Review Article

The Factors Influencing Meal Satisfaction in Older Adults: A Systematic Review and Meta-analysis

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ABSTRACT

Purpose: The aim of this study was to identify factors influencing meal satisfaction in older adults.
Methods: Authors searched four databases Ovid MEDLINE, Ovid EMBASE, the Cochrane Library, and KoreaMed using the following key search terms: "(elderly-mp. OR aged), AND (meal OR food OR eating OR feeding), AND satisfaction." Only articles published between January 1946 and May 2018 were considered. The preferred reporting items for systematic reviews and meta-analyses guidelines were adopted for quality assessment. The authors ultimately selected 7 of 1,695 references for review and meta-analysis.
Results: A meta-analysis was conducted to determine the factors influencing meal satisfaction in older adults aged more than 60 years. The results showed that meal satisfaction was low when age increased and the individual was served frozen meals. Satisfaction with meals was high when food choices were available and individuals were served high-quality food and when the food smelled and tasted good or was personally tailored. Satisfaction was also high when individuals ate with their families. Moreover, meal satisfaction seemed to be influenced by physical health, whereas it did not show a significant correlation with mental health.
Conclusion: Intending to improve the quality of life of older adults by increasing their meal satisfaction, the authors pointed out factors that institutions should attend to when providing meals to older adults. To contribute to the lack of any existing conceptual and theoretical framework in this field, further steps to be taken by the authors shall involve concept analysis that would assist in building a conceptual framework.
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Introduction

The world's older population is anticipated to rise by more than 1.6 billion by 2050 [1]. Owing to this increase in the population of older adults, interest in their health and well-being has been increasing along with medical expenses. The number of older adults who use hospitals and nursing homes is also steadily increasing [2].

Meals are essential for maintaining life. Through eating, human beings not only maintain, promote, and restore their health but also recall the past [2,3]. For older adults, eating is not only an important activity for life maintenance but also a great pleasure, and the desire to eat one's favorite food becomes a motivation to get out of the bed and increase the quality of life [4]. However, older adults may face insufficient nutrition owing to sensory problems (such as with taste, sight, smell, and touch) and dental problems [5].

For older adults, health is directly related to their diet, and malnutrition is, therefore, a concern. The US Department of Agriculture emphasized that nutrition education should be provided for those older than 60 years [6]. Physical weakness, degenerative diseases, and dietary changes as well as poor systematic management are common causes of malnutrition and are also typical in the aging process [7—9]; 30—50% of older adults in the society suffer from malnutrition [10]. A review of studies in 12 countries found that 13.7% of older adults residing in retirement households were undernourished [11].

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Eating is directly related to life satisfaction in older adults, as well as to their survival, but it is easy to underestimate its importance because eating is one of the rituals of daily life [4]. The studies have focused on the limited aspects of eating in older adults such as nutrition; however, meal satisfaction is also an important factor that affects the well-being of older adults. Despite the importance that the domain of meal satisfaction has for older adults, its significance has not been properly acknowledged. The research on this domain has also been limited. Previous studies on meal satisfaction in older adults have not analyzed the degree of satisfaction derived from the meal itself; instead, they focused on meal satisfaction in relation to life satisfaction and quality of life [12] as well as dental health [13] and the meal satisfaction of acute inpatients [14]. Moreover, although there have been comprehensive studies investigating factors that affect meal satisfaction, these studies lack analyses of the theoretical and conceptual aspects regarding meal satisfaction. To supplement this, further information must first be gained on the subject, such as determining which factors affect meal satisfaction [15]. This study aims to identify the factors that affect meal satisfaction and uses these findings for the second part of the research (concept analysis), and the third part of the research will be the development of a tool based on these findings.

Aims

This study investigated the factors related to meal satisfaction in older adults through a systemic literature review and meta-analysis in a multidimensional manner. For this purpose, the authors focused on the relationship between meal satisfaction and factors such as food, availability of meal choices, provision of personalized meals, social activity, mental health, and physical health as well as other general characteristics.

Methods

Design

This was a systematic review and meta-analysis.

