"You Are What You Eat"

A Literature Review of Connections between the Diet and the Elderly's Health

Human Aging and Elderly Service

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Abstract:

Health promotion can be achieved by educating and enabling people to make healthier lifestyle choices. The thesis uses the theory of health promotion as the framework, then focuses on the relationship between the diet and the health of the elderly, to raise awareness of the impact one's diet has on his or her health, through a review of twelve scientific researches, by focusing on the research question: "What are concrete cases demonstrating the potential connections between the diet pattern and the elderly's health conditions?"

Referring to the book " Doing a Literature Review in Health and Social Care" by Helen Aveyard, a systematic literature review is conducted following the steps of identifying the research questions, data searching, data selection and data analysis. Results shows that there are scientific evidences demonstrating the connections between the diet and the elderly's health, which are concluded into the relationship between the diet and the physical health, and the relationship between the diet and the cognitive health.

Possible limitations result from the conduct of the literature review on a basis of limited resources as well as those generated from the researches themselves.

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For my dear classmates and my kind teachers.

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Diseases come from the mouth.

Chinese proverb

Abbreviations used

UAS University of Applied Sciences

SPMSQ Short Portable Mental Status Questionnaire

CVD cardiovascular disease

PUFAs polyunsaturated fatty acids

BMD bone mineral density

CMD cardio metabolic diseases

AD active diet

CD control diet

Med Diet, MD Mediterranean diet

LTL leukocyte telomere length

MDS Mediterranean diet score

MetS metabolic syndrome

LDL low density lipoprotein

SCORE Systematic Cardiovascular Risk Estimation

ASM Appendicular skeletal muscle mass

25(OH) D 25-hydroxyvitamin D

LTL Leukocyte telomere length

SFA saturated fat acid

PUFA polyunsaturated fatty acids

1 INTRODUCTION

There is a saying “You are what you eat”. Do you believe in it?

Along with the human history an assortment of diet pattern has been developed, to supply the body with energy, to comfort the spirit, or to share good time with friends and families. All over the world, from the Himalaya Mountain to the Hawaii Island, from ancient temples in the Far East to modern buildings in America, there are different people doing different things, but all of them need to eat. There are Italian cuisine, French cuisine, Japanese cuisine and Chinese cuisine…There are people who prefer to eat meat and people who enjoy eating vegetables. Food seems to be one of the closest “friends” in our life. As long as we are alive, we need to eat.

Unfortunately sometimes the intimate friend may turn into an enemy by inducing various viruses into the human body which may lead to further development of diseases, thus reducing the quality of life to a certain degree. A variety of so-called civilized diseases are known to have a significant association with the lifestyle, and especially with the diet one consumes on a regular basis.

In this thesis, the relationship between “what one eats” and “what one is” will be explored in scientific details from several aspects.

1.1 Background

According to the Thesis Guide (version 1.2) from Arcada University of Applied Sciences (UAS), Motivations why the very topic is chosen as the focus of this research is going to be explained. The significance of the topic is going to be discussed. Background information will be provided in order to help to clarify the study further more. The motivations of the research topic choice, the significance of the chosen research topic and the background information will be described in the following text.

1.1.1 The Motivations of the Research Topic Choice

Why it is decided to set the research topic as the relationship between food and the health of the elderly? There are a total of four motivations listed, starting from personal reasons to more general consideration.

Personally, there are two motivations. First, the research topic is chosen by the author for an academic reason. The topic was chosen to enable the accomplishment of a bachelor degree thesis. Second, the author has gradually gained much knowledge from the study of the degree about the topic, which provided inspiration, confidence and passion for the author to continue the study.

From a more general viewpoint, there are as well two motivations. These following considerations may be ideal but the author has the faith that even small effort can make a big difference. After all, everything starts from small. Even the perfect is never to be achieved, it is still worth trying to become nearer and nearer to the best, by following its footsteps the society will be able to stay on the right track without losing hope.

Firstly, the topic is related to everyone. There is such a hope that the reader of this thesis will find the topic relevant for their life and the information useful for his or her own health. The author has, however, chosen to focus on the health of the elderly since the degree program from where the author will be granted a certificate upon graduation is "Human Ageing and Elderly Services". The topic will remain relevant for the reader because everyone is in the process of ageing and hopefully the thesis could make a tiny contribution towards the direction of successful ageing according to various individual criteria on the definition of successful ageing, which is believed to include a certain set of standards about the condition of the health.

Secondly, prevention outweighs treatment. Prevention makes sense from a micro to a macro level. On a micro level, the introduction of the chosen topic wills more or less help to spread the concept of healthy eating. Even there is only a single individual who will gain some benefit after getting access to the thesis, it means that there will be one more person getting know more about the importance of diet, thus he or she has a better chance towards the fitness by being aware of the food choice he or she makes. It is assumed that there will be more than one who read the thesis and gain some inspiration. Those who will be encouraged by the topic will hopefully continue update their knowledge and spread the information to loved ones. On a macro level, all these small efforts will consequently make their own contribution to both the society as a whole and to each individual within the society. Individuals will suffer less from chronic diseases caused by inappropriate diet while enjoying a higher quality of life while the society will have lighter financial burden in a sustainable way when the issue is observed by

long term, which will give rise to saved resources distributing to places in more need, therefore the society has a possibility to function more efficiently and smoothly.

1.1.2 The Significance of the Chosen Research Topic

Why the topic is deemed significant? Food choice matters in terms of the health as a whole – physically, mentally as well as socially. Those small food choices one makes in front of supermarkets' shelves have a big influence on the person's health. Healthy eating provides possibilities to an enhanced life quality by contributing to one's feeling of wellbeing. Especially in older ages, the state of one's health has the power to determine how the person's day is organized, what activities can be set in the schedule and where one's time is spent. To have a sound after-retirement life, it is essential for the elderly to be able to take care of the health by making informed food choices.

The significance of the topic will be further discussed in the final discussion part of this research in light of the theoretical framework which will be introduced in later part of the introduction...

1.1.3 The Background Information

From which background has the topic emerged? During recent years there have appeared researches of the effect of healthy eating on one's status of the wellbeing from lots of different perspectives. Three recent ones are listed below to provide a glance of the context:

1) Victor L Fulgoni et al (2013). Avocado consumption is associated with better diet quality and nutrient intake, and lower metabolic syndrome risk in US adults: results from the National Health and Nutrition Examination Survey (NHANES) 2001–2008 Nutrition Journal 2013, 12:1

This research investigates the relationships between avocado consumption and overall diet quality as well as physiological indicators of health. Avocado consumption and nutrition data were based on 24-hour dietary recalls collected by trained interviewers using the USDA Automated Multiple Pass Method. Physiological data were collected from physical examinations. Diet quality was calculated using the USDA's Healthy

Eating Index-2005. From the year 2001 to 2008, 17,567 US adults participated in the study, from which 347 were avocado consumers. Avocado consumption is found to be associated with improved overall diet quality, nutrient intake, and reduced risk of metabolic syndrome.

2) Whitehead, R. D. et al (2012). You are what you eat: Within-subject increases in fruit and vegetable consumption confer beneficial skin-color changes. PLoS ONE, 7(3), 1-9.

In this article the authors conclude a positive connection between increased fruit and vegetable consumption and healthier Caucasian skin appearance within six weeks ,which may be used as a motivation in dietary intervention. A longitudinal method is conducted in a group of 35 individuals. Meanwhile psychophysical methods are used "to investigate the minimum color change required to confer perceptibly healthier and more attractive skin-coloration." This research studies the relationship between food and wellbeing from a detailed angle.

3) Samieri, Cécilia et al. (2013). the Association between Dietary Patterns at Midlife and Health in Aging. Annals of Internal Medicine. Vol. 159 Issue 9, p584-594

The research examines the association between midlife dietary patterns and healthy aging. 10670 women (median age, 59 years) were included in the cross-sectional observational study. Health information was collected 15 years later from participants. It is found that better dietary quality at midlife seems to be strongly linked to greater health.

