The Role of Scientific Evidence in Natural Health Product Consumer Decision Making in Osteoarthritis

By

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A thesis submitted in conformity with the requirements for the degree of Master of Science

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ABSTRACT

Objectives: To use the means-end chain (MEC) decision-making approach to compare two groups of participants using natural health products (NHPs) with and without scientific evidence support.

Methods: The laddering technique was used to interview 25 participants with osteoarthritis. Hierarchical value maps were generated to depict the decision-making processes. Semi-structured questions probed the role of scientific evidence in the decision-making process and content analysis identified thematic similarities and differences between the two groups.

Results: The dominant decision-making chain between participants in the two scientific evidence categories was similar. Scientific evidence is an important decision-making factor but not as important as the advice from health care providers, friends and family.

Conclusions: The MEC-approach and its associated laddering methodology helped us understand how people make decisions about NHPs. There were essentially no differences in how consumers in our two groups incorporated scientific evidence into their choice of NHPs for OA.
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1 INTRODUCTION

Complementary and alternative medicine (CAM) includes a diverse group of health care systems, practices and products not generally considered part of conventional biomedicine (1), and not widely available in North American hospitals (2). Natural health products (NHPs) are one form of biologically-based CAM therapies commonly used in North America (2). NHPs are products derived from ingredients found in nature that are sold over the counter (OTC) for medical purposes (3). Despite growing scientific evidence for the effectiveness of some NHPs, previous studies have found that scientific evidence is but one decision-making factor influencing self-medication with NHPs (4, 5).

The NHP industry is an estimated 3 billion dollar industry annually (6). In 2005, the estimated annual out of pocket expenditures on NHPs in Canada was 3.6 million dollars (CAD) (7). In the same year, total health care spending in Canada in the public sector was $98.8 billion, and in the private sector was about $43.2 billion (8), where CAM therapies and products are almost entirely a private sector spending in Canada (1). Amongst the 1,430 NHP users surveyed by Ipsos-Reid in 2005, over 70% reported ever using a NHP and 38% reported the daily use of NHPs (9). While certain complementary and alternative (CAM) practitioners recommend NHPs as part of their scope of practice (10), self-selection of NHPs accounts for a larger proportion of use and expenditure (10).

Given that 30-45% of individuals with osteoarthritis are choosing to use NHPs (11, 12), a greater understanding of the factors affecting consumer’s choice of NHPs for this condition is needed.

There are conflicting studies on the role of scientific evidence in NHP decision-making. The decision to take OTC medications for some pain conditions does not appear to
involve an evidence-based process for some individuals (13, 14). Recommendations of trusted individuals such as health care providers (pharmacist, doctors), and friends and family (15) appear to play a larger role in OTC decision-making in general. Yet previous decision-making studies in CAM have suggested that individuals review and prioritize evidence as a decision-making factor (5, 16, 17). Additionally, lack of scientific evidence or evidence of ineffectiveness has swayed consumers away from using CAM therapies (18, 19). It is unclear how important the role of evidence plays in how consumers choose to use NHPs.

A previous study on consumer decision-making in NHP and pharmaceutical non-prescription sleep aids (4) using the means-end chain (MEC) approach (20, 21) identified that product attributes such as “natural” or “chemical” source, associated consequences after taking the product (e.g., perceptions of effectiveness, side effects), and evoked values (e.g., quality of life) linked with the products play a key role in consumer product choice. While the aforementioned sleep aid study provides a starting point for our understanding of NHP self-medication practices, several questions remain unanswered. For example, effectiveness was frequently mentioned by study participants as an important functional consequence for selecting sleep aids (4). However, since few clinical trials support the use of NHPs as a sleep aid (22-24), it is unclear exactly how important this factor was in the decision-making process because many people report choosing to use NHP sleep aids despite this lack of scientific evidence. The current study attempts to address this gap by focusing on a condition (i.e., osteoarthritis) where more scientific evidence exists to support the use of some NHPs. Osteoarthritis (OA) is prevalent in the senior population and is commonly managed by prescription, non-prescribed drugs, and NHPs (12).
It is important to understand the decision-making factors, particularly the role of scientific evidence when people choose to self-medicate with NHPs to understand information sources that consumers consider as scientific evidence and the individuals who provide information about scientific evidence to consumers. At the same time, it is also important to understand why some individuals may choose not to use scientific evidence to guide their decisions to use NHPs. Ultimately, understanding decision-making factors in NHP selection will assist in formulating effective knowledge translation strategies about using scientific evidence in NHP selection for optimal health outcomes.

1.1 Research Question
“How does the level of scientific evidence supporting the efficacy of NHPs impact consumer decision-making in the self-selection of NHPs by individuals with osteoarthritis?”

1.2 Study Objectives
1. To apply the laddering methodology and means-end chain analysis to construct a hierarchical value map for osteoarthritis-related NHP self-medication decisions.
2. To describe the factors (product attributes, perceived consequences and values) impacting consumer choice of NHPs for the self-management of osteoarthritis symptoms.
3. To compare hierarchical value maps of consumers who report choosing NHPs with low scientific evidence with those who have only selected NHPs with high scientific evidence of efficacy for osteoarthritis-related symptoms.

In order to answer our research question and meet our study objectives, first, the context of our inquiry is discussed in the Literature Review chapter, followed by a detailed
explanation of the methods we used to carry out our research in the Methods chapter. A report of our findings is found in the Results chapter, ending with the Discussion and Conclusions chapter which compares and contrasts our results with those of others, highlighting our unique contributions to the literature.

In the Literature Review chapter, the frequently used terms are defined such as natural health products (NHPs) and decision-making to set the context for this study. We then discuss NHPs used in the treatment of Osteoarthritis (OA) with a focus on levels of scientific evidence supporting their use. Natural health product (NHPs) federal regulations and patterns of use are described, including contentious issues such as levels of scientific evidence required for specific health claims. The literature on CAM decision-making in cancer and arthritis is reviewed as the decision-making factors and processes may apply to NHP use in OA. We review the literature on the role of friends, family and health care providers and their impact on patient decision-making about CAM and other health care issues. Consumer use of scientific evidence in over-the-counter medications is explored and compared with decisions to select CAM and NHPs. Lastly, the theoretical perspective which guides the design of this study, the means end chain (MEC) approach, and its associated laddering methodology is described with an emphasis on the assumptions of the approach.

Next, the methods used for this project are described in the Methods chapter. First, our research question and study objectives are presented. The primary study design of in-depth in-person interviews using the laddering technique which is associated with the Means End Chain (MEC) theory is then introduced. The study participants are described including sampling, inclusion and exclusion criteria, sample size justification, and recruitment. Next, data collection using the laddering and semi-structured interview questions about evidence,
and demographic survey data are described. Our methods of data-analysis for the laddering
data, the semi-structured interview data and demographic survey data are described. The
chapter ends with a review of validity, reliability and ethical issues.

Our Results chapter starts by first describing the participants, including a comparison
of participants in the two (high and low) scientific evidence categories. MEC laddering
results are first presented in the implication matrix, outlining a numerical representation of
our data. Next, our results are presented graphically in the hierarchical value maps (HVMs)
with elaboration of key product attributes most salient to our research question (the role of
scientific evidence and the impact of advice from health care providers and non-health care
providers) using data from the interviews. We first describe the overall patterns of our results
and then compare and contrast the participants in the high and low scientific evidence groups
for each section of the description of HVM (attributes, consequences and values).

The Discussion and Conclusion of this thesis begins with a summary of our key
finding about the role of scientific evidence in consumer decision making. We then describe
the information sources our participants used as scientific evidence gathered from the in-
depth semi-structured interviews. Next, we compare the decision-making process of
participants who used NHPs with high and low scientific evidence. The majority of this
chapter consists of a comparison of our findings to previous literature and highlighting our
unique contributions. Our notable contributions to the literature are that scientific evidence is
relatively unimportant to consumers who select NHPs. Consumers infrequently read the
original scientific evidence, instead, the recommendations of trusted individuals such as
health care providers or friends and family play a more important role. When consumers
learn about scientific evidence, it is from health care providers or they read about it in the
media. Next, there is a discussion of the limitations and recommendations arising from our study which set the stage for future research. We also discuss the implications for future research, including who our findings are most useful to and why. The chapter ends with the conclusions we can draw from this project.

1.3 Summary

In summary, this thesis explores the role of scientific evidence as a possible decision-making factor in consumer decisions related to self-selection of NHPs. There is widespread use of NHPs, including 30-45% of those diagnosed with OA. Even though scientific evidence appears to play a relatively minor role in over-the-counter pharmaceutical drug selection, previous CAM decision-making studies found that some individuals prioritize scientific evidence in their decision to use CAM. The means end chain approach and its associated laddering methodology was successfully applied in a previous study investigating NHPs used as sleep aids to elucidate salient decision-making factors (attributes, consequences, and personal values), however the role of scientific evidence was not systematically studied. This study aims to address the gaps in our knowledge by investigating the impact of scientific evidence in NHP selection in osteoarthritis, a condition where more scientific evidence exists to support the use of NHPs.
2 LITERATURE REVIEW

2.1 Organization

This chapter provides the context and theoretical background for the study. First, the frequently used terms will be defined. Secondly, osteoarthritis (OA) and the use of NHPs by those diagnosed with OA will be explored. Thirdly, natural health product (NHPs) federal regulations and patterns of use will be described. Next, NHP levels of evidence and therapeutic claims will be discussed. Subsequently, the literature on consumer decision-making in CAM will be reviewed, with an exploration of the role of significant others and health care providers, the role of scientific evidence and a comparison of this to other over-the-counter medications. Finally, the theoretical perspective which will guide the design of this study, the means end chain (MEC) approach, and the laddering methodology will be described with an emphasis on the assumptions of the approach.

2.2 Definition of terms

To ensure clarity in this thesis, a few key terms need to be defined. *Natural health products (NHPs)* are defined by Health Canada to be products containing active ingredients found in nature that are marketed for medical use in: a) the diagnosis, treatment, mitigation or prevention of a disease, disorder or abnormal physical state or its symptoms in humans; b) restoring or correcting organic functions in humans; or c) modifying organic functions in humans, such as modifying those functions in a manner that maintains or promotes health.

NHPs contain active ingredients that fall in one of the following categories:

1. A plant or a plant material, an alga, a bacterium, a fungus or a non-human animal material;
2. An extract or isolate of a substance described in item 1, the primary molecular structure of which is identical to that which it had prior to its extraction or isolation;
3. Any of the following vitamins: biotin, folate, niacin, pantothenic acid, riboflavin, thiamine, vitamin A, vitamin B<sub>6</sub>, vitamin B<sub>12</sub>, vitamin C, vitamin D, vitamin E; 4. An amino acid; 5. An essential fatty acid; 6. A synthetic duplicate of a substance described in any of items 2 to 5; 7. A mineral; 8. A probiotic (25).

The term **consumers** in this study context refers to individuals who self-select and purchase health related products including NHPs (26).

**Decision making** is defined as a process of combining desires (defined as utilities, personal values, goals, and ends) and beliefs (defined as expectations, knowledge, and means) to choose a course of action (27).

**Scientific evidence** is defined as information derived from rigorously designed studies normally conducted by academic scholars (as opposed to industry) including articles in peer-reviewed journals and scientific reports, empirical analyses, or results of scientific experiments or investigations (5).

**Scientific evidence** as defined for this project, is based on the evidence standards used by the Natural Standard Database (28) to summarize the level of evidence available to support the efficacy of a wide range of NHPs. The Natural Standard evidence standards are based on the hierarchy of scientific evidence most commonly evoked by the evidence-based medicine (EBM) movement. First, the context of what led to the development of EBM and its strategies are briefly described. Next, the hierarchies of evidence, and some critiques on the order of the hierarchy and the value of randomization are presented. Lastly, this section concludes with why we chose our criteria of scientific evidence.

While the ideas of using data instead of opinion as the basis for medical decision-making have been around for a long time, the EBM movement grew out of several important
realizations (29). First, there was an increased need for \textit{valid} information about diagnosis, prognosis, therapy and prevention with respect to patient care. Second, the existing traditional sources of information such as textbooks, expert opinions, review articles were inadequate - out of date, ineffective, incorrect, too voluminous or inconsistent (29, 30). Next, there was a disconnect between clinical skills and judgment which increase with experience, and the knowledge base and clinical performance which decline with experience. Lastly, there were time constraints posed on clinicians, researchers, and teachers to assimilate this evidence.

All of these factors provided the impetus for the development of what is known as EBM. The EBM group was led by Gordon Guyatt et al. in 1992 at McMaster University and is a growing area of interest and active study (29).

Several EBM strategies evolved out of these unmet needs (29)—

1. Development of strategies to enable tracking and appraising evidence based on validity and relevance.

2. Creation of systematic reviews and other concise summaries of the effects of health care (such as by the Cochrane Collaboration).

3. Creation of evidence-based journals aimed at publishing clinical articles with validity and which could be applied for more immediate use.

4. Creation of information systems to enable access of the aforementioned systematic reviews and evidence-based journal articles.

5. Identification and application of effective strategies for continuous learning and improvement.
The goal of adopting these strategies was to enable improved clinical outcomes while judiciously using resources.

Central to understanding EBM is appreciating a hierarchy of scientific evidence. Double-blind, randomized controlled trials (or ideally meta-analyses of multiple trials) are ranked at the top with respect to quality of scientific evidence because they are thought to provide the most valid and reliable evidence for the efficacy of a given treatment (31). Cohort studies and case control studies are ranked lower in the EBM hierarchy. A generally-accepted EBM hierarchy is provided in the Appendix, Table 1b.

Of course this traditional hierarchy of “types” of scientific evidence is one of many different ways of assessing the “best” kind of evidence and it is has been criticized (30). There are at least 40 similar scales of grading scientific evidence (32). For example, some argue that the hierarchy itself has not been subjected to the scrutiny of a randomized controlled trial. Regarding the ranking of the hierarchy of scientific evidence, one view is that randomization is over-rated while observational studies are under-rated (31). One prominent voice is Sir Michael Rawlins, head of the UK National Institute for Health and Clinical Excellence, a key health policy maker in the UK:

“The notion that evidence can be reliably placed in hierarchies is illusionary. Hierarchies place RCTs on an undeserved pedestal for… although the technique has advantages it also has significant disadvantages. Observational studies too have defects but they also have merit.” P357 (31).

Rawlins goes further to critique the whole idea of a hierarchy of scientific evidence:
“Hierarchies attempt to replace judgment with an over-simplistic, pseudo-quantitative, assessment of the quality of the available evidence. Decision makers have to incorporate judgments, as part of their appraisal of the evidence, in reaching their conclusions” p357 (31).

A full review of the debate about what constitutes scientific evidence is beyond the scope of this thesis; however, we acknowledge that no system is universally accepted. For this study we selected a scientific evidence grading system that is commonly used by clinicians and the basis for several clinical books and web sites providing “evidence-based” information about NHPs for clinical decision-making. While not perfect, our choice reflects a very real influence on clinical decision-making by health care practitioners making it a logical choice when asking questions related to how patients incorporate “scientific” evidence into their decision-making.

2.3 Osteoarthritis and NHPs

Osteoarthritis (OA) is the most common form of arthritis, affecting about 12% of North Americans, and a condition responsible for significant chronic disability. OA is a common chronic degenerative joint condition which causes significant pain and loss of function (33). Women are up to four times more likely to suffer from OA in general than men (34). Pharmacotherapy for OA typically includes non-steroidal anti-inflammatory drugs (NSAIDs), specifically COX-2 inhibitors (33, 35). Approximately 60% of seniors with OA report using nonprescription medications (12) and 30-45% report using NHPs (11, 12) to treat their OA. In a Canadian study of medication use of 190 participants with confirmed OA, 50% used NSAIDs and 25% tried acetaminophen (36). Of the study participants, 36% used natural health products and 66% used either NHPs or analgesics or both (36).
Surveys indicate that individuals with OA who are CAM consumers are more likely to be women (9, 37-42), and have higher levels of education (39, 41). However, age and severity of OA do not appear to be associated with CAM use (37, 39). Individuals who are middle aged or older (9, 40) or younger adults (42) all report similar rates of NHP use.

NHPs which are promoted for the treatment of OA include: bromelain, glucosamine, chondroitin, Salix alba (willow bark), S-adenosylmethionine (SaMe), methylsulfonylmethane (MSM), Persea americana (avocado), Uncaria tomentosa (cat’s claw), Harpagophytum procumbens (devil's claw), Rosea canina (rose hip), Curcuma longa (turmeric), and Zingiber officinale (ginger) (11, 12, 43).

A range of scientific evidence exists to support the use of these NHPs for the treatment of OA. The Natural Standard Database, an authority in CAM and integrative medicine, uses an evidence-based validated grading scale which assigns a scientific evidence level to a treatment based on the level of available scientific evidence (44). These scientific evidence levels run the spectrum from strong (level A), good (B), unclear or conflicting (level C), fair negative (level D), strong negative (level F), and lack of scientific evidence. See Appendix Table 1a: Natural Standard Database evidence-based validated grading criteria.

Amongst the list of commonly used NHPs for OA, we selected four commonly used natural health products – glucosamine and chondroitin which had a high level of scientific evidence support and MSM and bromelain which had no or weak scientific evidence support. See Appendix Table 2 for a relative comparison of the scientific evidence for the efficacy of four NHPs commonly used for OA-related use. Despite having quite different types of scientific evidence supporting their efficacy, these NHPs were very similar with respect to
other characteristics including: their physical properties (e.g. dosage form), onset of action, dosing schedule, average cost, and adverse reaction profile. According to the Natural Standard Database, all except for bromelaine are white, odourless, crystalline substances found in capsule form (24). Bromelain can be a white to yellow in colour. The onset of action typically takes several weeks for glucosamine, chondroitin and MSM (24). Bromelaine can take effect in several days. The dose of all three NHPs except for bromelaine is typically a 500 mg capsule, and while the daily dose can vary, a 1500mg daily dose (500 mg three times a day) is most commonly recommended. Bromelain capsules can range from 80 to 1000 mg and the daily dose is also two to three times a day (24). The average cost of the products ranged from 18 to 35 cents for a daily supply. All side effects were mild, consisting of risk of allergic reactions (24). Chondroitin was reported to possibly potentiate blood thinners (24). Overall, we found that all four NHPs were very comparable in their physical properties, onset of action, dose and dosing schedule, average cost and adverse effect profile. See Appendix Table 2.

2.4 NHPs – federal regulations and use

In 2004, Health Canada implemented new regulations governing NHPs under the Food and Drugs Act (1985) after extensive consultation with stakeholders (consumers, health care providers, and manufacturers of NHPs)(45, 46). The Regulations were planned to be fully implemented by the beginning of 2010(46, 47). The NHP Regulations outline that licensed NHPs must be safe for public consumption and be sold as OTC products, available for self-selection and self-care. The Canadian regulating authority of NHPs is the Natural Health Products Directorate (NHPD), whose mandate is “to ensure Canadians have ready
access to NHPs that are safe, effective and of high quality, while respecting freedom of choice and philosophical and cultural diversity” (3).

Prior to the NHP Regulations, some NHPs were considered as foods (such as glucosamine) and others as drugs (such as homeopathics) (46). Arguably the NHP Regulations are in place as a response to consumer demands for more information on safety, efficacy and quality of NHPs (47), and to increase the credibility of NHPs overall (48). The NHP Regulations require that NHP manufacturers, packagers, labelers, and importers obtain site licenses to demonstrate ability to adhere to good manufacturing practice (3, 47-49). NHPs require pre-market approval which culminates in the awarding of product licenses when efficacy and safety claims on the label are reviewed and approved by the NHPD (3, 47).

Under the NHP Regulations, an important component of obtaining an NHP product license is the application for claims or efficacy assessment made about the product (46, 50, 51). Previously, when NHPs were regulated by the Food and Drug Regulations as food products, no health claims could be made (50). The current NHP Regulations allows therapeutic claims be made about the specific product (46, 50). The NHPD defines claims as “a statement or representation in product labeling or advertising regarding the character, value, quantity, composition, merit or safety of the product“ (46, 51). In general, there are two categories of therapeutic claims – those based on traditional use and non-traditional use (50, 51). Perhaps the most contentious issue surrounding what constitutes “acceptable evidence” upon which to approve a label claim is related to “traditional use” evidence (46, 48). Opponents of “traditional use” as a standard of evidence supporting therapeutic health claims have argued that traditional use is “unscientific“ and an extended period of use does
not mean that an NHP is necessarily effective and safe (48). Another concern raised is that approving products based on “traditional use” has allowed NHP industries to be exempt from providing costly scientific justification for making product health claims at the expense of public safety (48). Others have defended the “traditional use” category to provide consumers with the spectrum of evidence supporting a claim so they can make their own decisions, staying true to the NHPD’s mandate of “…respecting freedom of choice and philosophical and cultural diversity” (48).

2.5 Consumer decision-making in CAM

It appears as though NHP regulators and health care practitioners tend to emphasize the importance of scientific evidence supporting a CAM product or therapy (48), whereas based on the little that is known about consumer decision-making, consumers vary widely regarding their use of scientific evidence as a decision-making criterion (5, 17, 19, 52).

2.5.1 CAM decision-making by patients diagnosed with cancer

The literature on consumer decision-making about CAM/NHPs has focused primarily on individuals who have cancer; however, it is unclear how much is applicable to those diagnosed with OA. The brief review below highlights the findings which are most helpful in guiding this study’s design. The literature suggests that the factors involved in decision making for men with prostate cancer and women with breast cancer who use CAM are relatively similar (18, 49, 53, 54). Both tend to adopt a holistic view on health, value a proactive approach to solving their health care issues, frequently rely on their social network as a referral source on CAM, and have been “pushed” towards CAM from negative experiences with conventional health care (18, 49, 53, 54). Men have been found to value
taking control of their lives with CAM (49, 54). Experiencing conflict and ambivalence between CAM and conventional medicine was reported by women with breast cancer (18, 53). Individuals with breast and prostate cancer identify that effectiveness and safety of the treatment is important to them when reviewing information sources to make a treatment decision (5, 18, 19, 49, 55).

When cancer patients gather information on CAM prior to making treatment decisions, several authors found these individuals experienced conflict in their decision making processes as they explored their options (5, 19, 53). Information sources (in no particular order) include expert opinion, scientific literature, anecdotal advice from various social networks, testimonials, advertising, the Internet, gut feeling, previous experience with CAM, and trial and error (5, 19). As is seen in this list, scientific evidence is only one source of information. Consumers frequently report feeling extremely frustrated at the large volumes of sometimes conflicting information on CAM (18, 53). Some consumers also reported that credible information sources are hard to find (5, 19).

