence on the effectiveness of nutrition-based interventions in the community-dwelling older adult population. In general, it was found that nutrition counseling interventions involving active participation in the development of a health plan, goal setting, self-efficacy, and collaboration showed the most promise in affecting positive outcomes in the nutrition status or nutrition-related outcomes in community-dwelling older adults. Future research should determine which types of nutrition interventions may have a similar effect in community-dwelling older adults with less active participation and self-reported health perceptions, and lower educational attainment.

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