Evaluating correlates of healthy eating and dietary quality among older adults: A mixed methods approach to development and application of a new survey instrument

by

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Abstract

Background: Community-dwelling older adults face unique challenges related to nutrition and health, but little is known about their unique barriers and facilitators for healthy eating behaviors. This study sought to develop a new instrument to measure the capability, opportunity, and motivation for healthy eating behaviors (COM-HE) among community-dwelling older adults. It also aimed to assess the validity, reliability, and acceptability of the new instrument and to examine associations between the COM-HE instrument and self-reported dietary quality.

Methods: A mixed methods approach was used to obtain qualitative and quantitative data. Participants were aged 65 years or older, community-dwelling, and English-speaking. Participants engaged in focus groups (n = 12) and pilot testing (n = 81) to evaluate the COM-HE instrument. The REAP-S questionnaire was utilized to examine correlations between the COM-HE instrument and self-reported dietary quality. Descriptive and inferential statistics were used to highlight potential relationships between study variables.

Results: The COM-HE instrument achieved acceptable internal validity (Cronbach's alpha = 0.847–0.986), displayed varying levels of unidimensionality based on multiple principal component analyses (total variance explained by three components = 86.72%), and was correlated with self-reported dietary quality scores (r = .409, adjusted R^2 = .099, p < .05). Preliminary data suggest that the scale was acceptable in terms of readability and understanding among a convenience sample of well-educated older adults.

Conclusion: The new COM-HE instrument was acceptable, reliable, and valid among a homogenous sample of adults over 65 years of age. These results suggest a need for additional development, evaluation, and refinement of the instrument in more diverse groups of older adults.

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Chapter 1 - Introduction

Adequate nutrition is a foundational component for maintaining independence and functional status among community-dwelling older adults, but little is known about the barriers and facilitators to practicing healthy eating behavior among this population. Furthermore, to our knowledge, the published peer-reviewed literature lacks an instrument for quantitatively measuring facilitators and barriers for healthy eating behaviors among community-dwelling older adults. Such an instrument would enhance the ability of health professionals to quickly identify appropriate nutrition interventions for this population, thus leading to improved dietary quality and health outcomes for community-dwelling older adults.

The implications of inadequate nutrition for a multitude of health outcomes are well established. Malnutrition, encompassing both undernutrition and overnutrition, is associated with increased risk of morbidity and mortality among older adults (Leslie & Hankey, 2015; Wallace et al., 1995). It is estimated that approximately 80% of adults over the age of 65 are living with at least one chronic condition, and one-third of older adults experience limitations in activities of daily living, which includes preparing meals (Olivari et al., 2018). Because nutrition is a modifiable risk factor, but age is a non-modifiable risk factor for chronic diseases such as diabetes, cardiovascular diseases, arthritis, respiratory diseases, and cancers, there exists an appropriate emphasis on nutrition-related interventions for maintaining and improving functionality and quality of life among the older adult population (Leslie & Hankey, 2015; Shlisky et al., 2017). In addition, higher dietary quality is associated with lower risk of developing limitations in activities of daily living and depression, and more favorable health outcomes such as reduced risk of hypertension, improved glycemic control and cognitive function, and better self-rated health and

quality of life (Cena & Calder, 2020; Govindaraju et al., 2018; Reedy et al., 2014; Zhao & Andreyeva, 2022).

While the importance of achieving adequate nutrition for health is recognized, older adults face significant barriers to attaining optimal nutrition status. Between 2001 and 2018, the proportion of older adults in the U.S. with poor dietary quality increased from 50.9% to 60.9% (Long et al., 2022). Nutrition behaviors are not determined solely by intrapersonal factors such as self-efficacy, beliefs, and attitudes towards nutrition, but are also influenced by social and environmental factors outside of the individual. When choosing appropriate behavior change interventions, those that consider multiple aspects may be more effective (Sallis, 2018). One framework that appropriately describes these interwoven aspects of nutrition behaviors is the Behavior Change Wheel (BCW).

Developed by Michie et al. (2011), the BCW aids in intervention development and the conceptualization of various barriers to and facilitators for health behaviors. The BCW includes a central system consisting of three core domains that interact to produce behavior: capability, opportunity, and motivation. This central system of the BCW is referred to as the COM-B model, where the three core domains Capability (C), Opportunity (O), and Motivation (M) influence Behavior (B) both directly and indirectly. The model posits that one or more of the components in the COM-B model needs to change in order to change behavior (Michie et al., 2014). The COM-B model has been employed as part of intervention designs for a variety of populations and target behaviors (Ayton et al., 2017; Rosenkranz et al., 2021; Timlin et al., 2020). Each of the three core domains comprises two subdomains that further differentiate between the types of capability, opportunity, and motivation, for a total of six subdomains within the COM-B model. Gaining an understanding of these six domains is helpful because they can identify barriers to adopting or

maintaining a certain behavior and identify modifiable factors that need to change in order to facilitate a certain behavior (Michie et al., 2011). These six subdomains are the correlates of healthy eating behaviors that were examined in the current study. Researchers have proposed use of the term "correlates" rather than "determinants" when discussing variables associated with certain health behaviors, because "determinants" suggests a causal relationship, which is outside the scope of the current study (Bauman et al., 2002). Thus, we sought to examine the following correlates of healthy eating behaviors: Capability (physical and psychological), Opportunity (physical and social), and Motivation (reflective and automatic). A modified COM-B model is illustrated in .

Most investigations of factors within the COM-B model are qualitative in nature (Ayakaka et al., 2017; Cerin et al., 2019; Lim et al., 2019; Petroka et al., 2017; Timlin et al., 2020). One pre-implementation study by Ayton et al. (2017) developed a survey to evaluate COM-B factors related to fall prevention in hospitals, but this survey only contained seven items and was not assessed for psychometric properties. A different study done by Balku et al. (2017) utilized the COM-B model to inform a set of questionnaires assessing general health behaviors among adults and schoolchildren, but the number of items on the final questionnaires ranged from 150 to 201 items, well above the number of items that could be completed in a brief sitting. To assist with the utilization of the COM-B model for quantitative data collection, a generic COM-B questionnaire was previously developed by Keyworth et al. (2020) with the intent of modification for use in a variety of behaviors and populations. To our knowledge, the generic questionnaire has not yet been modified for use in the context of nutrition-related behaviors within the older adult population. The most similar application of the COM-B model was found in a study by Timlin et al. (2020), which identified the barriers and facilitators of adopting the MIND diet among 40–55 year olds

through focus groups and interviews, but this did not involve the generic questionnaire nor attempt to develop a new standard COM-B questionnaire. As such, utilization of the COM-B model to quantitatively measure facilitators and barriers for healthy eating among community-dwelling older adults represents an important gap in the available research literature.

While it is useful to understand the facilitators and barriers for nutrition-related behaviors in order to identify appropriate nutrition interventions, an examination of whether these correlates are associated with actual dietary quality is also warranted. Efforts to identify and intervene within areas of capability, opportunity, and motivation would be futile if improvements in actual dietary quality were not expected. Thus, it would be beneficial to determine whether certain behavioral determinants are related to actual dietary quality or not. For this reason, an assessment of dietary quality was also included in the current study.

Many methods are available to measure dietary quality, however, there is no "perfect" measurement for this type of assessment. Certain methods that provide highly accurate food intake data also result in substantial burden to the participant or researcher (e.g., weighing and recording all foods and drinks consumed over multiple days), and methods that are relatively easy to conduct are typically prone to greater levels of bias and may not be valid for determining usual dietary intake (e.g., 24-hour food recalls; Shim et al., 2014). Considering the characteristics of the population in the present study, the Rapid Eating Assessment for Participants – Shortened Version (REAP-S) instrument was selected as the tool to measure dietary quality. The REAP-S is a simple and quick dietary assessment tool which takes approximately 10 minutes to administer and is correlated with the 2010 Healthy Eating Index (Gans et al., 2006; Johnston et al., 2018; Segal-Isaacson et al., 2004). The instrument comprises 13 items that result in possible scores ranging from 13 to 39, with higher scores indicating higher dietary quality.

With these considerations in mind, the primary aim of the current study was to develop a new instrument to measure the correlates of healthy eating behaviors in older adults, guided by the COM-B model. Secondary outcomes of the instrument development process included evaluating psychometric properties including validity, reliability, and acceptability of the new instrument; and examining associations between the COM-B model components and self-reported dietary quality among community-dwelling older adults.

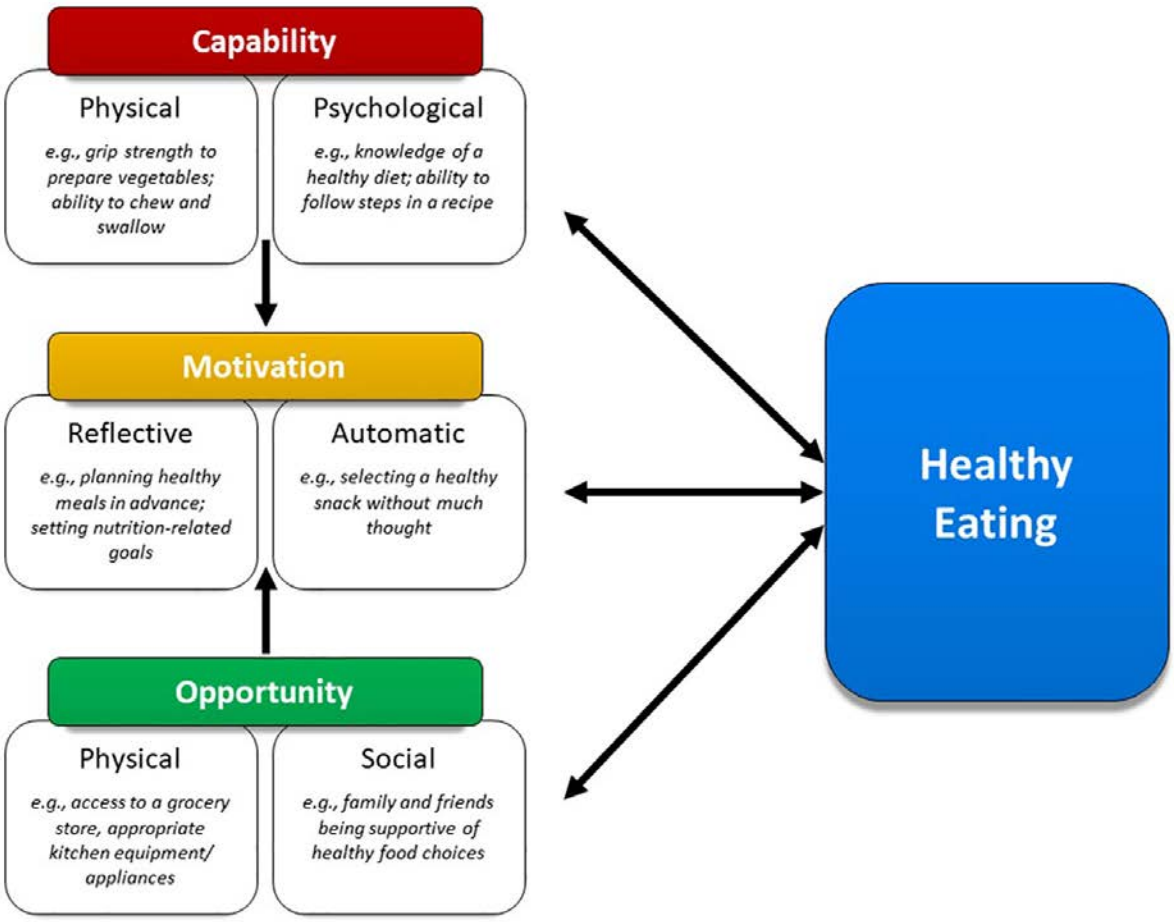

Figure 1.1 Capability, opportunity, and motivation for healthy eating behaviors

Chapter 2 - Methods

Study Design

A mixed methods approach was used to collect both qualitative and quantitative data. Study design was informed by the three phases for best practices in scale (i.e., instrument) development described by Boateng et al. (2018), which included item development, instrument development, and instrument evaluation (i.e., data analysis). Item development differed from instrument development in that item development involved generation of individual questions (i.e., items) that had potential to be included in the subdomains within the new instrument; instrument development involved compiling those items into one concise, cohesive instrument using an online survey platform. Participant recruitment was divided into two phases, referred to as Phase I: Focus Groups, and Phase II: Pilot Testing. The current study was submitted to the Kansas State University Institutional Review Board and received approval number 10911. The study methods are presented according to the chronological order in which they occurred over the timeline of the study, beginning with item development and progressing to participant recruitment, instrument development, and instrument evaluation. The process of instrument development activities is described in