While most CAM consumers appear to agree on the need for “evidence” to inform their decision, individuals varied enormously on what they determined to be high-quality information or scientific evidence (5). In one study, the role of CAM information-seeking and use of scientific evidence specifically varied depending on the individual’s previous experience with CAM (5). Three types of CAM consumers were identified by Verhoef et.
al.: new CAM users\(^1\), experienced CAM users\(^2\), and users with late-stage disease (such as cancer)\(^3\) (5).

*New CAM users* were reported to value the expert opinion of their physician, the experience of others with the same illness, and would feel assured if multiple sources of information converged to the same conclusion about a particular CAM therapy (5). Scientific evidence appeared to play a much smaller role in their decision-making than the aforementioned sources.

*Experienced CAM users* placed greater emphasis on personal experience, “gut instinct”, and trial and error rather than external sources of information, such as experts or others in their social network (5). These individuals chose therapies based on their personal beliefs, outlook and philosophy on health, and core values (5). Scientific support for efficacy was not needed for them to try a CAM therapy if there was congruence with their own value system (5).

In the same study, individuals with *late stage cancer* particularly valued information on “success rate”, such as individual testimonials where the individual overcame their illness. Other information sources that these individuals consulted were magazines, waiting-room pamphlets, and the television (5). These individuals held mixed views on the importance of scientific evidence – ranging from valuing scientific evidence to being skeptical of those conducting the research trials (5). Overall, these individuals did not consider risk associated with trying a therapy as long as the treatment sounded promising (5).

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\(^1\) New users: had very little experience with CAM and mainly used CAM to address the side effects of conventional treatments and to improve their quality of life.

\(^2\) Experienced CAM users: used CAM therapies exclusively or in conjunction with conventional medicine for at least six months. To these individuals, CAM was an integral part of their wellness regime.

\(^3\) Users with late stage disease: in the context of cancer, these are individuals with an unfavourable prognosis who were all hospitalized in a palliative care facility and had mixed levels of experience with CAM.
The literature on CAM decision-making factors suggest that consumers vary widely regarding their use of scientific evidence when making NHP-related decisions, likely related to their duration of CAM use and severity of disease. Individuals who choose to use CAM report having a holistic view about healthcare, and valuing the opinion of their friends, family, and health care providers. However, it is unclear how these factors fit together to influence the overall decision-making process. Also, it is not clear if all the relevant decision making factors are conscious. These unanswered questions led us to explore methods other than simple surveys and interviews to help us understand consumer NHP-related decision making.

2.5.2 CAM decision making by individuals diagnosed with arthritis

Caspi et al. found that CAM decision-making amongst rheumatology patients could be categorized based on their use of CAM and or conventional medicine (17). Caspi et al. interviewed rheumatology patients who only used conventional medicine, CAM only, or both CAM and conventional medicine to learn about their decision making processes (17). In the group (N = 4) who used both CAM and conventional medicine, participants described that they initially learned about CAM through a trusted individual (17). However, they believed that “scientific evidence” was more important than personal testimonies when they evaluated CAM treatments. Participants also assessed the quality of available scientific evidence before deciding to use CAM (17). In the same study, patients who only used CAM (N = 3) did not mention using “scientific evidence.” Personal testimonials from friends and family and believing that the underlying philosophies of CAM therapies “fit” intuitively with one’s worldview were key precursors to deciding to use CAM in these individuals (17). These
differing views on using scientific evidence based on using CAM only or in combination with conventional medicine made us wonder if consumers who select products with different levels of scientific evidence support would also differ in how they used scientific evidence to guide their decision.

2.6 The Role of Friends/Family and Health care practitioners in Health Care Decision-Making

Friends, family, and health care providers have been reported to influence patient health care decisions related to CAM (5, 17-19, 49, 53, 55-57). Previous studies show that friends and family play a significant role in individuals’ decisions to use CAM (18, 19, 53, 58). Several types of decisional involvement have been identified including creating a safe place for the patient to make a decision; collaborative decision making; moving the patient towards a decision; making the decision for the patient (58); assisting participants in gathering and evaluating CAM-related information (18, 19); and supporting participants financially and emotionally to aid in their decision to use CAM (53).

The literature also indicates that health care providers play a role in patients’ decision-making processes (56, 57). In a minority of cases, a doctor makes an initial recommendation to the patient to seek out CAM care (57, 59). Individuals also seek out the advice on CAM therapies from CAM practitioners who are considered “legitimate and trusted” sources of information (18, 19, 53). Some individuals reported a lack of consensus between and among their CAM and conventional HCPs regarding their benefits of CAM and possible negative interactions with their conventional medications (19). These experiences sometimes led to conflict for the individual (19) and in some cases, individuals disregard the
advice of their conventional HCP who are opposed to CAM therapies and still decide to self-medicate with NHPs for their osteoarthritis (36).

2.7 Factors affecting decision-making of over-the-counter (OTC) medication selection

As NHPs are regulated as OTC drugs in Canada, factors implicated in medication self-management decisions related to OTC drugs may be applicable to NHPs. Key factors predicting the use of OTC medication use have been explained by Andersen’s Health Behavioural model (predisposing, enabling, need) factors (60, 61). Other factors contributing to OTC medication use (in order from most important to least) are - the recommendation of the pharmacist, medical doctor, previous experience with the medication, friends and family, and advertising (15). In fact, it appears to be uncommon for consumers to consider scientific evidence as a decision making factor when selecting OTC drugs. In individuals who manage their conditions with OTC pain medications, such as those with acute or chronic lower back pain (14) and fibromyalgia (13), most did not use scientific evidence-based self-management techniques (13, 14). Further, in the case of OTC cough medication use, there are concerns around the weak evidence for their efficacy and potentially harmful consequences in young children provide an additional example of the continued use of a type of OTC conventional medications which is not supported by scientific evidence (62-64). Thus, the literature on consumer use of OTC products does not provide much insight into the use of scientific evidence when choosing NHPs which has been identified as a decision-making factor in some CAM decision making studies (5, 16, 17)
2.8 Scientific evidence and NHP decision making

A recent study investigating consumers’ choice of NHP vs. conventional OTC sleep aids identified the key factors in the decision-making of consumers as the product’s natural or chemical source, the perceived effectiveness or side effects, and perceptions of the impact of product use on their quality of life (16). The amount of research or scientific evidence supporting the product was cited as another product attribute that some participants considered when making purchasing decisions. However, many people described purchasing and using products that had limited (or no) scientific evidence to support their effectiveness (16). The sleep study did not specifically examine the extent that level of evidence impacts NHP decision-making; however, as described above, a previous study in arthritis patients found that some people who use both CAM and conventional medicine considered scientific evidence carefully, comparing the literature with their personal belief systems, prior to choosing to use CAM (17). This current study was designed to explore what, if any, role scientific evidence plays in consumers’ decisions to use NHPs.

The literature on scientific evidence and decision-making about CAM or NHPs in osteoarthritis is lacking although the qualitative cancer studies provide a useful starting point for us to understand the role of scientific evidence as it impacts consumer decision making in OA. The NHP decision-making sleep aid study provides an innovative application of the laddering technique to begin to understand self-medication practices of NHPs. In this current study, we are interested in the effect of level of scientific evidence as it affects consumer decision-making on NHPs. In order to do this we chose to use a theoretical approach called Means-End Chain analysis which is described in detail below.
2.9 The Means-End Chain Approach

The Means-End Chain (MEC) Approach is a decision-making framework which was used to guide our protocol development. MEC theory has been used in marketing research to understand product positioning of existing and new products to assist with strategic marketing decisions (20, 21). We chose this approach as it allowed us to gain insight into consumer’s *cognitive structure* when making decisions about NHPs. According to the MEC approach, *cognitive structure*, is a hierarchical representation of consumption-relevant decision-making (65). Concrete categories (attributes of products) are linked to increasingly abstract consequences of consuming the products, and further linked with underlying values that drive these decisions. At the individual level, values are relatively stable and strong determinants of consumer behavior (66). *Values* are defined as concepts or beliefs about desirable end states which are generalizable to different situations, and help guide selection or evaluation of behavior and events at both societal and individual levels (67, 68).

The MEC approach posits that under given situations, parts of the cognitive structure are retrieved and activated, guiding decision-making (65). We used the MEC approach to help us understand if evidence is part of NHP consumer’s cognitive structure. If evidence is a component of the cognitive structure, this approach also allows us to explore its role in decision-making, along with other factors impacting NHP decision-making.

2.9.1 Assumptions of the Means-End Chain Theory

Five assumptions are important to understanding MEC theory – these are described below. *First*, MEC theory assumes that decisions are cognitive processes that are conscious and intentional to help achieve certain goals (21). Grunert and Grunert describe cognitive processes as cognitive structures which change in response to new information from the
environment and enable specific information to be retrieved from the cognitive structures to shape behavior (65). Cognitive processes are known as either automatic or conscious. Automatic processes occur unconsciously and have an unlimited capacity. Automatic processes are learned and efficient, and are relatively static. An example of an automatic process starts with perceiving a familiar stimulus in the environment, linking it to cognitive categories stored in memory, then retrieving information from memory based on cues (65). In comparison, conscious cognitive processes (the ones assumed to occur when consumers make purchasing decisions) are bound by capacity limitations, and can easily adapt to the task at hand (65). These are problem-solving activities where one tries to find meaning in unfamiliar stimuli, combining information in new ways when evaluating and arriving at decisions (65).

Second, the MEC framework assumes that values are desirable end-states or goals which play a key role in determining consumer choice. These values are seen as needs or psychological states which are satisfied by the consumption behaviour (20). Personal values are also thought to represent self-concept, sometimes used as a leverage point in advertising (69). It is argued that advertising taps into consumer values at least for the initial decision to choose a product. Over time, however, product choices become habitual and automatic (69).

The third assumption inherent in the MEC framework is that a consumer’s motivation and cognitive structure can be measured when s/he is engaged in decisions regarding product choice. This cognitive structure can be represented by salient product attributes which consumers associate with specific consequences which result from choosing those products, and values which are associated with these consequences (21). These three levels of product-related knowledge together form a means-end chain. The chain proceeds in a direction from
more tangible product attributes, via consequences of using the product to more abstract personal values.

*Fourth*, in means-end chain theory, using or consuming a product is seen as a means to an end (26). Product attributes represent very little for the consumer *per se*, whereas they convey much importance when related to the perceived consequences or values they can bring about. The end in the means-end-chain approach is fulfilling a life goal or personal value the consumer is striving to achieve. The chain is a set of connections or linkages between the attributes-consequences-values (26). For the purposes of our study, we have assumed that our means-end chain model has three levels of abstraction consisting of 1) attribute - 2) consequence - 3) value.

The *fifth* assumption is that it is important to understand the linkages between product attributes, consequences and values because these hold the personal relevance of decisions (26). To establish a link between the different levels of abstraction, the participant retrieves information of a higher level of abstraction by a spreading activation theory (65). Spreading activation posits that a cognitive category is activated or made conscious when it is activated beyond a threshold level (65). When the spreading activation theory is applied to the laddering interview to understand the linkages of the attribute-consequences-value, each step in the variations of the question “why is that important to you?” is thought to activate the cognitive category that was mentioned last by the respondent. If the associations are sufficiently strong, activation of the last mentioned category retrieves additional categories. The participant then answers with the category that has received the next highest activation. This technique allows us to understand causal associations established by the participant.
After a point, the participant may have exhausted the associations named, and she/he will be unable to answer further (65).

2.10 Summary

In summary, the context and theoretical background for this study were reviewed in this chapter. About one third of individuals with osteoarthritis use NHPs which are supported by a wide range of scientific evidence for their effectiveness. The available literature on consumer decision-making in CAM suggests that consumers consider scientific evidence as an information source; however, they differ widely in the extent that they actually evaluated the quality of evidence. Personal testimonials by friends and family were the dominant source of information and almost always the initial reason why participants in previous studies chose to use CAM. The literature on the salient factors responsible for OTC medication self-selection concluded that evidence is not an important decision-making factor. Thus, it is not clear if NHP users are more like other CAM users or more like those that use other types of OTC products. The means end chain (MEC) theoretical perspective was chosen to explore if and how scientific evidence is involved in the decision-making process of individuals with osteoarthritis who choose to use NHPs. This approach should allow us to explore unconscious decision-making factors, by helping participants to make them conscious through the laddering interview technique described in the methods chapter.
3 METHODS

3.1 Organization

The methods used for this project are described in detail in this chapter. To begin, we reiterate our research question and study objectives. Next, the study design is introduced. The study participants are then described including sampling, inclusion and exclusion criteria, sample size justification, and recruitment. Next, our interview (laddering and semi-structured questions about evidence) and demographic data collection are described. This is followed by a description of our analysis plan for the laddering data, the semi-structured interview data and demographic survey data. The chapter ends with a review of validity, reliability and ethical issues.

3.2 Research Question

How does the level of scientific evidence supporting the efficacy of NHPs impact consumer decision-making in the self-selection of NHPs by individuals with osteoarthritis?

3.3 Study Objectives

1. To apply the laddering methodology and means-end chain analysis to construct a hierarchical value map for osteoarthritis-related NHP self-medication decisions

2. To describe the factors (product attributes, perceived consequences and values) impacting consumer choice of NHPs for the self-management of osteoarthritis symptoms.
3. To compare hierarchical value maps of consumers who report choosing NHPs with low scientific evidence with those who have only selected NHPs with high scientific evidence of efficacy for osteoarthritis-related symptoms

3.4 Study design

The primary method used in this study was in-depth in-person interviews using the laddering technique which is associated with the Means End Chain (MEC) theory as outlined in chapter 2 (26). We used the laddering interview technique to first ask participants to identify all salient product attributes (e.g., natural source). Next, we asked a series of questions to identify which consequences (e.g., reduction in pain) and underlying values (e.g., quality of life) participants associated with each product attribute to create “ladders”.

3.5 Study Participants

3.5.1 Sampling

To select a subset of the population to study, stratified convenience sampling and snow-ball sampling strategies were used. A convenience sample is a group of participants who meet the study criteria and who are also accessible to the study coordinator (70). Snow-ball sampling involves asking participants to suggest others in their social network who may be eligible to participate (70).

Participants were stratified into one of two categories - “high” and “low” evidence based on the NHP products they reported using in the last year. Individuals who had only used NHPs with levels A or B evidence support (see Appendix Table 3, extracted from the Natural Standard Database) such as glucosamine and chondroitin were placed in the “high”
evidence category. If a participant reported using any product lacking levels A or B evidence support (e.g., bromelain and MSM which have level C or lower evidence support), they were stratified to the “low” evidence category⁴.

3.5.2 Participant Inclusion and Exclusion Criteria

Inclusion criteria:

Participants included in the study were:

- adults with a self-reported diagnosis of osteoarthritis of any joint for at least the last three months;
- individuals who have self-medicating with at least one NHP from the following list: glucosamine, chondroitin, MSM or bromelain (See Table 2) in the last year;
- able to participate in English and give informed consent.

Exclusion criteria:

Healthcare practitioners (currently practicing or retired) such as physicians, nurses, nurse practitioners, naturopathic doctors, and students training for these professions, as well as employees (current or previous in the last 10 years) of pharmaceutical or NHP industries

⁴ Note: to facilitate comparison of the two groups with respect to “levels of scientific evidence”, four representative products were chosen as the focus of the study: glucosamine and chondroitin in the “high scientific evidence category”; and bromelain and MSM in the “low evidence category”. These four products have similar physical properties, speed of action, dosing schedule, cost and adverse reactions (See Appendix, Table 2)
or market research companies were excluded from participating in this study since their knowledge of pharmaceuticals or NHPs may introduce bias into the study. Individuals who had ever been treated by the study coordinator at the naturopathic clinic of the senior activity centre or at any of her other clinics were also excluded from the study because of the prior existing relationship. Finally, individuals over the age of 80 years were excluded from the study since we were concerned that very elderly individuals may find this interview process tiring or be unable to focus intensely for the 1.5 hour interview.

3.6 Sample size

Based on our research team’s previous experience with laddering interviews, 12-15 sets of ladders per evidence group would be sufficient to construct a robust hierarchical value map (16, 71). In order to obtain these numbers of ladders, we recruited 25 participants, assuming that approximately half of our participants would be in each evidence category, and at a minimum, each participant would have two to three ladders (65).

3.7 Recruitment

The study coordinator obtained permission to recruit patients at the Active Living Centre of the NYSC, an activity centre that provides “programs and services to promote the physical, emotional, and social well-being of adults 55+ living in our diverse community”(72). (See Appendix Figure 1: Letter of approval to recruit at the NYSC.) The NYSC has an active membership of approximately 300 seniors over the age of 55 who participate in day programs including an arthritis self-management program and “osteofit” exercise classes (72). In addition to the NYSC, we also circulated posters and advertisements within seniors-related community organizations, seniors-related community interest groups,
newspapers, magazines and events, and online communities (Craig’s list). Potential participants called the study coordinator in Toronto at the numbers provided on the flyers and email advertisement (See Appendix Figure 5: Recruitment poster). The research coordinator then asked the potential participant a list of screening questions (see Appendix Figure 6: Screening questions for recruitment) devised to ensure that participants have used NHPs promoted for OA which have a range of supporting scientific evidence from Appendix Table 3: NHPs for OA and levels of evidence for use, and to ensure that no members of the excluded professions were included in the sample. If the caller was determined to be a suitable candidate, the research coordinator then explained the study and answered any questions the participant had. If the caller agreed to participate, the research coordinator took the caller’s contact information (phone number, address and email address), and explained that a consent form and information letter would be forwarded so that he/she can read it in advance of the interview and direct any questions about the consent process or the study to the research coordinator (See Appendix Figure 6. Screening questions for recruitment; Figure 7: Study information letter; Figure 8: Study consent form). The participant was also informed at this time that the information he/she provided will be kept confidential, and that he/she had the right to refuse to participate or to withdraw at any time. (See Ethical issues below for measures to ensure confidentiality). The participant was also told that he/she would receive $50 compensation for participating in the study, a pre-agreed upon gift card received at the end of the interview. The research coordinator then scheduled an interview with the participant at this time if he/she agreed to these conditions.
3.8 Data Collection

The data were collected between May and November of 2009. Semi-structured interviews using the laddering process lasting approximately 1.5 hours were conducted by TT. NK, a senior graduate student trained in the laddering technique who had previously conducted laddering interviews for our team’s sleep study, assisted in conducting the first 5 interviews. Interviews were tape recorded and transcribed verbatim. There were four general steps to the interview. The first step included general questions inquiring about how participants found out about the products and questions about their osteoarthritis. The second step was the laddering interview which is described in detail below. The third step was a brief semi-structured interview about participants’ views on evidence. The fourth and final part of the interview was the collection of demographic information via a structured questionnaire. (See the Appendix Figure 9: Interview guide). The specifics of the laddering interview process are outlined below.

3.8.1 Laddering interview

A successful laddering interview requires the interviewer to guide the participant's responses; distill the ladders by sorting out levels of abstraction; encourage the participant to generalize from a given example to the personal meaning of the example, and to simplify elaborate examples (65). Within our laddering interview, there were two steps. First, participants were asked to tell the interviewer what they like and dislike about the products (See Appendix Figure 9: Interview Guide) which they have used for their OA in order to identify specific product attributes salient to each participant. Product attributes could be positive (e.g., it is from a natural source) or negative (e.g., the product is expensive). Next, participants were asked about the remaining products they have heard of but not used to find
out why they did not use those NHPs. Based on these responses, the interviewer compiled a list of all product attributes relevant to that individual participant. The participant was then asked to rank each of the product attributes in the list to identify the most preferred to least preferred (1 = most preferred). The ranking activity was done to ensure that the interviewer could start the laddering section of the interview with the product attributes the participants identified as the most important.

Each product attribute formed the starting point of a ladder. A ladder is the conceptual linkage of a product attribute, its associated consequence and the underlying personal value (see example below). The laddering process links a product attribute with personally meaningful values. The laddering interview typically included open-ended probing questions such as “Why is that important to you?” to encourage participants to think more deeply about the meaning of each step (20, 21, 26). By continuing this probe or using variations, increasingly abstract concepts were linked together. Since this interview technique is open-ended, coding of the concepts at each level of the ladder were important in order to meaningfully compare the results of multiple participants (71). (See Appendix Figure 9: Interview Guide; Table 12: Code summary for NHP OA study interviews -- laddering codes). An example dialogue is included for illustrative purposes. The text in brackets explains the attribute, consequence or value code (coding is described in more detail in the analysis section of this chapter):

Interviewer (I): Tell me what you like about glucosamine (eliciting product attributes).
Participant (P): I like that my friend recommended it to me (attribute: friend/family endorsement).
I: Tell me why it’s important to you that your friend recommended it?

P: If my friend tells me that it helped her, I believe it’s also going to help with the pain of my arthritis (consequence: effectiveness – decrease in pain).

I: Why is it important to you that it helps with the pain of your arthritis?

P: Well, I can walk to the park when I have less pain (consequence: activity of daily living).

I: Why is it important to you that you can walk to the park?

P: I enjoy nature and I’d like to lead a better quality life (value: quality of life).

3.8.2 Semi-structured interview

Semi-structured, open-ended questions were included as part of the in-depth interview to provide additional information about participants’ views of evidence. After concluding the laddering part of the interview, participants were asked several open-ended questions to explore their views on the role of scientific evidence in their decisions to use NHPs. Questions probed the topics of the importance of scientific evidence, whether or not scientific evidence affected their decisions, scientific evidence sources, examples of scientific evidence, and if scientific evidence was not used, what participants would use instead of scientific evidence. (See Appendix Figure 9: Interview guide for the specific questions asked). If asked to define "scientific evidence", the interviewer described it as information derived from rigorously designed studies, found in peer-reviewed journals and scientific reports.

3.8.3 Participant Demographic Survey

After conducting the interviews, a demographic questionnaire was administered to capture additional participant-variables which could affect their NHP decision-making based on the review of the literature presented in Chapter 2. The demographic questionnaire
consisted of questions about gender (39, 41, 73, 74), age (41, 73), ethnicity (73, 74), highest level of education (39, 41, 74), annual household income (74), and duration of using NHPs (5). We also asked participants to rate their views on the importance of scientific evidence (10 point Likert scale, where 1 was unimportant and 10 was the most important), their overall health (10 point Likert scale, where 1 was poor health and 10 was the best state of health) (74), the severity of pain (10 point Likert scale, with 1 point being no pain to 10, the most severe pain ever) (74). Finally they were asked to identify which anatomical joints which were affected. The survey can be found in Appendix Figure 7, part III.