Search methods

A literature search was carried out by referring to the Cochrane Collaboration Systematic Literature Review Handbook [16], preferred reporting items for systematic reviews and meta-analyses [17], and the Guide to systematic reviews of the literature of the Scottish Intercollegiate Guidelines Network [18].

Electronic database and keyword settings

The Scottish Intercollegiate Guidelines Network states the scope of a systematic literature review requires that Ovid MEDLINE, Ovid EMBASE, and the Cochrane Library to be searched. Accordingly, a search of electronic databases was performed using Ovid EMBASE, Ovid MEDLINE, the Cochrane Library, and KoreaMed on March 21, 2018. For the EMBASE and MEDLINE search, simple keywords as "(elderly.mp. OR aged/) AND (Meal OR food OR eating OR feeding) AND (satisfaction)" were used. Based on the abstracts found, all related terms expressing patient and satisfaction were confirmed. Final search keywords were finalized through a meeting composed of experts in nursing care for older adults and experts in research methods. Patients were older adults, and interventions included studies reporting the outcome of meal satisfaction.

Search outcomes

In the foreign literature, 1,366 studies were retrieved from EMBASE, and 1,174 studies were obtained from MEDLINE, whereas no systematic review of older adults' self-sufficiency was found in Cochrane. In KoreaMed, using "food AND aged AND old", 251 documents were obtained from a total of 1,695 documents after excluding duplicate documents.

Quality appraisal

In the present study, the documents selected for the systematic review and meta-analysis were all correlational studies that applied the "quality assessment and validity tool for correlational studies", a correlation quality evaluation tool. First, design evaluation items included detailed items such as prospective design and random sampling. Sample evaluation items were confirmed with subitems such as whether appropriately sized samples were extracted (whether the sample size was justified, whether data were collected from multiple institutions, whether anonymity was guaranteed, and whether the response rate was 60% or more). The evaluation items of the measurement tool included whether reliable and valid items were used and whether items with an internal reliability of 0.7 or more were used. Evaluation items of the theoretical background were items that could evaluate whether the theoretical background was presented. Finally, the statistical analysis evaluation item confirmed whether an appropriate statistical analysis was applied for the study's purpose. This included details such as statistical management methods for outliers. As a result of evaluating these detailed items, the research quality was judged to be excellent if the score was 8 or more out of 13 points.

Data abstraction

Animal studies, preclinical studies, nonoriginal studies (reviews), studies not published in Korean or English, studies not performed on appropriate patients, studies not carrying out appropriate interventions, studies not reporting statistical values, and duplicate publications were excluded. All these processes were conducted by two authors separately. A consensus was obtained through discussion for any disagreement between the two authors.

Data collection was done by extracting data as a pilot by filling out a standard form. After the two authors performed data extraction individually, they agreed on the final data through a research meeting. To eliminate the error caused by subjective judgment, data extraction was repeated at least twice.

Synthesis

Contents of the selected literature were described quantitatively. Based on the collected data, a meta-analysis was conducted on factors that applied to three or more studies. Standardized effect sizes of statistically reported individual studies (t, F, p, r, x^2) were calculated using the MS Excel effect size computation program [19]. Q tests were then performed to test homogeneity among studies [16]. Homogeneity was assessed by an I^2 test. A fixed-effect model was used for homogenization, and the mean effect size was calculated by combining effect sizes of individual studies using the Comprehensive Meta-Analysis 2.0 program (Biostat Inc., Englewood, NJ, USA) [20]. In this study, the mean effect size was calculated as the mean weighted correlation coefficient along with statistical significance. When studies were homogeneous, the average weighted correlation coefficient was calculated using the fixed-effect model [20]. Judgment of publication bias was based on a funnel plot with treatment effects (x-axis) measured in each

study and the scale (sample number or standard error, y-axis indicating the study's precision) [16].

Results

Literature selection process

Among the articles found, 76 studies were nonoriginal studies, 1 study was published in neither Korean nor English, 1,512 studies were not performed on appropriate patients, 25 studies did not carry out appropriate interventions, and 74 studies did not report influencing factors. Therefore, these studies were excluded. Finally, a total of seven works of the literature were selected. These were all correlational studies, and there were no experimental studies.