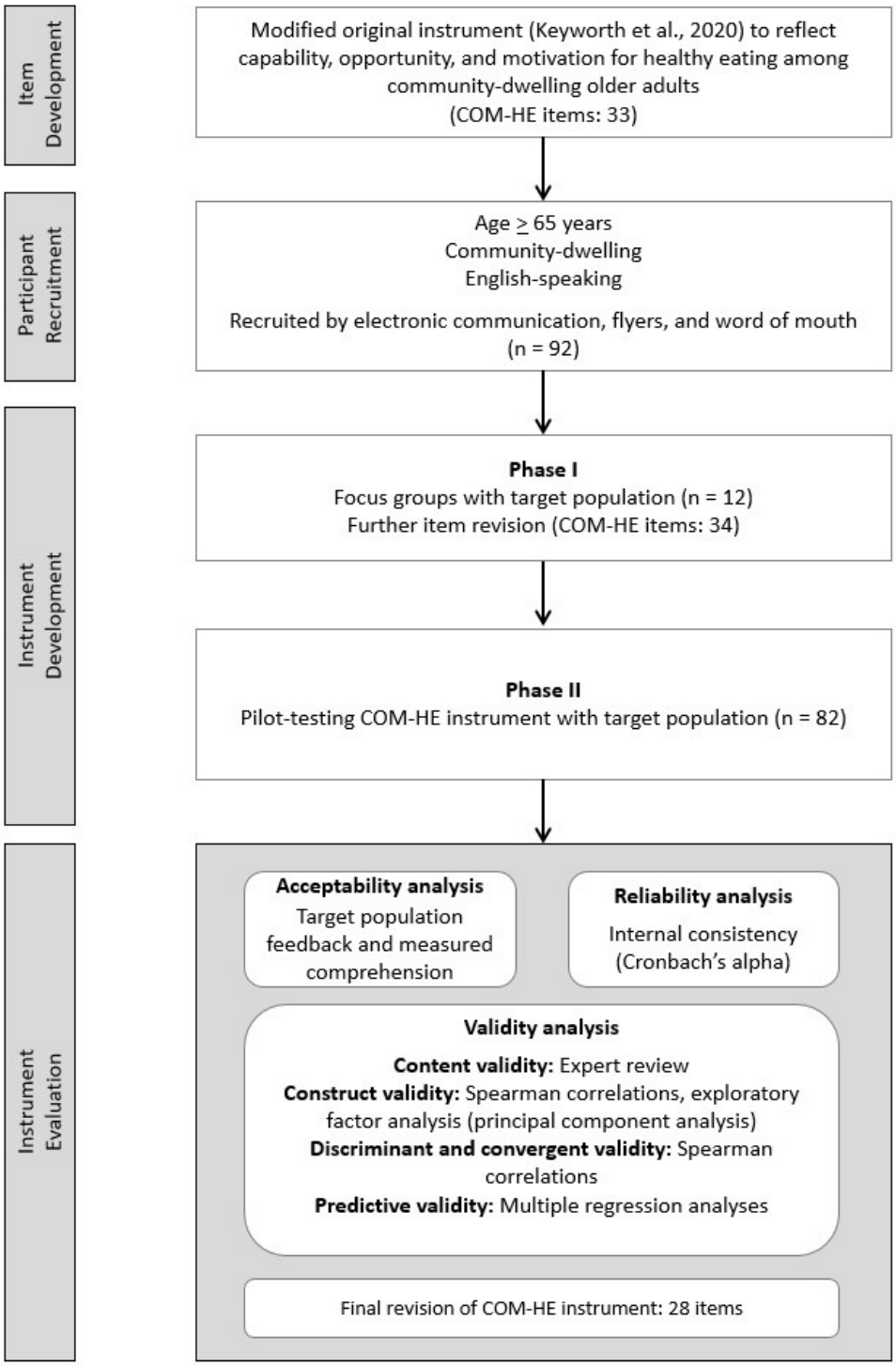

Figure 2.1 Development process for COM-HE instrument

Item Development

Original Items

The basis for the instrument in the present study originated from a previously developed questionnaire by Keyworth et al.(2020), which transformed each of the six subdomains in the COM-B model into a six-item generic questionnaire. In other words, each subdomain of the COM-B model was evaluated using only one item with wording that could be applied to any population with any target behavior. For example, the item evaluating physical opportunity stated, "*I have the PHYSICAL opportunity to change my behavior to improve my health.*" The generic questionnaire items were arranged in the following order: 1) physical opportunity, 2) social opportunity, 3) reflective motivation, 4) automatic motivation, 5) physical capability, and 6) psychological capability. Following each item, a brief definition of the subdomain was provided. Each item was measured using a 10-point Likert scale ranging from 0 (strongly disagree) to 10 (strongly agree). Following the suggestion from Keyworth et al. (2020) with regard to recommendations for the future use of their six-item questionnaire, the 'don't know' option was excluded from the current instrument.

COM-HE Items

The generic questionnaire was modified to further evaluate the capability, opportunity, and motivation for healthy eating behaviors (COM-HE) among community-dwelling older adults. Following the guidelines for best practices for instrument development, we first confirmed that there were no existing instruments measuring the capability, opportunity, and motivation for healthy eating behaviors in community-dwelling older adults. The COM-HE instrument included the same six subdomains as the original instrument. The purposes of each of the six subdomains were discussed by a panel of experts and definitions were generated to clarify the meaning of each

subscale for this study. Collaboration and practical expertise in nutrition, gerontology, and behavior change were imperative for the thoughtful expansion of each of the six subdomains to reflect the facilitators and barriers for nutrition-related behaviors unique to community-dwelling older adults.

Based on the original definitions for COM provided by Michie et al. (2011), we expanded each domain and subdomain to include language specific to nutrition-related issues for older adults. The resulting expanded definitions from this process are presented in .

Considering that physical limitations in activities of daily living are experienced by 80% of older adults (Olivari et al., 2018), we considered the ability to work around disability (not necessarily to be free of disability) as a component of the physical capability definition. Age-related changes to chewing and swallowing ability were also considered when defining physical capability, as it has been estimated that 15% of community-dwelling older adults experience dysphagia (Madhavan et al., 2016). Knowledge of the foods that comprise a general healthy dietary pattern is an essential component of the psychological capability subdomain, as are the abilities to comprehend, reason, and remember.

Physical opportunity involves the degree to which one's environment facilitates healthy eating behaviors, such as the proximity to healthy food sources, financial resources, and cooking equipment. Time was also included in the physical opportunity subdomain, as this is a resource that may enable or prevent one from practicing healthy eating behaviors. Social opportunity includes social and cultural norms, including the values, attitudes, habits, and customs that one is associated with (Reddy & Anitha, 2015). This also includes influences from peers, such as having the support of family and friends to make healthy food choices.

Within the reflective motivation definition, we considered outcome expectancies to play a role, such as the belief that maintaining a healthy diet will lead to improved health outcomes. Having goals, making plans, and deliberately intending to eat healthfully are also included in the reflective motivation subscale definition. Finally, automatic motivation includes an individual's wants, needs, impulses, and reflex responses towards eating behaviors. This also includes one's habits and mindless eating behaviors.

Once these subdomains were clearly defined, we sought to generate a number of items that would capture the desired aspects of each subscale without resulting in substantial participant burden of having too many items on a survey. Salutogenic language was used in the majority of the newly generated items to illustrate the focus on the health-promoting properties of eating behavior, rather than on disease-related properties (i.e., *"If I practice healthy eating, I expect that I will experience many health benefits (e.g., more energy, reduced risk of illness, living longer"*). However, the last item within each subdomain used non-salutogenic language (i.e., *"I do NOT want to practice healthy eating"*) for the purpose of easier identification of outliers and item misunderstanding during survey administration.

Because "healthy eating" can mean different things for different individuals even within the same family (Bisogni et al., 2012), we operationally defined the term healthy eating for the purpose of the current study. This comprehensive definition was included in the introduction section of the COM-HE instrument. The healthy eating definition was determined by referencing national and international recommendations for the components of dietary patterns that are conducive to positive health, including those from the 2015–2020 Dietary Guidelines for Americans (Dietary Guidelines Advisory Committee, 2015), the World Health Organization (2020), and previous literature on the social and cultural aspects of eating behaviors (Monterrosa

et al., 2020; O'Reilly et al., 2014; Rozin, 2005). Boundaries of this definition were also specified to further clarify the meaning of healthy eating for study participants. For example, after determining what the definition for healthy eating did include, it was also specified that healthy eating did *not* include trying the latest diet, restricting entire food groups for non-medical reasons, or eating excess added sugars, saturated fats, and *trans* fats. The full definition for "healthy eating" can be found in the introduction section of the COM-HE instrument in Appendix A.

This initial development process resulted in the generation of five to seven items for each subdomain in the draft COM-HE instrument. The draft instrument underwent continual revision until it was determined to be satisfactory to enter Phase I, which involved gathering feedback from the target population during focus groups. The final draft instrument comprised 33 items and was entered into Qualtrics, a user-friendly online survey software platform.

Domains	Capability	Opportunity	Motivation
Subdomains	**Physical Capability** • Energy, stamina, strength • Ability to work around physical limitations (disability, chronic conditions) • Body can handle the demands of obtaining, preparing, and consuming healthy foods	**Physical Opportunity** • Proximity to healthy food sources • Financial resources • Transportation • Kitchen equipment and appliances • Time	**Reflective Motivation** • Having goals and making plans • Considering outcome expectations • Considering pros/cons of healthy eating • Intent to eat healthfully
	Psychological Capability • Knowledge of a healthy dietary pattern • Comprehension and reasoning • Decision-making processes • Memory	**Social Opportunity** • Social and cultural norms • Support from family and friends • Modeling behavior • Peer influences	**Automatic Motivation** • Wants and needs • Impulse and reflex responses • Having a habit of eating healthfully • Mindless behaviors

Figure 2.2 Expanded definitions of C, O, M

Participant Recruitment

A convenience sample of eligible participants was obtained through electronic communication, flyers in public spaces, and word of mouth in the Riley County, Kansas area. Eligible participants were 1) aged 65 years or older, 2) community-dwelling (e.g., not residing in a nursing home, assisted living community, memory care facility, etc.), and 3) English-speaking. The inclusion criteria was intentionally kept as broad as possible for the purpose of gaining a representative sample of the local population. Individuals who were interested in the study were invited to initiate email correspondence with the researcher to receive additional information and confirm eligibility requirements. The study was described carefully in writing, any questions were answered, and informed consent was obtained prior to study participation. Participation was incentivized by entering each participant into a raffle for one of forty $25 grocery store gift cards upon completion of the study.

Twelve participants completed focus groups to evaluate the draft COM-HE instrument during Phase I, and all focus group participants opted to continue into Phase II. An additional 80 participants expressed interest in Phase II for a total $n = 92$. Out of these individuals, 82 completed pilot testing and 81 were included in data analysis. A diagram of recruitment flow can be found in

.

Instrument Development

Phase I: Focus groups

The purpose of conducting focus groups with members of the target population was to ensure participant comprehension of items, uncover any problematic items, and determine whether the items elicited the intended information (Boateng et al., 2018). Involvement of the target population in item development can help establish face validity, or whether an instrument appears

to measure what it aims to measure on the surface (Fink, 2010). Based on general focus group recommendations of having no less than four and no more than 12 participants per focus group (Carlsen & Glenton, 2011), we aimed to include five to eight participants per focus group with a total of 20–30 participants in Phase I. Four focus group sessions were held in-person at the Physical Activity and Nutrition Clinical Research Consortium (PAN-CRC) lab, virtually via Zoom, and through a hybrid of in-person and virtual groups. Practical limitations including scheduling conflicts and low interest in focus group participation prevented the complete adherence to focus group guidelines such that only two groups achieved more than four participants per group (group 1: $n = 5$; group 2: $n = 1$; group 3: $n = 2$; group 4: $n = 4$). During the focus group sessions, the draft COM-HE instrument was displayed on a screen and participant feedback was elicited through the use of semi-structured interview questions asked by one researcher. Drawing on recommendations from Carbone et al. (2002), the predetermined list of interview questions reflected a modified form of cognitive interviewing. This approach involved the use of retrospective and paraphrasing techniques with the flexibility to ask probing questions to elicit additional clarifying information. Participant comments were typed into a spreadsheet by three trained research assistants. No audio or video recordings were collected.

Suggestions from participants were considered and some were tested throughout the focus group phase to gauge acceptability of items that were revised or added. For example, participants in the first focus group suggested making a change to the item *"I want to practice healthy eating to improve my overall health,"* to reflect the fact that some older individuals might have a goal of maintaining, rather than improving, their overall health. Consequently, a new item was created to reflect this suggestion, and participants in the remaining focus group sessions were shown both the original and the modified version of the item to provide feedback on the proposed change.