3.9 Data analysis

We conducted three types of data analysis – analysis of the laddering data using the means end chain approach; content analysis of the semi-structured sections of the interviews focusing on perceptions of scientific evidence, the influence of health care providers and friends and family, and other information sources; and descriptive statistical analysis of the demographic survey data. Each type of analysis is discussed in detail below.

3.9.1 Laddering analysis - means-end chain analysis

The laddering interview data were analyzed using means-end chain analysis as outlined by Grunert and Grunert (1995) and Reynolds et. al. (2001). First, each interview transcript was read line by line by two independent investigators to identify specific concepts or codes in the data. We used a constant comparative method, comparing and contrasting each emerging concept with previous examples of the same concept. This allowed us to define the code’s properties, specifically what it included and excluded. After several coding sessions, the code name evolved to fit the full meaning of the concept (75). Each code was recorded in a coding table supported with quotes to enhance each coder’s understanding of
the concept. Patterns of meaning or codes were identified representing product attributes, perceived consequences of taking the products, and personal values. A final list of attributes, consequences and values including their code names and definitions is found in the Appendix Table 12: Code summary for NHP OA study interviews.

As part of the coding process, ladders made up of Attitude-Consequence-Value linkages were identified independently by each coder (65). For example, the sample interview transcript section above would be coded into the following ladder: Friend/family endorsed (attribute) - Effectiveness (decrease in pain) (consequence) - Activity of daily living (consequence) - Quality of life (value). Team discussions were scheduled after every 2-3 interviews to ensure that our findings (both in terms of identification of attributes, consequences and values as well as ladders) emerged through consensus between investigators (70).

After coding the data, MECanalyst Plus (produced by Skymax-DG) was used to construct a composite of all participants’ decision-making ladders which was represented both numerically as implication matrices and graphically as hierarchical value maps (HVMs).

Since we were interested in determining whether or not consumers who report choosing NHPs with low scientific evidence differ from those who have only selected NHPs with high scientific evidence of efficacy for osteoarthritis symptoms, participants’ data were constructed into three different HVMs with associated implication matrices:

1. All participants “Everyone” (n = 25) (Appendix Table 12: Everyone)
2. Participants who used only glucosamine and chondroitin, “High scientific evidence” (N = 13) (Appendix Table 13: High scientific evidence)
3. Participants who used bromelain and MSM “Low evidence” (N = 12). (Appendix Table 14: Low scientific evidence)

The HVMs were visually inspected and compared for similarities and differences between the “High” and “Low” scientific evidence groups. The scientific evidence decision-making chain comprises the attribute, consequences, and values which were linked to the product attribute scientific evidence or the health care provider-endorsed attribute since many people identified their health care provider as being their source of information about scientific evidence. The scientific evidence decision-making chains and key values were also compared between the two scientific evidence groups to understand the role of scientific evidence in consumer decision making. Additional links which met the cut-off starting from scientific evidence, health care provider, side effect, and activity of daily living were added to respective HVMs to provide greater clarity to the decision-making chain in cases where the MECanalyst computer program removed these redundant links and included indirect links if both were available. HVMs with and without these added links are included in the Appendix (See Appendix HVMs Everyone, High, Low scientific evidence with added links as solid lines, Figure 11, 12, 13; HVMs of Everyone, High, Low scientific evidence with added links as dotted lines, Figure 14, 15, 16). In the HVMs of the High and Low scientific evidence groups (Figures 12 and 13), the shaded boxes are attributes, consequences, or value which appear in the other scientific evidence group and not in the current HVM. The dotted lines represent linkages which do not appear in the current HVM. The orange coloured lines are the linkages which are unique to the participants in the current scientific evidence category. See Appendix, Figures 12 and 13, High and Low scientific evidence groups.
3.9.2 Semi-Structured Interview Data Analysis

LS, a pharmacy summer student, assisted the study team in the semi-structured data analysis as one of the transcript coders, creating the table of qualitative codes, entering the transcripts into NVivo, and in drafting the sections of the manuscript relating to the semi-structured interviews. The qualitative coding allowed us to probe more deeply into exactly how the product attribute scientific evidence, and endorsement of health care providers or friends and family impact participants decision-making about what NHPs to use.

Constant comparative content analysis was used to code discussions of scientific evidence and other sources of information throughout the interviews (with an emphasis on the open-ended semi-structured questions at the beginning and end of the interviews). The original descriptive coding scheme was developed inductively from the data (76) after coders read through the transcripts carefully to identify relevant content. This has been called "open coding" by some authors (77). Each code name was defined in the coding table, and a description of any qualifications or exclusions was provided, along with positive and negative examples in order to eliminate possible confusion when applying the code for subsequent pieces of text and interviews (76). Codes were continuously refined in an interactive process as is standard for constant comparison analysis. This process allowed for additional categories to be developed and for overlapping codes to be merged as necessary as coding proceeded (78). Records documenting all coding decisions and code name definitions were maintained and updated after each coding meeting to ensure a rich and comprehensive audit trail (78). (See Appendix Table 13: Themes and supporting quotes from semi-structured interviews for the final descriptive coding scheme.)
Coding was completed independently by two or three investigators, with regular meetings scheduled every two to three interviews in order to ensure consensus between investigators. The coding definitions were necessary to promote consistency of judgments between investigators and to ensure reliability of codes. Finalized codes were entered into NVivo, software to facilitate efficient storage and retrieval of data, and to assist with higher levels of content analysis (77).

Following the descriptive phase of the analysis, summary reports for both high and low evidence groups were generated for each descriptive code, containing all of the coded references per category. The sequence of secondary coding of these reports was determined by its relevance to the research question, beginning with the "scientific evidence" code, and included all salient information sources. In this second stage of examining the data, axial coding was then used to elaborate upon the initial coding and to draw connections between categories and sub-categories (77). Key themes emerging from the data were compared and contrasted between the high and low scientific evidence groups. The entire process of conceptual secondary coding was completed by three investigators; analyses proceeded until saturation was reached, and key findings were corroborated through discussion. A final list of themes and sub-themes along with illustrating quotes was compiled as a summary of the qualitative analysis data (See Appendix Table 13: Themes and supporting quotes from semi-structured interviews).

3.9.3 Demographic Survey Data Analysis

The demographic and disease characteristics of participants in the high and low evidence categories were compared. All descriptive statistical analysis was performed using Prism GraphPad version 5.0 for Windows. Continuous variables such as age and levels of
pain were analyzed with the unpaired 2-tailed t-test. The categorical variables ethnicity, and participants’ affected joints (e.g., knees, hips) were analyzed with the chi square test. All other categorical variables were analyzed with the Fisher’s test to more accurately compare small cell sizes (GraphPad version 5.0 User instructions). To facilitate the comparison of analysis, data were collapsed into theoretically meaningful categories as follows:

3.9.3.1 Ethnicity

A range of ethnicities were collected (Aboriginal, North American, European, South Asian, South East Asian, Arab/Middle Eastern, African, Caribbean, Filipino, Latin American, Other). In light of the North American and European categories being the two largest ethnicities, all other ethnicities were merged into an “Other” category in order to produce sufficiently large cell sizes to perform the chi square test.

3.9.3.2 Education

Our participants selected a range of different education levels – from under grade 8 to graduate school education. Just under half of our participants did not attend college, so we decided to split our participants into two groups – one with any college education, and another with no college education. These two groups were initially analyzed with the chi-square test. Considering the recommendation of our data-analysis program (Prism), these groups were re-analyzed with the Fisher’s test for greater accuracy, given our small cell sizes.

3.9.3.3 Income

Our participants selected a range of annual income levels from under $25,000 to over $75,000. About half of our participants earned less than $50,000, so that annual income level
was determined as the cut-off for our comparison. The Fisher’s test was used to analyze the difference the two groups of individuals who earned less than $50,000 and those greater than $50,000 per year.

3.9.3.4 Joints affected

Our participants selected a range of affected joints (hands, wrists, fingers, neck, lower back, hip, knee, ankle, foot, toe). To facilitate analysis, we grouped the affected joints identified by our participants into three anatomical groups – upper extremity, lower extremity, and other, these were chosen as our analysis categories. The chi square test was performed to analyze the difference between these three anatomical groups.

3.10 Validity and reliability

3.10.1 Validity of the MEC Approach

Validity is defined as how well measurements represent the phenomenon of interest (79). Validity in general terms is also likened to hitting the center of the bull’s eye where the bull’s eye represent the truth or phenomenon of interest. Validity can be divided into construct, content, predictive, and convergent validity (See Appendix Table 5, for definitions of each type of validity). The laddering technique associated with the MEC approach has been demonstrated to have content (face) (80), predictive (65), and convergence (81) validity. In this study, we were able to enhance predictive and content validity of our results following the recommendations of Grunert and Grunert described below.

Predictive validity is defined as “the ability of the measurement to predict an outcome” (79). Grunert and Grunert developed four strategies to increase predictive validity
of the data generated using the MEC approach (65). These strategies address the influence of the researcher’s cognitive structures and processes and include techniques used in data analysis (65).

The first strategy is to use a data collection technique that captures the cognitive process of the respondent which is minimally influenced by the researcher’s own cognitive processes. As was suggested by Grunert and Grunert, we used open-ended questions in our laddering technique to increase predictive validity. This is also known as “soft laddering” as it allows the respondent to relate his/her own cognitive categories using their natural speech. To do this, we started the laddering process by asking participants to list all the attributes that were important to them. Thus each ladder originated from an attribute which was identified by the participant. In contrast, “hard laddering” includes either a more structured interview technique, self-administered laddering questionnaires, or computerized data-collection device (65). Instead of starting the laddering process with attributes which are listed by the participant, in a hard laddering interview setting, the interviewer would present pre-defined attributes to the participant that would be associated with pre-defined consequences and values. The soft laddering technique that we used has also been assessed for content validity (80) so by adopting this technique, we were able to enhance both predictive and content validity of the MEC approach.

Following the second strategy for enhancing predictive validity suggested by Grunert and Grunert, participant interviews were individualized based on their target situation. If participants had trouble identifying product attributes or consequences, they were asked to give examples such as “give me an example of the last time …?”, or reverse laddering was
used such as “what is the opposite of…?” to elicit more complete answers. In contrast, those with *elaborate* associations with products sometimes activated several cognitive categories at once at each level of abstraction producing forked answers (e.g., one attribute would be associated with numerous consequences). The interviewer "unpacked" these associations into their components and followed up on each part of the forked answers one after another in a natural flow of speech (65).

Other measures we took to enhance validity were tape-recording and transcribing our interviews verbatim, allowing the full context of the laddering interview to be available to the research team coding the interview. At least two researchers first independently coded the transcripts, then team meetings were held after two or three interviews to ensure that the codes emerged through consensus. These techniques ensured that our interpretation of the data was closely aligned with the respondent’s original intended meaning. The study coordinator kept a table of codes with definitions of terms and illustrative quotes allowing researchers to understand the meaning of a given concept or code. An audit trail was left detailing the coding decisions made by the research team. The coding table was continuously revised and used iteratively to code subsequent interviews. Maintaining a table of codes also ensured validity of our data.

Another strategy we used to increase the validity of our data was the division of our participants into two scientific evidence categories based on the NHPs they actually used. Thus our categories are based on “revealed” preferences which is defined behaviour the individual exhibits (i.e., I am taking glucosamine). (82, 83). This is in contrast to “stated” preferences which are defined as individuals’ stated intentions (84), or what they say they will do (such as, “I plan to take glucosamine”). We therefore purposively recruited our
participants and analyzed our data according to participant’s revealed preferences – the types of NHPs which they actually chose to use (high vs low scientific evidence NHPs) which increases the validity of our approach because intentions do not always translate into actual behaviour.

3.10.2 Reliability of the MEC Approach in our population

Reliability, also known as precision of the data, is defined as the degree to which a measurement is the same value when measured several times (79). In the bull’s eye analogy, reliability is the close clustering of results with repeated measurements (whether on the bull’s eye or not). Different types of reliability exist, but the type most relevant to the type of data collected in our study population was inter-rater reliability. Inter-rater reliability is “used to assess the degree to which different raters/observers give consistent estimates of the same phenomenon” (85).

We focused on ensuring the reliability of our coded laddering data by using audit trails so that our coding could be repeated by another party if necessary. We did not compute formal inter-rater reliability. Instead at least two investigators independently coded each transcript, and we held team meetings to discuss our coding to ensure that our final results emerge through consensus (investigator triangulation). We also constructed a table of coding definitions and accompanying examples so that all investigators referred to the same understood concepts each time a given code was used which was also intended to increase the reliability of our data coding (See Appendix Table 12 – Laddering code summary and Table 13 – Semi-structured interview code summary).
3.10.3 Validity and Reliability of the Semi-Structured Interview Data

To ensure similar rigorous levels of validity and reliability of the semi-structured interview data, we adopted several strategies outlined here. First, participant interviews were audio recorded and transcribed verbatim to provide a detailed record of verbal interactions and to serve as a consistent source of qualitative information (76), part of our effort to enhance the validity of our data. Coding was completed manually on interview transcripts prior to computer entry, in order to ensure that all codable moments were captured to enhance validity of our data analysis. Data management software was used to organize information prior to theme development. The investigative team was composed of members with diverse backgrounds in order to reduce bias and subjectivity in the analyses to enhance validity of our study findings (70, 76).

To ensure reliability of coding our semi-structured interview data, we constructed a table of coding definitions and accompanying examples so that all investigators referred to the same concepts each time a given code was used (See Appendix Table 13: Themes and supporting quotes from semi-structured interviews). Throughout the study, reliability was enhanced by using audit trails and investigator triangulation, which promoted consistency in coding and helped to ensure that findings emerged through consensus between investigators (70, 78).

3.10.4 Validity of survey data

While our demographic survey questions were not formally validated, prior use of these questions in other research studies suggests face validity (5, 16, 74). The content and wording of questions 1 to 5 were based on our research team’s previous sleep study (16) and
demographic information gathered in a previous study on evidence and CAM (5). The content of questions 6 to 10 has been used in previous similar studies (5, 59, 74).

3.11 Ethical issues

Ethical approval was obtained from the Research Ethics Board of the University of Toronto. This approval was renewed annually for the study duration. (See Appendix Figures 2, 3, 4: Ethical approval, amendment, and renewal letters). Different types of ethical issues were considered such as whether or not to disclose the interviewer’s professional training, as well as minimizing coercion to participate, conflict of interest, risks, benefits, compensation, consent, participant withdrawal, and confidentiality. Our efforts to address each of these issues are described below.

3.11.1 Disclosure of professional training

The professional training of the interviewer, a licensed naturopathic doctor, could set up the expectation for participants that she was in a position to offer advice on NHPs, therefore her professional training was only disclosed if the participant directly asked. The study interviewer was only prepared to provide health-related advice if, during the course of the data collection, she believed the participant’s health was in danger – however no such situations occurred. The interviewer did not provide any advice on NHPs nor did she offer health-related advice during any point of the interview. All health-related issues were referred to the participants’ health care providers.

3.11.2 Coercion and perceived conflict of interest

Since the study coordinator and interviewer is a licensed naturopathic doctor, to prevent coercion of patients to participate in the study, existing patients of the study
coordinator were ineligible for the study. Potential conflict of interest could arise if the study’s interview process was used as recruitment of new patients for the study coordinator. To mitigate this potential conflict of interest, study participants could not become the coordinator’s future patients until a minimum of three months after the interview and only if the patient directly contacted the study coordinator (i.e., she would not use contact information collected as part of the study to recruit new patients at any point in time).

3.11.3 Risks and Benefits

There were no significant risks associated with participation in this study. However, as with any interview process, it was anticipated that some individuals could experience mild psychological distress since the interview process required participants to think deeply about why they have chosen specific NHPs. The interview process lasted 60-90 minutes which could be physically tiring. The age limit of 80 years was in place to limit the physical risk of participants since more elderly individuals may find this interview process more exhausting than other individuals.

There were no real benefits to participants in this study except for the knowledge that they are contributing to the research of NHP self-medication decision making. In addition, many individuals find participation in interview studies interesting and stimulating. This information was presented in the consent form.

3.11.4 Compensation

All participants were given an honorarium of $50 in the form of a gift card upon completion of the interview to compensate for their time and any travel expenses. The amount of $50 was based on the assumption that participation would take participants three hours of time including travel and participation in the interview. Based on this assumption,
the $50 compensation was calculated based on an hourly rate of $15/hour (x3), and the
addition of $5 for two subway tokens ($2.50 each) to travel to the interview site (either the
Leslie Dan Faculty of Pharmacy or North York Seniors Centre). This amount was approved
by our Research Ethics Board as being sufficient compensation for time and travel expenses,
without being coercive to participating “just for the money.” Providing a gift card instead of
monetary honoraria helped protect the confidentiality of participants because our financial
office did not need to know the identities of the individuals. Providing a gift card could be
perceived endorsement of the companies issuing the gift cards, but this was limited by having
a list of 5 sources of gift cards so that participants could choose among them. The only other
limitation to using gift cards was that the gift cards could not be re-issued if lost.

3.11.5 Consent

To ensure that participants were making an informed decision to participate, written
and verbal informed consent was obtained from each participant prior to beginning the
interview. See Appendix Figure 6 for study Consent form.

As part of the consent form, participants were made aware they could withdraw their
consent to participate at any time without any consequence in both the telephone screening
process, when they received the consent forms, and prior to beginning the interview. The
duration of the interview lasted between 60-90 minutes. To minimize participant discomfort
during the interview, individuals could take breaks and resume the interview if they chose to
continue.
3.11.6 Confidentiality

Participant confidentiality is important to the study team particularly since many individuals were interviewed at the North York Seniors Centre, a closely knit community of seniors. The study team took measures to keep the identities of participants confidential by coding participant responses (F1-20, and M1-5) and maintaining participant’s identifying information separate from their codes. Providing a gift card instead of monetary honoraria helped protect the confidentiality of participants without the need to issue a cheque to a particular individual. All confidential information was stored on a password-protected computer and/or locked in a cabinet accessible only by the study coordinator. All confidential information will be destroyed by shredding and erasing data-files from the study’s computer seven years after the study coordinator’s thesis defense.

3.12 Summary

In summary, the study methodology is outlined in this chapter. Our primary study design was using the laddering interview associated with the MEC approach. A stratified convenience sample and snow-ball sampling were used to recruit 25 participants who were allocated into “high” or “low” scientific evidence categories based on the level of evidence of the NHPs they took for their OA. Recruitment occurred at the North York Seniors Centre, at other senior-related community centres and an online community. A four part data collection process included a component capturing the participant’s experience with NHPs, a semi-structured interview using the laddering process (60-90 min), a semi-structured interview on perceptions of evidence, and lastly a demographic questionnaire. Validity of the MEC method, qualitative and survey data was described. Reliability of our coding processes was
achieved by using a code book of defined codes. Ethical issues such as disclosure of professional training, conflicts of interest, risks, benefits, consent, participant withdrawal, and confidentiality were all described and ways to mitigate these issues were summarized.
4 RESULTS

4.1 Organization

The results of our study are presented in this chapter. First, the participants will be described, including a comparison of participants in the two (high and low) scientific evidence categories. Secondly, our MEC ladderig results are presented – first by describing the implication matrix which outlines a numerical representation of our data. Next, the dominant chain identified in the hierarchical value maps (HVMs) will be described, including an elaboration of key product attributes most salient to our research question (the role of scientific evidence and the impact of advice from health care providers and non-health care providers) using data from the interviews. We begin with describing the overall patterns and then the participants in the high and low scientific evidence groups are compared and contrasted for each section of the description of HVM (attributes, consequences and values). The chapter ends with a summary of the results.