Definition of variables

After a review of the seven studies, the following variables were identified in an effort to describe the findings of this study. Within the framework of those reviewed studies, the variables are defined in the following section:

1) General characteristics

The reviewed studies contained two specific general characteristics (age and gender). Therefore, the definition of general characteristics in this study was limited to age and gender.

2) Food

The studies that were examined for this research mainly discussed the characteristics of food such as the temperature, quality, smell, texture, and the amount of food. In view of this, the variable "food" in this study indicates the characteristics of food.

3) Availability of meal choices

In line with the context of the reviewed studies, the availability of meal choices refers to a variety of meal options through the mealtimes.

4) Providing of personalized meals

As a variable, the provision of personalized meals refers to the preparation of food in a way that any specific circumstance in an older adult individual's life is taken into consideration. This includes whether the individual's life circumstances such as illness, disability, or physical weakness are taken into consideration as part of food preparation. Provision of personalized meals also pertains to whether the meals are appropriate to the individual's preferences, whether older adults are provided with seasonal foods, nutrients, or vitamins, and whether a nutritionist is available.

5) Social activity

Social activity can be defined as an activity considered appropriate on social occasions [21]. Within the context of the reviewed studies, social activity comprises family status, the presence of a food provider, satisfaction with neighborhood, satisfaction with the hospital, and satisfaction with life.

6) Mental health and physical health

The World Health Organization defines health as a state of complete physical, mental, and social well-being. Correspondingly, in this study, physical health is defined not as an absence of illness, but it is defined as general physical well-being [22]. Based on the World Health Organization's definition, mental health has been defined as a state of well-being in which the individual realizes his/her potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to contribute to his/her community [22].

Quality evaluation results

After conducting the systematic review, the seven studies were determined to be suitable for the research. All seven studies included in this meta-analysis were correlational studies. The representativeness of patients is important for the validity of a meal satisfaction tool. One of the evaluation indicators that reflect the representativeness of the included research is the sample size. All seven studies included in this meta-analysis were found to have appropriate sample sizes. The measurement tool also reported that there was no problem with the selected literature. As a result of quality evaluation, six studies scored 9 points and one study scored 10 points.

Characteristics of selected documents

Of the seven studies, five studies were conducted with older adults at home, whereas two studies were conducted with older adults who were acutely hospitalized. The tools used in these two studies were satisfaction with food-related life, whereas the others used the Wesley Hospital Foodservice Patient Satisfaction Questionnaire, meal satisfaction, Press Ganey satisfaction, satisfaction with meals, patient food satisfaction survey, or the Foodservice Satisfaction Questionnaire (Table 1).

Results of the systematic review

1) General characteristics

For general characteristics, age and gender were reported. One document reported the association of meal satisfaction with age [12,23]. This study showed that increasing age affected meal satisfaction with a correlation coefficient (r) of .11.

2) Food

Food, food quality, temperature, smell, frozen food, and meals have been described in the literature about satisfaction with food. The amount of food was reported in one study [24]. This study reported that food quality was affected by the increased amount of food, with an r of .15. Three studies [25–27] reported that food quality affected meal satisfaction, with an r of .76, .28, and .08, respectively. One study [25] reported that food temperature affected meal satisfaction, with an r of .65. One study [27] reported that food smell affected meal satisfaction, with an r of .21.

Two studies [27,28] reported a decrease in meal satisfaction owing to the provision of frozen food, with an r of .20 and .02, respectively. Only one study [24] reported that diluted meal type affected eating satisfaction, with an r of .04.

3) Availability of meal choices

Six studies [23–28] reported that eating satisfaction was affected by availability to choose meals, with an r of .54, .16, .03, .05, .19, and .08, respectively.

4) Provision of personalized meals

To determine whether personalized meals were provided, the capacity to provide personalized meals and presence of nutritionists were examined. Two studies [27,28] reported that eating satisfaction was affected by dietitians, with an r of .19 and .27, respectively. Three studies [25,26,28] reported that providing personalized meals affected meal satisfaction, with an r of .65, .04, and .08, respectively.