Participants were also asked to provide their general format-related preferences for completing online questionnaires, such as only one question being displayed at a time, being able to use "back" buttons to access previously answered questions, and the presence of a progress bar.

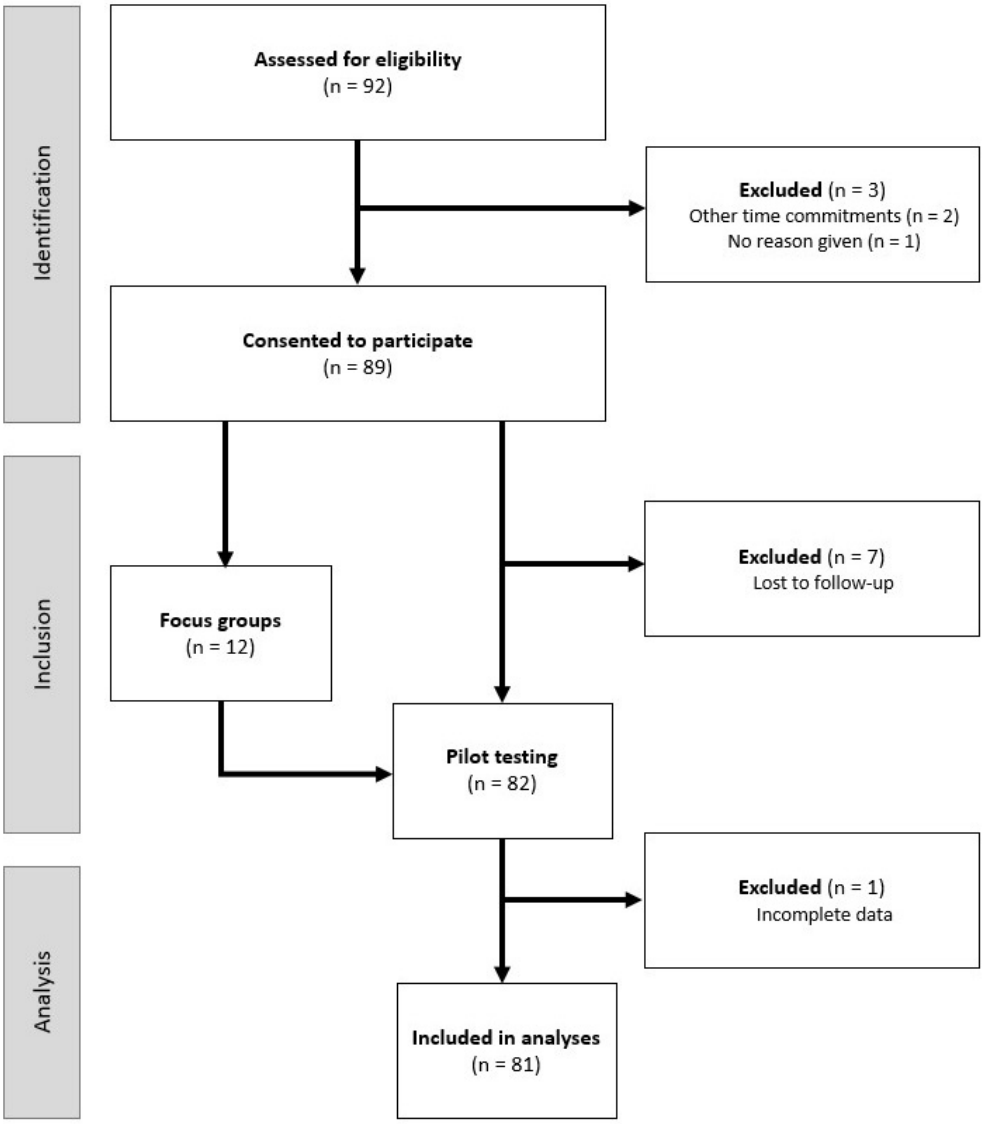

Figure 2.3 Participant Flow Diagram

Phase II: Pilot testing with target population

The pilot testing phase involved administering the revised COM-HE instrument to participants at two time points, approximately two weeks apart; and administering the REAP-S questionnaire at the first time point to obtain a measure of self-reported dietary quality. The two time points for data collection aimed to provide an assessment of reliability of the COM-HE instrument; however, these follow-up results are not yet complete and are not included in the current report. Both instruments were administered via Qualtrics, and participants received a link via email to complete the surveys. Reminders were provided approximately three days following the initial email if the survey responses had not yet been recorded.

The REAP-S questionnaire was modified slightly for easier application within Qualtrics, and two items were changed to more appropriately reflect current nutrition guidelines. Of the two modified items, the first evaluated dairy consumption, and the phrase “or dairy alternatives” was added to encompass current trends in the presence of dairy alternatives in the U.S. food supply (H. Stewart et al., 2020). The second modified item evaluated snack food consumption, which included a measurement of “regular potato chips, nacho chips, corn chips, crackers, regular popcorn, [and] nuts” — the food item “nuts” was removed from this category of other salty snack foods, as nuts are generally considered to be health promoting.

Data Analysis

Qualitative Analysis

Content analysis of qualitative data was conducted to categorize comments from participants regarding the COM-HE instrument during Phase I and Phase II. Phase I content analysis involved a thorough examination of the verbal comments transcribed for each item of the draft COM-HE instrument after all focus group sessions were completed. The purpose of content

analysis was to develop a deeper understanding of participants' thought processes while reading each item to ascertain comprehension of the concepts the items intended to measure (Kleinheksel et al., 2020). While it is more common in qualitative content analysis to identify salient themes as they emerge during thematic analysis of the text, the process of setting "templates," or a priori codes, is also an acceptable method of qualitative analysis and was useful for the purpose of this study (Neuendorf, 2019). Three categories were determined a priori to help differentiate between the items that appeared to 1) achieve sufficient understanding, 2) achieve moderate understanding, and 3) fail to achieve understanding among the target population. Items were coded as achieving sufficient understanding if at least two-thirds of focus group participants provided comments indicating a correct interpretation of the item (i.e., "This question *[I have the physical capability needed to practice healthy eating]* makes me think about my physical health and how I can prepare meals for myself," suggestive of a correct interpretation of the item by this participant). Items were coded as achieving moderate understanding if less than two-thirds but more than one-third of the participants made comments that indicated a correct interpretation, or when there was agreement among two or more participants that a revision should be considered by researchers (i.e., "I agree with [participant] that you should add the word 'maintain'"). Items were coded as failing to achieve understanding if less than one-third of focus group participants provided comments suggestive of correct interpretation of the item, or when there was general confusion about the meaning of an item. Items coded into the latter two categories were more carefully examined and revised to enhance readability and understanding for the final version of the COM-HE instrument. A summary of Phase I content analysis can be found in Table 3.2.

Content analysis in Phase II involved a similar examination of typed comments from the six open-ended questions, one from each subdomain, of the COM-HE instrument. These questions

were intended to uncover additional information regarding participants' apparent understanding of the items within each subdomain. Similar to the Keyworth et al. study, participant comments on the items in each subdomain were coded into a priori categories of "positive," "negative," or "neutral." Comments were coded as positive if agreement or enjoyment of the items was indicated; negative if confusion or dislike of the questions was expressed; and neutral if the thinking process for answering the questions was explained, personal health or nutrition behaviors were mentioned, or other features of the survey were noted. A summary of Phase II content analysis combined with the quantitative measures of understanding and ease of reading can be found in Table 3.4.

Quantitative Analysis

Quantitative data analyses included descriptive and inferential statistics using IBM SPSS Statistics software Version 28. Psychometric testing included the properties of acceptability, reliability, and validity. Chi-square tests of independence (χ^2) were used to evaluate potential differences in demographic variables (age, gender, education, and employment).

Acceptability

Acceptability was assessed by determining the readability and understanding of the subscales using two quantitative questions at the end of each subscale: 1) 'Overall, did you find the previous set of questions difficult or easy to read?' rated on a Likert type scale from 0 (difficult to read) to 10 (easy to read), and 2) 'Overall, how confident are you that you understood what the previous set of questions were asking?' rated on a Likert type scale from 0 (not at all confident) to 10 (very confident). Mean and standard deviation of the ratings were determined and are presented alongside the qualitative analysis in Table 3.4.

An evaluation of floor and ceiling effects was also utilized to gauge acceptability of the scale items within this sample of older adults. Floor and ceiling effects are considered to be present

when 15% of participants achieve the lowest or highest possible score on an item or scale, making it difficult to distinguish low-scoring or high-scoring individuals from one another (Terwee et al., 2007). Floor and ceiling effects are generally considered to be undesirable, because these effects can occur when scales lack extreme items on either end of measurement, but can also be present when the respondents are very similar to one another (Liu & Wang, 2021; Uttl, 2005).

Reliability

Internal consistency, which is a measure of reliability, was assessed using Cronbach's alpha levels. Alphas were determined for each subscale separately, and for the six COM-HE subscales together. This also involved an evaluation of the Cronbach's alpha if any one item was deleted. In general, Cronbach's alpha levels ranging from 0.70 to 0.95 are desirable and indicate acceptable internal consistency; however, alpha levels greater than 0.90 may indicate redundancy of scale items (Tavakol & Dennick, 2011). Cronbach's alpha levels determine the internal consistency of a scale, or the inter-relatedness of the items in a scale, and operate on the assumption that a scale is unidimensional (Tavakol & Dennick, 2011). While unidimensionality is related to internal consistency, it is a measure of construct validity rather than reliability.

Validity

Construct validity was evaluated with the principal component analysis (PCA) method of exploratory factor analysis (Watkins, 2018). Unidimensionality is ascertained through PCA by testing whether a set of items in a scale measure a single concept or construct (Tavakol & Dennick, 2011; Terwee et al., 2007; Watkins, 2018). While we did not expect to see a clear delineation of distinct components due to the COM factors having some related concepts even across subscales, we did expect the related subscales to have higher component loadings than the unrelated subscales. For example, we would expect to see some degree of overlap between psychological

capability (i.e., decision-making processes) and reflective motivation (i.e., considering the outcome expectations of healthy eating) as both of these subdomains involve deliberate thinking processes.

Multiple primary component analysis (PCA) tests were conducted to assess the dimensionality of the COM-HE instrument. PCA is useful for examining the items or subscales that contribute to any one component. The first set of PCA tests examined each subscale separately by loading all of a subscale's items and extracting one factor per test. This provided an evaluation of the unidimensionality, or whether the items in each subscale measured only one component. The six subscales were loaded together to extract three factors to assess whether the subscales reflected three separate components. Next, paired subscales (i.e., physical + psychological capability; reflective + automatic motivation; and physical + social opportunity) were tested by extracting two factors per test to examine whether each of the three core domains were measuring two separate components. Finally, all 28 COM-HE items were tested together to extract six factors to examine whether the six separate subscales measured six separate components. Eigenvalues were evaluated to assess the variance that could be explained by the extracted factor(s) (UCLA: Statistical Consulting Group, n.d.).

Discriminant and convergent validity were assessed using Spearman correlations, as a non-normal distribution was observed with all COM-HE subscales favoring negative skewness (Schober et al., 2018). Convergent validity describes the extent of correlation between two variables that theoretically are related; and discriminant validity describes the lack of correlation between two constructs that theoretically are not related to one another (Trochim, 2022). For example, we would expect the subscales within the capability scale to be highly correlated, but we may not expect as high levels of correlation between the capability and motivation scales. As a

general rule of interpretation, correlation coefficients between 0.90–1.0 indicate very strong correlations; coefficients between 0.70–0.89 indicate strong correlations; coefficients between 0.40–0.69 indicate moderate correlations, and coefficients of 0.39 or below indicate weak correlations (Schober et al., 2018). Correlation coefficients can be squared to find the coefficient of determination, which provides an interpretation of the proportion of variance in one variable that can be explained by the other, and vice versa (Schober et al., 2018).

Finally, predictive validity was assessed using a series of multiple regression models to examine associations between the COM-HE variables and REAP-S scores. The subscales were assessed for individual correlation with REAP-S score, then paired to assess the C, O, and M scales and REAP-S score, and finally with the COM-HE instrument as a whole. REAP-S scores were determined by adding together the scores for the first 13 items for each participants. Scores cold range from 13 to 39, with higher scores reflecting higher dietary quality.

Chapter 3 - Results

Participant Characteristics

A total of 81 study participants were included in analyses. The mean age of participants was 73.5 years (*SD* = 6.31), and the majority were female (63%). There was a marked lack of ethnic diversity in this sample, with 100% of participants describing themselves as non-Hispanic White (*n* = 81). The sample was also highly educated, with 82.7% of participants holding a bachelor's degree or higher. Males and females were not significantly different from one another based on education ($\chi^2 = 5.25$, $p = .263$) employment status ($\chi^2 = 6{,}24$ $p = .101$), or age ($\chi^2 = 9.02$, $p = .061$). Participant characteristics are presented in Table 3.1.