1.2 Aim of the Literature Review

According to the Thesis Guide (version 1.2) from Arcada UAS, the aim will be presented as early as this stage for the sake of setting focus on the right questions. The aim is stated in the following text.

Nowadays people are living longer, healthier lives. A major goal of the public health system is to maintain health among successful agers and prevent or delay chronic disease morbidity (Sahyoun 2002, p. S42).

The thesis is aimed to promote healthy lifestyle among the elderly by encouraging food choices which may be more beneficial for the health. The wish is to raise awareness of healthy eating in advanced age by strengthening beliefs in "the healthful food".

To draw a light on the power of healthy eating and to help to raise awareness of the elderly and social workers in healthcare-related fields, this thesis will explore evidence-based connections between food and the health through a review of 12 academic articles. Attempt will be made to explore the possible influence of different food on the wellbeing from physical, mental or social aspects both negatively and positively.

1.3 Research Questions

According to the Thesis Guide from Arcada UAS, the thesis' aim is to be formulated and defined with the help of research questions or hypotheses. A conclusion of the refined research questions will be given in the end of this section, followed by the process of the development of the hypotheses and the form of the decided questions.

To cure diseases medicines are put into the body, and on most occasions just like the way food is eaten. If medicines have the ability to cure diseases by functioning in the body through the mouth, something must be going on in the body after we eat the medicine. There are people who are addicted to alcohol or drugs-by drinking, injecting, inhaling or other means to transfer the substance into the body, addicts get comfort for a short time.

The hypotheses therefore comes at this point – if there is something happened in the body after foreign substance is absorbed into the system, there should be a way to improve the health condition by adjusting what comes into the body - in this case – what one consumes as food.

There are numerous connections between food and health, and it is even difficult for a scientist to analyze all the possible connections, putting aside there are still much more connections to be discovered. However this doesn't mean that there is no use to try to take a closer look at the associations. On the contrary, it would be beneficial to try to do research on the topic, in order to achieve a more comprehensive understanding of the role food plays in one's life. Eventually it is decided to narrow the research questions

down into a practical level.

There are many researches done around the topic of relationships between various food components and one's health. It is therefore not realistic to review all to reach a certain conclusion. Even though it is hardly doable to provide a complete answer, it is achievable to start small and to focus on the available resources, in order to provide an insight to those connections between what one eats and what one is. Eventually the research questions are set as the following from the general to more detailed aspects:

1) Is there any scientific evidence of potential influence of the diet on the health from various aspects (e.g. physical functioning or cognitive capacity)?

A first-round literature search was done to make sure that the answer is positive.

This then leads to the second research question, which will be the focus of the following literature review process.

2) What are concrete cases demonstrating the potential connections between the diet pattern and the elderly's health conditions?

1.4 Limitations

According to the Thesis Guide from Arcada UAS, this section will state reasons why the problem area is limited as it is presented. This part explains how the author limited the research material, what fell beyond the scope of the study and why.

It needs to be noted, however, it is the action of limiting the study scope that makes the work possible to conduct – not a bad thing in this sense.

Since there is a limited amount of time to conduct the literature review, only resources after the year 2009 have been searched through four online databases, which makes it possible to leave important studies out.

The sample collected is a rather small one, including researches mainly from Europe, which makes it difficult to generalize to other geographical areas.

No research is perfect. The design has strengths and weaknesses, and the limitation of the researches will be mentioned in the method part, under the title of data analysis using critical appraisal tools.

Limitation regarding the conduction of the literature review of the twelve selected researches and related thoughts from the author will be given in the discussion part under the title of further thoughts regarding the limitation of the research.

1.5 Theoretical Framework

According to the Thesis Guide from Arcada UAS, this section will indicate earlier research in the area and establish the relevance of this thesis in relation to the former ones. A theoretical framework will be employed to set this review into a bigger context of the health care and social service field.

A theoretical framework is the lens through which a study is approached. Establishing a sound theoretical framework gives a researcher focus and clarity, because a problem cannot be approached from all perspectives simultaneously. This will guide the questions the researcher asks, the literature consulted and the methods employed. A previously researched topic can be approached with a new framework that yields entirely different results. The importance of a theoretical framework is first to focus the researcher and, in the end, give context to the audience. (EHow online information)

Theories of health promotion from a book by Naidoo & Wills will be used as the theoretical framework for this thesis as explored in the following text.

The process of attempting to promote health may include a range of interventions such as those which foster healthy lifestyles, those which encourage access to services and involvement in health decisions, those which seek to promote an environment in which the healthy choice becomes the easier choice, and those which educate about the body and keeping healthy. (See Naidoo & Wills 2003 p.71.)

The principles of health promotion which were developed by the WHO have 5 aspects including building a healthy public policy, creating supportive environments, developing personal skills such as information and coping strategies, strengthening

community action, and reorienting health services away from treatment and care and improving access to health services. (See Naidoo & Wills 2003 p.78.)

An awareness that individuals make health choices which can contribute to the development of disease led to the view that it was possible to inform people about the prevention of disease, to motivate them to change their behavior, through persuasion and mass communication techniques, and to equip them through education with the skills for a healthy lifestyle. (See Naidoo & Wills 2003 p.80.) The term "health education" is used to conclude the above concept, falling under the umbrella of the broader definition of health promotion (see Naidoo & Wills 2003 p.83).

The process of mediation, advocacy and enablement were identified as ways in which health could be promoted (Naidoo & Wills 2003 p.79).

Health promotion requires coordination and cooperation between agencies. Health promoters mediate between different interests by providing advice to local groups and influencing policy.

Advocacy means representing the interests of disadvantaged groups and may mean speaking on their behalf or lobbying to influence policy. It can include any attempt to exert pressure on policy makers to recognize the nature of health disadvantage.

Health promotion aims to reduce differences in health status and ensure equal opportunities to enable people to achieve their full health potential. Health promoters should work to increase knowledge and understanding, and individual coping strategies. Enablement requires health promoters to act as a catalyst and then stand aside, giving control to the community. (See Naidoo & Wills 2003 p.83.)

The relevance of the literature review to this framework will be analyzed in the discussion part after other essential parts of the thesis are presented.

1.6 Definitions

According to the Thesis Guide from Arcada UAS, this section will explain the central concepts referred to in the thesis.

1.6.1 The Definition of Health

The term “health” is a broad concept. It ranges from the narrowly technical to the overall moral or philosophical. The word “health” comes from the old English word for heal (hael) which means “whole”, concerning the whole person and the integrity, soundness of that person. (See Naidoo & Wills 2003 p.5 f.)

In 1946 the World Health Organization concluded the concept of health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. The wellbeing consists thus not only physical aspect but also psychological and social ones (see Earle et al. 2007 p.44).

In 1986 the World Health Organization stressed health as a resource for everyday living by stating that “to reach a state of complete physical mental and social wellbeing, an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities.

According to Earle et al., there are various factors that can influence one’s health: age, sex and hereditary factors, individual lifestyle factors, social and community influences, living and working conditions and last but not least social and environmental conditions. (See Earle et al. 2007 p.76 ff.)

1.6.2 The Definition of an older or elderly person

According to the World Health Organization, most developed countries have accepted the chronological age of 65 years as a definition of 'elderly' or older person. While this definition is somewhat arbitrary, it is many times associated with the age at which one can begin to receive pension benefits. At the moment, there is no United Nations standard numerical criterion, but the UN agreed cutoff is 60+ years to refer to the older population.

Although there are commonly used definitions of old age, there is no general agreement on the age at which a person becomes old. (Definition by WHO)

In this thesis the elderly refer to people aged 55+ or about to enter the group. The reason for choosing 55 as the age boundary is that in the reviewed articles there were researches where parts of the subjects were a little younger than the age of 60.

2 THE METHOD

According to the Thesis Guide from Arcada UAS, the method section begins with the argumentation for the chosen methods along with the description of the methods with references to some literatures. The procedures of employing the chosen methods will be presented following the argumentation, under the titles of Identify Research Questions, Data Search, Data Selection and finally Data Analysis.

2.1 The Argumentation for the Chosen Methods

In the following text rationales for the choice of the method of systematic literature review will be explained into two subtitles, namely the definition of systematic literature review, the advantage of systematic literature review.