5) Social activity

Regarding social activity, the presence of family members, the presence of a food provider, and satisfaction with neighborhood, the hospital, and life were examined. Three studies [23,26,27] reported that the presence of family members affected meal satisfaction, with an r of .03, .08, and .03, respectively. Four studies [23,24,27,28] reported that the presence of a food provider affected meal satisfaction, with an r of .12, .01, .13, and .10, respectively. Two studies [26,27] reported that the satisfaction level of relationship with neighbors affected meal satisfaction, showing an r of .03 and .15, respectively. One [29] study reported that life satisfaction affected meal satisfaction, with an r of .36. One study [29] reported that satisfaction with the hospital affected meal satisfaction, with an r of .68.

6) Mental health

Two studies [26,29] reported that mental health affected meal satisfaction, with an r of .02 and .30, respectively.

7) Physical health

Three studies [23,27,29] reported that physical health affected meal satisfaction, with an r of .30, .26, and .09, respectively.

Meta-analysis results

Meta-analysis was conducted for the reported two or more indicators. Publication bias was confirmed when there were more than three publications.

1) Publication bias

The publication bias is shown in Figure 2.

2) Food

Food amount, quality, temperature, smell, frozen food, and meals were described in the literature about satisfaction with food. The meta-analysis of meal satisfaction according to food revealed an I^2 value of 96.60, showing high heterogeneity. The results of the analysis by each indicator revealed that providing frozen food had significant effects on meal satisfaction, with a pooled correlation coefficient of .15 ($p < .001$). Food quality also significantly affected meal satisfaction, with a pooled correlation coefficient of .24 ($p < .001$). Smell of food also had a significant effect on meal satisfaction, with a pooled correlation coefficient of .21 ($p < .001$).

3) Availability to choose meals

Six studies reported the effect of availability to choose meals on meal satisfaction. In the meta-analysis, the pooled correlation coefficient was .16 ($p < .001$).

Table 1 Main Characteristics of Selected Studies (N = 7).

Author (yr)	Place	N	Age (yrs)	Instrument	Factors	Quality
Skinnars (2017)	Home	1,154	85.4	Meal satisfaction	Guideline meal choice, councils, dietitians, private meal, chilled food, provider, on-site cooking	9
Barsamian (2010)	Home, chronic hospital	158	≧60: 46%	Press Ganey satisfaction	Meal choice, private meal, food quality, food temperature	9
Frongillo (2010)	Home	1,505	≥60	Satisfaction with meals	Meal choice, private meal, food quality, family, mental health, relationship with neighborhood	9
Dean (2008)	Home	3,291	≥65	Satisfaction with food-related life	Chilled food, dietitians, providers, food quality, smell, family, physical health, relationship with neighborhood, income, oral health, knowledge about food, organic food, meal choice	9
Grunert (2007)	Home	765	≥65	Satisfaction with food-related life	Mental health, physical health, satisfaction with hospital, satisfaction with life	9
Wright (2013)	Chronic hospital	313	≥60	Foodservice satisfaction questionnaire	Provider, age, family, physical health	10
Jefferies (2015)	Chronic hospital	240	≥60	Patient food satisfaction survey	Meal choice, provider, diet form, amount of diet	9

4) Provision of personalized meals

For this item, both personalized meals and nutritionists were checked. The meta-analysis showed that the pooled correlation coefficient was .27 ($p = .031$). Therefore, providing personalized meals had significant effects on meal satisfaction.

5) Social activity

Regarding social activities, it was confirmed that family status, the presence of a food provider, satisfaction with neighborhood, satisfaction with the hospital, and satisfaction with life could all affect meal satisfaction. The meta-analysis found that they had a significant effect on meal satisfaction, with a pooled correlation coefficient of .13 ($p < .001$). The pooled correlation coefficient for the effect of family members was .03 ($p = .015$), showing a significant effect although the effect size was small. The presence of a food provider also had a significant effect on meal satisfaction, with a pooled correlation coefficient of .11 ($p < .001$).

6) Mental health

Two studies reported that mental health could affect meal satisfaction. On the contrary, in the meta-analysis, the pooled correlation coefficient was .16 ($p = .258$), showing that mental health did not have a significant effect on meal satisfaction.