4.2 Overview of participants’ demographic characteristics

We screened 31 individuals and recruited 25 participants with 13 in the high\textsuperscript{i} scientific evidence category and 12 in the low\textsuperscript{ii} scientific evidence category. Based on their answers to screening questions at least two individuals did not qualify for the study based on their descriptions of their OA which were unlikely to be real OA (one person was in her 30s and another individual in her 40s had generalized joint tenderness). Additional participants were not eligible to participate because they were either current or former health care providers, previously worked in marketing, or were over the age of 79. Our sample of participants had a mean age of 58.8 years (range 42-78 years) and 19 were female.
Participants identified themselves as being North American (N = 10), European (N = 13), and other (N = 6) ethnicities. A total of 15 participants completed at least partial college education. Fourteen participants (56%) earned less than $50,000 a year. About half of our participants had extended health insurance (N = 12) whereas only one reported insurance coverage for NHPs. The majority of participants reported use of NHPs for longer than six months (N = 21). See Table 6b for a summary of the characteristics of our participants within the text of this chapter. The full data table is found in Table 6a of the Appendix. Overall, no statistically significant differences were found between participants in the high and low scientific evidence categories with respect to gender, age, ethnicity, education level, net household income, presence of extended health insurance, duration of using NHPs, importance of scientific evidence, overall health, and pain severity (See Table 6b). The characteristic which was the closest to being significantly different between the two groups was the duration of using NHPs (p-value = 0.096). A larger proportion of participants in the low scientific evidence category reported using NHPs for over 6 months (100%) compared with those in the high evidence category (69%), although this difference was not statistically significant.
### Table 6b: Summary Table of Demographic Data- High and Low evidence groups

<table>
<thead>
<tr>
<th>Item</th>
<th>Everyone (N = 25)</th>
<th>High (N = 13)</th>
<th>Low (N = 12)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female, N (%)</td>
<td>19 (76)</td>
<td>10 (77)</td>
<td>9 (75)</td>
<td>1a</td>
</tr>
<tr>
<td>Mean Age in years (range)</td>
<td>58.8 (42-78)</td>
<td>55.08 (42-78)</td>
<td>62.92 (43-78)</td>
<td>0.100b</td>
</tr>
<tr>
<td><strong>Ethnicity, N (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.422b</td>
</tr>
<tr>
<td>North American</td>
<td>10 (40)</td>
<td>6 (46)</td>
<td>4 (40)</td>
<td></td>
</tr>
<tr>
<td>European</td>
<td>13 (52)</td>
<td>5 (38)</td>
<td>8 (62)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6 (24)</td>
<td>4 (67)</td>
<td>2 (33)</td>
<td></td>
</tr>
<tr>
<td>At least some college as highest education, N (%)</td>
<td>15 (60)</td>
<td>9 (69)</td>
<td>6 (50)</td>
<td>0.428a</td>
</tr>
<tr>
<td>Annual household net income less than $50,000d N (%)</td>
<td>14 (56)</td>
<td>7 (54)</td>
<td>7 (58)</td>
<td>1a</td>
</tr>
<tr>
<td>Have Extended health insurance , N (%)</td>
<td>12 (48)</td>
<td>6 (46)</td>
<td>6 (50)</td>
<td>1a</td>
</tr>
<tr>
<td>Use of NHPs to treat Osteoarthritis longer than 6 months N (%)</td>
<td>21 (84)</td>
<td>9 (69)</td>
<td>12 (100%)</td>
<td>0.096a</td>
</tr>
<tr>
<td>Mean importance of scientific evidence rating (0 = unimportant, 10 = very important) (standard deviation)</td>
<td>8 (2.3)</td>
<td>8 (2.6)</td>
<td>7.9 (2.1)</td>
<td>0.931c</td>
</tr>
<tr>
<td>Mean overall health rating (0 = worst, 10 = best) (standard deviation)</td>
<td>7.2 (1.2)</td>
<td>7.0 (1)</td>
<td>7.5 (1.4)</td>
<td>0.322c</td>
</tr>
<tr>
<td>Mean pain scale visual analogue scale, 0 = worst, 10 = best (standard deviation)</td>
<td>6.7 (1.8)</td>
<td>6.2 (2.0)</td>
<td>6.9 (1.6)</td>
<td>0.328c</td>
</tr>
<tr>
<td>Joints affectedd N(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper extremity</td>
<td>4 (21)</td>
<td>1 (10)</td>
<td>3 (33)</td>
<td>0.270b</td>
</tr>
<tr>
<td>Lower extremity</td>
<td>12 (63)</td>
<td>8 (60)</td>
<td>4 (44)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3 (16)</td>
<td>1 (10)</td>
<td>2 (22)</td>
<td></td>
</tr>
<tr>
<td>Total joints affected</td>
<td>19 (100)</td>
<td>10 (100)</td>
<td>9 (100)</td>
<td></td>
</tr>
</tbody>
</table>
Notes: A: Fisher test, b: Chi-square test, c: unpaired t-test; d: four participants did not indicate their income. Participants could indicate more than one anatomical joint; five participants did not indicate an affected anatomical joint.

In the high scientific evidence category, participants produced a mean number of 13.2 ladders (range of 6-33) with a mean number of constructs per ladder of 4.4 and a mean number of constructs per individual of 57.2. In the low evidence category, participants produced a mean of 11.9 ladders (range 3-20) with a mean number of constructs per ladder of 4.0 and a mean number of constructs per individual of 47.8. Unpaired 2-tailed t-tests of participants in the two scientific evidence categories found that the mean number of ladders were not significantly different. See Appendix Figure 17 for formulas of mean number of constructs per ladder and a mean number of constructs per individual.

4.3 Overview of NHPs used by our participants

Participants who used products containing glucosamine and chondroitin only were allocated into the “high” scientific evidence category. Initially, we attempted to recruit participants who only used bromelain and MSM (i.e., who had not used glucosamine and chondroitin); however, almost no eligible participants fulfilled this criterion. The recruitment strategy was then modified and we accepted participants who used glucosamine or chondroitin providing they had also used bromelain or MSM. These individuals were assigned to the “low” scientific evidence category because they had decided to use products with low levels of evidence support. Even though we could not verify that our participants actually ingested the NHPs, most (76%) participants brought their NHP bottles to their interview (12/13 high evidence; 7/12 low evidence). As illustrated in Table 17, all participants used glucosamine, an NHP with a high level of scientific evidence support.
4.3.1 Table 17: Table of specific combination products used by our participants.

<table>
<thead>
<tr>
<th>NHP constituents taken</th>
<th>Scientific evidence level High, (13 participants)</th>
<th>Scientific evidence level Low, (12 participants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucosamine only</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Glucosamine and chondroitin</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Glucosamine and bromelaine</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Glucosamine, chondroitin, MSM and bromelaine</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Glucosamine, chondroitin, and MSM</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Glucosamine, chondroitin, bromelaine</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

4.4 Implication matrices

The implication matrix provides a summary of the number of participants who established links between specific product attributes, consequences and values. The implication matrix was generated by the MECAnalyst program by counting the total direct and indirect linkages between the decision making factors (attributes, consequences and values). Each link between an attribute, consequence or value was only counted once per participant. Thus if a single participant made the link between health care provider (HCP) endorsed (product attribute) and decreased pain (consequence) multiple times, the program would only include it once in the implication matrix. However, if several different participants established the same linkage, the program would count the separate linkages. To illustrate how to read an implication matrix, a sample matrix derived from our data is provided in Table 18.
### Table 18: Sample Implication Matrix

<table>
<thead>
<tr>
<th></th>
<th>HCP endorsed</th>
<th>Non-HCP endorsed</th>
<th>Side effect (decreased)</th>
<th>Compliance</th>
<th>Effectiveness (decrease in pain)</th>
<th>Activity of daily living</th>
<th>Mood</th>
<th>Quality of life</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCP endorsed</td>
<td>0,0</td>
<td>0,0</td>
<td>3,2</td>
<td>0,0</td>
<td>6,2</td>
<td>0,9</td>
<td>0,1</td>
<td>0,7</td>
</tr>
<tr>
<td>Non-HCP endorsed</td>
<td>0,0</td>
<td>0,0</td>
<td>2,0</td>
<td>0,0</td>
<td>12,1</td>
<td>1,8</td>
<td>0,3</td>
<td>0,9</td>
</tr>
<tr>
<td>Side effect</td>
<td>0,0</td>
<td>0,0</td>
<td>4,1</td>
<td>5,3</td>
<td>3,8</td>
<td>2,0</td>
<td>3,7</td>
<td></td>
</tr>
<tr>
<td>Compliance</td>
<td>0,0</td>
<td>1,0</td>
<td>0,0</td>
<td>12,1</td>
<td>1,10</td>
<td>0,2</td>
<td>0,10</td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>0,0</td>
<td>0,0</td>
<td>1,0</td>
<td>0,0</td>
<td>23,1</td>
<td>6,7</td>
<td>9,11</td>
<td></td>
</tr>
<tr>
<td>Activity of daily living</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>1,0</td>
<td>0,0</td>
<td>8,1</td>
<td>20,0</td>
</tr>
<tr>
<td>Mood</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>1,0</td>
<td>1,0</td>
<td>0,0</td>
<td>8,0</td>
</tr>
<tr>
<td>Quality of life</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
<td>0,0</td>
</tr>
</tbody>
</table>

In reading the implication matrix, all the attributes, consequences and values are listed as both row and column headings. The table thus has cells that provide information about the links between every factor with every other factor. The first number in each cell is the number of direct links made by participants between the two factors. The second number (after the comma) is the number of indirect links. For example, in the first row we can see that three people made a direct link between “HCP endorsed” and “decreased side effect.” Similarly, two people established an indirect link between these two factors which means that participants associated the recommendation of a HCP with decreased in side effects with some intermediate linkages in between. The decision making factors in the rows and columns appear in the order the data were entered into the computer program and thus the order they are listed in the matrix has no specific significance for the overall analysis.

The diagonal line of shaded boxes in the implication matrix corresponds to where a factor is linked to itself and thus all values are (0, 0). In all other cells with (0, 0), this means that there are no linkages between these factors (e.g., HCP endorsed/compliance). Above the
diagonal line is the area where laddering proceeded in the forward direction (i.e., from attribute, consequence, to value. Below the diagonal line, the numbers generally represent linkages where laddering proceeded in the reverse direction (i.e., from consequence back to product attribute). Backwards linkages occurred rarely in the data and are often an artifact of the way the interview questions were worded.

The implication matrix provides detailed numerical data of the exact number of linkages between individual decision making factors but it does not adequately facilitate the identification of patterns in the decision-making processes. The hierarchical value map (HVM) summarizes the data found in the implication matrix to allow for more meaningful interpretation of the data. However, reviewing the original implication matrix was necessary to clarify numbers of direct and indirect linkages represented in the HVMs in some cases which will be explained below.

4.5 Hierarchical value maps (HVMs)

In general, a hierarchical value map is a graphic representation of the implication matrix which is routinely used to identify patterns called dominant chains in the means end chain approach (26). For the linkages appearing in the HVM to be meaningful, a cut off or minimum number of linkages is normally determined. Linkages mentioned by a small number of participants are not included because they either represent idiosyncratic participant responses or they play a relatively minor role in NHP decision-making (26). When determining the cut off number, one is balancing the outcomes of increasing clarity of the data and the loss of information (26) and the best cut off to adopt is an area of debate. See Appendix Tables 9, 10 and 11 for the information content of our HVMs at each possible
cut-off values. In the HVM of everyone, a cut-off was determined as five for the connection to appear while in each of the high and low evidence groups, a cut-off of three was determined. At a cut-off of five (Everyone), 54% of the active links appear, whereas at a cut-off of four 60.3% appear, and at a cut-off of six 46.7% appear. In the high and low scientific evidence group HVMs, a cut-off of three retained 54% and 62% of the data, respectively. Similar to all participants, in the high and low evidence categories, if a cut-off is decreased to two, extra data appears which can interfere with the interpretation of the dominant chains. When the cut-off is increased to four, valuable data is lost, making meaningful data interpretation more difficult. In all cases, we aimed to capture 50-60% of the active links which others have argued is sufficient to present meaningful dominant chains (86).

When reading the HVMs, the numbers inside the boxes represent the percentage of all participants who mentioned the factor during their interviews. The lines connecting each of the factors represent a summary of the linkages established by participants. The thickness of the arrows is a composite of the frequency of participants who mentioned that connection (either directly or indirectly) combined with the total number of participants who mentioned the originating factor. Thinner lines represent fewer participants while thicker lines represent a larger number of participants mentioning a link between two factors. In order to clarify the graphical representation, the computer program eliminates redundant lines. Normally in the case of redundancy, indirect connections are retained and direct connections are dropped because the indirect connections provide richer information about the decision-making process.

We compared each respective implication matrix with the HVM which was graphically-generated by MECAnalyst for Everyone, High, and Low scientific evidence
participants, to identify if there were differences between each of the groups. Some linkages were missing in the initial iteration of the HVM, consistent with Grunert and Grunert’s non-redundancy principle. According to this principle, when there is a linkage between A-C and via A-B-C, the direct linkage of A-C disappears based on the economy of storage assumption (65). Starting with the HVMs which were generated by MECAnalyst, we added missing linkages to our HVMs if the links were related to our key attribute of interest – evidence - or if they appeared to play a key role in the scientific evidence decision-making chain. The linkages we added manually are identified with dotted lines in the HVMs found in the Appendix, Figures 14, 15, 16. The scientific evidence decision-making chain captures the decision-making factors which relate to our central research question, the role of scientific evidence in natural health product selection.

We also removed one small separate link between the attribute “low cost” which was related to the consequence of participant’s ability to “economize” from the final HVM because it did not appear to provide additional information to help us answer our study question.

4.5.1 Laddering results of Everyone: Decision Making Chain

The description of the decision-making chain from the HVM of Everyone (Appendix Figure 11) begins with an analysis of the product attributes, followed by the consequences and then the values (factors) and descriptions of linkages between the most important decision making factors. Given our central interest in the role of scientific evidence, this product attribute is analyzed in the most detail. We later discovered that linkages between HCP and non-HCP to the consequences of effectiveness in pain reduction and the mechanism of action of the NHP (or how it worked) were related to participant’s recall of scientific
evidence about efficacy. Similarly, participant’s recall of HCP describing that NHPs are associated with fewer side effects is related to their perceived evidence of safety. Therefore we included an analysis of our participant’s recall of HCP and non-HCP to further understand where our participants obtained their scientific information from.

After reviewing the overall role of each product attribute, consequence, and value, we compare and contrast how each factor may have played a different role (or not) for those participants in the high or low scientific evidence categories. Overall, few major differences were found. A full list of definitions and sample quotes describing each of the decision-making factors (product attributes, consequences and values) appearing in the Everyone map can be found in Appendix, Table 12: Code summary for NHP OA study interviews.

As can be seen in the Appendix, Figure 11 (Everyone HVM), the scientific evidence decision-making chain mentioned by the majority of participants is described as follows - if a product had scientific evidence supporting its use or if it was endorsed by a HCP, it was generally described to have fewer side effects (92%). Our participants remembered their HCP but not non-HCP as discussing how a product worked (its mechanism of action) (52%). A product’s mechanism of action was also linked to how it could effectively reduce pain (100%). An endorsement by either a HCP or non-HCP was thought to be linked with a product’s effectiveness (100%). If a product was made from a natural source (60%) or if it was from a high quality brand (48%), it was frequently linked with having fewer or no side effects. Both HCP and non-HCP endorsing a product mentioned the product’s effectiveness (see Appendix Figure 11 Everyone HVM).
Participants talked about the product’s pain reduction ability (100%) as being key in allowing participants to perform their activities of daily living (100%). By being able to do daily activities, participants reported feeling healthier physically (healthy, 72%), and emotionally (mood, 60%), and being able to participate in social activities (36%). Finally, the more abstract consequences were linked to two key values: quality of life (84%) and independence (60%). For example, in the dominant chain one can identify that participants linked the consequences of feeling healthier and being in a good mood, to their ability to achieve a better quality of life (84%). Participants also directly linked being able to perform daily activities with achieving a better quality of life (see Appendix Figure 11: Everyone HVM). Some participants who were able to perform more activities of daily living described being independent (60%), another important value. Each of the factors in the dominant chain is described in greater detail in the next section.

4.5.2 Product Attributes

The key product attributes in the decision-making chain are described in detail beginning with scientific evidence, and two related product attributes - endorsements of trusted individuals who are HCP and non-HCP. Several product attributes not directly related to scientific evidence were mentioned by our participants as impacting their selection of NHPs. These were the attributes natural source of a product, combination products, quality brand, dosage form and taste. All of these attributes are described in greater detail below.

4.5.2.1 Scientific Evidence

Participants generally agreed that scientific evidence was important in their selection of NHPs (mean 8/10, scale 0= not important to10 = important) with no significant differences
between the groups (See Table 6a). The results from the HVM of Everyone showed that scientific evidence played a role in consumer decision making since it was one of the product attributes mentioned by over half (52%) of our participants. Scientific evidence about an NHP was defined in our study as published research studies using the scientific method. Scientific evidence was generally associated with NHP efficacy and safety. Participants mostly reported hearing about scientific evidence from an indirect source such as a friend or family member, a health care provider, a TV segment, or reading about it through a form of media (newspaper, magazine, or internet). Participants had a general understanding of what the scientific method was; however, most of them did not describe reading scientific research studies first hand.

Scientific evidence did not appear to be necessary for some participants to choose a NHP to treat their OA. This was true for even those participants who had learned about scientific research supporting the efficacy of an NHP. The following representative quotes reveal that scientific evidence merely provided extra information, and that it was not a key factor influencing participants' decisions to select a particular NHP:

Interviewer: “Why is it important that you read a study in the paper?”
M: “Well, it wasn’t particularly important. It was just … another nail in the coffin, so to speak, as to why I chose to take them. […] I don’t really remember [what the study said]. It’s just that it talked about the benefits of taking it. […] It wasn’t important to me. It wasn’t important at all. If I hadn’t read it, it wouldn’t have made a difference, but when I did read it, it confirmed what the other people said.” (High Evidence, M1).

F: “If the studies were not available, for me to click on and if they [the people who made the web site] had not mentioned studies, but they had just explained to me about Glucosamine and the benefits, then I would have been fine with that.” (Low Evidence, F9).
In fact, recommendations from friends and family or from a healthcare provider (without necessarily referring to scientific evidence) were identified as more important sources of information than scientific evidence by many participants:

Interviewer: How important is scientific research when you’re deciding to take a natural health product?
F: Hum, it has some bearing but not, it’s not the be-all, end-all.
Interviewer: Okay. What is the be-all, end-all?
F: I would say just basically referencing friends and family.
(High Evidence, F18)

F: Okay, let’s say a study like that will be close to my doctor recommending it. It would be very close. (High Evidence, F14).

Some participants believed that scientific evidence was important and that they would be interested in learning more about scientific evidence however they admitted that they never read scientific studies themselves.

Interviewer: “have you ever looked for, um, scientific research?”
F: “No I never did.”
Interviewer: “How important is scientific research?”
F: “Very important because, because again that’s knowledgeable people who are scientists and they’re doing the research.” (High Evidence, F19).

M: “... I’m certainly, you know, interested in hearing about any research that studies this, um, but I guess I have not had sufficient initiative to go out and find the research, um, so how important is the research? You know, moderately important, I guess based on my actions.” (Low Evidence, M4).

Our participants generally reported hearing about scientific studies from trusted individuals such as health care providers, or they would hear about scientific evidence summarized in the media such as on the television or through reading the newspaper. Most often, participants could not remember the details of the scientific studies but had a general idea of the scientific method used.
F: “Well, I’ve heard of studies. I mean my doctor mentioned the studies. There was a study and one group took Glucosamine and another group took a placebo. I’ve heard of these studies.” (High Evidence, F15).

I never really read so much about research studies. It’s only if it was presented easily on television or on the news, a very quick kind of capsule version of it. Not so much about, not so much about Glucosamine. But I, I remember, um, as I said, a couple of years ago there was something about MSM. MSM, um, and there was a hoop-la and they said, well studies have shown that it’s not as, um, effective as once thought, and dut, dut, dut, dut. I don’t really recall too much. I really can’t remember all the details. (High Evidence, F20).

M: I think that I saw something about a study or something that, you know, Glucosamine works. That Glucosamine was effective. Interviewer: Okay. Uh, what kind of study was it? M: I don’t know. I can’t remember. Really I just saw, I saw something in the paper and I can’t, I don’t recall exactly what it was, but I think it referred to something about a study that was done (High Evidence, M1).

Participants’ discussions of research and scientific evidence revealed that when individuals use the term "research" or talk about "doing research" they almost always mean "looking for information." The term "research" when used by our participants did not refer to scientific evidence or looking for scientific evidence in most cases. Examples of "research" provided by participants included consulting friends and family, asking for advice from a health food store employee, or conducting internet searches:

Interviewer: When you do research, what does that mean?
F: “Asking the family, going on the internet, checking different sources ... this is basically friends and family research. Yah, what worked for them and what didn’t work for them.” (High Evidence, F18).

Interviewer: “So if it was a product that you don’t normally get and it was on sale,”
F: “Then I’ll have to do a little bit more research on that. Then I’d have to ask someone in the store how good it is. I would ask, uh, the, um, person in the health food store [...] I’ll get some feedback from that individual [...] Yes, I
mean my research pretty much comprised of the fact of going to a health food store and asking, that’s part of my research.... going to the health food store and asking what have you got for joint pain.” (High Evidence, F15)

F: “So if [my son] says take it, it’s good. He must have gone through a lot of research with the people who already took it.” (Low Evidence, F5).

Other information sources participants reported using when making their decisions about whether (and which) NHP to try for their OA included health food store clerks, the internet and various types of mass media. The internet and various media were other common information sources used by participants; however neither was commonly used as a sole source. The internet was discussed as being a useful tool for learning more about a product, and was a common source of scientific evidence for those few participants who consulted scientific research:

Interviewer: Why is the internet very useful?
F: Because you can find a lot of information in a very short period of time and get a wide range of answers […] It’s fast and there’s access to a lot of different experts. It’s amazing the information you can get off the internet, university studies and stuff like it’s amazing what you can find, what you can track down.” (High Evidence, F7).

Interviewer: Why is it important in your decision making process, though that you read about something first?
M: Right. Well it kind of reinforces, um, your, uh, decision to keep taking these supplements, you know, provides a certain level of, you know, peace of mind and you know psychological comfort to get that re-enforcement. Um, and oftentimes on these sites, you know, you’ll get, you know, physicians or whatever, you know, adding their input and that adds credibility and you know, so, um, you know, it’s good re-enforcement, I would say, for the decision to, um, take the supplement.” (Low Evidence, M4).

In terms of media, newspapers and magazines were often sources of information used by participants, along with television:
F: I did get the heads up from my doctor and I did get the heads up from reading it in a health magazine. (High Evidence, F4).

F: the [newspaper and magazine] articles were fairly objective about, you know, what was good for you. And what you should be doing, so it all makes, adds up to making you believe that they are a firm that you could have confidence in. (Low Evidence, F16).

It appeared that some of our participants were critical consumers of mass media. They described recognizing that these may not be the most objective sources of information when making a decision to use NHPs:

F: But don’t believe everything you read […] I try to look at the source of the literature a little bit more […] more sort of trustworthy and uh, more objective.” (High Evidence, F20).

Scientific evidence was mentioned by participants in both the high and low scientific evidence categories indicating that evidence impacted their NHP choices in both groups. It does not appear that our participants in the two scientific evidence categories valued scientific evidence differently. However, as was noted earlier, participants using only NHPs with scientific evidence of efficacy recalled more information from their HCPs that was related to the effectiveness and mechanism of action of NHPs.

Overall, there were no real differences between participants who chose products having a high level of scientific support compared to those who chose products with a low level of scientific support with respect to the role of scientific evidence in their decision making processes. Their perceptions and use of scientific evidence as well as their descriptions of the other information sources used to support their decision-making with respect to NHPs for OA were remarkably similar. In our sample, the only two participants who sought the advice of CAM providers selected products with high levels of scientific
evidence; however, this question was not systematically discussed in all interviews so it is not clear if this finding is significant

4.5.2.2 Endorsement by Other Individuals (healthcare providers and non-healthcare providers)

One of the most important product attributes influencing a participant’s selection of an NHP was endorsement by someone the individual trusted. These people have been categorized into non-healthcare providers (non-HCP) which included anyone without any recognized health care training such as friends, family, or health food store personnel and healthcare providers (HCP) including those considered both conventional and CAM.