Table 3.1 Participant characteristics

	Total (*n* = 81)		**Male (*n* = 30)**		**Female (*n* = 51)**	
Variable	***n***	***%***	***n***	***%***	***n***	***%***
Gender						
Male	30	(37.0)				
Female	51	(63.0)				
Prefer to self-describe	0	(0)				
Total	81					
Ethnicity						
White	81	(100)				
Other	0	(0)				
Total	81					
Education						
Less than 9th grade	0	(0)	0	(0)	0	(0)
9–12th grade, no diploma	0	(0)	0	(0)	0	(0)
High school or GED equivalent	1	(1.2)	0	(0)	1	(2.0)
Associate's degree or vocational training	6	(7.4)	1	(3.3)	5	(9.8)
Some college (no degree)	7	(8.6)	1	(3.3)	6	(11.8)
Bachelor's degree	27	(33.3)	9	(30.0)	18	(35.3)
Graduate or professional degree	40	(49.4)	19	(63.3)	21	(41.2)
Total	81		30		51	
Employment status						
Not working (retired)	62	(76.5)	23	(76.7)	39	(76.5)

Working (paid employee)	12	(14.8)	2	(6.7)	10	(19.6)
Working part time (paid or unpaid)	5	(6.2)	4	(13.3)	1	(2.0)
Working (self-employed)	2	(2.5)	1	(3.3)	1	(2.0)
Total	81		30		51	
	(Total)		**(Male)**		**(Female)**	
Age (years)	***Mean***	***(SD)***	***Mean***	***(SD)***	***Mean***	***(SD)***
	73.54	(6.31)	75.83	(6.65)	72.20	(5.74)

Phase I: Focus Groups

Content analysis of focus group data indicated adequate acceptability of the draft COM-HE instrument and revealed 13 items that were perceived as problematic among the target population based on the coding criteria outlined for the qualitative analysis. Out of the 33 COM-HE subscale items and eight descriptions assessed by participants during the focus group sessions, 26 subscale items (79%) and 2 descriptions (25%) achieved sufficient understanding and did not need to be modified, suggesting appropriate face validity of the generated items. Four subscale items (12%) and 3 descriptions (38%) achieved moderate understanding and were modified only slightly. Finally, 3 subscale items (9%) and 3 descriptions (38%) failed to achieve understanding and underwent significant modification before inclusion in the final instrument. A summary of item modification following Phase I is presented in Table 3.2.

Participants appeared to have the greatest difficulty understanding the descriptions of each subscale (5 out of 6 descriptions required revision). In terms of achieving understanding of items within subscales, participants appeared to have the most difficulty with items in the reflective motivation subscale (3 out of 7 items required modification). Participants expressed the greatest levels of understanding for items in the psychological capability, automatic motivation, and physical opportunity subscales, in which there were zero item revisions required. These results

indicate adequate face validity of instrument items among the target population. After making revisions to problematic items and descriptions, 34 items across six subscales were pilot tested in Phase II.

Table 3.2 Content analysis of focus group data

Category	COM-HE item or description	Resulting modifications	Quotes to support item modification
Items failing to achieve understanding (n = 6)	*Healthy eating description:* A diet that reflects healthy eating includes vegetables, fruits, whole grains, low-fat dairy or dairy alternative, seafood, legumes, nuts, moderate consumption of alcohol (up to 2 drinks per day for men; up to 1 drink per day for women) if alcohol is consumed at all; lower in red and processed meat, low in sugar-sweetened foods and drinks and refined grains.	Addition of "foods appropriate for personal medical conditions"	"[It] depends on personal health. I can't eat whole grains because of the potassium."
		Addition of food item examples in multiple categories	"Is pork considered a red meat?"
	Physical opportunity description: What is PHYSICAL opportunity? Your surroundings (e.g., the places where you live, work, and visit) provide the opportunity to practice healthy eating. Physical opportunity also includes material and non-material resources like money, equipment, time, and transportation.	Added emphasis on "access" and providing nutrition-related examples of resources (kitchen equipment and appliances)	"[I'm thinking] more along the lines of physical activity, not opportunity. What if you said 'physical access'?"
	Social opportunity description: What is SOCIAL opportunity? Influences from other people, social cues, and cultural norms provide the opportunity to practice healthy eating. (e.g., Support from friends and family)	Clarification of the meaning of cultural norms related to healthy eating behaviors	"[I'm] struggling with cultural norms. What is meant by culture?"
	Social opportunity item: Healthy eating is common for people in my culture.	Modification to emphasize aspect of social connectedness	"How do I define my culture? I have trouble with cultural norms. People's definitions will be different for culture."
			"Maybe try saying, 'Healthy eating is common is my social circles.'"

	Reflective motivation item: The benefits of healthy eating outweigh the costs.	Modification to use "positives" and "negatives" rather than "benefits" and "costs"	"When I hear 'costs' I think of money, but I know there are other costs to healthy eating. But by seeing the word, it almost makes me focus only on the money cost."
	Physical capability item: My body feels fully able to allow me to practice healthy eating.	Clarification of "fully able" and addition of examples	"Could you include something more descriptive? Like, 'I am able to go to the grocery store, purchase the food, prepare the food, store it, able to chew it, and clean up.'"
Items achieving moderate understanding (n = 7)	*Social opportunity item:* My friends and family are supportive of my healthy eating practices.	Separation of the double-barreled question into two separate items	"In some cases maybe your friends are pushing you in one direction with food and then your family in another. Maybe split the question into two."
	Reflective motivation description: What is REFLECTIVE motivation? Having goals, making decisions, and conscious planning and beliefs about the good and bad consequences of healthy eating. (e.g., I intend to…; I have the desire to…; I feel the need to practice healthy eating)	Clarification of "good and bad consequences of healthy eating"	"Do I consider why I desire to make certain healthy or non-healthy eating patterns?"
	Reflective motivation item: I want to practice healthy eating to improve my overall health.	Addition of the word "maintain"	"I think maintain would be better than improve… I suppose I could always improve but I am more focused on maintaining [my health]."
	Reflective motivation item: I think that I should practice healthy eating so that I can lower my risks related to chronic disease.	Addition of examples of chronic diseases	"The things that come to mind with chronic diseases are diabetes, heart issues, arthritis... any chronic disease that can be impacted by healthy eating."

	Automatic motivation description: What is AUTOMATIC motivation? Doing something without needing to think about it or having to consciously remember. (e.g., Healthy eating is something I do before I realize I'm doing it.)	Inclusion of the word "habit"	"What you're used to — your habits."
	Physical capability description: What is PHYSICAL capability? Having the physical skill, strength, or stamina needed to practice healthy eating. (e.g., I have enough physical strength and energy, I can overcome physical limitations, I have the necessary physical skills)	Modification to clarify meaning of "overcome any physical limitations"	"The example part is confusing... what does 'I can overcome physical limitations' mean?"
	Physical capability item: I can overcome any physical limitations (e.g., illness, disease, disability) to practice healthy eating.	Modification to clarify meaning of "overcome any physical limitations"	"I'm still struggling with 'overcome'. I would suggest: 'I do not have any physical limitations that would keep me from practicing healthy eating.'"

Phase II: Pilot Testing

Descriptive statistics

Descriptive statistics for capability (M = 4.71, SD = 0.83), opportunity (M = 4.45, SD = 0.52), motivation (M = 4.05, SD = 0.61), and REAP-S score (M = 31.74, SD = 3.87) are presented in Table 3.3. The scores for the capability, opportunity, and motivation scales were obtained by computing an average from the two subscales making up each main scale (possible score of 1–5). REAP-S score was determined by adding the scores of the first 13 items (possible score of 13–39). Analysis of variance (ANOVA) tables were generated to determine whether there were statistically significant differences in capability, opportunity, motivation, or REAP-S scores based on demographic characteristics. There were no significant differences in capability, opportunity, motivation, or REAP-S score based on age, gender, education, or employment status.

Table 3.3 Descriptive statistics for capability, opportunity, motivation, and REAP-S score

	Descriptive statistics (*n* = 81)					
	Minimum	*Maximum*	*Mean*	*SD*	*Skewness*	*Std. Error*
Capability [a]	1.00	5.00	4.71	0.83	-3.99	0.27
Opportunity [a]	2.00	5.00	4.45	0.52	-2.26	0.27
Motivation [a]	2.25	5.00	4.05	0.61	-0.67	0.27
REAP-S score [b]	21.00	38.00	31.74	3.87	-0.60	0.27

[a] Possible score ranging from 1–5, with higher score indicating higher levels of the variable

[b] Possible score ranging from 13–39, which higher scores indicating higher dietary quality

Acceptability analysis

Each subscale on the new instrument concluded with three items to assess the acceptability of the subscale, using sliding scales ranging from 0 to 10, to measure ease of reading and understanding of the subscales. Ratings for ease of reading were all very high, ranging from the lowest mean for physical capability ($M = 9.28 \pm 1.00$) to the highest mean for physical opportunity ($M = 9.54 \pm 0.84$). These scores indicated that the items were all very easy to read among this well-educated sample. Ratings for understanding were similarly high, with the lowest mean occurring for psychological capability ($M = 9.41 \pm 0.91$), to the highest mean occurring for physical opportunity ($M = 9.63 \pm 0.79$), indicating high levels of understanding of the items across all six subscales.

Content analysis was performed on the open-ended questions at the end of each subscale, and comments were coded into positive, negative, or neutral categories to help gauge the acceptability of the new instrument. A summary of acceptability measures from Phase II is displayed in Table 3.4. The number of participants providing any comment ranged from eight (physical opportunity) to 15 (reflective motivation) per subscale. The majority of participants did not provide any comments on these open-ended questions. The most prominent theme across all

six subscales was the dislike/confusion regarding the reverse scored item in each subscale (e.g., *"I do NOT feel that I have the social opportunity for healthy eating."*). A less prominent but still noticeable theme was technical difficulties in using the online survey platform. Other comments tended to clarify the participants' reasoning behind their selected answers. Only one participant provided incomplete data, indicating an additional layer of instrument acceptance due to the absence of missing data. After considering the results of internal reliability tests and content analysis, the subscales were modified to omit the final question that was reverse scored in each subscale.

Table 3.4 Phase II acceptability analysis

Acceptability by Subscale	Participant Rating [a]		Comment Type			
	Mean	***(SD)***	***Positive***	***Negative***	***Neutral***	***No comment***
Physical Capability			1 (1.2%)	6 (7.3%)	7 (8.5%)	68 (82.9%)
Ease of reading	9.28	1.10				
Understanding	9.61	0.65				
Psychological Capability			1 (1.2%)	8 (9.8%)	5 (6.1%)	68 (82.9%)
Ease of reading	9.30	1.05				
Understanding	9.41	0.91				
Reflective Motivation			0 (0%)	2 (2.4%)	13 (15.9%)	67 (81.7%)
Ease of reading	9.43	1.00				
Understanding	9.55	0.88				
Automatic Motivation			1 (1.2%)	1 (1.2%)	10 (12.2%)	70 (85.4%)
Ease of reading	9.40	1.04				
Understanding	9.49	0.91				
Physical Opportunity			0 (0%)	2 (2.4%)	6 (7.3%)	74 (90.2)
Ease of reading	9.54	0.84				
Understanding	9.63	0.79				
Social opportunity			0 (0%)	2 (2.4%)	10 (12.2%)	70 (85.4%)
Ease of reading	9.50	0.76				
Understanding	9.57	0.73				

[a] Possible scores ranging from 0 to 10, with 10 indicating greater ease of reading and understanding

Floor and ceiling effects

Finally, an additional measure of acceptability of scale items was examined using floor and ceiling effects, which are considered to be present when 15% of participants achieve the lowest or highest possible score on an item or scale (Terwee et al., 2007). Extreme ceiling effects were evident for 27 out of 28 items when examined separately. The one item that did not reach a ceiling effect was, "My healthy eating practices tend to happen mindlessly," where only 11.1% of participants selected the highest score for the item. However, when the items were loaded into their six respective subscales and examined for ceiling or floor effects, just four subscales had ceiling effects present. Since there were no items or subscales reaching floor effects, only the ceiling effects are presented in Table 3.5. These findings may suggest that four out of the six subscales are not acceptable in terms of being able to differentiate high-scoring from low-scoring individuals; however, it is more likely that this sample of well-educated participants heavily influenced the presence of ceiling effects in the majority of the subscales.