7) Physical health

Two studies reported that physical health could affect meal satisfaction (see Figure 1). In the meta-analysis, the pooled correlation coefficient was .28 ($p < .001$), confirming that physical health had a significant effect on meal satisfaction (Figure 3).

Discussion

The purpose of this study was to investigate factors affecting meal satisfaction in older adults with a systematic review and meta-analysis. Of 1,695 of the searched studies, 7 were finally included for the meta-analysis. Factors affecting meal satisfaction of older adults older than 60 years, who were evaluated in this study, were general characteristics, food, the presence of meal options and provision of personalized meals, social activities, mental health, and physical health.

Considering general characteristics as a factor, meal satisfaction levels were found to decrease with increasing age. This finding was consistent with the findings of the study by Cichero [30] that emphasized food texture. People's ability to feel food texture is known to decrease with age. The report shows that older adults should be provided with soft food because they may have problems in chewing food without teeth, dentures, and implants. This study emphasizes the necessity of conducting surveys on the perceptions of health to provide guidelines for the development of senior-friendly food that could be included in welfare services and policies regarding senior citizens.

The results of this study revealed that meal satisfaction was affected by factors such as quantity, quality, temperature, the smell of food, and whether or not the food was frozen. Evans and Crogan [3] argued that the provision of sufficient food affects a person's basic sense of happiness. Lee [31] who inquired into the meaning of meals to older adults in the nursing homes found that most residents often compared the amount of food they received with that of other people and complained when a person next to them was provided with more food than they were. Along with efforts to consider the psychological needs of older adults living in nursing homes and

geriatric hospitals, these institutions should allow their senior residents to determine the amount of food they receive. The outcome of the study also showed that meal satisfaction varied depending on the quality of the meal. Quality of food not only refers to the provision of fresh fruits and vegetables but also refers to the diversity of ingredients, the ease of preparing meals [32], and religious and cultural needs. If nursing homes and hospitals would consider the food preferences regarding these needs of older adults, this could help older adults feel satisfaction and joy and maintain a healthy life. Another finding of the study was that meal satisfaction levels were higher when one could smell the food. Aging-related changes may result in reduced olfactory functions in older adults [5]. Nursing homes that care for older adults should help stimulate their appetite by letting them participate in food preparation to increase their interest in the food served [5]. To compensate for their loss of the sense of smell, attempts should be made to improve the condition of food serving containers and food texture while providing food. Regarding the temperature of food, older adults who received warm food were more satisfied with their meals, whereas those who received frozen foods were less satisfied. The survey demonstrated that 77% of 140 people who were receiving food service preferred to receive warm food [33]. Although food production and delivery may cause deterioration of food or hygiene problems, older adults still want to receive warm food. As Rogers and Snow [34] also stressed, it should be considered that meals are not served too hot or too cold and that individuals' preferences for the temperature of food or drinks should be considered before serving them.

This study's findings also showed that to increase meal satisfaction in older adults, it was beneficial to offer food choices and personally tailored meals suitable for each older adult's environment. Datta et al [32] emphasized that there are insufficient evidence-based guidelines for individualized dietary service; they also argued that offering food choices, supporting independence, and promoting social interactions are key elements of mealtime care for nursing home residents. In that sense, it would be beneficial if community welfare centers switched to a buffet style to allow residents to choose from the menu what they want to eat or prepare a specific meal plan that involves a buffet meal once or twice a week. In this way, the amount of leftover food can also be reduced to a minimum.

Regarding the importance of the availability of personalized meals, meal satisfaction was high when one's diet composition was prepared by a nutritionist. In other words, nutritionists working in hospitals and nursing homes can provide balanced nutrients to the residents of their organizations, thus helping them maintain their health [35]. Khole et al [8] emphasized that the diet of older adults is influenced by changes in the residence and lifestyle, as well as by social, economic, physical, and psychological factors. Recently, owing to the increase in single older adult households and considering the lack of a diet provided by a nutritionist, the diet of senior people is affected mainly by their economic, physical, and social limitations. In the case of older adults who are discharged from a hospital, it could be beneficial to provide them with a nutritionist who prepares health-conscious menus for them at home. Therefore, it is necessary to develop an education program for hospital staff that considers patients' eating habits based on their recovery speed. This could allow them to restore their health and help them eliminate the possibility of rehospitalization and reduce their medical expenses.