Overall, the majority of participants mentioned the fact that a product was endorsed by someone, either a HCP or non-HCP (or both) as being an important product attribute influencing their decision to try that particular NHP. Both high and low scientific evidence participants relied heavily on the recommendation or endorsement of HCP and non-HCP; and the types of HCP and non-HCP that the participants talked to was not significantly different. (See Table 19).
4.5.2.3 Table 19 – Trusted others and participants in high and low scientific evidence categories

<table>
<thead>
<tr>
<th>Trusted other category</th>
<th>Participants in the High Scientific evidence group</th>
<th>Participants in the low Scientific evidence group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health care provider endorsed</td>
<td>CAM provider</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Health care provider general</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Health care provider Pharmacist</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Health care provider – Medical doctor</td>
<td>3</td>
</tr>
<tr>
<td>Non-health care provider endorsed</td>
<td>Friends and Family</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Health Food Store</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18</td>
</tr>
</tbody>
</table>

The fact that a HCP (including any conventional and CAM health care provider such as pharmacists, nurses, medical doctors, physiotherapists, chiropractors and naturopaths) recommended or endorsed a product was one of the most important product attributes in the decision making process. The participants described HCP as experts in their fields who had superior knowledge about NHPs than the participant:

Interviewer: You would trust … the health care provider, so whether it was a family doctor, your radiologist, [or] pharmacist?  
M: Any... person that might supposedly have a better knowledge of it than myself.” (High Evidence, M1)

Medical doctors comprised the majority of the HCPs discussed in the interviews. Trust also appeared to be a key element in participants’ interactions with their doctors, and their respect for their doctor's knowledge enabled them to put their faith in recommendations from their MDs:
He’s [my] family doctor, and has been for thirty years. I mean, I trust what he says to me, what he tells me. I don’t think I’ve ever questioned anything he ever says to me. (High Evidence, M1).

Well, I mean, you do want the comfort of knowing that, uh, a qualified professional is giving you advice and guidance. So, I mean, I, I would probably be foolish to ignore the advice of, you know, experts in her field. (Low Evidence, M4).

The doctor served as a substitute source for participants to obtain information about scientific evidence, especially if they knew that their doctors were knowledgeable about research, rather than looking into the scientific evidence themselves:

F: at the time [doctors] couldn’t really talk about too many alternative things. Now they do. But there was a time where he could, you know, I can’t say this. Because there haven’t been no real studies. But now there are a lot of studies (High Evidence, F20).

M: You know, because one doctor will say, yes, my patients have really, have been benefited from this. Another one will say, well didn’t you read that study in such and such journal which says, there’s been a blind study with a placebo shows that it had no benefits whatsoever. (Low Evidence, M5).

Participants who discussed their doctor quoting scientific evidence usually recalled the information from their physician as being negative or neutral about the efficacy of a NHP product:

And [the doctor] said, well it’s not a product that really works. The doctor, he told me it’s, I could take a placebo pill, it would be the same way, so it would be, I guess […] he didn’t say it was bad. Don’t take it, it’s going to do negative things. He just said, it has no value. (Low Evidence, F2).

I brought it up in the conversation […] and then [the doctor] mentioned, well, it’s been tested with individuals in the past with no effect. (High Evidence, F15).
Although some participants depended primarily on the advice provided by their physicians, many consulted additional information sources:

So, I mean, um, I, it’s not that I do not listen to my doctors or I don’t, um, value their input, it is that I view it as a consulting opinion that they are giving to me […] I use that to, as a screening board to sort of do my own research […] I can’t rely solely on my GP’s, um, opinion.
(Low Evidence, M5).

This unwillingness to depend only on physicians' advice appeared to be related to participants' desire to be "in control" of the decision about what to do for their OA. It was discussed particularly in the context of breaking away from the traditional reliance upon doctors and the conventional medical system for one’s healthcare needs:

There are a lot of options out there and so I try to be a little bit informed and to be a little more pro-active when you have a little more control. There was a time when I would believe what doctors would say but sometimes I know a little more than the doctors on, in particular instances. […] I took the time and effort to learn a little bit, so, if I’ve done that I don’t want someone taking that away from me and treating me like I’m stupid. I don’t want that. Yah, because, because I’ve been forced to learn. Because I have many ailments. I’ve been forced to do research on my own. You know, I would listen to people, but I also kind of would read a little bit here and there on my own. […] it’s not important to be totally in control because no one ever is, and I know that’s not the question. It’s important to be, again, to be an influence in your health because so much is out of your control, so if whatever you can have control of, it’s empowering. (High Evidence, F20).

I guess it’s one of the few ways to deal with it in a, you know, kind of layman’s way, um, without having to, you know, go see somebody, make an appointment and, and you know sort of get the health care system involved […] Um, I don’t know, maybe just the satisfaction of, you know, sort of taking some moderate initiative as opposed to doing nothing at all about it. (Low Evidence, M4).

In addition to physicians, other healthcare professionals including pharmacists, CAM providers, nurses, physiotherapists, veterinarians served as sources of information about
Trust appeared to be a key element of participants’ relationships with these individuals and led to our participants describing high levels of faith in recommendations from these individuals:

I do listen to professionals because they know far more than I do.
(High Evidence, F19)

Interviewer: So tell me why it’s important to you that the pharmacist recommended the [natural health] product?
F: Because I’m sure he knows, he has studied and he has a good knowledge behind him. He was a wonderful man. I really did like him. For many things he recommended to me, whether it was, maybe it’s just a part of the, for income complications or whatever, he was very knowledgeable and I trusted him, mostly for his knowledge. Cause he’s a pharmacist. He has a degree so he knows. He can’t just pick up a bottle and say here, take this. I think he’s good. So that’s why I trusted him. I do respect people with knowledge.
(High evidence, F19)

If [my Naturopathic doctor] says it’s good, I’m taking it, that’s all. Cause I don’t, I haven’t read up on it. […] if you are with a [naturopathic] doctor and he says it’s good, then you just have to trust them. (High Evidence, F10)

I trusted [the physiotherapist and the pharmacist] and I started using it and when I need it I take it and that’s about it. I did not, um, look for or ask other people what do you think, did you use it. No, I did not do any other research.
(High Evidence, F19)

Endorsement from friends and family members was another key product attribute in the dominant decision-making chain. Friends and family were usually the initial sources of information about NHPs for osteoarthritis and participants often described friends and family as their only or their most important information source about NHPs. This finding is reflected in example comments from participants choosing products with both high and low levels of scientific support:

NHPs. Trust appeared to be a key element of participants’ relationships with these individuals and led to our participants describing high levels of faith in recommendations from these individuals.
Well again, it’s like, it’s a trusted source, someone you know, who has benefited. It doesn’t mean that you will benefit from it but it means that they’re giving you what I feel is an honest, um, you know, account of their experience with this product. And so that would mean it’s okay while, as opposed to just reading some testimonial, anonymous testimonial on an e-mail or internet. These are people I know, people whose opinions I trust and would be further incentive for me to get out there and find out more about the product and then ultimately go to the health food store and say, you know, what do you know about this. (Low Evidence, M4).

M: Like I said, if my friend didn’t tell me that it worked, I wouldn’t know […] I didn’t do a search, no. I just took my friend’s word for it.” (High Evidence, M3).

Similar to HCP, a key reason why friends and family had so much influence on participants with respect to their decisions to initially try NHPs was because participants trusted these individuals. Participants had faith in the recommendations made by family and friends:

If my son says take it, I’ll trust him. (Low Evidence, F5).

The only reason was that my friend told me it helped her and I trust her judgment with things because she’s suggested other things in the past for me to take about different things. (High Evidence, F17).

The HCP and non-HCP appeared to be playing different roles in the decision making process for participants in the high and low scientific evidence groups. Participants in the high scientific evidence group related the endorsement of a HCP to both the fact that a product worked (i.e. it decreased their pain) and how it worked (its mechanism of action):

Interviewer: Could you tell me why it was important to you that your rheumatologist recommended [glucosamine]?
F: She worked with me a long time before I had my knee replacement, trying to prolong, I guess, because I was probably in my late forties, and I needed, my right knee was looking bad. She hadn’t even looked at the left knee and so we were trying to save it, preserve it, not have to have surgery, cause it’s a very big surgery. And she’s a really smart person and really um, helpful and she also knows my situation of income and what I can afford and so she wouldn’t be like telling me to take a bunch of things that are pricey that I can’t
afford. She would have said then, no, to give me a prescription cause my
prescriptions are covered, but she just said that this was a good natural
ingredient, you know, add something to help build [the joint]. If I still wanted
to take something besides that for pain, it wasn’t a forced thing but I, I really
value her opinion and she’s a very smart woman.
Interviewer: So why was it important to you that it helps preserve your knee?
F: Well, at that point I was pretty scared of the knee replacement and I knew
also from her that I have osteoarthritis in other areas too, like my neck and my
feet, places like that where they’re not going to do a neck replacement and you
know I thought, feet you’ve got to walk on all the time, uh, so I thought, okay
if the knees are bad, so maybe let’s do some preventative work rather than just
stopping pain. Which I think that’s what Celebrex which is something I took
as a prescription. I think that was just a symptomatic, I’d have to recheck that
too, but that’s what I, my understanding is that it’s symptomatic. Sometimes
maybe I’ll take that but I want to work on, preserv[ing] the joints that weren’t
affected.
Interviewer: Right.
F: Or that were starting to be affected, not let them get any worse.
(High evidence, F14)

Interviewer: “Um, so [you heard about these NHPs from] various different
people [health care providers]. Um, and, what is it that you heard about
Glucosamine Chondroitin?”
F: “That it was good for maintaining and possibly regeneration of joints,
tissues.”
(High evidence, F7)

In contrast, participants in the low evidence category linked the fact that a product
was endorsed by a HCP with the perceived lack of (or fewer) side effects but did not identify
a strong link to mechanism of action. The following quote is an example of the linkage
between a pharmacist’s endorsement and prevention or reduction of side effects:

“And generally, [the pharmacist said] you know, if it doesn’t, help you that
much, it’s certainly not going to hurt you to use it [Glucosamine and
Chondroitin , and MSM].” (Low evidence, M4)

I: Why is it important that the pharmacist checks your glucosamine?
F: [Because] you can damage your condition. You can get it when your
pressure’s high. When your blood pressure you taking the pill and it doesn’t
go down. Or your heart suffers.
(Low evidence, F5)
In both scientific evidence groups, the non-HCP, sometimes referred to as “word of mouth” (from sources such as friends and family, health food store personnel etc) were described as typically talking about the efficacy of a product in most cases:

Interviewer: So, uh, tell me why it was important to you that your friend recommended it.
M: Well, that was important to me, I was just talking [to a friend] and I, I had an arthritis flare up, and they happened to be taking stuff for arthritis. I don’t like to take all these things from the doctor, so, you go natural or herbal. The most thing that they say, this product works. I don’t ask why it works, and when does it work. I just, I only just want to get something that’s going to work for me.
(Low evidence, M3)

I: Can you tell me why it’s important to you that you heard about it through word of mouth?
F: Because there are people that have arthritis themselves and it worked for them, so it’s worth trying it for me. It’s always good, um, to get the person themselves and not the advertisement. Everybody’s different. Some people it works for and others it doesn’t do anything.
Interviewer: Okay. So why is it important that it worked for other people?
F: Because then maybe I have a chance for it to work [for me].
(Low evidence, F13)

Advice from an employee at a health food store was often obtained in conjunction with information gained through another (more trusted source of information). Overall health food stores were not widely considered good sources of information and were never used as a sole information source by our participants:

M: Um, I guess I had done some reading initially and spoke to my then GP who suggested trying, not this specific brand, but suggested trying Glucosamine and um, Chondroitin. Uh, and uh, this particular brand came to me because I had a health food store that I frequent and they recommended this particular brand.
It’s okay.” (Low Evidence, M5).

Interviewer: why is it important to you that it was recommended by the health food store?
F: Well, the guy I deal with is very knowledgeable and I trust his judgment.
F: Well, they also recommend things and like I said, not everything works for everybody.
But I’m a listener, I chose just to listen and uh, and um, see what their expertise is on their product.
(Low evidence, F13)

4.5.2.4 Natural Source

Another key product attribute contributing to use of NHPs was that the product was made from a natural source. Participants generally perceived that products derived from a natural source were inherently safer, with fewer or negligible side effects. Overall, natural products were thought to be superior for the body, as illustrated by these quotes:

F: You know, if it’s something from the shell fish. It’s something natural so it won’t harm my body, I think
(Low Evidence, F3)

M: …my perception is that natural products are, um, gentler on the system, um, that produce, can produce less side effects. (Low Evidence, M5)

Choosing a product derived from a natural source was seen as an intuitive decision that made logical sense, as illustrated by this quote:

Interviewer: Okay. Any other reasons why you decided to take these products?
F: It was natural.
Interviewer: Natural.
F: It seemed to make sense. Um, it’s, um, made up of shell fish or, um, sort of cartilage sounding stuff. (High evidence, F17)

Our participants talked about additional product attributes not directly related to scientific evidence but related to the NHPs themselves. These were combination products, the importance of quality brands, taste, and dosage form.
4.5.2.5 Combination products

Combination products consisted of multiple ingredients believed to be superior to the separate ingredients alone. The main advantage of taking a combination product was described by our participants as enabling compliance, making sure that participants actually take the product the way it was supposed to be taken:

F: Because I’m taking enough pills now that it’s better that it’s three in one.
Interviewer: Okay, so now why is it important that you don’t take as many pills?
F: Convenience.
Interviewer: So what does it mean that it’s convenient?
F: Um, well it’s easier to remember when to take it as well. So I don’t miss a pill, the proper way of taking them.
(Low evidence, F 13)

4.5.2.6 Quality brand

Another product attribute relating to NHPs in general was quality brand. A quality brand was described as a well recognized brand which participants learned about through their information sources and endorsements by their friends, family, or health care providers. Quality brands were thought to be manufactured by companies using more predictable quantities of ingredients, making higher quality products:

Interviewer: Right. And how do you know that it’s a good name?
F: Different articles that I’ve read, said which companies are better than others…I’ve heard that sometimes, um, there’s different brands that don’t have the amount of ingredients in it that they say that they have, active ingredients.
(High Evidence, F7)

Participants linked quality brand with perceptions that the product would be unlikely to cause side effects, the consequence mentioned by most participants as being linked to brand. For example, one participant describes purchasing products from a reputable
manufacturer who makes quality products presuming then that they would get higher quality ingredients to avoid side effects associated with the product.

Interviewer: Why is it important to you that you purchase products from a reputable manufacturer?
F: Because I’ve not heard that there is anything that is negative about this manufacturer. They seem to be popular.
Interviewer: So nothing negative. What are you referring to?
F: Negative in the way of side effects. I presume that they’ve got the top quality ingredients. But that’s what I’m presuming.
(High evidence, F15)

4.5.2.7 Taste

Participants discussed the palatability of the product as it affected their consumption decision. Taste was a deciding factor where an unusual taste could be a deterrent to taking a product (lower compliance).

“F: Well, you know, [if] it’s a nice taste, I don’t mind it, but sometimes, they have some funny taste and you don’t like it.” (Low Evidence, F3)

4.5.2.8 Dosage form

The dosage form of a product was linked in participants’ minds with how easily the product was absorbed and how likely participants were to take the product (compliance).

The following dialogue with F11 illustrates this linkage:

Interviewer: So you touched on this earlier but, why does the size of the tablet matter to you?
F: I have difficulty swallowing sometimes and if it gets stuck, it’s not a very pleasant feeling. It was heavy [feeling]. If it was offered in liquid form or something smaller it would be even better.
Interviewer: …so why is it important to you that you can swallow the tablet?
F: So that I would be encouraged to take it. It wouldn’t be a hindrance to me or having to worry about choking on the tablet…also that it might be, more easily [to] digest or getting into my system.
Some dosage forms were preferred by our participants (such as capsules and liquids) as they were described as having better absorption and thus participants reported they are more likely to take on a consistent basis.

Interview: Why is it important to you that you take a form that you prefer, so in our case, the capsules?”
F: “Because it works, it has because if I’m paying for something and if I’m going to be loyal to something, you damn well better make something that I can live with on a daily basis.”
Interviewer: “What do you mean by that? Earlier you talked about tablets coming back up. What do you mean by it better be something you can live with?”
F: “Well, if something is hard for people, [it’s important] to find the best way that your body can absorb it, the best way that it can go down,”

The most salient product attributes described by our participants were scientific evidence, the endorsements of trusted individuals (friends and family; health care providers), and natural source. Additional NHP-specific attributes – combination product, quality brand, taste, and dosage form were also described. Participants linked these product attributes to consequences which resulted from taking the NHPs, described in detail in the following section.

4.5.3 Consequences

Participants in both scientific evidence categories mentioned a similar number of consequences (9 in the low group; 10 in the high group). First, the consequences mentioned by all participants are discussed, followed by a comparison between the two scientific evidence groups (high and low). This discussion on consequences will focus on
consequences related to our primary product attribute of interest (scientific evidence) as well as with endorsements of HCP and non-HCP, identified by the participants as being of key importance in their decision-making.

The most important consequence in our data was lack of (or fewer) side effects which was mentioned by almost all our participants. Believing the product would have fewer side effects, the majority of participants were more likely to take the product (and be compliant) and then reported experiencing reduced pain as illustrated by the quote:

F: If it made it worse or there were side effects I would have to stop taking it. Why is it important for me to take it? Because I’m helping myself control, control the symptoms.
(High evidence, F15)

A NHP’s mechanism of action (or how participants perceived it worked) was a consequence often linked with pain reduction, which in turn enable participants to perform activities of daily living. This participant described glucosamine and chondroitin as helping her prevent further disc degeneration to allow her to have greater mobility and in turn gain independence.

“I’m doing whatever I can to, uh, slow the disease or uh, prevent further disc degeneration.
Interviewer: So now why is it important to you that you slow the disease and prevent disc degeneration?
F: Again I think it comes down to wanting to be mobile and active, independent.”
(High evidence, F11)

Another participant describes the mechanism of action of chondroitin and glucosamine as replenishing a naturally-occurring substance to help cure the arthritis and alleviate the underlying symptoms rather than just reducing pain.

“…my understanding is that Chondroitin and Glucosamine is [a] natural product that your body produces but you may not be producing enough of it. And so, by supplementing with something that your body needs or it can
benefit from, it may be closer to a cure or to at least addressing underlying symptoms than simply strictly looking at pain relief.”
(Low evidence, M5)

Pain reduction was another important consequence which was mentioned by all participants. Participants described that if they experienced less pain, they were able to perform more household or recreational activities which brought them more happiness.

“Interviewer: why is it important to you that something decreases pain?
F: Oh, who wants to be in pain, I mean, I don’t know, because to be pain free I have more happiness in my life, longevity, just able to do the little things.
Interviewer: What kinds of little things?
F: Getting up in the morning, being able to even deal with, uh, I don’t know, washing bathtub or able to do any type of work. For me to say now, hey, you know, I still enjoy swimming.”
(Low evidence, F4)

Pain was viewed as a source of stress so alleviating pain was associated with becoming stress-free. Participants reiterated the importance of being able to perform activities and so that they will be in a better mood and feel healthier, as illustrated in this quote.

“Interviewer: Why is it important that it doesn’t, that you don’t want to have pain?
F: Why is it important? Why I don’t want to have pain?
Interviewer: Uh huh
F: Just for the daily function, to be stress-free, because pain can also be a stress.
Interviewer: Uh huh
F: Because your spouse sees it on you and he feels that he should do something and I don’t want to, um, I don’t want to pull him down by, uh, feeling sorry for me, so it’s important for me that I get up and I, I feel safe and I feel fine, and I don’t have pain, pain-free so I can do things and go out and take the dog for a walk and maybe I decided I’m going to clean the carpet, but if I have pain then I’m really sad and then I feel, um, oh, maybe I’m not as useful. Not that I feel rejected. No. I never do. But I like to be, I like to live. I like to live healthy.”
(High evidence F19)
When asked to describe what being healthy meant, this individual described it as having a solid foundation on several facets of health to be more resilient towards what comes at you.

“F: [Being healthy] is to build a sound foundation. If we have a sound foundation then you’re in a better way of withstanding, who knows what comes at you. I: So by a sound foundation, um, can you explain what you mean by that? F: Sound foundation, physically, mentally, emotionally, spiritually.” (Low evidence F4)

Two consequences mentioned by participants in the high scientific evidence category, but not mentioned by participants in the low scientific evidence category, were the importance of social activity and being in control of one’s health.

To this participant, having pain from his osteoarthritis affected his ability to hold a newspaper and prevented him from playing golf which also used to allow him to socialize with his friends.

“Interviewer: So why is it important for you that you are more agile and that you don’t have any pain? M: Well, first of all, I wanted to have more agility because I was playing golf. Cause I could play golf then. I can’t play golf now...And as far as the pain goes, I just don’t want pain. I have enough with my neuropathy, I don’t want any more, adding any extra pain. That’s what I’m getting now - in my knees and as I say, reading the newspaper and it’s the most noticeable thing. I mean, I guess there are other factors but the most noticeable pain is holding the newspaper. Interviewer: Holding the newspaper. So playing golf, so why is it important to you that you can play golf? M: Now, I don’t play golf but it was important at the time because I had a lot of friends that, uh, I met when I played golf and I played with a group of people.” (High evidence, M1)
Being in control meant taking responsibility for one’s health and not being dependent on doctors, as mentioned by this participant.

“F: I have a responsibility in my health, that I should never take anything.  
Interviewer: So, um, so why is it important that you have a responsibility of your own health?
F: Well, I don’t want to be so dependent on doctors.”
(High evidence, F14)

Another participant described being in control as being informed and empowered to take charge of one’s health when the opportunity arises:

F: and there are a lot of options out there and so I try to be a little bit informed and to be a little more pro-active when you have a little more control. There was a time when I would believe what doctors would say but sometimes I know a little more than the doctor’s on, in particular instances. [...] I took the time and effort to learn a little bit, so, if I’ve done that I don’t want someone taking that away from me and treating me like I’m stupid. I don’t want that. Yah, because, because I’ve been forced to learn. Because I have many ailments. I’ve been forced to do research on my own. You know, I would listen to people, but I also kind of would read a little bit here and there on my own. [...] it’s not important to be totally in control because no one ever is, and I know that’s not the question. It’s important to be, again, to be an influence in your health because so much is out of your control, so if whatever you can have control of, it’s empowering.”
(High Evidence, F20).