It is worth to be mentioned at this point that the reason another research methodology such as one involving primary data collection was not chosen can be explained by a limit of available resources including research fund and contacts, meanwhile literature review does provide much more comprehensive access to the research topic with a wide range of expert researches, thus making it the most suitable method for this thesis.

2.1.1 The definition of systematic literature review

A systematic literature review is a research methodology in its own right. A literature review is the comprehensive study and interpretation of literature that relates to a particular topic. A research question is identified and the answer is sought by searching for and analyzing relevant literature systematically. The review leads to insights that are only possible when each piece of relevant information is seen in the context of other information. If a piece of literature is one part of a jigsaw, then a review of these literatures is the whole completed jigsaw. (See Aveyard 2010 p.5 f.) .

2.1.2 The advantage of systematic literature review

The merits of literature review are listed as the following two:

1). literature reviews seek to summarize the literature that is available on any topic. The reader thus does not have to access each individual research included in the review. The social and health care professionals are facing lots of new information, the literature review lighten their burden by providing easier access to the latest development of relevant researches in the professional area. This method makes it practical to gain more knowledge in a limited time-frame for the reader. (See Aveyard 2010 p.6)

2). The methodology avoids the situation where one is possibly misled by reading a single piece of research, taking advantage of its nature about bringing together each single piece of relevant information to present the whole picture. There will always be pieces of literature that do not quite seem to fit together with the main body of research. It is therefore important to assess the value and contribution of one article in the light of other articles that address the same topic, rather than to make a conclusion from the findings of just one paper. The findings of single research papers are not enough- or should not be enough- to influence practice. (See Aveyard 2010 p.6 f.)

2.2 The Procedures of Employing the Method of Literature Review

The procedures were break down into four stages starting first with the identification of the suitable research question which will be explained together with the rationale and the origins of the research question.

The second stage involved a process of searching for appropriate literatures which will be documented with the aid of a report of the search terms and the search strategy.

The third stage is about how the literatures were critiqued and analyzed with certain critical appraisal tools.

The fourth stage relates to the way this information was brought together by content analysis. (See Aveyard 2010 p.20)

These four stages will be presented in great detail in the following parts to make the process as transparent and repeatable as possible.

2.2.1 Identify research questions

The interest is the role one's diet plays in terms of influencing his or her health. A considerable period of time is spent before the most suitable research questions were finally determined.

Sometimes, often even, the best questions are very simple, those that arise from your own practice and require answer that you can feed back into practice. Finding the right research question is one of the most important aspects of undertaking your literature review. However, the right question does not necessarily mean a complex or big question. Normally the reverse is true. (Aveyard 2010 p.23)

The poor research question is likely to be too broad and unanswerable within the time frame. An example of a question that would be too difficult and complex to answer for a small-scale project could be-What are the effects of domestic

violence on family life? – This is a huge and complex topic on which there is a lot of discussion and research evidence. Within the time span of a small-scale project, the researcher would be unable to cover the breadth of the topic and would be unlikely to be able to reach any conclusion based on the evidence reviewed. (Aveyard 2010 p.24)

According to the suggestions from the book "Doing a Literature Review in Health and Social Care" by Helen Aveyard, the questions were set in neutral language rather than in a leading way, without making any assumptions about the answers.

Starting from the first question, "Are there any scientific evidence of potential connections between the diet and the health from aspects concerning for example physical functioning or cognitive capacity?" A first-round literature search was conducted to make sure that the answer is positive.

This then leads to the second research question: What are concrete cases demonstrating the potential connections between the diet pattern and the elderly's health conditions? The focus is on the health condition of the elderly, making the question answerable within the limited timeframe by setting a specific angle for the review.

The second question will guide the way for the remaining procedures to keep the whole study on the decided track.

2.2.2 Data Search

The search of literatures was done by following three rigid steps. In order to collect academic researches of relatively high quality and reliability, Arcada's remote access to Nelli made it possible to search information from a wide variety of resources on an academic basis. The literatures reviewed in the study were extracted from the following online databases EBSCO (Academic Search Elite), BioMed Central and Cochrane Library (Terveysportti).

The rationale for using the above databases is that they offer a great deal of literatures in the health-care related field. And according to Aveyard academic search engines are far more specific than a general search engine such as Google, they allow one to do advanced searching using different combinations of words and have direct access to

academic journals and books. Therefore, they will only direct one to relevant academic literature, rather than the thousands of hits one gets when doing a Google search. (Aveyard p.74)

Step 1: brainstorm keywords

In the brainstorming process of creation the keywords, the author took advantage of an online thesaurus (thesaurus.com) and the Google translate to identify synonyms for "diet" "health" and "the elderly" respectively in order to make the alternative words as much as possible, thus making sure the search of literatures comprehensive and exhausted.

Key words are created as the following in three aspects:

1), Diet and related concept which may generate relevant articles, including dietary pattern, dietary habits, food, food choice, food intake, food and drink, nutrition, nutritional therapy, nourishment, healthy eating, eating habits, eating regime, eating plan.
2), Health and related concepts (wellbeing, function, functional capacity, capacity, body, wellness, fitness, state, good condition, disease, illness, sickness, weakness, patient),
3), elderly and related concept (aged, aging, old, retired, older adults, geriatric populations).

Step 2 a pilot search to identify the search terms

Before the final decision of the search terms were made, a pilot searching in the database EBSCO were conducted using different combinations of the above key words to choose the most suitable ones, which would make the search organized and the search range properly wide.
The search terms were finally decided in the following three dimensions:
1), diet and related words including dietary, food, nutrition, eating.
2), health and related words including wellbeing, function, capacity, condition, disease, patient.
3), elderly and related words including aging, old, older adults.

Step 3 the final search

By combining the above search terms in the three databases, there were 1651 results generated to be potentially relevant to the research question in either the topic or the abstract or both.

2.2.3 Data Selection

The data selection phase contains three steps. In order to conduct the selection in a rational way, inclusion and exclusion criteria were created, which will be mentioned during the description of this phase.

Step 1: the initial screening

The initial selection was done while the data searching process .During the initial selection process, resources were scanned by characteristics including the author, the source, subject terms, and (author supplied) keywords. The topic and abstract of the article was checked as the most important determents to see if the article potentially addresses the research questions. Articles which fulfill the focus of research questions in their topics were selected as the most promising resources for later review, namely the topic indicates that the paper examines possible association between the diet and one's health from one or more aspects (physically, mentally and socially), involving the consideration for the elderly. Articles which clearly do not serve the research purpose in their topics were excluded in the first instance. Articles which demonstrate their relevance in abstracts were selected as well after assessing the topic alone could not determine their relevance. The first round selection led to a total of 49 articles.

Step 2: a second round quality check

The 49 articles were going through a second-round quality check for the most relevant data, from which 17 articles survived. These 17 articles will go through a third check by critical appraisal tools in the next step.

Besides the general limiters which were provided by the online databases and utilized in the searching process, two extra excluding criteria were set to make the study stay

focused in the chosen direction in order to answer the decided research questions properly. The two extra exclusion criteria for quality check were:

1) A piece of article is excluded from the review if it is not related to the research question in a very direct manner, i.e. the article does not serve directly the focus of this study. Some articles seem to be interesting and of high quality, however, they need to be put aside eventually to keep the study in the chosen direction.

2) The article is a literature review itself: there is no urgent need to repeat the process. It is intended to collect first-hand literature to come up a summary out of those isolated information to bring new insights to serve the busy readers on a practical level.

All together the five exclusion criteria were set as the following under the instruction of the book "Doing a Literature Review in Health and Social Care":

1) Primary research relating to the relationship between the diet and the health of people other than the elderly

2) Not English language

3) Unpublished research

4) Pre-2009

5) A literature review

Accordingly, the four inclusion criteria were:

1) Primary research relating to the diet and the health of the elderly

2) English language only

3) Published literature available in full text only

4) 2009 onwards

Some of the criteria were set for practical reasons, given that there was a limited time frame as well as financial resources for the author to conduct the research, which have be mentioned in detail as limitations of the review in the introduction section.