Physical health was found to have a positive influence on meal satisfaction. Similarly, meal satisfaction also seemed to play an important role in preventing physical and mental complications and various diseases [36]. Among the older adults living in the community, on the one hand, there are older adults who are healthy and have the ability to live independently, whereas on the other hand, there are older adults who can live independently but are suffering from a disease. It could be beneficial to establish a
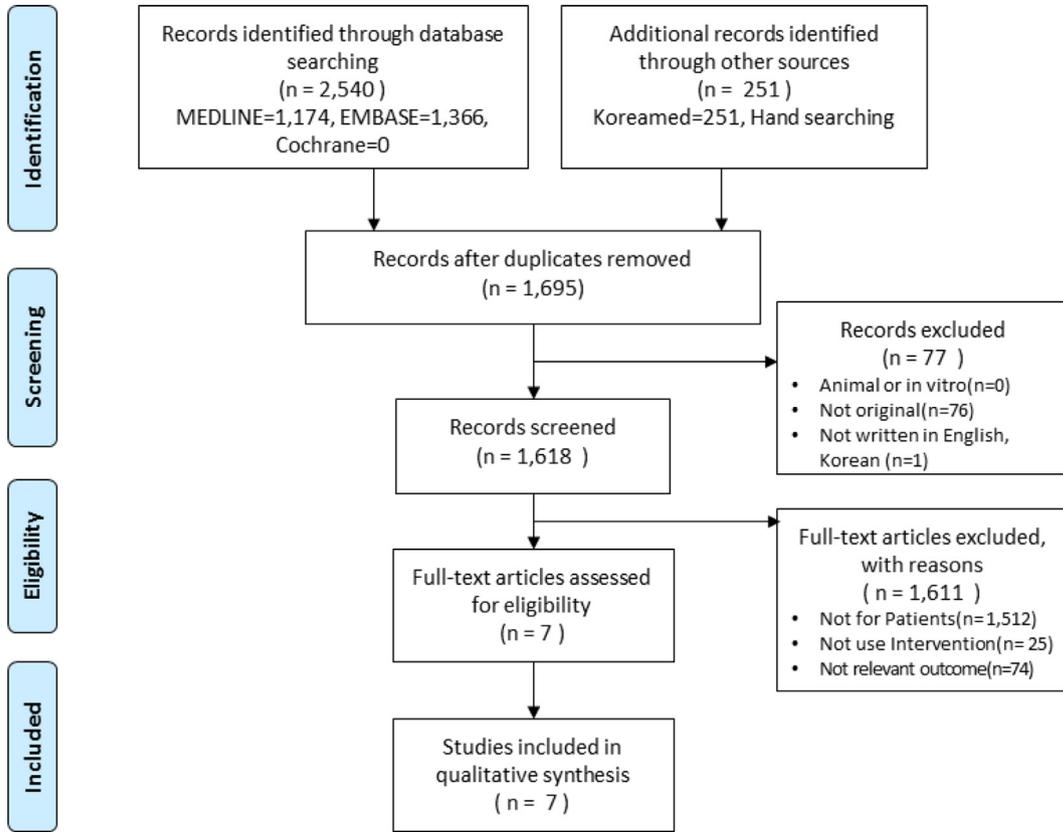
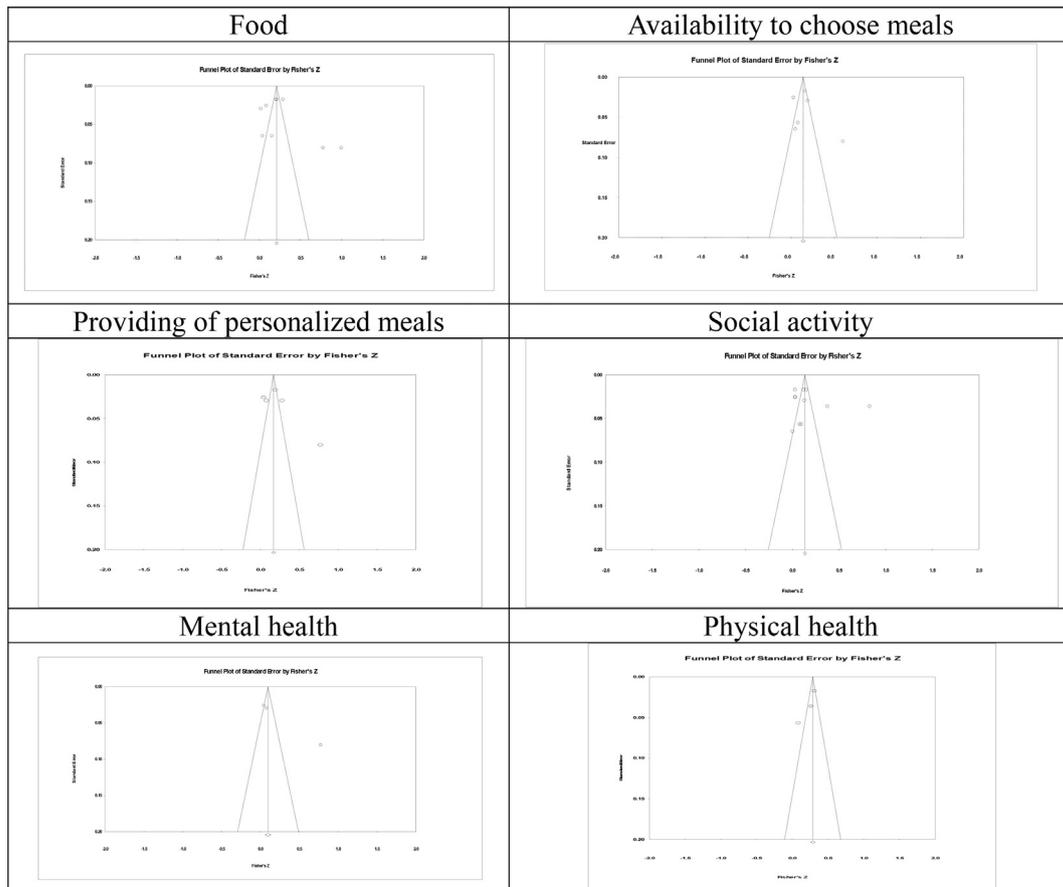Figure 1. Literature selection process.
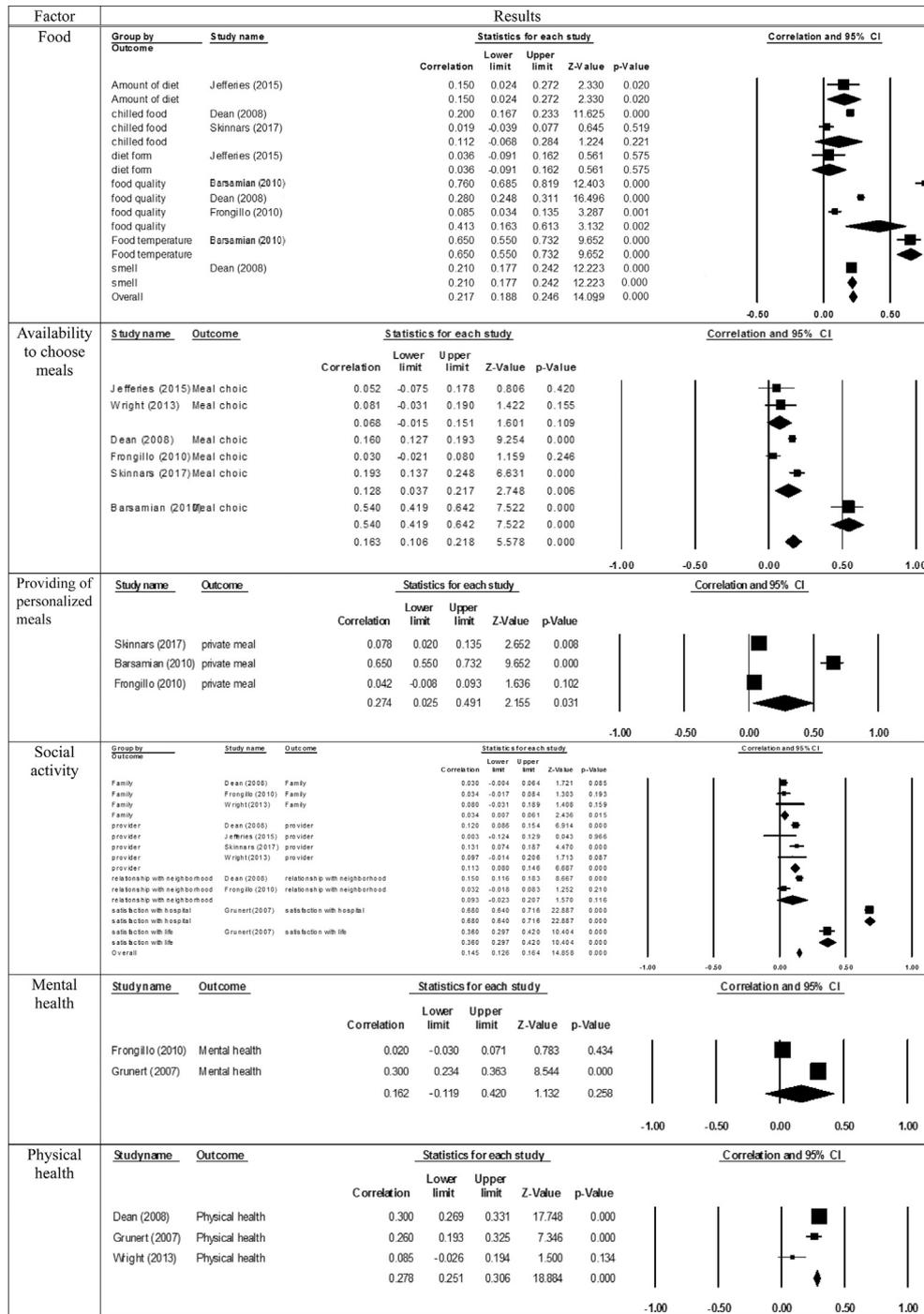