There were some, but not many, differences in the consequences identified in the dominant decision-making chains of the participants in the high scientific evidence group compared with those in the low scientific evidence group. (See Appendix Figure 12 and 13 High and Low scientific evidence HVMs). For example, in the high scientific evidence group, participants described HCPs as mentioning the effectiveness of the NHPs in the areas of pain reduction and also how it works (mechanism of action). In the low scientific evidence group, participants recalled HCPs as mentioning NHPs with fewer or no side effects without mentioning their effectiveness or mechanism of action.
Comparing the high and low scientific evidence groups, a product’s lack of side effects was related to a participant’s compliance in the low scientific evidence group but not in the high scientific evidence group. In the low scientific evidence category, convenience was mentioned as a consequence of taking a product while this was not mentioned by participants in the high scientific evidence category.

In summary, the most important perceived consequences of taking NHPs supported by scientific evidence was the perception that there would be reduced side effects, a reduction in pain, understanding the mechanism of action of the NHP, being able to carry out activities of daily living, and feeling healthy. Following the consequences of taking NHPs, participants were encouraged to talk about their underlying values which these consequences enabled them to fulfill.

4.5.4 Values

Overall, the two values of striving for an improved quality of life and maintaining independence appear to be underpinning the decision to use NHPs (See Appendix Figure 11: Everyone HVM). A value mentioned by more individuals in the low scientific evidence group but very few of those in the high scientific evidence group was a natural way of living, one of the key differences between the two groups.

Most participants in both high and low scientific evidence groups described understanding how experiencing pain reduction improved their mobility and quality of life. (See Appendix Figures 10 and 11: High and Low scientific evidence HVMs). Most participants referred to “quality of life” without elaboration of what it meant, while others defined it as attaining more happiness, meaning, or purpose to live (See Appendix, Table 12, Code summary of NHP OA study interviews).
M: “I think that’s just a natural thing, you know, that’s just part of your
desire for life and what you want from it….I mean, to me that’s just part of
living to want more there, to be able to live, to better the quality of your life,
however you do it is better.
(High evidence, M1)

F: “When you have less pain and inflammation that means…to me your
quality of life will be better because you have mobility.”
(High evidence, F18)

Interviewer: “Um. Uh, what do you mean by an improvement of life?”
M: “Uh, well when you have less pain or when you have more mobility, um,
your quality of life is improved.” (Low Evidence, M5).

In this dialogue, the participant talks about the importance of reducing her pain levels
so that she will feel an improved mood and indirectly experience a better quality of life (here
described as not being an “old sour lady”):

F: “[It’s] important to me to have less pain because I can function better.”
Interviewer: “Uh huh.”
F: “And I can feel more positive and um, I can, I am ?hesitant to take, to go
anywhere, to do anything, and I don’t have to worry, oh, what if I have pain
tomorrow. I know that it’s a medication, it controls the pain so, I feel, um, I
don’t like to have pain because pain makes you, um, feel down and makes
you feel not energetic and you feel you’re suffering and people feel sorry for
you, so, if I could live without pain I think it’s good for the mind.”
Interviewer: “Um. Why is it important to you to feel positive?”
F: “Because, um, to feel positive, because I always have been positive in my
life and I just don’t want to turn to a sour old lady, like a lot of older people
they get negative and they get sour and I see them, they look ? and um, I am
dealing with some whom I’m helping and doesn’t matter what I do, they’re
just so negative.”
(High evidence, F19)

Participants in both categories also frequently linked the ability to perform daily
activities which are related to the ability to be mobile such as walking and traveling from one
place to another with the value of independence, a value capturing autonomy and freedom.
(See Appendix Figure 12 and 13 High and Low scientific evidence HVMs). The quotes below illustrate this concept:

F: Um, so I don’t have to feel this pain in the joints and that I can move anywhere I want to do, when I want to do it. (High evidence, F18)

F: I don’t need, I don’t want a wheelchair. Somebody has to bring me to places. I want to be able to go on my own. (Low evidence, F5)

In both groups, many participants mentioned a direct relationship between performing activities of daily living and achieving quality of life. (See Appendix Figures 10 and 11: High and Low scientific evidence HVMs). Comparing the high and low evidence groups, the portion of the dominant chain from effectiveness to the terminal underlying values is largely similar. The values mentioned by participants in both scientific evidence groups overlapped significantly – achieving quality of life and independence were values mentioned by the majority of participants in both groups.

A value mentioned mostly by participants in the low scientific evidence group and fewer of the participants in the high scientific evidence group was being able to adopt a “natural way of living” (33%).

The quote below illustrates this participant’s perception that natural products are safer and also help him fulfill his value of adopting the “natural route”:

Interviewer: Can you tell me why it’s important to you that it’s a natural product?
M: Well as I said my perception is that natural products are, gentler on the system, can produce less side effects, and [are] just better tolerated by people with sensitive systems, which I think I could be categorized as having. I have a sort of overall, I don’t know if the word is bias, is accurate, but an overall sort of bend towards going the natural route if possible. (Low evidence, M5)
This participant also reiterates the importance of a product’s “natural” attribute with fewer side effects which in turn allows her to live naturally:

F: I figure that something natural shouldn’t have any side effects because it’s natural…
Interviewer: Tell me why it’s important for you that you’re taking something that seems to have very few side effects?
F: Well, it’s important because I want to be natural. I want to live, like naturally.
(High evidence, F8)

Overall, most participants emphasized that reduced pain and the ability to perform activities of daily living allowed them to have better quality of living and greater independence. In the low scientific evidence group, an additional value – of valuing a natural way of living was frequently related to NHPs with fewer side effects.

4.6 Overall Summary of Results Chapter

Overall, we recruited 13 participants in the high scientific evidence category and 12 in the low scientific evidence category. The demographic characteristics of the participants in both scientific evidence categories were not statistically different. However, a larger proportion of participants in the low scientific evidence category used NHPs for over 6 months (100%) compared with those in the high evidence category (69%) even though this difference was not statistically significant. Implication matrices consisting of all the linkages between the decision-making factors were constructed for all participants, and for participants in the high and low scientific evidence categories individually. The numerical data were then represented in hierarchical value maps (HVMs) to help identify key patterns and decision-making factors present in the data.
The dominant decision-making chain used by our participants started with the following four attributes - trusting the endorsement of a non-HCP (such as a friend) or a HCP (e.g. pharmacist), having scientific evidence supporting a NHP, and identifying if the NHP was from a natural source. Participants reported non-HCPs talking about the effectiveness of an NHP, whereas HCP would describe how a product worked to reduce pain (its mechanism is action) or a product’s lack of side effects. Participants also linked evidence to support the product’s efficacy to it having fewer (or no) side effects. Believing the product would have fewer side effects, consumers were more likely to take the product and then reported experiencing reduced pain, enabling increased daily activity, improved physical and emotional health. Improved physical and emotional health ultimately led to a better quality of life. Consumers also linked greater levels of daily activity with the value of independence.

The dominant chain between participants who chose products in the two scientific evidence categories was very similar. Very few participants in general used direct scientific evidence sources in the decision-making process (e.g., journal articles). Participants considered indirect sources (e.g., internet searches or through a HCP) scientific evidence. The key difference between participants in the two categories was that participants using only NHPs with scientific evidence of efficacy recalled more information from others they trusted that was related to the effectiveness and mechanism of action of NHPs. Another key difference between the two scientific evidence groups is that those in the low scientific evidence category mentioned the value “natural way of living” which is not mentioned by the majority of participants in the high scientific evidence category. The implications and future research stemming from our research findings are discussed in the Discussions and Conclusions chapter.
5 DISCUSSION AND CONCLUSION

5.1 Organization

This chapter will begin by summarizing our key finding about the role of scientific evidence in consumer decision making. Secondly, we describe the information sources our participants used as scientific evidence. We then compared the decision-making of participants who used NHPs with high and low scientific evidence. The focus of this chapter will be a comparison of our findings to previous literature and highlighting our unique contributions. This will include a discussion of how the MEC-approach, its associated laddering methodology, and the semi-structured interviews allowed us to gain insight into consumer decision-making. We also include a section on limitations and recommendations for future research to follow-up on our current research findings. We discuss the implications for future research, including who our findings are most useful to and why. The chapter ends with the conclusions we can draw from this project.

5.2 Overview of findings

We found that scientific evidence about the safety and efficacy of NHPs was identified as an information source by our participants who rated it as a very important (8/10, 10 = most important) factor in their decision-making process; however probing in semi-structured interviews revealed it was relatively less important than the recommendations of friends and family (non-HCP) or health care providers. Our participants discussed scientific evidence as a product attribute that they related to their perceptions of the efficacy and safety of the NHPs. However when we probed further, it became clear that very few participants obtained scientific evidence information from direct sources (e.g., scientific journals). When our participants described using scientific evidence as part of their decision-making they
almost always described indirect sources (e.g., summaries of scientific studies reported on web sites or references to scientific studies by health care professionals).

Our application of the MEC approach allowed us to understand how the decision making of participants who chose products in the two different scientific evidence categories (high vs low) was very similar. In general, participants described deciding to use NHPs because of endorsements by trusted individuals, perceptions about the scientific evidence for the efficacy or safety of the product, the reputation of a high quality brand, and because a product was made of a natural source. This meant that participants expected the NHP had fewer or no side effects, which meant that they were more likely to take it, experience a reduction in pain, be able to perform more of their daily activities, and ultimately lead a life of improved quality and independence.

Scientific evidence can be described as a product attribute which is a means to fulfil an end in the decision-making process. The ends are core values which we found were quality of living and independence for all participants in general. For participants using NHPs without scientific evidence, another value emerged - adopting a natural way of living. Participants would use scientific evidence in their selection of NHPs so that they can achieve these ends which are ultimate drivers of their decisions.

5.2.1 *Scientific Evidence is important but not as important as advice from health care providers and friends and family*

Our participants identified scientific evidence as a key product attribute impacting their selection of NHPs, which is consistent with previous qualitative study findings where patients with arthritis (17), breast cancer (5, 18, 19), and prostate cancer (49, 55) reported
using scientific evidence as an information source guiding their decision making process when selecting CAM treatment therapies. Specifically, our participants described relying on scientific evidence about *efficacy* and *safety* of NHPs when making decisions about what to use to treat their osteoarthritis symptoms. The role of scientific evidence about the efficacy and safety of CAM therapies was also highlighted by previous decision-making studies in breast cancer (19) and prostate cancer (49). Absence of scientific evidence of the efficacy in CAM (49) and concerns about potential interactions between NHPs and conventional medications have also been identified as reasons not to use CAM (19, 53).

While participants in this study rated scientific evidence as eight out of 10 on a 10 point quantitative scale, on more detailed interviewing, it was found that scientific evidence played a relatively unimportant role in decision-making compared to other factors. Different than other previous CAM decision-making studies, our participants described scientific evidence as just another “nail in the coffin” for participants to use NHPs. The reason for finding this difference could have been our in-depth semi-structured interview questions which probed their views of scientific evidence and allowed participants to relate to the relative importance of scientific evidence. Another reason for the difference in our participants’ views on scientific evidence could have been related to differences in recruitment location. Our participants were recruited from seniors community activity centres and an online community (Craig’s list), whereas previous CAM decision-making studies recruited their participants from a combination of conventional clinical settings, integrative clinics, CAM community clinics and community support groups (17, 18). The inclusion of more conventional clinical settings and integrative clinics could have selected
for participants who read or value direct scientific evidence sources more than our predominantly community-based sample.

Participants who selected products with a low level of scientific evidence support could have been driven by their unconscious value of desiring to live a natural way. This is consistent with Verhoef’s experienced CAM users and Caspi’s “alternative” or CAM-only using participants who appear to select CAM therapies based on a philosophical congruence with their holistic world-view and belief in the mind-body connection (5, 17). Verhoef also found that women with more severe forms of breast cancer held mixed views towards the importance scientific evidence with most choosing to use CAM as long as it sounded promising, regardless of the scientific evidence supporting its use and associated risks (5). Along with the influence of friends and family, many individuals appear to be driven to make decisions which are aligned with their values with weighing the scientific evidence for efficacy a secondary consideration at best.

5.2.2 Trusted others’ recommendations were more important than scientific evidence

Recommendations from trusted individuals (health care providers, friends and family) were more important to participants and were often the initial reasons participants chose to use NHPs. The influence of trusted individuals in CAM decision-making has been described previously in cancer patients - particularly the role of friends and family (5, 17-19, 53, 58, 87) and those with expert knowledge such as health care providers (5, 18, 53).

In our study, we found that participants talked about finding out about NHPs through their friends and family, similar to previous literature (5, 18, 19, 53). Non-HCPs who also influenced our participants were friends, family, and health food store personnel. Our participants reported trusting their friends and family and believing that these individuals had
their best interests in mind. Participants did not explicitly talk about their friends, family, and health food store personnel as mentioning aspects of scientific evidence. Rather they remembered friends and family simply endorsing particular NHPs as being efficacious.

Our participants reported talking to doctors, nurses, pharmacists, CAM providers, physiotherapists, and veterinarians. Trust appeared to be a key element of participants’ relationships with these individuals and led to our participants describing high levels of faith in recommendations from these individuals. Of particular note, participants remembered medical doctors as communicating scientific evidence as being negative or neutral about the efficacy of NHPs. This suggests that participants did not only depend on the advice of their doctors because almost none of the doctors encouraged participants to use the NHPs. As was mentioned by the participants, they consulted with a range of sources, and frequently trusted their own judgment in making a decision to select NHPs.

Our study found that participants recall HCPs as explaining the rationale for efficacy (how something works, or its mechanism of action), and that NHPs have fewer side effects whereas non health care providers more often were recalled to endorse a product and simply state that it works.

The laddering methodology associated with the MEC theory allowed us to explore in greater detail what other researchers have found previously, which was that HCP and non-HCP played an important role in their decision-making process. Their endorsements were again product attributes, however with more in-depth probing of the semi-structured interview, we found that they played a more important role than scientific evidence as reasons why participants would initially take a product. Therefore, participants appear to remember HCP and non-HCP as conveying important aspects of evidence.
5.2.3 Using indirect sources of scientific evidence

Most of our participants did not report going to the scientific research to read it first-hand, instead, they considered indirect sources such as internet searches, newspaper-articles, or health care providers’ endorsements of scientific evidence. Other previous CAM decision-making studies in cancer patients also found that participants used indirect sources of information such as the internet, articles from newspapers and magazines, and recommendations of HCP (18, 19, 53, 87). Different than our study, other researchers did not ask the same question that we did – regarding whether or not participants regarded these information sources the same as scientific evidence.

Our finding that participants consider media sources of scientific evidence or medical information has been reported and investigated by others. A study of media reporting of clinical trials of herbal remedies found that newspapers tend to report herbal study results with a relatively negative tone compared with pharmaceutical clinical trials for similar indications (88). Another consistent finding is that newspapers frequently omitted reporting important risks and adverse effects associated with herbs, authors’ conflicts of interest, and methodological specifics such as sample size, dose, duration of intake of these trials (88, 89). Bubela et. al. have found that even with the much larger number of clinical trials on herbal treatments indexed on Pubmed from 1980 to 2004, there has not been an associated increase in reporting of these studies in North American newspapers (90). The reason could be that most clinical trials reported in newspapers were published in high-impact journals (88), leaving out many herbal trials which were published in lower impact journals (90).

Our findings are in contrast to scientific evidence -use as reported in a previous CAM-decision-making study in arthritis individuals led by Caspi et al. (17). In this study,
participants using both CAM and conventional care for their arthritis or related musculoskeletal symptoms reported weighing reading scientific evidence and the findings against their personal belief systems (17). The reason for this difference between our findings and Caspi’s findings may be because our participants were recruited from community activity centres whereas Caspi’s patients were recruited from Academic Research Centres, possibly selecting for participants who would read direct sources of scientific research (17).

5.3 Small differences in decision-making process between high and low scientific evidence groups

We found that there were no statistically significant differences in demographic characteristics of participants who chose NHPs with high and low scientific evidence. The decision-making processes of people in these two groups were also very similar with only very small content differences. The relatively small differences observed were that participants in the high evidence category mentioned HCPs as describing NHPs being able to reduce pain and also how NHPs work its mechanism of action. In contrast, participants using products with low levels of scientific evidence of support recalled HCPs emphasizing the few or reduced side effects of NHPs and did not remember their HCPs discussing the effectiveness of the NHP or how it worked (mechanism of action) which is consistent with the lack of scientific evidence supporting the efficacy of those specific NHPs. This small but important difference suggests that participants should be consulting with their HCP prior to using NHPs since HCPs will likely let them know about how an NHP works and whether or not it is effective for their condition.
5.3.1 Duration of using NHPs/CAM and severity of disease

Our participants in low scientific evidence groups may have been using NHPs longer than those in the high scientific evidence group even though the difference did not meet statistical significance. We found no significant differences in severity of OA between the two groups. Both factors – duration of use and disease severity were previously found to guide patient’s choice of CAM-related information sources including scientific evidence (5). Verhoef found that participants who had used CAM for longer than six months were more sceptical towards using scientific evidence than those who had used CAM for less than six months. Furthermore, women who had more serious forms of breast cancer were found to hold mixed views towards scientific evidence –ranging from valuing scientific evidence to being skeptical of those conducting the research trials (5). In our study, all participants (12/12, 100%) in the low scientific evidence group had used NHPs for longer than six months, whereas fewer (6/13, 69%) of those in the high scientific evidence group had this longer experience with CAM. The difference in duration of use was not significantly different between the two groups (p = 0.096) probably at least partially because of our small sample size. Nonetheless, our data do suggest that there is a trend towards a difference in duration of use between the two scientific evidence groups. The directionality of the trend that we found is consistent with Verhoef’s findings with those who have used NHPs for longer relying less on scientific evidence.

We found that severity of self-reported pain severity was not significantly different (p = 0.328) on a visual analogue scale among individuals in our high and low scientific evidence categories. The reason for this finding could be because our participants had a
heterogeneous group of anatomical joints affected (upper extremity 4%, lower extremity 12%, other joints 3%) and we did not have a large enough sample of the different category of joints to detect a difference in pain severity between the two scientific evidence groups.

5.4 Unique contribution of our study using the MEC Approach

We studied the decision-making process using the laddering methodology associated with the MEC Approach. The linkages between key product attributes, consequences, and ultimately values hold important information to understand the decision-making process. Using the MEC approach, we were able to tap into participants’ world views by eliciting their unconscious values which this theory suggests are the driving factors for their NHP selection.

Our unique contribution to the literature lies in understanding that using scientific evidence is one of several means to fulfill an end. The end is one (or several) core values which drive the decision to select NHPs. Consumers may initially decide to select an NHP based on numerous concrete product attributes such as endorsements by trusted individuals, its natural source, or the attraction of a reputable brand regardless of the presence or absence of scientific evidence. These product attributes appear to be associated with the safety of NHPs, understood as the presence of fewer or decreased chance of side effects. Other product-attributes unrelated to scientific evidence such as dosage form and taste are believed to improve absorption or improve compliance, respectively.

The most important consequences indirectly related to scientific evidence in the minds of our participants are the disease-specific characteristics of osteoarthritis, namely pain, stiffness, and physical disability (91). Ultimately participants associate the avoidance of
these disease-specific consequences with fulfilling core-values, or the driving force behind these decisions.

5.4.1 Understanding participant’s values

Applying the MEC approach we were able to understand the values driving our participants’ selection of NHPs. In this study, our participants discussed three core values – natural way of living, quality of life, and independence. Rokeach has categorized 18 instrumental and 18 terminal values generally thought to represent stable North American core values (67). The values mentioned by our participants appear to fit with Rokeach’s values and the findings of previous health-related decision-making studies.

5.4.1.1 Value – natural way of living

The most distinct value which appears to characterize participants who selected products without scientific evidence support was the value of desiring to adopt a “natural way of living”. This is consistent with previous research which suggests that individuals who use CAM appear to value a holistic way of living and the connection between the mind and body (5, 17, 19), not shared by those who only use conventional medicine (17). Fulfilling the value of adopting a natural way of living does not necessarily exclude using NHPs with scientific evidence. Yet, being more experienced with CAM therapies, these individuals may have been more open to experimenting with a wider range of NHPs regardless of the level of scientific evidence supporting their efficacy and safety as long as they believed that taking the treatment was consistent with their desire to adopt a “natural way of living”.

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This value was not mentioned as often by participants in the high scientific evidence category and thus this value did not meet the cut off in that group nor in the overall HVM when all the data were combined. A minimum number of linkages was determined for the HVM of all participants and each of the high and low scientific evidence category participants to capture 50-60% of the active linkages, a meaningful representation of the data available (71). Linkages mentioned by a small number of participants are not included because they either represent idiosyncratic participant responses or they play a relatively minor role in NHP decision-making (26). This suggests that the value “natural way of living” appears to be important to NHP selection to the individuals in the low scientific evidence group but less important to individuals in the high scientific evidence group.

Several previous CAM decision-making studies found that individuals who are drawn to CAM therapies like that these treatments are “natural”, and believed to be inherently “safer” than conventional medications or other medical treatments (5, 16, 19). A preference for things natural has also been studied in food choices (92, 93). The “natural way of living value” is also possibly related to Rokeach’s core value “a world of beauty” which is an appreciation of the beauty of nature and the arts (67). The value “natural way of living” could also be related to the consequence “more natural” by other researchers, such as those interested in buyers of soybeans with functional health attributes (94) and those investigating the HVMs of individuals purchasing fresh food from food teams and farmers’ markets (95).

Similar to our finding, in a MEC decision-making study of participants who selected sleep aids, the product attribute “natural” appeared to be more important than scientific evidence of efficacy. The “natural” product attribute was mentioned by all participants of the study and was a critical decision-making factor for participants to select NHP sleep aids as
opposed to chemical-based pharmaceutical sleep aids (16). Just as we found that participants who discussed the “natural” product attribute linked it with fewer NHP side effects, “natural” sleep aids were often selected over pharmaceutical medications because of perceived safety even in the absence of efficacy (16).

5.4.1.2 Values – Independence and Quality of Life.

Two additional values mentioned by all participants were largely in agreement with Rokeach’s terminal values. The value “Independence” mentioned by all participants is similar to Rokeach’s value “Freedom”, representing independence and free choice (67). Participants in another MEC approach study who bought fresh organic food also mentioned the value “Independence” (96). “Quality of life” as mentioned by our participants appears to include a combination of two values “Pleasure”, or an enjoyable, leisurely life, and “An exciting life”, a stimulating, active life (67). Previous MEC studies in organic food purchase (97), soybeans with functional health properties (94) have appeared to use the value “Pleasure” to represent a similar “Quality of Life” value as mentioned by our participants. Selecting products which help participants fulfill their core values could be viewed as being consistent with their philosophical beliefs, regardless of the supporting scientific evidence.