Step 3: critical appraisal of the literature

Once the literature which is deemed to address the research questions was obtained through a comprehensive search, it is needed to critically view the literature before the strengths, limitations and the relevance can be determined at last.

When the literature is appraised, three assessments are made: 1. is the literature relevant to my review? 2. Have I identified literature at the top of my hierarchy of evidence? 3. Is this literature of high enough quality to include in my review? Critical appraisal of the literature is the process of addressing the three questions. It enables the author to make assessments as to the relevance of the potential resources and to identify the strengths and limitations – and therefore the impact – which the paper will have on addressing the research question. (See Aveyard 2010 p.90 ff.)

The 17 articles were all quantitative research containing a research question, an identified method, discussed results as well as conclusions. Once the type of literature was identified, the appropriate appraisal tool was selected. (See Aveyard 2010 p.97)

The chosen set of tools was produced by the Critical Appraisal Skills Program from the University of Oxford. The advantage of the CASP tool is that there is a specific tool for most, if not all, of the studies. At undergraduate level, the 9 main questions were considered rather than the more detailed ones. (See Aveyard 2010 p.98)

In the CASP homepage eight critical appraisal tools are designed to be used when viewing research, including tools for Systematic Reviews, Randomized Controlled Trials, Cohort Studies, Case Control Studies, Economic Evaluations, Diagnostic Studies, Qualitative studies and Clinical Prediction Rule. Since the 17 articles were quantitive research, critical appraisal tools for Randomized Controlled Trials, Cohort Studies, Case Control Studies, and Diagnostic Studies were chosen to further evaluate these researches. The specific questions for each are listed as the following, the hints provided by CASP help to address the questions to three answers as yes, no and can’t tell.

The three screening questions designed for Randomized Controlled Trials by CASP are:

1) Did the trial address a clearly focused issue?

2) Was the assignment of patients to treatments randomized?

3) Were all of the patients who entered the trial properly accounted for at its conclusion?

The two screening questions designed for Cohort Studies by CASP are:

1) Did the study address a clearly focused issue?

2) Was the cohort recruited in an acceptable way?

The two screening questions designed for Case Control Studies by CASP are:

1) Did the study address a clearly focused issue?

2) Did the authors use an appropriate method to answer their question?

The two screening questions designed for Diagnostic Studies by CASP are:

1) Was there a clear question for the study to address?

2) Was there a comparison with an appropriate reference standard?

By the end of the critical appraisal of the literature, 12 research articles were left for the final analysis and conduct of this review. The 12 researches will be presented below in chronological order according to their publish date in order to provide a glance of the whole scope, taking advantage of the abstracts provided by their authors. This presentation will be however re-organized by the author of this thesis into the aim, design, result and possible limitations for each of the twelve articles.

The presentation will be followed by the last but not least stage of content analysis of the entire method section. As the other five articles make little contribution to the final conduction of content analysis, they will not be mentioned below. Therefore only the following twelve articles will be read and re-read in the ultimate stage of the method section, i.e. the content analysis. The twelve selected literatures are:

1) Vizuete, Aránzazu Aparicio et al. (2010) Association between food and nutrient intakes and cognitive capacity in a group of institutionalized elderly people. European Journal of Nutrition. Aug2010, Vol. 49 Issue 5, p293-300.

Aim: To determine the association between food intakes and cognitive capacity among institutionalized elderly.

Design: 178 institutionalized elderly (aged 65+) from the Madrid region participated in the study. The diets were recorded by precise weighing over a week, and the cognitive capacity was assessed using the Short Portable Mental Status Questionnaire (SPMSQ). Groups were formed as those who did not incur errors and who incurred one or more errors. The subjects were also grouped according to whether they were above or below the age of 50.

Result: The subjects with no errors in the SPMSQ test consumed greater quantities of cereals, eggs, oils, and fats. An inverse association was seen between fish, vegetable consumption, the intake of fiber, vitamin B6, and folic acid and cognitive capacity score. The subjects had also greater intakes of carbohydrates, polyunsaturated fatty acids, riboflavin, and vitamins C, D, and E. The research shows the importance of the diet in the maintenance of cognitive function.

2) Hamer, M et al. (2010) Dietary patterns, assessed from a weighed food record, and survival among elderly participants from the United Kingdom. European Journal of Clinical Nutrition. Aug2010, Vol. 64 Issue 8, p853-861.

Aim: to examine the association between dietary patterns and mortality among community dwelling participants from Great Britain aged 65+

Design: with the assistance of the gold standard dietary assessment method and a weighed food record, dietary intake was recorded in 1017 elderly. Exploratory factor analysis was performed to examine dietary patterns. Participants were followed up over an average of 9.2 years for mortality.

Results: The factor analysis revealed four components accounting for 9.8% of the total variance. A ‘Mediterranean-style’ dietary pattern explained the greatest proportion of the variance, followed by ‘health-aware’, ‘traditional’ and ‘sweet and fat’ factors. 683 deaths occurred during the follow-up. After adjustment for potential confounders, only the Mediterranean-style dietary pattern remained associated with mortality. The benefits of the Mediterranean diet were only observed among women while the traditional diet

was a risk factor for mortality among men. The research confirms that dietary patterns are important in longevity among the elderly.

A possible limitation is the lack of information about dietary patterns earlier in the life course, which may be an important influence on health (McNaughton et al., 2007).

3) Polychronopoulos, Evangelos el al (2010) Dietary meat fats and burden of cardiovascular disease risk factors, in the elderly: a report from the MEDIS study. Lipids in Health & Disease. 2010, Vol. 9, p30-35

Aim: to evaluate the relationships between dietary fats and cardiovascular disease (CVD) risk factors (diabetes, obesity, hypercholesterolemia, hypertension), among elderly without CVD.

Design: Dietary and clinical data from 1486 elderly (aged 65-100) was analysed.18.5% of males and 33.3% of females had three or four CVD risk factors, the major source of fat was olive oil.

Result: A 5% increase in energy adjusted fat intake from meat was associated with a 21% increase in the likelihood of having an additional CVD risk factor; no significant associations were observed regarding other types of fat consumed. The research states a hypothesis that the consumption of fat from meat seems to increase the burden of CVD risk factors among elderly.

A possible limitation is that this study is cross-sectional and consequently has the potential of recall biases, particularly in the assessment of dietary habits. In addition there was no specific data on the type of meat.

4) Javier, R et al. (2012) Associations of dietary polyunsaturated fatty acids with bone mineral density in elderly women. European Journal of Clinical Nutrition. Apr2012, Vol. 66 Issue 4, p496-503.

Aim: to investigate the relationship between dietary polyunsaturated fatty acids (PUFAs) and bone mineral density (BMD) among elderly women.

Design: 554 Subjects from the Kuopio OSTPRE Fracture Prevention Study filled a 3-day food record and a questionnaire on lifestyle factors, diseases and medications. BMD

was measured at lumbar spine, femoral neck and total body. The associations between dietary fatty acids and BMD were analyzed by a linear mixed model.

Results: Positive relationship was found between the dietary PUFAs and BMD at lumbar spine and in total body but not at femoral neck. The intake of total PUFAs, linoleic and linolenic acids, n-3 and n-6 fatty acids were associated with BMD at lumbar spine. The research supports the beneficial effect of dietary PUFAs on bone health among elderly women.

5) Juscelino Tovar et al. (2012) a diet based on multiple functional concepts improves cardio metabolic risk parameters in healthy subjects, Nutrition&Metabolism 2012, 9:29

Aim: to assess the impact of a diet combining functional concepts on risk markers of cardio metabolic diseases (CMD) in healthy overweight individuals.

Design: 44 healthy subjects (age 50-73, BMI 25-33, fasting glycaemia ≤ 6.1 mmol/L) participated in a randomized crossover intervention during 4 weeks with a 4-week washout period which compared an active diet (AD) with a control diet (CD) devoid of the "active" components.

Result: Weight reductions were observed with both diets. CD did not modify the metabolic variables measured while AD did. The differences remained significant after adjustment for weight change. The improved biomarker levels recorded in healthy individuals following the AD suggest preventive potential of this diet against CMD.