Table 3.5 Ceiling effects for six subscales

	Frequency of achieving highest possible score (n = 81)		
Subscale	**n**	**%**	**Ceiling effect present?***
Physical Capability	63	77.8	✓
Psychological Capability	50	61.7	✓
Reflective Motivation	19	23.5	✓
Automatic Motivation	4	4.9	
Physical Opportunity	59	72.8	✓
Social Opportunity	11	13.6	

*Ceiling effects are present when >15% of participants achieve the highest possible score on a given subscale.

Reliability analysis

The COM-HE instrument achieved acceptable internal consistency as measured by Cronbach's alpha levels. These results are presented in Table 3.6. Cronbach's alphas for the subscales when the reverse-scored items were included ranged from 0.826 to 0.915, with a total instrument Cronbach's alpha of 0.717. After omitting each reverse-scored item, alphas for the subscales ranged from 0.847 to 0.986, with a total instrument Cronbach's alpha of 0.71. Both the qualitative data (i.e. study participants indicating dislike of the reverse-scored items) and quantitative data (i.e., an increase in Cronbach's alphas on four of the six subscales after modification) supported the omission of the reverse-scored items in the present study, which aligns with published literature suggesting that more problems are observed with negatively-worded survey items (Tsang et al., 2017). After considering these data, we determined that the reverse-scored items should be omitted from all subscales for the remaining statistical analyses. Once modified, each of the subscales and the instrument as a whole displayed acceptable internal reliability based on the general acceptability target of achieving Cronbach's alphas between 0.7 to 0.95 (Boateng et al., 2018). However, the physical and psychological capability subscales both had alphas greater than 0.90, suggesting that there may be some redundancy in these two subscales with potential for reducing the number of items in future iterations of the instrument.

Table 3.6 Internal reliability

	Pre-modification*		Post-modification		Pre- to post-modification
Subscale	**Number of items**	**Cronbach's alpha**	**Number of items**	**Cronbach's alpha**	**Absolute Change**
Physical capability	5	0.851	4	0.986	0.135
Psychological capability	6	0.873	5	0.938	0.065
Reflective motivation	7	0.915	6	0.898	-0.017
Automatic motivation	5	0.841	4	0.847	0.006
Physical opportunity	5	0.826	4	0.871	0.045
Social opportunity	6	0.899	5	0.888	-0.011
Total COM-HE Instrument	34	0.717	28	0.710	-0.007

*Modification to the instrument involved deleting the reverse-scored item from each subscale

Validity analysis

Construct validity

Results for construct validity based on principal component analyses revealed mixed results for unidimensionality, which was to be somewhat expected due to the interrelated nature of the COM-B model. Paired component loadings to extract two principal components (PCs) were conducted for C, O, and M, and these results are presented in Table 3.7.

When all 28 COM-HE items were loaded to extract six principal components (PCs), the Kaiser-Meyer-Olkin (KMO) value was .815, suggesting adequate sampling to conduct exploratory factor analysis (Watkins, 2018). Six PCs explained 81.8% of the variance, but only 5 of these had eigenvalues >1, suggesting that the COM-HE instrument may instead be a five-factor model explaining 78.77% of the variance. This indicates potential crossover between the six COM-HE subscales rather than true unidimensionality of each, but this was expected to some degree due to the dynamic nature of the COM-B model.

Results from the paired loadings allude to some degree of unidimensionality, but eigenvalues >1 were only observed in the opportunity and motivation pairings. When the physical and psychological capability items were loaded to extract two PCs, 93.73% of the variance was explained by two PCs, but the majority of the variance was explained by a single component (PC1 eigenvalue = 7.61, 84.51% of variance). When physical and social opportunity items were loaded onto two components, 73.17% of the variance was explained. The variance explained by these two PCs were more evenly distributed (PC1 eigenvalue = 4.15, 46.12% of variance; PC2 eigenvalue = 2.43, 27.05% of variance) compared to the two capability PCs. Finally, when the reflective and automatic motivation items were loaded to extract two PCs, 70.69% of the variance was explained, and the two PCs were also more evenly distributed (PC1 eigenvalue = 4.4, 44.04% variance; PC2 eigenvalue = 2.67, 26.65% variance) than the two capability PCs. These results indicate that the opportunity and motivation scales measure two PCs each, but they do not tell us with certainty whether the extracted PCs map onto the respective subscales for opportunity and motivation, or if the identified PCs display any overlapping qualities.

When the six subscales were loaded to extract three components, there was a lower level of sampling adequacy (KMO = .600, $p < .001$) and an apparent crossover of dimensionality between subscales. Out of the three PCs extracted, only two had eigenvalues >1, indicating that the six subscales may only be measuring two main concepts. However, three PCs accounted for 86.72% of the total variance, as compared to only 72.94% of variance being explained by the two PCs with eigenvalues >1. When evaluating the PC matrix, higher PC loading values indicate greater contribution to the corresponding PC. Physical capability (PC1 loading = 0.858), psychological capability (PC1 loading = 0.795), and reflective motivation (PC1 loading = 0.795) had the highest component loadings for PC1. Social opportunity (PC2 loading = 0.686) and automatic motivation

(PC2 loading = 0.851) had the highest component loadings for PC2. The third PC did not reach an eigenvalue >1, but the highest component loadings were seen for psychological capability (PC3 loading = 0.42) and for social opportunity (PC3 loading = 0.29). The component loadings for the six subscales are presented in Table 3.8.

Table 3.7 Paired principal component analyses

Capability: Total Variance Explained

	Initial Eigenvalues			**Extraction Sums of Squared Loadings**		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.606	84.509	84.509	7.606	84.509	84.509
2	0.830	9.224	93.733	0.830	9.224	93.733
3	0.195	2.165	95.899			
4	0.136	1.516	97.414			
5	0.087	0.968	98.383			
6	0.069	0.768	99.151			
7	0.038	0.426	99.577			
8	0.024	0.261	99.838			
9	0.015	0.162	100.000			

Extraction Method: Principal Component Analysis.
KMO = .896 ($p < .001$)

Opportunity: Total Variance Explained

	Initial Eigenvalues			**Extraction Sums of Squared Loadings**		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.151	46.123	46.123	4.151	46.123	46.123
2	2.434	27.049	73.172	2.434	27.049	73.172
3	0.661	7.341	80.513			
4	0.456	5.070	85.583			
5	0.397	4.410	89.992			
6	0.362	4.028	94.020			
7	0.246	2.737	96.757			
8	0.163	1.814	98.571			
9	0.129	1.429	100.000			

Extraction Method: Principal Component Analysis.
KMO = .786 ($p < .001$)

Motivation: Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.404	44.040	44.040	4.404	44.040	44.040
2	2.665	26.650	70.690	2.665	26.650	70.690
3	0.831	8.314	79.005			
4	0.626	6.264	85.268			
5	0.478	4.785	90.053			
6	0.294	2.937	92.990			
7	0.225	2.249	95.239			
8	0.192	1.924	97.164			
9	0.165	1.652	98.815			
10	0.118	1.185	100.000			

Extraction Method: Principal Component Analysis.
KMO = .800 ($p < .001$)

Table 3.8 Component loadings when extracting 3 principal components

Component Matrix	Principal Components (PC)		
	PC1	PC2	PC3
Physical Capability	**0.858**	-0.407	0.253
Psychological Capability	**0.795**	-0.404	**0.420**
Physical Opportunity	0.753	0.080	-0.542
Social Opportunity	0.467	**0.686**	**0.290**
Reflective Motivation	**0.795**	0.171	-0.400
Automatic Motivation	0.180	**0.851**	0.218

Highest component loadings in bold.
Extraction Method: Principal Component Analysis.

Discriminant and convergent validity

Discriminant and convergent validity were also examined to measure construct validity using Spearman correlations expressed by Spearman's rho (*r*) between the six subscales. These results are presented in Table 3.9 and Table 3.10. Physical capability and psychological capability

had a moderate positive correlation *(r* = .537, *p* = .01). Reflective motivation and automatic motivation had a weak positive correlation *(r* = .368, *p* = .01). Physical opportunity and social opportunity were not significantly correlated (*r* = 0.181, *p* = .106). These results indicate convergent validity within subscales, although only moderately. Significant correlations were also seen between several sets of subscales, in the case of automatic motivation and social opportunity (*r* = .511, *p* = 0.01); reflective motivation and social opportunity (*r* = .391, *p* = 0.01); social opportunity and psychological capability (*r* = .352, *p* = 0.01); physical opportunity and psychological capability (*r* = .305, *p* = 0.01); and reflective motivation and psychological capability (*r* = .264, *p* = 0.05). These correlations do not necessarily imply a lack of discriminant validity, but rather reinforce the understanding that the COM-B components interact with one another to influence behavior. For instance, the decision-making processes outlined within psychological capability are intuitively associated with the aspect of reflective motivation that deals with consciously considering the pros and cons of eating healthy, which may help to illustrate the statistical association between reflective motivation and psychological capability found here.

Some significant positive correlations remained when the subscales were combined into their respective C, O, and M scales. Opportunity and motivation were moderately positively correlated *(r* = .553, *p* = .01); capability and opportunity were weakly positively correlated *(r* = .422, *p* = .01); and motivation and opportunity were not significantly correlated. Again, these results suggest modest discriminant validity between subscales, but confirmed the expectation of some scales and subscales being correlated due to the distinct yet interweaving nature of the COM-B domains.

Table 3.9 Discriminant and convergent validity by subscales

Spearman's rho (ρ)	**Physical Capability**	**Psychological Capability**	**Reflective Motivation**	**Automatic Motivation**	**Physical Opportunity**	**Social Opportunity**
Physical Capability	1.000	.537**	0.112	-0.001	0.201	0.210
Psychological Capability	.537**	1.000	.264*	0.027	.305**	.352**
Reflective Motivation	0.112	.264*	1.000	.368**	0.213	.391**
Automatic Motivation	-0.001	0.027	.368**	1.000	0.012	.511**
Physical Opportunity	0.201	.305**	0.213	0.012	1.000	0.181
Social Opportunity	0.210	.352**	.391**	.511**	0.181	1.000

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 3.10 Discriminant and convergent validity by C, O, M scales

Spearman's rho (ρ)	**Capability**	**Opportunity**	**Motivation**
Capability	1.000	.422**	0.118
Opportunity	.422**	1.000	.553**
Motivation	0.118	.553**	1.000

** Correlation is significant at the 0.01 level (2-tailed).

Concurrent validity

Multiple regression analyses were conducted to assess the associations between the six COM-HE subscales and REAP-S score among community-dwelling older adults. These results are presented in Table 3.11. When assessed together, the six COM subscales had a moderate positive association with REAP-S scores (r = 0.409, adjusted R^2 = .099, p < .05), and explained 9.9% of the variance in REAP-S scores. Motivation had a positive but weak association with REAP-S

scores (r = .379, adjusted R^2 = .133, p < 0.001). Out of the two motivation subscales, automatic motivation had the stronger correlation with REAP-S score (r = .37, adjusted R^2 = .126, p < .001). There was also a weak positive correlation between opportunity and REAP-S scores (r = .247, adjusted R^2 = .049, p < .05). Out of the two opportunity subscales, social opportunity had the stronger correlation with REAP-S score (r = .233, adjusted R^2 = .042, p < .05). Capability did not have a significant association with REAP-S scores among community-dwelling older adults.

These findings indicate that the COM-HE instrument is moderately positively correlated with dietary quality as measured by REAP-S score, thus indicating appropriate concurrent validity between the instrument and dietary quality. Furthermore, motivation was the scale that explained the greatest amount of variance in REAP-S score, revealing an important insight into one potential facilitator for healthy eating behavior among community-dwelling older adults. The correlation between motivation and REAP-S score was largely driven by automatic rather than reflective motivation; and the correlation between opportunity and REAP-S score was largely driven by social rather than physical opportunity, signaling two additional key insights for healthy eating behavior in this sample of older adults.

Table 3.11 Concurrent validity between COM-HE and REAP-S score

Criterion	***r***	***R^2***	***Adjusted R^2***	***p value***
Capability	0.069	0.005	-0.008	0.542
Physical capability	0.060	0.004	-0.009	0.595
Psychological capability	0.076	0.006	-0.007	0.502
Opportunity	0.247*	0.061	0.049	0.026
Physical opportunity	.151	0.023	0.010	0.178
Social opportunity	0.233*	0.054	0.042	0.036
Motivation	0.379**	0.144	0.133	<.001
Reflective motivation	0.189	0.036	0.024	0.090
Automatic motivation	0.370**	0.137	0.126	<.001
Six COM subscales together	0.409*	0.167	0.099	0.031

*Correlation is significant at $p < 0.05$

**Correlation is significant at $p < 0.001$

Chapter 4 - Discussion

Main findings

The current study provides a detailed description of the development and application of a survey instrument developed to measure the perceived capability, opportunity, and motivation for healthy eating behavior among community-dwelling older adults. To our knowledge, this is the first study to generate original questionnaire items related to healthy eating behaviors among the older adult population based upon the generic, six-item COM-B questionnaire developed by Keyworth et al. (2020). There were five main findings of this mixed methods study.