5.5 Limitations

As with all studies, this one has limitation including its small sample size (25 participants total; 13 and 12 in the high and low scientific evidence groups, respectively); participants who used NHPs with low levels of scientific evidence support could have also used NHPs with high levels of scientific evidence support; participants’ self-reported diagnosis of OA; participants’ self-reported intake of NHPs; participants’ range of anatomical joints affected by OA and participants’ self-reported intake of specific NHPs;
other limitations inherent of the MEC approach, and the interviewer’s training. Each of these limitations is explored in this section. Next, we describe measures to ensure validity and reliability of the MEC approach.

Our relatively small sample size (25 participants) consisting of participants recruited from community seniors activity centres and online was hypothesis generating but may not be generalizable. With our small number of participants, it is difficult to generalize our results to individuals who may have more severe forms of OA such as those who seek out care at community health clinics or hospital arthritis centres. Based on the large number of ladders generated by our interviews and the nature of the MEC interviews – mean of 13.2 ladders in the high scientific evidence group (range of 6-33) and a mean of 11.9 ladders (range 3-20) in the low scientific evidence group – our sample size provided rich data for us to construct meaningful HVMs to compare the high and low scientific evidence groups. Thus we feel confident that we have an accurate picture of our participants’ decision making processes.

Initially, we attempted to recruit participants who only used bromelain or MSM (i.e., who had not used glucosamine and chondroitin) for the low scientific evidence group; however, almost no eligible participants fulfilled this criterion. The recruitment strategy was then modified and we accepted participants who used glucosamine or chondroitin providing they had also used bromelain or MSM. These individuals were assigned to the “low” scientific evidence category because they had decided to use products with low levels of evidence support. It is possible that the reason for why participants in these two evidence categories were very similar is because many of our participants used combination products. In fact, all participants used glucosamine (alone or as part of a combination product), an NHP
with a high level of scientific evidence support as seen in the table. It could be argued that since there was significant overlap in products selected, this explains the overall decision-making process was largely very similar between the two evidence categories. However, our sample is an accurate reflection of the products people are actually using in community which is a strength. Given the small yet important differences that we observed between the two scientific evidence categories, this study suggests that further studies are required to investigate whether or not there are in fact differences between the two scientific evidence groups.

In our recruitment, we relied on individuals with a self-reported diagnosis of osteoarthritis. One participant brought in a report of their X-ray showing their OA diagnosis, however no other participants did. Since our study was whether the level of scientific evidence affected participant’s selection of NHPs for OA, participant’s perceptions of their illness is justifiably just as important as their actual diagnosis.

We recruited participants who self-reported their intake of specific NHPs. To ensure that our participants actually took the NHPs in the two scientific evidence groups and that the specific products taken contained the ingredients they said they contained, all participants were asked to bring bottles of their NHPs to the interview or to write down the name of the ingredients from their bottles. Most participants (more than 75%) actually brought in their bottles to show us the specific NHPs they took.

As was discussed in the literature review chapter, the laddering methodology associated with the MEC approach is also subject to several assumptions and limitations. First, MEC theory assumes that decisions are cognitive processes that are conscious problem-solving activities and intentional to help achieve certain goals (21). With experience,
however, product choices are arguably no longer conscious since they become habitual and automatic (69). Our participants who have used NHPs for a longer duration of time could have adopted habitual and automatic decision-making processes, nullifying the first assumption. We mitigated this limitation by repeatedly emphasizing to participants in the laddering interview to think back to the time when they first found out about NHPs and why they decided to use NHPs in the first place. Prior to the interview, the interviewer prefaced the discussion with “before you started taking NHPs, what were factors that you considered in selecting NHPs?” Another prompt was “When you saw all those products at the pharmacy/healthfood store, how did you decide which products to take?” The goal of prompting participants was to bring them back to the factors they considered when they consciously made the initial decision to use NHPs.

Another assumption is that consumer’s motivation and cognitive structure can be measured when s/he is engaged in decisions regarding product choice. This suggests that the laddering interview process easily elicits consumer’s decision-making processes as it is. While this was true for most participants, two participants (one in each scientific evidence category) had greater difficulty thinking easily about how they decided to use their respective NHPs during the laddering interview. This was reflected in larger numbers of pauses, the need for the interviewer to use more words of encouragement, offering the participants breaks to the participants, and the participant experiencing a greater level of frustration with the repeated “why is this important to you” prompts. For some participants it is difficult to measure their cognitive structure relative to other participants. These participants also had a smaller number of ladders at the end of their interview. Particularly in these cases, we could
not exclude the possibility that participants might have made up their answers to satisfy the needs of the interviewer.

The training of the interviewer is another limitation as it relates to accurately measuring participant’s cognitive structures using the soft-laddering methodology. To mitigate this limitation, the study coordinator who conducted the majority of the interviews was trained in simulated interviews first with the study team alone (the principal investigator and a senior graduate student trained in the laddering technique), then with a volunteer patient and the senior graduate student. In each of these simulated interviews, the interviewer was coached to appropriately ask laddering questions with periodical time-outs, rephrasing of previous questions, and debriefing after the interviews. Next, for the first five interviews, the interviewer conducted the laddering interviews with the senior graduate student who served as a mentor and assisted with clarifying questions and ensured that the interviewer was competent to conduct the laddering interviews on her own.

5.6 Validity and reliability

We adopted various measures to enhance the validity and reliability of the MEC approach, semi-structured interview, and survey data which are described in greater detail below.

For example, we tape-recorded and transcribed our interviews verbatim and double-coding our interviews with at least two investigators (65). A coding table with definitions of terms and quotes were continuously revised and used iteratively to code subsequent interviews to ensure that our codes truly reflected what was said by our participants to enhance validity and reliability of our data (65). We also used a computer program
MECAnalyst to perform techniques of aggregation of laddering data as a hierarchical value map (HVM), and condensation by determining a cut-off number of threshold links to reveal the most important links also to enhance predictive validity as suggested by Grunert and Grunert (65). See Methods chapter for detailed discussion of these approaches.

5.7 Implications

Our study findings are of primary interest to consumers, health care providers, the media and researchers with respect to knowledge translation of scientific evidence about NHPs. We found that consumers appear to access scientific evidence from information sources with a range of credibility and quality (such as websites) and through their HCP and trusted family and friends. Based on our findings, participants in both scientific evidence categories are remembering their HCP to be providing them with important information on scientific evidence. The fact that participants are using heterogeneous information sources to learn about scientific evidence means that there is potential to improve knowledge translation and accessibility of scientific evidence on NHPs. The four main implications from our study are outlined as follows:

1. An implication for consumers is that they should consult with their HCP prior to using NHPs since our study participants appeared to be learning about scientific evidence from their HCP.

2. Health care providers (HCP) who are advising their patients about NHPs also need to be well-informed about current scientific evidence on NHP efficacy and safety. Based on our study findings and in agreement with previous CAM
decision-making studies, consumers/patients appear to recall information on NHP efficacy and safety which was discussed with their HCPs. HCPs therefore have a responsibility to critically assess the quality and validity of scientific evidence about the efficacy and safety of NHPs in order to adequately educate their patients.

3. Another implication is that the media also has a responsibility to accurately portray scientific evidence about NHPs. When our participants did read about scientific evidence, most did not read it first hand, but instead relied on the internet or other media sources. As previously suggested, not only should controversial, newsworthy stories be reported, reporters and editors should ideally produce critically-assessed scientifically-based articles on NHP-related topics to meet the demands of consumers.

4. An implication for knowledge translation is that we need more research on how best to convey scientific research on NHPs to the lay public via health care providers and through other information sources (such as the internet and other media).

5.8 Recommendations for future research

The findings of this study suggest several avenues of future research, in particular – understanding the interaction between HCP and consumers/patients with regards to scientific evidence about NHPs, applying the MEC theory in a similar larger-scale study to further understand similarities and differences between population segments, and lastly research effective knowledge translation about conveying scientific evidence to the lay public.
Our main finding is that HCP appear to be the main avenue of scientific evidence for consumers/patients so future research could focus on the content of the interactions with the HCP. Questions to ask could be -- what are HCP telling consumers/patients about scientific evidence as it relates to NHPs? Since some participants appear to weigh the advice of their friends and family equally as the advice from HCPs, can HCP learn from the interaction between consumers/patients and their friends and family so that their patients will remember the scientific evidence discussed in the clinical encounter?

Secondly, our study found that the MEC approach was useful at understanding the decision-making factors, specifically the role of scientific evidence and also at comparing consumers in two segments – determined by their use of products with varying scientific evidence levels. Future research using the MEC approach comparing participants in two segments could interview larger samples of participants (at least 35 participants per group) in order to compute a congruence coefficient for heterogeneity between two segments, as used by Boecker et. al. (71). Such a coefficient appears in two forms – a simple and weighted version. The simple coefficient calculates a ratio of the linkages appearing in one HVM compared with those in another HVM. The weighted coefficient also takes into account the intensity of frequency of linkages where linkages mentioned more frequently have a greater impact on the coefficient than links with lower frequencies (71). Such a coefficient could allow a more in-depth comparison of two segments within a population (such as consumers using NHPs with high and low scientific evidence support). By understanding similarities and differences between segments, future research could more effectively design communication strategies targeted to these groups.
Lastly, the discrepancy of participant reports of the importance of scientific research and their little use of actual scientific research suggests that future research could investigate the validity of these self-reported “importance” scales and also seek to understand more effective knowledge translation strategies to convey scientific evidence on NHPs to the lay public. As was learned in this study, scientific evidence appears to be merely a means to fulfill an end, where the end is achieving a value of personal importance. Future research could explore using participant values to enable a more effective communication strategy targeted to consumers with the goal of enabling them to make NHP selections based on scientific evidence.

5.9 Conclusion

Using MECAnalyst, we constructed a HVM representing the cognitive process for osteoarthritis-related NHP self-medication decisions for all participants. Next, we compared the HVMs of consumers who report choosing NHPs with low levels of scientific evidence with those who have only selected NHPs with high levels of scientific evidence of efficacy for osteoarthritis-related symptoms. The relatively small differences observed were that participants in the high scientific evidence category mentioned HCPs as describing NHPs being able to reduce pain and also how NHPs work (mechanism of action of NHPs). In contrast, participants using products with low levels of scientific evidence of support recalled HCPs emphasizing the few or reduced side effects of NHPs and did not remember their HCPs discussing the effectiveness of the NHP or how it worked (mechanism of action) which is consistent with the lack of scientific evidence supporting the efficacy of those specific NHPs. Another key difference between the two scientific evidence groups was that
those in the low scientific evidence category mentioned the value “natural way of living” which was not mentioned by the majority of participants in the high scientific evidence category. Coupled with the trend towards longer duration of using NHPs, participants in the low scientific evidence group likely chose NHPs based on a congruence with their world view of adopting a natural way of living rather than using scientific evidence. Despite these relatively minor differences, overall, we found that their decision-making processes of participants in these two scientific evidence groups were largely similar with small content differences. Future research could investigate larger participant groups (N ≥ 35) in two segments to enable quantitative comparisons such as computing congruence coefficient for heterogeneity between two segments to further understand the similarities and differences between the two groups. This would allow us to design more effective communication strategies targeted to these groups informing the use of scientific evidence in NHP selection.

By applying the laddering methodology associated with the MEC approach, we described the factors (product attributes, perceived consequences and values) impacting consumer choice of NHPs for the self-management of osteoarthritis symptoms. We found that the most salient decision-making chain used by our participants started with the following four attributes - trusting the endorsement of a non-HCP (such as a friend) or a HCP (e.g. pharmacist), having scientific evidence supporting an NHP, and identifying if the NHP was from a natural source. Participants reported non-HCPs talking about the effectiveness of an NHP, whereas HCP would describe how a product worked to reduce pain (its mechanism is action) or a product’s lack of side effects. Participants also linked scientific evidence to support the product’s efficacy to it having fewer (or no) side effects. Believing the product would have fewer side effects, consumers were more likely to take the product (compliance)
and then reported experiencing disease-specific consequences, namely reduced pain, enabling increased daily activity, and improved physical and emotional health. Improved physical and emotional health ultimately led to a better quality of life. Consumers also linked greater levels of daily activity with the value of independence. The MEC theory enabled us to understand the underlying values which were the driving forces behind consumer selection of NHPs. Future research could explore using participant values to enable a more effective communication strategy targeted to consumers to encourage them to make NHP decisions based on scientific evidence.

In conclusion, this study found that scientific evidence does play a role in consumer decision-making; however, it is used primarily as a means to fulfill an end of satisfying important personal values. Very few participants in general used direct scientific evidence sources in the decision-making process. Participants considered indirect sources of scientific evidence (e.g., internet searches or information from a HCP). We suggest that consumers/patients should be encouraged to consult with their HCPs prior to using NHPs. HCPs and the media have responsibilities to critically assess the quality and validity of scientific evidence since consumers/patients rely on them for scientific evidence. Future research could focus on the content of the interaction between patients and HCPs and knowledge-translation strategies to more effectively convey scientific evidence to the lay audience.
# APPENDIX

## 6.1 Tables

### 6.1.1 Table 1a. Natural Standard Database evidence-based validated grading criteria

<table>
<thead>
<tr>
<th>Level of scientific evidence</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong> Strong scientific evidence</td>
<td>Statistically significant evidence indicating benefit from 2 quality RCTs OR Evidence from one quality RCT and one quality meta-analysis OR Evidence from multiple RCTs with a majority of RCTs indicating benefit and evidence supporting use from basic science, animal studies or theoretical data.</td>
</tr>
<tr>
<td><strong>B</strong> Good scientific evidence</td>
<td>Statistically significant evidence indicating benefit from 1-2 quality RCT OR Evidence of benefit from 1 quality meta-analysis OR Evidence of benefit from 1 cohort/case-control/non-randomized trials and evidence supporting use from basic science, animal studies or theoretical data.</td>
</tr>
<tr>
<td><strong>C</strong> Unclear or conflicting scientific evidence</td>
<td>Evidence of benefit from 1 small RCT without adequate size, power, statistical significance, or quality of design by objective criteria, OR Conflicting evidence from multiple RCTs without a clear majority of quality trials indicating benefit or ineffectiveness, OR Evidence of benefit from 1 cohort/case-control/non-randomized trials and without evidence supporting use from basic science, animal studies or theoretical data, OR Only evidence supporting use from basic science, animal studies or theoretical data.</td>
</tr>
</tbody>
</table>

Traditional or Theoretical Uses which Lack Sufficient Evidence | Unable to evaluate efficacy due to lack of adequate available human data.
### Table 1b. Evidence-based medicine hierarchy of scientific evidence

<table>
<thead>
<tr>
<th>Level of scientific evidence</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Randomized controlled trial or meta-analysis (Lower limit of confidence interval for treatment effect exceeds minimal important benefit)</td>
</tr>
<tr>
<td>II</td>
<td>Randomized controlled trial or meta-analysis (Lower limit of confidence interval for treatment effect overlaps with minimal important benefit)</td>
</tr>
<tr>
<td>III</td>
<td>Non-randomized concurrent cohort study</td>
</tr>
<tr>
<td>IV</td>
<td>Non-randomized historic cohort study</td>
</tr>
<tr>
<td>V</td>
<td>Case series without control subjects</td>
</tr>
</tbody>
</table>

Adapted from Cook et al 1995 (98)
### Table 2. NHPs used in the treatment of OA and level of supporting scientific evidence (information obtained from the Natural Standard Database)

<table>
<thead>
<tr>
<th>Some NHPs promoted in the treatment of OA</th>
<th>Level of scientific evidence for use in OA</th>
<th>Physical properties</th>
<th>Onset of action (“speed of action”)</th>
<th>Most common dosing schedule (“convenience”)</th>
<th>Average Cost/day (“cost”)</th>
<th>Adverse reactions or interactions (“side effects”)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glucosamine</strong></td>
<td>A</td>
<td>Most often occurs as a white odorless crystalline sulfate salt (glucosamine sulfate) that is sold in capsules</td>
<td>May take several weeks to one month for onset of effect</td>
<td>500 mg capsule three times a day or 1500 mg once daily, oral administration for 90 days, up to three years</td>
<td>$0.18</td>
<td>To be avoided in shellfish allergy</td>
</tr>
<tr>
<td><strong>Chondroitin</strong></td>
<td>A</td>
<td>Most often occurs as a white odorless crystalline sulfate salt (chondroitin sulfate) that is sold in capsules</td>
<td>May take several weeks for effect</td>
<td>200-400mg capsule two to three times daily, or 800-1,200mg once daily for up to three years</td>
<td>$0.40-0.60</td>
<td>May potentiate blood thinning medications or natural health products.</td>
</tr>
<tr>
<td><strong>Methylsulfonylmethane (MSM)</strong></td>
<td>C</td>
<td>A white, odorless, crystalline substance that is sold in capsules</td>
<td>Unclear</td>
<td>500 mg capsule per day for up to twelve weeks. Adult dosing can range from 500-8000 mg per day.</td>
<td>$0.20-0.35</td>
<td>To be avoided in sulfur allergy</td>
</tr>
<tr>
<td><strong>Bromelain</strong></td>
<td>Traditional or theoretical uses which lack sufficient evidence</td>
<td>A white/yellow crystalline substance that is sold in capsules</td>
<td>May take several days for onset of effect</td>
<td>80-1000 mg capsule, two to three times a day</td>
<td>$0.30</td>
<td>To be avoided in pineapple allergy</td>
</tr>
</tbody>
</table>
### 6.1.4 Table 3: NHPs for OA and level of evidence for use.

<table>
<thead>
<tr>
<th>Some NHPs promoted in the treatment of OA</th>
<th>OA-related use</th>
<th>Level of evidence for use in OA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucosamine</td>
<td>OA of knee</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>OA general</td>
<td>B</td>
</tr>
<tr>
<td>Chondroitin</td>
<td>OA of knee</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>OA general</td>
<td></td>
</tr>
<tr>
<td>Methylsulfonylmethane (MSM)</td>
<td>OA</td>
<td>C</td>
</tr>
<tr>
<td>Bromelain</td>
<td>OA</td>
<td>Traditional or insufficient evidence</td>
</tr>
</tbody>
</table>
### Table 4: Number of participants per evidence level category (for file use only)

<table>
<thead>
<tr>
<th>Evidence level category</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Note:</td>
</tr>
<tr>
<td></td>
<td>• To tally after classifying eligible participants in Table 2</td>
</tr>
<tr>
<td></td>
<td>• Recruiter’s goal: 10-12 participants per group</td>
</tr>
<tr>
<td></td>
<td>Use of NHPs in evidence level A only (Glucosamine and/or Chondroitin)</td>
</tr>
<tr>
<td>Low</td>
<td>Use of NHPs in evidence level traditional/insufficient evidence only (MSM and/or bromelain)</td>
</tr>
</tbody>
</table>
### Table 5: Different Types of Validity

<table>
<thead>
<tr>
<th>Type of validity</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct</td>
<td>A framework of hypothesis testing based on the knowledge of the underlying construct.</td>
<td>Example constructs - anxiety or depression. Tests would be validated by devising hypotheses such as, ‘Because anxious people differ from non-anxious people in carrying out complex tasks, then those who score high on this new test of anxiety should perform differently from those who score low’.</td>
</tr>
<tr>
<td>Content</td>
<td>Measures the intrinsic validity of a test. Content of a test that adequately tests the subject being evaluated.</td>
<td>Example - knowledge of biochemistry assessed in a biochemistry test. The assumption was that if all aspects of the biochemistry content were included, and there were no items that were irrelevant, then the test would be intrinsically valid at assessing whether or not the person had mastered the course content.</td>
</tr>
<tr>
<td>Predictive</td>
<td>Measures how well the item or scale predicts expected future observations</td>
<td>Diagnostic tests, where the outcome of an autopsy or the further progression of the disease to confirm or disconfirm the test’s predictions.</td>
</tr>
<tr>
<td>Convergent/concurrent</td>
<td>Measures how well the item or scale correlates with gold-standard measures of the same variable</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Streiner and Norman, 2008 (99).
## Table 6a: Demographic Data of High and Low evidence groups

<table>
<thead>
<tr>
<th>Item</th>
<th>Everyone</th>
<th>High</th>
<th>Low</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>10</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Age (mean)</strong></td>
<td>58.8</td>
<td>55.08</td>
<td>62.92</td>
<td>0.100</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
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<td>5</td>
<td>8</td>
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<tr>
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<td>1</td>
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<td>South East Asian</td>
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<td>0</td>
<td></td>
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<tr>
<td>Arab, Middle-Eastan</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>African, Caribbean</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td></td>
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<tr>
<td>Filipino</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
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<td>Latin American</td>
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<td>0</td>
<td>0</td>
<td></td>
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<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other</td>
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<tr>
<td><strong>Highest education</strong></td>
<td></td>
<td></td>
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<td></td>
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<td>Grade 8 or less</td>
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<td>0</td>
<td>1</td>
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<tr>
<td>Grade 9-13</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td></td>
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<tr>
<td>Apprenticeship</td>
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<td>1</td>
<td>0</td>
<td></td>
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<tr>
<td>Partial college</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>College Diploma</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Partial university</td>
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<td>1</td>
<td></td>
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<td>University Graduate Degree</td>
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<td>1</td>
<td>2</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
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<td></td>
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<td>6</td>
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<td>College – Yes</td>
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<td>9</td>
<td>6</td>
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<td><strong>Annual household net income</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Under $25,000</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>$25,000-$49,000</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>$50,000-$74,000</td>
<td>9</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>$75,000 or above</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Under $50,000</td>
<td>9</td>
<td>5</td>
<td>4</td>
<td>1</td>
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<tr>
<td>$50,000 or over</td>
<td>11</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
### Table 6a: Demographic Data of High and Low evidence groups

<table>
<thead>
<tr>
<th>Extended health insurance&lt;sup&gt;a&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12</td>
<td>6</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>7</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of NHPs to treat Osteoarthritis&lt;sup&gt;a&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 6 months</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0.096</td>
</tr>
<tr>
<td>Over 6 months</td>
<td>21</td>
<td>9</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Importance of scientific evidence (0-10, 10 = important)&lt;sup&gt;c&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8</td>
<td>7.9</td>
<td>0.931</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall health (0-10, 10 = best)&lt;sup&gt;c&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>7.9</td>
<td>7.5</td>
<td>0.322</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain scale (visual analogue, 0-10, 10 = best)&lt;sup&gt;c&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.7</td>
<td>6.2</td>
<td>6.9</td>
<td>0.328</td>
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</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Joints affected&lt;sup&gt;b&lt;/sup&gt;</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hands, wrists, fingers</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Neck</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Lower back</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hip</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Knee</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Ankle, foot, toe</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upper extremity&lt;sup&gt;b&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1</td>
<td>3</td>
<td>0.270</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lower extremity</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>8</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total**</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>10</td>
<td>9</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Recruitment location&lt;sup&gt;b1&lt;/sup&gt;</th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NYSC</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>0.125</td>
</tr>
<tr>
<td>Craig’s List</td>
<td>17</td>
<td>11</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Health food store</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Notes: A: Fisher test, b: chi square test, b1: chi square test for trend, c: t-test.