A limitation is the unbalanced gender participation. The relative heterogeneity of the cohort regarding metabolic characteristics may also be limiting, together with the study length.

6) Claesson, Marcus J et al (2012), Gut microbiota composition correlates with diet and health in the elderly, Nature. 8/9/2012, Vol. 488 Issue 7410, p178-184.

Aim: to examine the relationship between diet, microbiota and the health status among elderly.

Design: 178 elderly formed groups correlating with residence location in the community, day-hospital, and rehabilitation or in long-term residential care. Clustering of 178 elderly subjects was then developed by diet and microbiota composition.

Result: Microbiota composition correlated with measures of frailty, co-morbidity, nutritional status, markers of inflammation and with metabolites in faecal water. There is a relationship between diet, microbiota and health status. The research gives credit to the role diet plays in microbiota alterations rates upon aging.

7) Shahar, Danit R et al. (2012) Adherence to Mediterranean Diet and Decline in Walking Speed over 8 Years in Community-Dwelling Older Adults. Journal of the American Geriatrics Society. Oct2012, Vol. 60 Issue 10, p1881-1888.

Aim: To determine the association between Mediterranean diet (Med Diet) and 20-m walking speed.

Design: 2225 well-functioning individuals aged 70+ participated in the research during 8 years. Walking speed was assessed in relation to low, medium, and high adherence to the Med Diet.
Results: Walking speed declined in all Med Diet adherence groups over 8 years while it was highest in the high adherence group. Higher Med Diet adherence was an independent predictor of fewer declines in the walking speed. The research suggests a long-term effect of diet on mobility performance with aging.

8) Tiainen, A-MK et al. (2012) Leukocyte telomere length and its relation to food and nutrient intake in an elderly population. European Journal of Clinical Nutrition. Dec2012, Vol. 66 Issue 12, p1290-1294

Aim: to study the association between fats, fruits, vegetables and leukocyte telomere length (LTL) in a cross-sectional study design.

Design: LTL was measured by quantitative real-time polymerase chain reaction in 1942 subjects aged 57-70 years from the Helsinki Birth Cohort Study. The diets were assessed by a validated semi quantitative 128-item food-frequency questionnaire.

Results: There were only a few statistically significant effects of diet. Total fat and Saturated Fat Acid intake were negatively associated with LTL in men while vegetable

intake was positively associated with LTL In women. Men consuming the most butter and least fruits had significantly shorter telomeres than those consuming the lowest amounts of butter and highest amounts of fruits. No association was found between LTL and body mass index, waist-hip ratio, smoking, physical activity or educational attainment.

The data may not be generalizable to other ethnicities than Caucasians.

9) Virginia Boccardi et al (2013), Mediterranean Diet, Telomere Maintenance and Health Status among Elderly, PLoS ONE. Apr2013, Vol. 8 Issue 4, p1-6.

Aim: to examine the association between Leukocyte telomere length (LTL), telomerase activity and Mediterranean diet (MD) and their influence on healthy status.

Design: 217 elderly were stratified according to Mediterranean diet score (MDS) into three groups as low, medium and high adherence. LTL was measured by quantitative polymerase chain reaction and telomerase activity by a PCR-ELISA protocol.

Result: high adherence group showed longer LTL and higher telomerase activity compared to other groups. Linear regression analysis including age, gender, smoking habit and MDS showed that MDS was independently associated with LTL and telomerase activity levels. Telomerase activity was associated independently with LTL and negatively affected by inflammation and oxidative stress. Telomerase levels are associated with the health status among elderly rather than LTL variability. It shed light on the significant role MD playing in promoting health.

The limited subjects and the lack of a replication study are potential limitations of this study. Another limitation is the method used to estimate mean telomere length, the qPCR assay.

10) Anne Nilsson et al. (2013) a diet based on multiple functional concepts improves cognitive performance in healthy subjects. Nutrition & Metabolism 2013, 10:49

Aim: A) to investigate effects on cognitive functions of a dietary regime combining functional concepts potentially beneficial to risk markers associated with the metabolic syndrome (MetS) in overweight but otherwise healthy subjects. B)to evaluate cognitive performance in relation to results on cardio metabolic risk variables (BMI, blood

pressure, glucose, insulin, cholesterol, triglycerides, free fatty acids, lipoprotein A-1 and B, hs-CRP, HbA1c, interleukin-6, TNF-α, and PAI-1)

Design:44 healthy subjects (50–73 years, BMI 25–33, fasting glycaemia ≤ 6.1 mmol/L) participated in a randomized, controlled crossover intervention during 4 weeks, separated by a 4-week washout period, comparing an active diet (AD) including foods with potential anti-inflammatory action, with a control diet (CD) devoid of the "active" components. Cognitive tests were performed after each diet period, at fasting and in the postprandial period after a standardized breakfast.

Result: In comparison with the CD, the AD improved performance in the Rey Auditory-Verbal Learning test and test of selective attention. Performance in cognitive tests was inversely associated with plasma concentrations of cardio metabolic risk markers (fasting cholesterol, blood glucose, blood pressure) and cardiovascular risk scores (Framingham and Reynols), and positively associated with apolipoprotein A1. A relationship seems to exist between cardio metabolic risk markers and cognitive performance.

11) Maarit Hallikainen et al.(2013) Diet and cardiovascular health in asymptomatic normo- and mildly-to-moderately hypercholesterolemic participants – baseline data from the BLOOD FLOW intervention study, Nutrition & Metabolism 2013, 10:62

Aim: to evaluate arterial stiffness and endothelial function in asymptomatic adults and to relate the results to CHD risk factors and lifestyle habits with the emphasis on diet.

Design: 94 participants were recruited. Arterial stiffness was assessed as the cardio-ankle vascular index in large arteries, and endothelial function as the reactive hyperemia index with peripheral arterial tonometry. The Systematic Cardiovascular Risk Estimation (SCORE) was calculated.

Result: The majority had an elevated low density lipoprotein (LDL) cholesterol concentration and over half were overweight. 49% of the participants had a moderate risk of cardiovascular disease. Compared to general recommendations, half of the participants had too high intake of fat and in 66% the consumption of saturated fat was too high. The intake of carbohydrates was too low in 90% of the participants and for fiber 73% were below recommendations. There was evidence of borderline or increased

arterial stiffness in 72% of the participants and endothelial function was impaired in 8%. Arterial stiffness was associated with LDL cholesterol concentration, dietary cholesterol intake, and SCORE. The research emphasizes the urgency of adequate lifestyle and dietary interventions to prevent future coronary events from happening.

In the cross -sectional study data was collected only at one time point, making it difficult to prove causalities for the associations found. The study population was of limited size, volunteering to take part in the intervention, and therefore one cannot extrapolate these results to the general population.

12) Lee, S.-G et al (2013), Additive association of vitamin D insufficiency and sarcopenia with low femoral bone mineral density in noninstitutionalized elderly population: the Korea National Health and Nutrition Examination Surveys 2009–2010. Osteoporosis International. Nov2013, Vol. 24 Issue 11, p2789-2799.

Aim: to investigate the effect of vitamin D and sarcopenia on bone mineral density (BMD) among noninstitutionalized elderly.

Design: 3482 individuals aged 60+ were selected from the Fourth and Fifth Korea National Health and Nutrition Examination Surveys in 2009 and 2010. Appendicular skeletal muscle mass (ASM) and BMD were assessed by dual-energy X-ray absorptiometry; serum 25-hydroxyvitamin D [25(OH) D] and a panel of clinical and laboratory parameters were also measured.

Results: The study population was divided into four groups according to the vitamin D and sarcopenic status. BMD in total femur and in the femoral neck but not the lumbar spine was markedly decreased in sarcopenic subjects with vitamin D insufficiency comparing to other groups. BMD was significantly associated with ASM, calcium intake and conventional risk factors such as age, body mass index, and history of fracture. Sarcopenia, low daily calcium intake, low 25(OH) D levels, age, and BMI are independent predictors for low femur BMD. The research shows that vitamin D insufficiency and low BMD are more prominent in elderly with sarcopenia.