First, the COM-HE instrument is well accepted by the target population. Both qualitative and quantitative analyses indicated high levels of acceptability, with the majority (79%) of items not requiring revision after focus groups were conducted, and all subscales having a mean score above 9.0 (on a scale of 0 to 10) for ease of reading and understanding when the instrument was pilot tested among community-dwelling older adults. An interesting acceptability finding was that the physical and psychological capability subscales had larger proportions of negative comments (7.3% and 9.8% comments were negative, respectively) as compared to the other four subscales (a maximum of 2.4% of comments being negative on any one subscale). This may have been due in part to the two capability subscales having been arranged first in the online questionnaire, and the phenomenon of survey fatigue which involves lower levels of effort as a survey progresses and is also observed more often with open-ended types of questions (O'Reilly-Shah, 2017). Although the acceptability results may have been influenced by the study sample of mostly well-educated older adults, the results provide a good starting point for assessing the overall appropriateness of the new instrument and can be used to guide future iterations of the instrument. It is also worthwhile to note that while the original instrument developed by Keyworth et al. (2020) containing only six

items provided a sufficient foundation for instrument development in the present study, one item for each COM subscale is not sufficient to measure the multiple concepts that each subscale includes. For example, our definition of physical opportunity spans across multiple features of the subdomain including proximity to healthy food sources, financial resources, transportation, kitchen equipment, and time — it would be ill-advised to attempt to measure these distinct aspects of physical opportunity with a single item on a questionnaire. To this end, it was deduced that the inclusion of up to six items per subscale did not attenuate the ease of reading nor the perceived understanding of the COM-HE instrument among this sample of community-dwelling older adults.

The second key finding provided evidence for reliability when considering internal consistency of the COM-HE instrument. Cronbach's alphas for each of the six subscales separately and the COM-HE instrument with the subscales measured together were greater than 0.7, indicating satisfactory internal consistency (Tavakol & Dennick, 2011). These alpha levels show that each subscale contains items that are adequately interrelated. However, the alpha levels reaching >0.9 in two subscales (physical and psychological capability) may indicate redundancy of some items, suggesting that these two subscales may benefit from the omission of very similar items or the addition of items that measure a different aspect of the respective subscales in future versions of the instrument. The internal consistency in the present study (Cronbach's alphas = .710 – .986) were similar to that of a questionnaire which sourced previously-validated measures from the Theoretical Domains Framework and mapped them onto the COM-B domains to measure eating and physical activity behaviors among young adults (Cronbach's alphas = .65 – .96) (Willmott et al., 2021). The internal consistency results for the COM-HE instrument were slightly higher than a questionnaire developed to measure the capability, opportunity, and motivation for exercise among obese children (Cronbach's alphas = .712 – .796) (Taylor et al., 2016). Overall,

the COM-HE instrument achieved good internal consistency and can be considered reliable among well-educated community-dwelling older adults.

Third, the instrument displays varying levels of construct validity based on principal component analysis and Spearman correlations. PCA revealed a five-component model explaining 78.77% of the variance when the subscales for capability (physical and psychological), opportunity (physical and social), and motivation (reflective and automatic) were analyzed, indicating that these six COM-HE subscales may not map evenly onto the components that were extracted. However, when the subscales were paired according to C, O, and M, both opportunity and motivation each had two-component models, but capability resulted in a one-component model. This implies that the two capability subscales may only measure one component, which can help explain the result of a five-component model when all six subscales were evaluated together. These PCA results are particularly interesting when considering that the psychological and physical capability subscales also had the highest Cronbach's alpha levels (.938 and .986, respectively), indicating potential redundancy within each subscale. When taken together, these findings could signify that the two capability subscales require additional modification to further differentiate between physical and psychological capability.

Fourth, the findings for discriminant and convergent validity contributed to better understanding the associations within and between domains of the COM-B model. Spearman correlations revealed that the two capability subscales were moderately positively correlated, the two motivation subscales were weakly positively correlated, and the two opportunity subscales were not significantly correlated with one another. However, when the subscales were combined and evaluated, the opportunity scale was significantly positively correlated with capability (r = .422, p = .01) and motivation (r = .553, p = .001). These findings regarding the interrelatedness of

COM scales are similar to those of a study evaluating the correlations between COM factors for preventative care provided by veterinarians (Bellet et al., 2015); the literature is limited in terms of evaluating correlations between COM factors for human health behaviors. This finding highlights the interrelated nature of the COM-B model, where all three domains act directly and indirectly to influence behavior.

The fifth key finding reveals that the six COM subscales are moderately positively correlated with self-reported dietary quality as measured by regression analyses (r = .409, adjusted R^2 = .099, p = .031). This finding provides valuable information regarding the relationship between dietary quality and the subdomains within capability, opportunity, and motivation. The six correlates (physical and psychological capability, reflective and automatic motivation, and physical and social opportunity) explained 9.9% of the variance in REAP-S score, which is not inconsequential considering the complex nature of internal and external factors that influence dietary quality. However, the explained variance is less than what has been observed for the COM-B model with eating behavior among young adults with a mean age of 24.9 years, where COM-B explained 23% of variance in eating behavior (Willmott et al., 2021). However, the variance in the current study is comparable to the variance explained by other behavioral theories such as the theory of reasoned action, which has been found to explain 6.25–30.25% of the variance in nutrition-related behaviors (Sheppard et al., 1988), and the social cognitive theory, which has been found to explain 14–61% of variance in dietary intake (Stacey et al., 2015). In the present study, motivation had the strongest positive correlation with dietary quality (r = .379, adjusted R^2 = .133, p < .001) out of the three COM scales, which is also similar to the aforementioned study where motivation explained 23% of the variance in eating behaviors for young adults. Furthermore, the observed positive association between social opportunity and healthy eating behaviors (r = .233,

p = .036) in the present study contrasts with the findings of a qualitative study in which most independently-living older adults indicated that they did not pay much attention to, and their behaviors were not influenced by, the eating habits of other people (Bukman et al., 2020). Lastly, capability added negligible contributions to the measure of concurrent validity, which again suggests that either 1) capability is not correlated with dietary quality among this sample of older adults, or 2) the two capability subscales did not adequately measure what they were intended to measure; or perhaps a combination of both, considering the influence of ceiling effects. Overall, the instrument displays moderate validity when assessing concurrent associations between the COM domains and dietary quality, especially within the opportunity and motivation scales.

Strengths and limitations

A main strength of the study was the mixed methods approach to developing the COM-HE instrument. It has been noted in the research literature that mixed methods research facilitates the collection of more robust evidence than either qualitative or quantitative methods could gather individually (Regnault et al., 2018; Zoellner & Harris, 2017). Qualitative and quantitative methods each provide their own strengths and limitations, whereas combining both methods aims to address both the subjective (i.e., perceptions, life experiences) and objective (i.e. health outcomes) aspects of a research question (Zoellner & Harris, 2017). Mixed method study designs have been employed among countless populations and various health outcomes, with recent mixed method studies utilizing the COM-B model including a person-centered falls prevention intervention (Morris et al., 2019), an inpatient stroke rehabilitation behavior change intervention (C. Stewart et al., 2020), and a questionnaire examining barriers and facilitators of optimal anti-rheumatic drug use among patients with inflammatory rheumatic disease (Voshaar et al., 2016).

The newly generated items in the COM-HE instrument align well with other correlates of healthy eating behavior among community-dwelling older adults which have been previously described in the literature (Bukman et al., 2020; Miller & Steinle, 2020; Payette & Shatenstein, 2005). We considered a breadth of intrapersonal, interpersonal, and environmental correlates of eating behaviors and included multiple factors within each subscale definition. This development of multifaceted subscales, rather than using a single item to measure a broad subdomain, is a major strength considering the complex interactions between capability, opportunity, and motivation for healthy eating behaviors. The finding that the instrument was acceptable to the target audience even with 34 items during pilot testing (prior to omitting the reverse-scored items) demonstrates community-dwelling older adults' willingness to complete a short measure related to healthy eating behaviors, which could potentially expand to settings outside of research.

The qualitative and quantitative findings specific to the capability (physical and psychological) scale were paradoxical. Focus group data indicated that study participants had the greatest levels of understanding with the physical and psychological capability items, as evidenced by only two physical capability items requiring revision, and zero psychological capability items requiring revision after the focus groups. However, in both qualitative and quantitative data analyses during pilot testing, we observed the greatest amount of conflicting evidence with these two subscales. For example, take the findings that physical and psychological capability had the greatest proportion of negative comments during pilot testing compared to the other four subscales; the unusually high Cronbach's alpha levels on only these two subscales hinting at redundancy of items; and the one-component model for the two subscales that was extracted during PCA compared to the two-component models extracted for the opportunity and motivation subscales.

Careful attention should be paid to the items in the physical and psychological capability subscales should the instrument undergo further revision and testing.

The most obvious limitation with the current study was the homogenous sample in terms of race and education level. With 100% of participants (n = 81) reporting they were non-Hispanic White, and 82.7% holding a bachelor's degree or higher, it is highly probable that these characteristics were significant contributors to the observed ceiling effects and may have influenced the relatively high dietary quality scores using the REAP-S tool. The highly educated individuals in the sample may have also influenced the acceptability results that tended towards very high levels of understanding and ease of reading the instrument. Another limitation is the absence of data regarding income levels, marital status, living arrangement, and chronic disease status. These would have been helpful factors to make possible distinctions from the otherwise homogenous study sample, but we aimed to keep the participant burden low by controlling the number of demographic-related items on the questionnaire.

Future directions

Implications for practice

In both health care and public health practice, it is important for clinical and public health decision makers to gain an understanding of the underlying factors that determine healthy eating behaviors. On the one hand, tools which measure dietary quality (i.e., the REAP-S tool, 24-hour recalls, FFQs, etc.) can give researchers and health professionals a detailed estimate of dietary quality, but these tools by themselves do not provide insight into the correlates of differing levels of dietary quality (i.e., the correlates of healthy eating behavior that may be associated with high or low dietary quality). For example, there are several widely-used malnutrition screening and

assessment tools that have been validated in community populations, such as the Mini Nutritional Assessment – Short Form (MNA-SF; Rubenstein et al., 2001), the Malnutrition Universal Screening Tool (MUST; Elia, 2003), and the Subjective Global Assessment (SGA, Detsky et al., 1987); however, these tools do not take into consideration the correlating factors such as capability, opportunity, and motivation that may influence, or be influenced by, the presence of suboptimal nutrition status. With this in mind, the COM-HE has potential for concurrent use with other validated tools to assess nutrition status and inform nutrition interventions. There is great potential for application in health screening settings where an interdisciplinary team of health professionals can work collaboratively to improve patient outcomes. The COM-HE instrument can reveal valuable information about individuals or populations regarding their initial dispositions towards healthy eating behaviors. For example, a registered dietitian in an outpatient setting may find the COM-HE instrument helpful as a supplementary tool during nutrition assessment to help inform the nutrition diagnosis and intervention process. The instrument may be useful in various community health settings to determine whether current public health nutrition interventions (such as congregate meal programs) are adequately meeting the nutrition-related needs of the population and identify potential gaps in intervention or program implementation.

Implications for research

Findings from this mixed methods study provide insight into the capability, opportunity, and motivation for healthy eating behaviors among community-dwelling older adults. There is also potential for this instrument to be tested in other populations and geographic locations. A similar mixed methods approach would be useful for identifying any items that may require revision to better align with the needs of various study populations. Considering the results of the present study, it also seems fitting to make modifications to the physical and psychological capability

subscales in order to reach a two-component model for capability. This study adds to the literature an expanded version of the original generic six-item questionnaire (Keyworth et al., 2020) with an emphasis on healthy eating behaviors among community-dwelling older adults, a rapidly growing segment of the U.S. and global population.

In summary, the current study showed that the COM-HE instrument was acceptable, reliable, and valid when tested in a sample of well-educated community-dwelling older adults. When assessed simultaneously, all six subscales were correlated with dietary quality, and motivation and opportunity were identified as having the strongest positive correlations with dietary quality when assessed separately. In the future, additional research using the developed COM-HE should be conducted in order to inform the work of health care professionals and future nutrition interventions in the older adult population.

Chapter 5 - MPH Emphasis Area Competencies

The table below describes the attainment and utilization of the five competencies of Public Health Nutrition.