Figure 2. Publication bias.

Figure 3. Pooling result.
Note: CI = confidence interval.

system that can improve meal satisfaction in older adults by classifying older adults population using such characteristics.

In general, studies that focus on the effect of mental health on older adults' meal satisfaction tend to focus on negative aspects such as depression, anxiety, and helplessness. As a point of difference, this research aimed to determine which factors have a positive effect on meal satisfaction. The authors searched through records and screened 1,695 articles, but in this study, only correlational studies were analyzed and not experimental studies. This suggests that more research is needed in the study of meals and meal satisfaction in relation to older adults. In

addition, the results showed that although physical health affected meal satisfaction, the effect of mental health was not significant. It should also be considered that measuring satisfaction is difficult owing to its subjectivity. Therefore, more research is needed to measure the relation between mental health and meal satisfaction.

Limitations

Five of the seven studies included were of older adults living at home, whereas two studies were of patients in acute care hospitals

or nursing homes. Therefore, the results of this meta-analysis do not fully reflect the opinions of older adults in geriatric hospitals or nursing homes. Considering the fact that previous studies on meal satisfaction of older adults are limited, the age-group that consists of people who are 60 years and older was selected so that the study would be meaningful in understanding the factors affecting meal satisfaction in older adults.

Conclusion

This study performed a systematic literature review and conducted a meta-analysis to identify factors influencing meal satisfaction in older adults. Seven of 1,695 identified references were selected. For older adults who were able to choose their meals and were provided with customized meals suiting their taste, the satisfaction regarding meals was higher. The meal satisfaction of older adults should be dealt with in a more transparent, systematic, and detailed manner because it is directly related to the survival and healthy life of older adults.

The findings of this study could be used as basic data for concept analysis and for developing a tool measuring meal satisfaction in older adults. Such a tool could be used to assess the meal satisfaction of older adults living in welfare centers, hospitals, and nursing homes. Various institutions could benefit from this tool for making interventions to improve the health and quality of life of senior citizens in their care.

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Conflict of interest

The authors do not have any conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anr.2019.06.001.

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