2.2.4 Data analysis

By the time this stage has been reached, the most suitable research questions have been identified, an appropriate search strategy to locate relevant information has been developed, and this information has been critically appraised to assess the strengths and limitations of the evidence. The process of analysis of the collected data is yet to come. (See Aveyard 2010 p.123)

As mentioned by Aveyard, one possible approach for the analysis of the twelve quantitive researches is meta-analysis. It refers to the statistical analysis of a large collection of results from individual studies for the purpose of integrating findings. Meta-analysis is able to demonstrate for example the effectiveness of a drug, or a fact that was not apparent when seen in isolation. However, this possibility of utilizing meta-analysis was turned down because that it is a complex process that may not be appropriate at undergraduate level. (See Aveyard 2010 p.126)

A simplified approach of content analysis was therefore chosen as the following:

The 12 articles were initially read through. Connections between each were interpreted. The data was compared within the context of each other. Information related to the research questions was collected. The evidences extracted from the 12 individual researches were brought together, demonstrating the relationship between diet and the health. This scientific evidence was grouped into two categories according to the nature and frequency of the appeared information, in order to answer the research questions in a structured way.

The final stage of the literature review is to combine the evidence and present the findings. This is addressed in the next chapter (Aveyard 2010 p.122). The findings were organized in a logical style under the two main categories by adding subtitles, connection sentences as well as obvious symbols (codes) in between the text when it is proper to do so, in acknowledgement of the advice the author has got from the thesis supervisor, with the consideration to serve the busy reader thus creating more chances to contributing efficiently to broadcasting of the information.

3 RESULTS

According to the thesis guide from Arcada UAS, now that the purpose of this thesis has been formulated, the material has been gathered, the method has been selected and the literatures have been analyzed. The results of the analysis will be presented in this section.

The author endeavoured to present the results as objectively as possible, since personal interpretations and reflections do not belong here. It has to be stressed here that all the scientific statements originate from the authors of the 12 selected literatures, in acknowledgement of their great devotion to the accomplishment of this literature review.

The results will be presented under two themes according to the need of the research question, namely The Diet's Impact on The Physical Health and The Diet's Impact on The Cognitive Health.

Since it may be rather heavy for the readers to master the results under just two categories, the author strived to organize the results as reader-friendly as possible, by adding subtitles, connection sentences as well as obvious symbols(codes) in between the text when it is proper to do so, in hope to serve one of the main purposes of this thesis, i.e. to bring new insight of the relationship between the diet and the health through a combination of isolated resources, to serve the potential readers in a practical time-frame which fit in their busy schedules.

The connection between these results will be further explained in the discussion part of the thesis, along with the author's personal interpretations.

The final findings of the whole literature review are presented as the following:

3.1 The Diet's Impact on The Physical Health

Among the twelve selected researches, ten of them focused on the diet's impact on the physical health. The information is organized below as three parts, i.e. The Mediterranean diet and the health, Fats and the health, other relationships between the diet and the physical health.

3.1.1 The Mediterranean diet and the health

Among the twelve selected researches, a quarter of them have mentioned the potential benefits of The Mediterranean diet to the health, which will be mentioned below into the following six paragraphs.

The Mediterranean diet is a model of a healthy diet that represents the dietary pattern from Mediterranean areas. It refers to a diet with large consumption of olives, fruits, vegetables, cooked legumes, nuts and cereals.

Dietary patterns are important in **longevity** among the elderly. A study by M Hamer et al. used weighed food records to investigate dietary patterns in a representative sample of community dwelling participants from Great Britain aged 65+ and their associations' with all-cause mortality. A Mediterranean-style dietary pattern was inversely associated with a reduced risk of all-cause mortality, and remained significantly associated with mortality after adjustment for a range of confounders. (M Hamer et al.2010)

There is an association between high adherence to the Mediterranean diet (MD) and a slower rate of cellular **ageing** charactered by a lower rate of telomere shortening and higher telomerase activity, which might be involved in **healthy life-span**.

Higher frequency of healthy subjects in the MD highest-adherence group was found. Healthy old showed significantly longer Leukocyte telomere length (LTL) compared with the unhealthy group and higher telomerase activity. There was a retrospective association between high adherence to Mediterranean diet and telomere maintenance system. Higher adherence to MD significantly correlates with telomere length, independently of multiple confounding variables affecting telomere attrition.

The findings by Virginia Boccardi et al. reveal a lower incidence of chronic disease such as hypertension, myocardial infarction, vascular diseases, dementia, stroke, congestive heart failure among elderly with higher circulating telomerase activity levels. Mediterranean diet plays a novel role in promoting healthy life-span. (Virginia Boccardi et al.2013)

A study by Danit R. Shahar et al. addressed the association between physical performances captured by **20-m walking speed** over 8 years and The Mediterranean diet (MedDiet). Walking speed is an indirect measure of lower extremity function that is

highly predictive of subsequent disability in various older populations. Over 8 years of follow-up, usual and rapid 20-m walking speed declined in the three MedDiet adherence groups, but the group with the best adherence performed better all the time. In those who survived to perform the test in Year10 of the study, higher MedDiet adherence was related only to rapid 20-m walking speed. (Danit R. Shahar et al.2012)

3.1.2 Fats and the health

In a cross-sectional study of elderly Finnish men and women by MK Tiainen et al., LTL was inversely associated with total fat, **saturated fat acid** (SFA) and butter intake in men. They are in line with each other, as butter is rich in SFA. Finnish men consume more fat as a percentage of total energy intakes than women. The results for women were similar, but did not reach statistical significance. In women, vegetable intake was positively associated with LTL.

The gender difference in the result might be explained by vegetable intake being much higher in Finnish women than in men. The result that in overweight and obese men margarine intake was associated with longer telomeres might be explained by other factors influencing LTL. Overweight and obese women having high intakes of vegetables exhibited longer telomeres. This shows that the effect of high vegetable intake on LTL remains regardless of weight. (MK Tiainen et al.2012)

A study by Evangelos Polychronopoulos et al. evaluated the association of dietary fat intake on **cardiovascular disease** (CVD) risk factors, revealing that high intake of fat from meat was associated with an increased likelihood of having more CVD risk factors among the elderly. According to previous studies meat is not an essential component of the diet and societies that have adopted vegetarian studies do not show any evidence of malnutrition when the supply of total food is adequate.

Meat is conventionally considered as a protein food and an important source of fat. On the contrary, high meat consumption highlights a crucial important public health issue, especially in the elderly. Only fat consumption from meat and its products is positively associated with the likelihood of having increased CVD risk factors, while fat from other source had no significant effect. (Evangelos Polychronopoulos et al.2010)

In a study by Maarit Hallikainen et al, the majority of asymptomatic middle-aged participants had elevated LDL cholesterol concentration and displayed borderline or increased arterial stiffness. Their **dietary habits** were far from ideal. Over two thirds consumed too much saturated fat, 90% consumed too little carbohydrates, and 70% too little fibre. The European guidelines on cardiovascular disease prevention in clinical practice emphasize that a healthy diet is the corner stone of cardiovascular disease prevention e.g. SFA intake should **not** be more than 10 % of total energy intake. Dietary cholesterol intake was associated with CAVI. This is important because it connects the dietary habits to arterial well-being. CAVI is an index of arterial stiffness in large arteries reflecting the elastic properties of the arterial wall between the aortic arch and the lower extremities (Maarit Hallikainen et al. 2013)

The above evidences have showed the negative influence of SFA to the physical health.