Table 5.1 Summary of MPH Emphasis Area Competencies

MPH Emphasis Area: Public Health Nutrition		
Number and Competency		**Description**
1	Information literacy of public health nutrition	A review of public health nutrition literature was carried out throughout all phases of my thesis study, especially during the item development phase. Significant findings related to geriatric nutrition concerns that were applicable to the COM-B model were incorporated into instrument development. A wide variety of public health nutrition topics were examined during FNDH 844 and MPH 802.
2	Compare and relate research into practice	My thesis research findings were discussed in relation to relevance for the older adult population, dietetics practice, and public health practice. Suggestions for potential use of the COM-HE instrument in future research and practice settings were identified.
3	Population-based health administration	MPH 720 discussed the 10 Essential Public Health Services, which can be applied to many public health nutrition programs such as Meals on Wheels America, the national community-based nutrition program that

		addresses senior isolation and hunger. Administration of this type of program requires extensive assessment, policy development, and evaluation of the population and health outcomes.
4	Analysis of human nutrition principles	FNDH 820 examined a multitude of functional foods for chronic disease prevention as well as evaluated evidence for the efficacy of these foods across various populations and chronic disease states. One example of putting this type of knowledge into practice was through an educational program I provided for older adults at the Riley County Seniors' Service Center through the Food & Farm Council of the City of Manhattan and Riley County where I shared the research behind the MIND diet for promoting brain health, a topic specifically requested by seniors at the Center.
5	Analysis of nutrition epidemiology	MPH 754 and FNDH 844 described the criteria for the highest levels of evidence for nutritional epidemiological research. I conducted critical appraisals of nutritional epidemiology articles and interpreted the findings in light of the grade of evidence for each.

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Appendix A - COM-HE Instrument

Below is a copy of the COM-HE instrument as it was administered during pilot testing.

The Capability, Opportunity, and Motivation for Healthy Eating (COM-HE) Instrument

Start of Block: Informed Consent

Informed Consent

PROJECT TITLE: Evaluating Determinants of Healthy Eating and Dietary Quality Among Older Adults

PROJECT APPROVAL DATE/ EXPIRATION DATE: IRB Approval No. 10911, 11/19/2021 to 11/18/2024

LENGTH OF STUDY: 30 minutes

PRINCIPAL INVESTIGATORS: Sara Rosenkranz, PhD; Richard Rosenkranz, PhD
CO-INVESTIGATOR: Anna Biggins, RDN

CONTACT DETAILS FOR PROBLEMS/QUESTIONS:
Sara Rosenkranz, PhD 785-341-6690 SaraRose@ksu.edu; Richard Rosenkranz, PhD ricardo@ksu.edu; Anna Biggins 913-213-4053 abiggins15@ksu.edu

IRB CHAIR CONTACT INFORMATION:
Rick Scheidt, Chair, Committee on Research Involving Human Subjects, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224; Cheryl Doerr, Associate Vice President for Research Compliance, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224.

PURPOSE OF THE RESEARCH:
The purpose of this research study is to develop a tool to measure the factors that determine healthy eating behaviors of older adults. The tool is a questionnaire which will be improved using feedback from the target population. Once the questionnaire is ready to be used, the study aims to identify any associations between self-identified reasons for healthy eating behavior and actual dietary quality among older adults. This study contains three parts. As a participant, you will have the option to participate in both the pilot testing phase and the main study phase.

PROCEDURES OR METHODS TO BE USED:
Pilot Testing: The current survey is part of the pilot testing phase. If you choose to proceed, you will complete questionnaires at two different time points. At Time 1 (after reading this), you will complete a self-administered anonymous online draft questionnaire to measure the reasons behind eating behaviors, as well as a questionnaire about your diet. At Time 2 (about 2 weeks from now), you will only complete the online draft questionnaire. At both time points, you will be sent an email with a link to the required questionnaires. On the draft questionnaire that you will complete at both Time 1 and Time 2, you will be asked to assess each question in terms of how easy it is to read and understand. You will be asked to provide any additional comments about the questionnaire that may help researchers further improve it before it is finalized. You can expect to spend around 30 minutes to 1 hour taking the questionnaire(s) at each time point. If you would like assistance with the online questionnaire or prefer to complete it on paper, please let a researcher know and we will do our best to accommodate your request. Your name will be entered in the $25 grocery store raffle upon completing both surveys at follow-up. As a pilot testing participant, you are also eligible to participate in the main study, but it is not required.

RISKS OR DISCOMFORTS ANTICIPATED:
We will do our best to ensure that all personal information is unidentifiable outside of the research assistants directly involved with data collection. All data files will be stored in locked file cabinets in locked offices and on password-protected computers. All online survey data will remain anonymous. There may be discomfort answering questions related to access to food. All participants will receive information regarding local food security resources at the conclusion of the study.

BENEFITS ANTICIPATED:
You will get to take part in the development of a new health tool that will help nutrition and health practitioners better meet the needs of their clients and patients. The finished questionnaire tool that you help develop in this study will be of use to public health practitioners and help inform intervention design tailored towards the nutrition needs of older adults. By participating in this study, you will be entered in a raffle to win a $25 Kroger gift card. Raffle entries will be given for participation according to each phase of the study, with the ability to earn three raffle entries by participating in all three study phases.

EXTENT OF CONFIDENTIALITY:
Confidentiality of participants will be maintained by keeping any contact information on password-protected computers and de-identifying all data before storing it. You will receive a participant ID number at the beginning of your participation to keep your personal identity confidential. The only identifying information to be collected will be your email address as a way to communicate with the researchers about study requirements, and this will not be shared with any outside parties. The only people who will have access to data are those listed on this

form.

By clicking the "I Agree" button below, you are giving your consent to be enrolled as a participant in this study.

O I Agree

O I Do Not Agree

End of Block: Informed Consent

Start of Block: Participant ID

What is your Participant ID Number?

If you have not been provided with a Participant ID, please contact abiggins15@ksu.edu or 913-213-4053

O Participant ID: _____

End of Block: Participant ID

Start of Block: Introduction

Please take your time to read this introduction carefully.
This survey will ask questions about the opportunities, motivations, and capabilities that influence what and how you eat.

Health is more than just the absence of disease. The definition of “healthy eating” used in this survey involves several aspects of health. When a question mentions “healthy eating,” it means choosing a variety of foods and meals that will improve health.

These foods and meals are well-balanced and eaten in adequate amounts to support physical, social, and mental well-being. Healthy eating also includes some of the actions that make it possible to eat healthy foods. Some examples include being able to get healthy foods and having the knowledge, skills, and physical ability to prepare healthy foods.

This definition of healthy eating recognizes that there is more to healthy eating than the type and amount of foods eaten. It also involves practicing mindfulness by slowing down and paying attention to the food being eaten. Healthy eating includes having a healthy relationship with food. It recognizes how food can make people feel socially and culturally connected to one another. Healthy eating takes into account your personal medical conditions and the foods you should eat or avoid to stay well.

A diet that reflects healthy eating includes:

• Vegetables
• Fruits
• Whole grains (e.g. 100% whole wheat bread, oatmeal, whole wheat tortilla, etc.)
• Low-fat dairy or dairy alternatives
• Seafood, beans/legumes, nuts, lean meats and poultry
• Moderate consumption of alcohol (up to 2 drinks per day for men; up to 1 drink per day for women) if alcohol is consumed at all
• Lower in red and processed meat (e.g. bacon, deli meats, hot dogs, etc.)
• Low in sugar-sweetened foods and drinks and refined grains (e.g. white breads, desserts, sugary cereals, etc.)

Healthy eating does **not** include trying the latest diet, restricting entire food groups for non-medical reasons, or eating excess added sugars, saturated fats, and *trans* fats.

End of Block: Introduction

Start of Block: Physical Capability

What is PHYSICAL capability?

Having the physical skill, strength, or stamina needed to practice healthy eating.

(e.g., I have enough physical strength and energy to obtain healthy foods, I can work around any physical limitations that make it difficult to prepare healthy food, I have the necessary physical skills to practice healthy eating)

Remember: HEALTHY EATING supports physical, social, and mental well-being. Healthy eating: includes a variety of vegetables, fruits, whole grains, low-fat dairy or dairy alternative, seafood, legumes, and nuts; is moderate in alcohol; is lower in red and processed meat; and is low in sugar-sweetened foods and drinks and refined grains.

Q1
I have the PHYSICAL capability needed to practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q2 I feel that my body is fully capable of doing everything that is needed to practice healthy eating (e.g. obtaining healthy foods, prepping and cooking, chewing and swallowing, etc.)

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q3 For the most part, I can find a way to work around physical limitations (e.g. illness, disease, disability) to practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Q4 On a day-to-day basis, I can practice healthy eating without any assistance.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

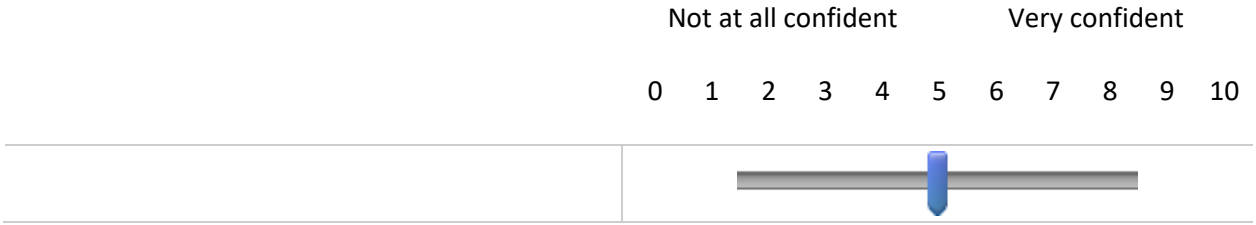
Q5 I do NOT feel that I have the physical capability to practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Overall, did you find the previous set of 5 questions difficult or easy to read?

Overall, how confident are you that you understood what the previous set of 5 questions were asking?



(Optional) Comments on any of the previous set of 5 questions?

_____

End of Block: Physical Capability

Start of Block: Psychological Capability

What is PSYCHOLOGICAL capability?

Knowledge, comprehension, and reasoning needed to practice healthy eating.

(e.g., Having the necessary know-how, understanding, and ability to figure things out; Being able to engage in tasks requiring memory, attention and decision-making processes).

Remember: HEALTHY EATING supports physical, social, and mental well-being. Healthy eating: includes a variety of vegetables, fruits, whole grains, low-fat dairy or dairy alternative, seafood, legumes, and nuts; is moderate in alcohol; is lower in red and processed meat; and is low in sugar-sweetened foods and drinks and refined grains.

Q6 I am PSYCHOLOGICALLY capable of practicing healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q7 I can describe the actions that I should take to practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q8 I know how to apply the idea of healthy eating to my own life.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Q9 I have the clear thinking that I need for all aspects of healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q10 My abilities to understand and remember are helpful for practicing healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

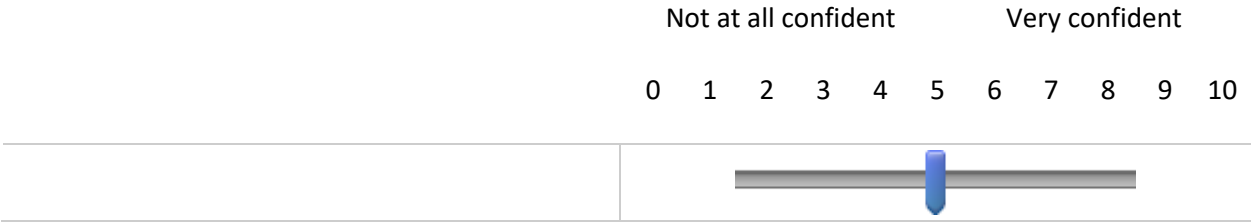
Q11 I do NOT think that I am psychologically capable of practicing healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Overall, did you find the previous set of 6 questions difficult or easy to read?

Overall, how confident are you that you understood what the previous set of 6 questions were asking?



(Optional) Comments on any of the previous set of 6 questions?

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End of Block: Psychological Capability

Start of Block: Reflective Motivation

What is REFLECTIVE motivation?

Having goals, making decisions, and consciously planning to practice healthy eating. Reflective motivation involves intentionally making an effort to practice healthy eating after considering the positives and negatives of choosing to eat healthfully.

(e.g., I intend to…; I have the desire to…; I feel the need to practice healthy eating)

Remember: HEALTHY EATING supports physical, social, and mental well-being. Healthy eating: includes a variety of vegetables, fruits, whole grains, low-fat dairy or dairy alternative, seafood, legumes, and nuts; is moderate in alcohol; is lower in red and processed meat; and is low in sugar-sweetened foods and drinks and refined grains.

Q12 I am motivated to practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q13 I want to practice healthy eating to maintain or improve my overall health.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q14 I think I should practice healthy eating so that I can lower my risks related to chronic disease (e.g. heart disease, cancer, diabetes, etc.).