On the contrary, there is a positive relationship between the intake of total **polyunsaturated fatty acids** (PUFA), total n-3 fatty acids and linoleic and linolenic acids with **bone mineral density** (BMD) at lumbar spine and total body in elderly women. The significant associations were observed only in women who were without hormone therapy at baseline. No associations were demonstrated between the consumption of total fat and saturated or monounsaturated fatty acids and BMD. The associations of dietary PUFAs with BMD were demonstrated at lumbar spine and in total body but not at femoral neck. Dietary PUFA has beneficial effect on bone health. (R Jarvinen et al 2012)

3.1.3 Other relationships between the diet and the physical health

Elderly sarcopenic subjects with vitamin D insufficiency had significantly decreased bone mineral density (BMD) at the femur and femoral neck regions. There is a site - specific effect of lean muscle mass and vitamin D level on BMD. The combination of sarcopenia and vitamin D insufficiency may thus accelerate femoral BMD loss in geriatric populations. The importance of vitamin D supplementation and maintaining muscle mass should be emphasized for elderly adults with a high risk of osteoporotic fracture. (S.-G. Lee et al 2013)

A multifunctional diet combining functional concepts on risk markers of **cardio metabolic diseases** (CMD) could modulate different CMD-related variables in a group of middle-aged healthy overweight individuals. The beneficial metabolic effects of the diet suggest this type of regime as a promising tool for dietary preventive action against CMD. In addition to improving metabolic risk indicators, Active Diet promoted a significant drop in systolic blood pressure. (Juscelino Tovar et al. 2012)

The healthy food **diversity** positively correlated with microbiota diversity indices. A healthy, diverse diet promotes a more diverse **gut microbiota**. Health–microbiota associations were statistically significant and the diet shapes the microbiota, which then affects health in older people. The association of the intestinal microbiota of older people with inflammation and the clear association between diet and microbiota argue in favour of an approach of modulating the microbiota with dietary interventions designed to promote healthier ageing. Dietary supplements with defined food ingredients that promote particular components of the microbiota may prove useful for maintaining health in older people. (Marcus J. Claesson et al 2012)

3.2 The Diet's Impact on The Cognitive Health

A research by Vizuete, Aránzazu Aparicio et al. concluded that subjects who fell into the group with **no** errors in a cognitive test consumed greater amounts of cereals, eggs, and oils. After adjusting for energy intake and educational level, a negative association was found between the score and the consumption of vegetables and fish, i.e. the more vegetables and fish consumed, the less error was made, thus making the score lower. The subjects who incurred fewest errors in the test made better food choices or had better food habits.

The relationship between better cognitive capacity and the consumption of **more** cereals and vegetables might explain the inverse relationship seen between number of errors incurred in the test and the intake of fibre, folic acid, pyridoxine, and vitamin C. A negative association was also seen between the number of errors incurred and the consumption of fats and oils. This might help to explain the relationship between better cognitive capacity and the intake of vitamin E, soluble in fat. The subjects with no errors in the SPMSQ test had a greater intake of cholesterol in contrast of most studies. However, when cholesterol intake was examined in terms of dietary density, the

association with SPMSQ score disappeared. The subjects had an adequate intake of cholesterol—lower than that reported in the other studies. While a high intake of cholesterol may be associated with cognitive decline, an adequate intake may not be.

The main type of oil used in food preparation was sunflower oil which might provide a greater intake of PUFAs which are essential for cell function in the maintenance of **brain cell** integrity. The subjects without errors in the SPMSQ generally followed a more **adequate** diet. This would seem to indicate that they made better food choices or had better food habits. Their greater consumption of cereals, vegetables, eggs, and fish would certainly supply essential nutrients that might facilitate the maintenance of cognitive capacity. (Vizuete, Aránzazu Aparicio et al.2010)

A study by Anne Nilsson et al. indicates that diet may modulate **cognitive performance**, and a relationship exists between cardio metabolic risk markers and cognitive performance, providing additional motives for diet-based prevention of metabolic disturbances related to the **metabolic syndrome** (MetS). A four-week diet which significantly improved cardiovascular risk variables also resulted in favourable effects on cognitive functions. In parallel to the improvements in cognitive functioning, the active diet also improved cardio metabolic risk markers connected to the MetS. Higher levels of metabolic risk markers were related to worse performance in cognitive tests. The results suggest the possibility of reversing cognitive decline by choice of diet. (Anne Nilsson et al.2013)

4 DISCUSSION

According to the thesis guide from Arcada UAS, in the discussion part the results are summarised. The author will critically examine and discuss the results from her point of view.

4.1 The Answer to the Question

The research questions that were posed in the introduction were:

Is there any scientific evidence of potential influence of the diet on the health from various aspects (e.g. physical functioning or cognitive capacity)?

As mentioned before, the answer has been sought as yes already in the first-round literature search.

The second research question, which has been the focus of the literature review process, is: What are concrete cases demonstrating the potential connections between the diet pattern and the elderly's health conditions?

The answer of this question will be summarized in the following text by the author's interpretation of the results.

Dietary patterns are important in longevity among the elderly. The longevity may indicate a slower rate of cellular ageing, which has been proved by a research conducted by Virginia Boccardi et al...

In addition to the longevity, what is more important regarding the quality of life of the elderly may be that the time in life the individual spends with a sound health condition, i.e. the healthy life-span. The research by Virginia Boccardi et al. confirmed the novel role of Mediterranean-style diet in the maintenance of the healthy life-span, through a measurement of the rate of telomere shortening and the frequency of telomerase activity, which might be involved in healthy life-span. This indicating that individuals who follow a Mediterranean-style diet may have less chance to encounter chronic diseases in their old age, compared with the hypothesis that they follow another type of diet which is deemed to be less beneficial for the health.

The matter is further explained by the research of Danit R. Shahar et al.,where the physical health captured by 20-m walking speed over 8 years was found to be positively influenced by the Mediterranean-style diet, indicating individuals who follow a Mediterranean-style diet may have a better lower extremity functioning system.

As the information presented by themselves, a lower rate of telomere shortening and higher telomerase activity might be involved in healthy life-span. Healthy old showed significantly longer Leukocyte telomere length (LTL) compared with the unhealthy

group and higher telomerase activity. LTL is negatively affected by a diet with high intake of saturated fat acid (animal fat such as butter) while positively by a diet with high intake of vegetables according to the result from MK Tiainen et al.

However not all fats are proved to be harmful for the health. Evangelos Polychronopoulos et al. highlighted in their research that high meat consumption is positively associated with the likelihood of having increased CVD risk factors, while fat from other source had no significant effect.

This is further explained in the research by Maarit Hallikainen et al, where too much saturated fat in the diet may lead to the declining status of arterial well-being, which is a significant determinant for the development of cardiovascular disease.

At the meanwhile R Jarvinen et al concluded in their study that there is a positive relationship between the intakes of total polyunsaturated fatty acids (PUFA), total n-3 fatty acids with bone mineral density (BMD).

Regarding to BMD, there is another research by S.-G. Lee et al. showing that the combination of sarcopenia and vitamin D insufficiency may accelerate femoral BMD loss in geriatric populations.

Besides the powerful impact of the diet to the physical health which was listed above, researches (n=2) also show that a healthy diet may contribute to better cognitive performance.

In conclusion, there are scientific evidences showing the existence of the relationship between diet and the health. These evidences suggest that a diet characterised by a high intake of cereals, fruits, vegetables, cooked legumes, nuts, olives may have beneficial effect on the overall health in the elderly population. This information may be used in the process of making more healthful food choices for the elderly, either by the elderly on their own, or by people who involved in the decision making process.

4.2 Possible Inadequacies of the Study

As mentioned in the introduction part of the thesis, further thoughts regarding the limitation of the research will be presented here, under the titles of limitations regarding the literature review and further thoughts concerning the results.

4.2.1 Limitations regarding the Conduct of the Literature Review

Regarding the process of undertaking the literature review, it was the first time for the author to conduct one, which restricted the author's ability to proceed as smoothly as an experienced researcher. Within a limited time-frame the research was done, making it far less than perfect. Given more time, the author would perform better by including more data to analyze, thus the review would be more comprehensive and the findings may be quite different than the current one. It would be also more ideal to refine the use of language several times to make the whole piece of work flow more smoothly, thus making it easier to read from the readers' point of view.