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q15 On a day-to-day basis, I intentionally practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Q16 The positives that come from healthy eating outweigh the negatives.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q17 If I practice healthy eating, I expect that I will experience many health benefits (e.g. more energy, reduced risk of illness, living longer).

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

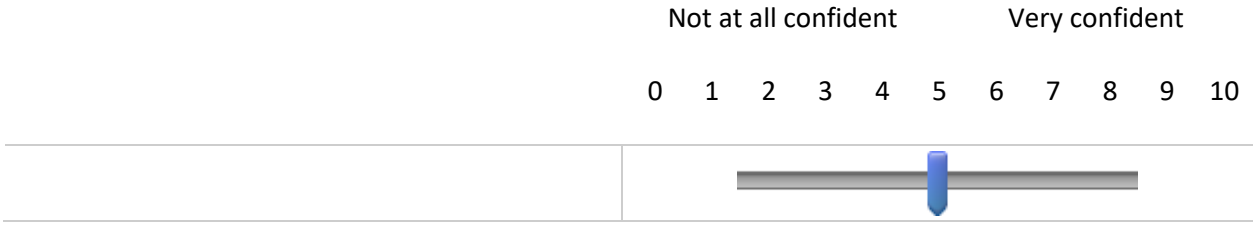
Q18 I do NOT want to practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Overall, did you find the previous set of 7 questions difficult or easy to read?

Overall, how confident are you that you understood what the previous set of 7 questions were asking?



(Optional) Comments on any of the previous set of 7 questions?

_____

End of Block: Reflective Motivation

Start of Block: Automatic Motivation

What is AUTOMATIC motivation?

Doing something without needing to think about it or having to consciously remember. Automatic motivation refers to something that is a habit.

(e.g., Healthy eating is something I do before I realize I'm doing it.)

Remember: HEALTHY EATING supports physical, social, and mental well-being. Healthy eating: includes a variety of vegetables, fruits, whole grains, low-fat dairy or dairy alternative, seafood, legumes, and nuts; is moderate in alcohol; is lower in red and processed meat; and is low in sugar-sweetened foods and drinks and refined grains.

Q19 Healthy eating is something I do automatically.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q20 Healthy eating comes naturally to me.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q21 Healthy eating is more of a habit than something I need to remember consciously.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Q22 My healthy eating practices tend to happen mindlessly.

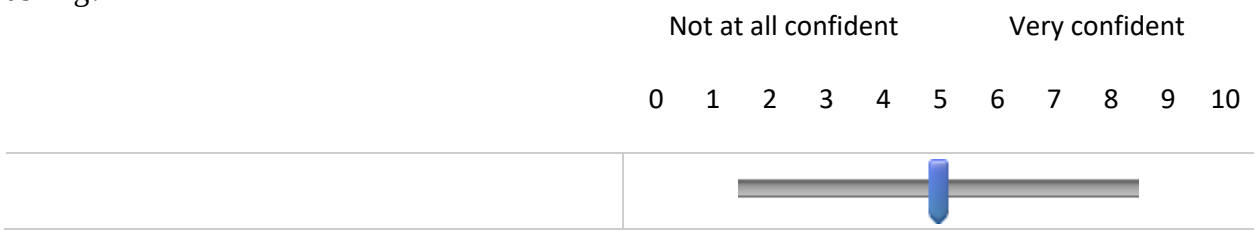
- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q23 For me to practice healthy eating, I really have to remember and plan for it.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Overall, did you find the previous set of 5 questions difficult or easy to read?

Overall, how confident are you that you understood what the previous set of 5 questions were asking?



(Optional) Comments on any of the previous set of 5 questions?

_____

End of Block: Automatic Motivation

Start of Block: Physical Opportunity

Page Break

What is PHYSICAL opportunity?

Your surroundings (e.g., the places where you live, work, and visit) give you a chance to practice healthy eating.

Physical opportunity also includes having access to material and non-material resources like money, kitchen equipment and appliances, time, and transportation. Physical opportunity refers to having the right resources available to help you practice healthy eating.

Remember: HEALTHY EATING supports physical, social, and mental well-being. Healthy eating: includes a variety of vegetables, fruits, whole grains, low-fat dairy or dairy alternative, seafood, legumes, and nuts; is moderate in alcohol; is lower in red and processed meat; and is low in sugar-sweetened foods and drinks and refined grains.

Q24 I have the PHYSICAL opportunity that I need for healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q25 The right foods are available to me for healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q26 I have the resources (e.g. time, money, transportation, kitchen equipment) that I need for healthy eating on a day-to-day basis.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Q27 I have access to what I need for healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

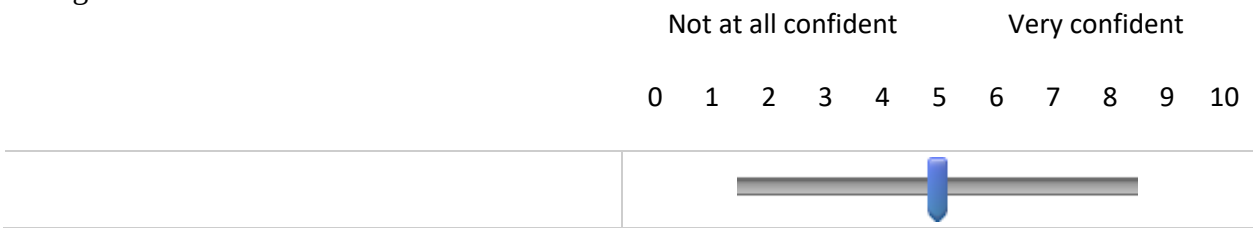
Q28 I do NOT feel that I have the physical opportunity for healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Overall, did you find the previous set of 5 questions difficult or easy to read?

Overall, how confident are you that you understood what the previous set of 5 questions were asking?



(Optional) Comments on any of the previous set of 5 questions?

_____

End of Block: Physical Opportunity

Start of Block: Social Opportunity

What is SOCIAL opportunity?

Influences from other people, social cues, and cultural norms provide the opportunity to practice healthy eating. Cultural norms can be described as the social setting/environment in which we live, including the social and cultural aspects of life that dictate the way we think about things.

(e.g., Having support from friends and family to practice healthy eating)

Remember: HEALTHY EATING supports physical, social, and mental well-being. Healthy eating: includes a variety of vegetables, fruits, whole grains, low-fat dairy or dairy alternative, seafood, legumes, and nuts; is moderate in alcohol; is lower in red and processed meat; and is low in sugar-sweetened foods and drinks and refined grains.

Q29 I have the SOCIAL opportunity that I need for healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q30 In general, my friends are supportive of my healthy eating practices.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q31 In general, my family is supportive of my healthy eating practices.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Q32 The people who I spend time with normally practice healthy eating.

- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q33 Healthy eating is common for the groups of people with whom I feel most connected.

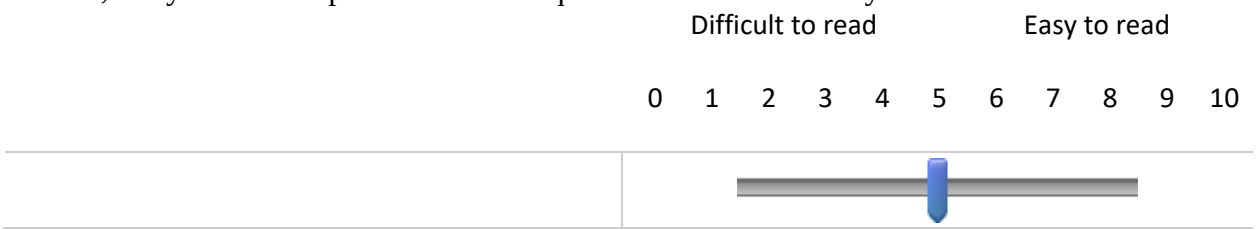
- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Q34 I do NOT feel that I have the social opportunity for healthy eating.

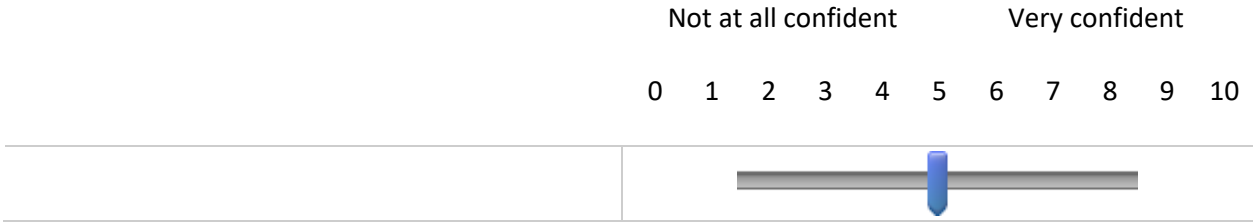
- O Strongly disagree
- O Somewhat disagree
- O Neither agree nor disagree
- O Somewhat agree
- O Strongly agree

Page Break

Overall, did you find the previous set of 6 questions difficult or easy to read?



Overall, how confident are you that you understood what the previous set of 6 questions were asking?



(Optional) Comments on any of the previous set of 6 questions?

_____

End of Block: Social Opportunity

Start of Block: Demographics

What is your age?

- O 65 – 69 years
- O 70 – 74 years
- O 75 – 79 years
- O 80 – 84 years
- O 85 years or older
- O Prefer not to answer

Page Break

Which describes you? Please select all that apply.

- [ ] White
- [ ] Black or African American
- [ ] Asian
- [ ] American Indian or Alaska Native
- [ ] Native Hawaiian or Pacific Islander
- [ ] Hispanic, Latino, or Spanish origin
- [ ] Other (please specify) _____

Page Break

Which statement best describes your current employment status?

- O Working (paid employee)
- O Working (self-employed)
- O Not working (temporary layoff from a job)
- O Not working (looking for work)
- O Not working (retired)
- O Not working (disabled)
- O Not working (other) _____
- O Prefer not to answer

Page Break

What is the highest level of school, college or vocational training that you have finished?

- O Less than 9th grade
- O 9–12th grade, no diploma
- O High school graduate (or GED/equivalent)
- O Associate's degree or vocational training
- O Some college (no degree)
- O Bachelor's degree
- O Graduate or professional degree

Page Break

What is your gender?

- O Male
- O Female
- O Prefer to self-describe _____

End of Block: Demographics

Appendix B - Recruitment Flyer

Adults Over Age 65 Needed for Nutrition Research Study

This study involves taking a set of online surveys.
No in-person visits required.

Contact Anna Biggins, RDN for more details:
abiggins15@ksu.edu

Chance to win a $25 grocery store gift card!

The study has been reviewed by the Kansas State Institutional Review Board and received Approval No. 10911

Appendix C - Focus Group Guide

Draft COM-HE Instrument Focus Group – Interviewer's Guide

Focus group participants will view the instrument on a screen as the interviewer guides the cognitive interviewing process. At least one other research assistant will type all verbal comments into a spreadsheet.

Step 1: Read the first four short paragraphs of the "Introduction" section of the COM-HE instrument out loud.

ASK:

- Are there any parts of this section that are unclear to you?
- Please summarize this survey's definition of "healthy eating" in your own words.

ASK probing questions as necessary to elicit additional parts of the introduction that are confusing or unclear to the participants.

- Examples: What about that phrase was unclear to you? How would you phrase it to be more easily understood?

Research Assistant will **RECORD** comments in the Focus Group Data Excel document under the "Introduction Part 1" column.

Step 2: Read the last two sections of the "Introduction" section of the COM-HE instrument out loud.

ASK:

- Are there any parts of this section that are unclear to you?
- Please summarize this survey's definition of "healthy eating" in your own words.

ASK probing questions as necessary.

Research Assistant will **RECORD** comments in the Focus Group Data Excel document under the "Introduction Part 2" column.

Step 3: Read the full description of "Physical Opportunity" out loud.

ASK:

- Are there any parts of this section that are unclear to you?
- Please summarize "physical opportunity" in your own words.

ASK probing questions as necessary.

Research Assistant will **RECORD** comments in the Focus Group Data Excel document under the "Physical Opportunity Description" column.

Step 4: Read each item in the "Physical Opportunity" category out loud, and ask the following questions *for each item.*

ASK:

- What do you think this question refers to?
- Can you rephrase the question in your own words?
- Which words in this question are unclear to you, if any?

ASK probing questions as necessary.

Research Assistant will **RECORD** comments in the Focus Group Data Excel document under the column for each item.

Repeat Steps 3 & 4 for all remaining descriptions and questionnaire items, recording in the Excel document accordingly.

Appendix D - Focus Group View

Researchers and focus group participants gathered in the PAN-CRC conference room where the draft COM-HE instrument was displayed on a screen. Participants provided their comments on each description and item in response to the questions asked from the focus group guide.