The ideal literature review would uncover all literature on the topic by a team of experienced researchers, whereas it is acknowledged that this literature review has not been able to reach the perfect. The author, however, did everything in her power to ensure that the approach was as systematic as possible. (See Aveyard 2010 p.101)

What has been learnt so far is that it is beneficial to proceed as quickly as possible until a draft of the literature review is done, so that the researcher would have a general picture of the whole process and possible difficulties he or she may encounter along the way. By the time a draft is finished, benefits will appear by saving more time and energy for the researcher to refine the work on a foundation which requires modifications rather than to conduct the literature review slowly with uncertainty, hoping to achieve a certain quality at the first time, which is less practical.

4.2.2 Further Thoughts Concerning the Results

Concerning the relationship between the diet and one's health, several considerations regarding the possible limitations of the result are listed as the following.

- ✓ The Good Health Doesn't Always Come From A Good Diet

There are many factors affecting one's health and it is difficult to measure by just adjusting some of the many possible factors to see the independent and real effect of a diet to the health.

An individual may thrive on a diet, but it doesn't necessarily mean that the diet can support the optimal health, for the reason that the health condition is affected by many other factors, such as that the person has inherited good genes from the parents to prevent diseases from occurring even when the diet consumed is far from the ideal. The same person may achieve even better status of wellbeing by eating differently.

This is somehow similar to a few other phenomena in life, an example would be that a student has got a satisfactory mark from a test, however the fact doesn't necessarily result from the study method used by the individual. There are many other reasons for this good mark, including the possibility that the student has a talent on the exam subjects - even though he or she hasn't got a "secret weapon" to study for the test, the result can still be achieved. The student would, however, have a better chance to get a higher mark if the way he or she prepared for the exam is improved.

To sum up, there are healthy people who seem to follow a diet which is believed to have negative effect on the health. By witnessing the soundness of the person, one cannot conclude that the diet plays a novel role in the process of developing fitness. The reader is thus suggested to have this conscious in mind when absorbing the information from this review.

- ✓ The Same food Works Differently to Different People

It is believed that eating involves both the physical entity and the mind. One's acceptance towards a certain type of food may play a role in the influence of the diet to the individual's health. For example, Muslim doesn't eat pork for religious reason. For others eating pork is not likely to give rise to negative feelings while for Muslim, it can cause an undesirable reaction which is harmful to the health, especially for the spiritual health. Therefore even the same food works differently for different people, according to what and how people think of the food. Though a certain type of food may have a good impact on the health when viewed in isolation, the fact that human is a whole (not only the physical entity) makes it complex to assess the loss and gains if the food is not well accepted by the individual who consumes it.

In addition, different people need different food according to their needs, especially for their own specific health condition. For example, people who consumes little fruits may need to consume more which this is not necessarily true for people who consume adequate. Individuals with certain diseases may need to restrict their diet and try to avoid certain food. However, the food itself may be considered healthful for others who suffer no such diseases. People who eat little may need to eat more, while people who eat much may need to adjust the amount to less. When it comes to recommending the so-called good food to others, it would be a nice thing to do by putting feet to others' shoes.

- ✓ Food = Nutrients?

From the results we can see that many researches have recommended a certain nutrient to the soundness. For example, Vitamin D for the health of bones. Nutrients which originate from natural food are indeed worth to be considered as tools during the evaluation of certain food's impact to the health. However, the food is much more than the nutrients it is believed to contain. The fresh taste, good smell, nice colour and suitable size of the food give people pleasure when eating, and food will lose lots of value if it is broke down to those simple and cold nutrients.

Many cases in the science area have proved that there was and will be mistakes as long as people continue discover rules of the nature. Heroin got its name from the time once people believed it is a miracle drug for almost any diseases It takes time for the truth to become apparent. This rule should apply to the field of nutritionism as well. We are facing a developing not developed concept, many things need to be discovered before a certain type of diet or a single food can be judged by its nutrients. It is the food that contains nutrients, not the nutrients that represent the food.

4.3 Practical Meaning of the Thesis

It is through the lens of the theory of health promotion that the literature review was approached and structured, therefore the practical meaning of the thesis will be clarified within the theoretical frame of health promotion.

Along with daily life and work experience, the author has gained a frequent contact with the elderly. It is a pity that there have been situations where the food consumed by the elderly may not serve best –if not harm- for the optimal health. Often this can result from a lack of awareness of the influence of food on the status of one's wellbeing, leading to food choices which may hinder one's way to a better health condition.

What matters most is not what one chooses to eat, but whether one is informed enough to make the right choice. If insight of the potential connections can be researched and illustrated in the way of a systematic review of the recent scientific literature, evidence will be gained for possibly better practice in the process of choosing food for the elderly, whether by those who live independently, or by people who are involved in the selection and preparation of food for those elderly who need assistance in their everyday life, thus promoting the health of the elderly.

The thesis attempts to promote health by fostering healthy lifestyles, encouraging involvement in health decisions, promoting an environment in which the healthy choice becomes the easier choice, and educating about the body and keeping healthy. (See Naidoo & Wills 2003 p.71.)

The thesis is in line with the principles of health promotion developed by the WHO. By the above mentioned attempts, the thesis contributes to creating supportive environments, developing personal skills such as information and coping strategies, strengthening community action, and reorienting health services away from treatment and care.

An awareness that individuals make food choices which can contribute to the development of diseases led to the view that it was possible to inform people about the prevention of disease, to motivate them to change their behaviour, through persuasion and mass communication techniques, and to equip them through education with the skills for a healthy lifestyle. (See Naidoo & Wills 2003 p.80.)

The presentation of the results from the literature review aims to reduce differences in health status and ensure equal opportunities to enable people to achieve their full health potential. The author work to increase knowledge and understanding, and individual coping strategies.

4.4 Ethical Issues

A human being cannot achieve his or her best status of wellbeing if the individual is solely viewed and treated from the physical aspect, the mind and the social condition of that person also play significant roles in the process of health promotion. Some health-promotion behaviour such as the care-worker persuading the elderly to eat more healthy-is mostly conducted to help the elderly to enhance the physical health. However, this kind of behaviour may cause negative emotion such as anxiety and stress, leading to decreasing health condition. Sometimes the health benefit one can get through a change in the diet is far less than the benefit one already gets by sticking to the old food habits. For example, many people smoke to release stress and get relaxed, though smoking is generally considered not helpful for the physical body, the behaviour may protect the smoker from devastating stress, which will harm the psychological health. Every coin has two sides and it is therefore hard to decide which will do more good to the person's wellbeing as a whole. (cp. Earle et al. 2007 p.45)

It is worth to mention that the right of choosing the lifestyle including the diet lies in the hands of the individual. If a person prefers to a certain type of food even though he or she recognized the possible negative influence of the food, it is in the end the one's right to do so. Nothing should be forced regarding the choice of food. What the thesis aims to do is to inform and persuade, but not to force. It is the readers who can decide whether or not the information is relevant for their food choice.

4.5 Suggestion for Further Research

To end with, the author will highlight what remains unanswered and could be interesting to focus upon for future researchers. (See thesis guide from Arcada UAS).Three points are concluded below.

First, no evidence was found in the literature review regarding the relationship between the diet and the health from social aspects. This is due to a limited time frame as well as a relatively small amount of literatures available on this issue. However it is hypothesized that the social health can be influenced by the physical and mental health, provided the fact that a human exists out of all three aspects. Further research is suggested on this issue.

Second, there are people with different diet patterns who have not participated in the research collected, thus the effect of these diets remain unknown, which may indicate a direction for further researches.

Third, although MD is proved to be beneficial for the health, there are still individuals who followed this diet régime experiencing a declining of the health status. Why there is still many people get worse under MD? Not only the strength but also the weakness of the diet has to be studied. Is there certain elements in the diet hinder their way to the fitness, or is it due to other factors than the diet itself? The reason behind this need to be further explored in order to provide a better solution for the situation.

4.6 Conclusion

Compared with curing a certain disease by medical treatment, the merits of the diet therapy are that the overall health condition can be improved while the disease cured, thus the individual has a smaller chance to get other diseases as well. If the medical treatment is imagined to be giving the fish, then the diet therapy will be teaching how to get the fish.

It is believed that in the developed society of modern times, people eat not only to survive, but also to thrive. Especially in old age, the diet one consumes may contribute greatly to the quality of life, supported by the findings of this thesis.

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