Four participants did not indicate their income. Participants could indicate more than one joint; 5 participants did not indicate an affected joint.
### Table 7: Participants who used high scientific evidence products

<table>
<thead>
<tr>
<th>MEC Participant Code</th>
<th>Product used</th>
<th>Evidence level</th>
<th>Brought in product bottle</th>
<th>Recruitment location</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 F7</td>
<td>GC</td>
<td>High</td>
<td>Yes</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>17 F8</td>
<td>G</td>
<td>High</td>
<td>Yes</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>16 F10</td>
<td>GC</td>
<td>High</td>
<td>Yes</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>14 F11</td>
<td>GC</td>
<td>High</td>
<td>Yes – Jamieson</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>9 F14</td>
<td>G</td>
<td>High</td>
<td>No</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>7 F15</td>
<td>GC</td>
<td>High</td>
<td>Yes</td>
<td>Health Food store</td>
</tr>
<tr>
<td>4 F17</td>
<td>G</td>
<td>High</td>
<td>Yes Lifebrand</td>
<td>Craig’s List</td>
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<tr>
<td>3 F18</td>
<td>GC</td>
<td>High</td>
<td>Yes</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>2 F19</td>
<td>GC</td>
<td>High</td>
<td>Yes Life Weber</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>1 F20</td>
<td>G</td>
<td>High</td>
<td>Yes Omega Quick Reliv</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>19 M1</td>
<td>GC</td>
<td>High</td>
<td>Yes</td>
<td>NYSC</td>
</tr>
<tr>
<td>11 M3</td>
<td>G</td>
<td>High</td>
<td>Yes – Swiss</td>
<td>Craig’s List</td>
</tr>
<tr>
<td>25 M6</td>
<td>GC</td>
<td>High</td>
<td>Yes – Jamieson</td>
<td>Craig’s List</td>
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6.1.9 Table 8: Participants who used low scientific evidence products

<table>
<thead>
<tr>
<th>MEC Participant</th>
<th>Code</th>
<th>Product used</th>
<th>Evidence level</th>
<th>Brought in product bottle</th>
<th>Recruitment location</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 F2</td>
<td>GCMSM</td>
<td>Low</td>
<td>Yes – Jamieson</td>
<td>NYSC</td>
<td></td>
</tr>
<tr>
<td>23 F3</td>
<td>GCMSM</td>
<td>Low</td>
<td>No</td>
<td>NYSC</td>
<td></td>
</tr>
<tr>
<td>22 F4</td>
<td>BGCMSM</td>
<td>Low</td>
<td>No</td>
<td>NYSC</td>
<td></td>
</tr>
<tr>
<td>21 F5</td>
<td>BG</td>
<td>Low</td>
<td>No</td>
<td>NYSC</td>
<td></td>
</tr>
<tr>
<td>20 F6</td>
<td>GCMSM</td>
<td>Low</td>
<td>Yes</td>
<td>NYSC</td>
<td></td>
</tr>
<tr>
<td>15 F9</td>
<td>GCMSM</td>
<td>Low</td>
<td>Yes Lifebrand</td>
<td>Craig’s List</td>
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</tr>
<tr>
<td>13 F12</td>
<td>GCMSM</td>
<td>Low</td>
<td>Yes Kirkland</td>
<td>Craig’s List</td>
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<tr>
<td>12 F13</td>
<td>GCMSM</td>
<td>Low</td>
<td>Yes Movefree</td>
<td>Craig’s List</td>
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<tr>
<td>5 F16</td>
<td>BGCMSM</td>
<td>Low</td>
<td>Yes Simply Supplements</td>
<td>Health food store</td>
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<td>10 M2</td>
<td>GCMSM</td>
<td>Low</td>
<td>No</td>
<td>Craig’s List</td>
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</tr>
<tr>
<td>8 M4</td>
<td>GCMSM</td>
<td>Low</td>
<td>No</td>
<td>Craig’s List</td>
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</tr>
<tr>
<td>6 M5</td>
<td>BGC</td>
<td>Low</td>
<td>Yes Organika GC Organika B</td>
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6.1.10 Table 9: Everyone - Information content of hierarchical value map for cut-off levels 1-6.

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<tr>
<th></th>
<th>Cut off = 1</th>
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<th>Cut off = 3</th>
<th>Cut off = 4</th>
<th>Cut off = 5</th>
<th>Cut off = 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active content codes</td>
<td>43</td>
<td>36</td>
<td>28</td>
<td>23</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>% of total codes</td>
<td>100%</td>
<td>84%</td>
<td>65%</td>
<td>53%</td>
<td>53%</td>
<td>51%</td>
</tr>
<tr>
<td>Active chunks</td>
<td>395</td>
<td>387</td>
<td>362</td>
<td>342</td>
<td>335</td>
<td>335</td>
</tr>
<tr>
<td>% of total chunks</td>
<td>100%</td>
<td>50.0%</td>
<td>31.4%</td>
<td>22.3%</td>
<td>17.8%</td>
<td>13.6%</td>
</tr>
<tr>
<td>Active links</td>
<td>1020</td>
<td>843</td>
<td>711</td>
<td>615</td>
<td>551</td>
<td>476</td>
</tr>
<tr>
<td>% of total links</td>
<td>100%</td>
<td>82.6%</td>
<td>69.7%</td>
<td>60.3%</td>
<td>54.0%</td>
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</tbody>
</table>

6.1.11 Table 10: High scientific evidence participants - Information content of hierarchical value map for cut-off levels 1-6.

<table>
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<tr>
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<th>Cut off = 4</th>
<th>Cut off = 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active content codes</td>
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<td>31</td>
<td>21</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>% of total codes</td>
<td>100%</td>
<td>74%</td>
<td>50%</td>
<td>48%</td>
<td>38%</td>
</tr>
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<td>Active chunks</td>
<td>215</td>
<td>201</td>
<td>172</td>
<td>169</td>
<td>143</td>
</tr>
<tr>
<td>% of total chunks</td>
<td>100%</td>
<td>41.4%</td>
<td>22.8%</td>
<td>15.4%</td>
<td>10.9%</td>
</tr>
<tr>
<td>Active links</td>
<td>589</td>
<td>422</td>
<td>316</td>
<td>253</td>
<td>201</td>
</tr>
<tr>
<td>% of total links</td>
<td>100%</td>
<td>71.6%</td>
<td>53.7%</td>
<td>43.0%</td>
<td>34.1%</td>
</tr>
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</table>

6.1.12 Table 11: Low evidence participants – Information content of hierarchical value map for cut-off levels 1-6.

<table>
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<tr>
<th></th>
<th>Cut off = 1</th>
<th>Cut off = 2</th>
<th>Cut off = 3</th>
<th>Cut off = 4</th>
<th>Cut off = 5</th>
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<tr>
<td>Active content codes</td>
<td>35</td>
<td>25</td>
<td>22</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>% of total codes</td>
<td>100%</td>
<td>71%</td>
<td>63%</td>
<td>54%</td>
<td>51%</td>
</tr>
<tr>
<td>Active chunks</td>
<td>180</td>
<td>168</td>
<td>159</td>
<td>145</td>
<td>139</td>
</tr>
<tr>
<td>% of total chunks</td>
<td>100%</td>
<td>46.2%</td>
<td>28.9%</td>
<td>15.7%</td>
<td>12.2%</td>
</tr>
<tr>
<td>Active links</td>
<td>431</td>
<td>325</td>
<td>257</td>
<td>179</td>
<td>151</td>
</tr>
<tr>
<td>% of total links</td>
<td>100%</td>
<td>75.4%</td>
<td>59.6%</td>
<td>41.5%</td>
<td>35.0%</td>
</tr>
</tbody>
</table>
### 6.1.13 Table 12: Code summary for NHP OA study interviews

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
</table>
| Access        | A product attribute where a product is easily obtainable (F9) at a pharmacy or health food store and saves time (M3). | F9, 416 F: and it’s, uh, on lunch, my lunch hour and [the pharmacy] is, you know, like a stone’s throw away  
Interviewer: Um  
F: run in, ? out of the shelf exactly where it is, you know, the three in one, grab it and as I said, I always buy it on sale, even if I haven’t finished the one that I have,  
Interviewer: Uh huh  
F: as long as it’s on sale, I’ll just buy it. |
| Chemical source | A product attribute where individuals prefer a chemical source compared with a natural source. This may be due to beliefs of purity, more environmental sustainability. | F11, 499 F: I might wonder about how, how it was sourced. You know, if it’s synthetic or if there is a synthetic version  
Interviewer: Uh huh  
F: rather than whatever the natural version was and you know, if they were comparable. I would probably go for the synthetic as opposed to the natural thing. |
| Combination product | A product attribute where the product contains more than one constituent. Some individuals believe that a combination product is superior to the sum of its constituents. This is differentiated from single-ingredient products (F14, 2031). | F9, 297 F: I have always taken [chondroitin, glucosamine and MSM in combination] this way. It just makes sense to me instead of having all these bottles or jars around and having to shop for one or the other.  
F11, 270 F: I saw that the combination seemed to have either just a little bit more of one than the other, but it had the same, the same benefits of taking the two pills, so for me it was just, I just take one pill. |
<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
</table>
| Cost - high             | A product attribute denoting a high cost, influencing product selection.                                                                                                                                                                                                 | F7, 348  
F: It’s more expensive when you add the Chondroitin, it’s a lot more expensive.                                                                                                                      |
| Cost – low              | A product attribute denoting a low cost, influencing product selection.                                                                                                                                                                                                  | M1, 2122  
M: and uh, it, and I look on the shelf and unless the, the [X brand] is a lot more than something else, then I take it, buy the [X brand]. If there’s another product, another Glucosamine that was on sale, cheaper, I would buy that. |
| Covered by drug plan    | A product attribute where the natural health product is reimbursed by an extended health care plan.                                                                                                                                                                     | M1, 2030  
Interviewer: Would it affect your decision to take the Glucosamine and Chondroitin, for example, because you talked about [the latter] being more expensive.                                                   
M: If it, if they were covered by uh, by a plan, I would probably take both.                                                                                                                                  |
| Dosage form             | A product attribute denoting the oral forms of the product that are administered, including capsules, tablets and liquids. Dosage form is also related to ease of storage, pill size (F18), ease of swallowing (F16, 719), and portability of the product. Includes previous code – Correct dose (F4, line 1600). | F3, lines 495  
Interviewer: So it has no taste. Um, any other reasons?  
F: And um, other reason, I think, is the capsule  
Interviewer: Capsule?  
F: I don’t like the caplet, because I think  
Interviewer: You don’t like the caplet?  
F: No, because I this is better, because it’s a gel. And um, I think the other  
Interviewer: These are capsules  
F: Yah  
Interviewer: And you like that it’s capsules?  
F: Yah, because I tried the caplets and I didn’t like it. So |
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<tr>
<td>Trusted other endorsed</td>
<td>A product attribute which includes endorsements by either a CAM practitioner, MD, pharmacist, other health care provider (such as physiotherapist) and friends and family. Definitions and examples of each category of endorsement is found below.</td>
<td></td>
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<tr>
<td>Endorsed - Friend or family</td>
<td>A product attribute where the product has been recommended or promoted by a friend or family.</td>
<td>F5 (son), 712 F: If my son says take it, I trust him F8 (friend), 245 F: Just really through my friend. And she’s sure [glucosamine] really works, [She said, “if” it works good for me, so you should try it”, so that’s pretty much how I found out about it.</td>
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<tr>
<td>Endorsed – Health care provider</td>
<td>A product attribute where the product has been recommended by a health care provider.</td>
<td>F7, 443 F: I don’t, I don’t think there’s anybody that doesn’t know about it. It’s very common, so if I would have talked to about colleagues with it, people in the health care profession</td>
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<tr>
<td>Endorsed – CAM practitioner</td>
<td>A product attribute where the product has been recommended by a CAM practitioner such as chiropractor, massage therapist, naturopath, acupuncturist.</td>
<td>F10, 1093 Interviewer: …tell me why it’s important to you that your naturopathic doctor recommended, um, this product? F: Well, because I feel that he would help me be as pain free as possible. You know.</td>
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<tr>
<td>Endorsed – MD</td>
<td>A product attribute where the product has been endorsed or recommended by a physician.</td>
<td>F4 lines 934 Interviewer: Right. Um, so tell me why that was important to you, that your doctor recommended it? F: Because of his, well to me, uh, because I’m not a client, I’m working with him, as a team.</td>
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<tr>
<td>Endorsed – Pharmacist</td>
<td>A product attribute where the product has been endorsed or recommended by a pharmacist.</td>
<td>F: And um, I can then try it on his recommendation, go back and say, yes, you know, this is helping me. M1, 2566 Interviewer: Right F: and um, I can then try it on his recommendation, go back and say, yes, you know, this is helping me.</td>
</tr>
<tr>
<td>Scientific Evidence</td>
<td>A product attribute where there is scientific evidence supporting the use of the product.</td>
<td>F4 lines 1429 M: Any, yah, any person that might supposedly have a better knowledge of it than myself. F: If you have to get something else, I won’t get it unless the pharmacist told me it’s safe to go get it. Even if you go get syrup for cough. I say I need a cough syrup, but I’ll take it— I’ll ask the pharmacist to give me the best…</td>
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<tr>
<td></td>
<td><strong>Attribute</strong></td>
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<td></td>
<td><strong>Natural Source</strong></td>
<td>F17, lines 228 onwards</td>
</tr>
<tr>
<td></td>
<td>A product attribute where constituents are derived from ingredients</td>
<td>Interviewer: Okay. Any other reasons why you decided to take these</td>
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<td></td>
<td>found in nature.</td>
<td>products?</td>
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<td>F: It was natural.</td>
<td>F: It seemed to make sense. Um, it’s, um, made up of shell fish or,</td>
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<td>Interviewer: Natural.</td>
<td>um, sort of cartilage sounding stuff</td>
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<td></td>
<td>F: It seemed to make sense. Um, it’s, um, made up of shell fish or,</td>
<td>F3, lines 424 onwards</td>
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<td></td>
<td>um, sort of cartilage sounding stuff</td>
<td>F: so I thought, you know, why not. You know, if it’s something, I</td>
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<td>know that, you know, it’s something from the shell fish. It’s</td>
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<td>something natural so it won’t harm my body, I think.</td>
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<td>I: So you read about it that it doesn’t harm your body?</td>
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<td>F: Well, I think, because it’s something natural.</td>
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<td>I: Natural?</td>
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<td></td>
<td></td>
<td>F: Yah.</td>
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<td></td>
<td><strong>Product packaging</strong></td>
<td>M1, 632</td>
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<td>A product attribute where the product package or label played a role</td>
<td>M: Yah, the package is appealing. It’s white and uh, it’s quite an</td>
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<td></td>
<td>in product selection</td>
<td>appealing package.</td>
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<td></td>
<td><strong>Quality brand</strong></td>
<td>F7, 1244</td>
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<tr>
<td></td>
<td>A well recognized brand perceived to contain accurate ingredients as</td>
<td>Interviewer: Right. And how do you know that it’s a good name?</td>
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<td>per labeling, no fillers (F15), and an overall good product.</td>
<td>F: Different articles that I’ve read, said which companies are better</td>
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<td>than others…I’ve heard that sometimes, um, there’s different brands</td>
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<td>that don’t have the amount of ingredients in it that they say that</td>
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<td></td>
<td></td>
<td>they have, active ingredients.</td>
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<td></td>
<td><strong>Taste</strong></td>
<td>F3 1432-1434</td>
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<td></td>
<td>A product attribute referring to the palatability of the product.</td>
<td>F: Well, you know, it’s, um, I mean if it’s, you know, a nice taste,</td>
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<td>I don’t mind, but sometimes, you know, they have you know some</td>
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<td>funny taste and you don’t like it.</td>
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| Absorption    | A physical consequence representing how quickly and effectively a product is absorbed after intake. This is synonymous with speed of action. | F3, lines 1302  
F: And I know that sometimes they say some of the, you know, the things that you take, you know, it shouldn’t you know, absorb fast. It should slowly go through your body but I think that it, I don’t know, if it does.  
Interviewer: Um, so it melts and then the body absorbs it faster, right? And why is that important to you, that the body absorbs it faster?  
F: Because I don’t know, because I think maybe that the other one stays there, for example, if I’m taking it three times a day |
| Activity of daily living | A physical consequence where individuals have the energy and mobility to participate in daily activities such as walking and house work. | F5, 1487  
When I’m not sick...I can do gardening.  
F7, 1544  
Interviewer: Oh, okay. So, um, what do you need to do and what do you need to be rested to do?  
F: All my activities of daily living. |
| Addiction     | A physical consequence representing the habit forming or potential for dependency of particular natural health products. | M2, 397  
Interviewer: So, all right. So starting with the first reason, so what it’s made of, why is it important to you that it’s made of something natural?  
M: Well, because you’re not going to be, uh, you want to give it up, you’re not going to be dependent on it and it’s not  
Interviewer: So you  
M: habit forming for you. |
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<tr>
<td>No Addiction</td>
<td>A physical consequence representing the absence of habit forming or potential for dependency of particular natural health products.</td>
<td>M2, 1245 Interviewer: Okay. Now, um, why is it important to you that you take something that’s safe? Cause you said you want to feel better and you want to make sure it’s safe. M: Well it’s much better to take something that’s safe or than take something that may cause you more problems. Interviewer: Yes, so then, by it being safe, what do you mean? M: Well safe that means there’s no side effect, and there’s no, uh, no chance of you being dependent on it.</td>
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<td>Compliance</td>
<td>A physical consequence where individuals follow the recommended dosing schedule. This is related to the frequency of ingesting the product. Includes previous codes – “easy to take”, and “convenience”.</td>
<td>F11, 1139 They’re hard to swallow so, if I cut down to one, one three times a day as opposed to two three times a day… I’ll remember to take them. I’ll be willing to take them… If it’s too much of a hassle I would probably fall off the program.</td>
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<td>In control</td>
<td>A psychosocial consequence of feeling empowered, not reliant on doctors or health care providers, having enough knowledge to make a good decision.</td>
<td>F11, 913 F: Because I think you’re more in control, control of my own health. Interviewer: So, um, so what do you mean by that? Why is it important that you’re in control of your health? F: I can’t really control [many facets of my health], but I can at least feel some assurance of the fact that, at least…I’m doing whatever I can to, uh, slow the disease or uh, prevent further disc degeneration.</td>
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| Convenience                 | A consequence describing how easily it is to ingest a product (e.g., with any beverage) and store a product (e.g., no refrigeration). Reduces the total number of products purchased and number of pills taken and can be taken at any time of day (F14) | F5, line 380  
It’s easy to get. You can take it with anything. You can take it with coffee. You can drink it with water. I’ve got water with me. Um.  
F9, line 455  
F: And, [I like that] I don’t have to take it with food.                                                                                                                                                                                                                       |
| Economize                   | A physical consequence of maximizing value for money spent                                                                                                                                                 | F7, 1233  
F: Well I would choose the cheapest one with a good name.  
F10, 2058  
F: Well, I was taught, you know, spend when you have to and save when you can.                                                                                                                                                                                                 |
| Effectiveness - Decrease in pain | A physical consequence denoting effectiveness of treatment where there is a reduction in pain, and inflammation (F18, 663).                                                                              | F4, line 1615  
F: …if I’m not taking the proper dosage I could, uh, I’ll be in more pain. I could think to myself, oh, this is not working, and I’ll stop it.  
F5, line 1070  
F: I prefer this [natural] one – it takes longer and give me a 1-10, it relieves my pain 8, than this one [Tylenol – is] 100%. I prefer having a little pain but no chemical.                                                                                           |
| Effectiveness - Perceived mechanism of action | A physical consequence denoting effectiveness of treatment relating to the mechanism of action, such as repairing cartilage at the joint.                                                                   | F4, lines 457  
F: Well, because when we get older our body doesn’t manufacture certain, um, I’m not a doctor or anything, but I’ve been told that this is not in your system as well as when you’re younger.  
I: Oh, okay.  
F: So we have to replace them.                                                                                                                                                                                                                                     |
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| Essentials of daily living    | A consequence of economizing where an individual can spend money on essentials. Also includes previous **Make a Living** codes where an individual attains financial stability, including supporting the family and paying bills. | M1, 2328  
M: But I would use it for essentials.  
Interviewer: So you’d use it for essentials?  
M: Yah  
Interviewer: Um, and so, well what happens when you can spend more on essentials, you know, so what drives you to save more so that you can spend more on essentials?  
M: What drives me, my desire  
Interviewer: Okay. Um, can you give me some examples?  
M: Well, as far as food is concerned  
Interviewer: Uh huh  
M: you might say, well, I’ll buy those cherries, even though they’re very expensive, I’ll buy them because I’ve saved money so I’ll splurge on cherries. |
| Healthy                       | A physical consequence of achieving optimal health.                          | F4: 1799  
F: [Being healthy] is to build a sound foundation. If we have a sound foundation then you’re in a better way of withstanding, who knows what comes at you.  
I: So by a sound foundation, um, can you explain what you mean by that?  
F: Sound foundation, physically, mentally, emotionally, spiritually. |
| Health care system savings    | A consequence where participants describe the goal of saving the health care system money so that funds can be redistributed to others with greater need. | F19, 975  
“F: So I feel, uh, the least I use the health system, maybe the most they can spend on people who really are not available to help themselves or are not capable or they are financially worse off than I am. So let them, let them take the benefit.” |
| Ineffectiveness – No decrease in pain | A physical consequence where the treatment does not product a reduction in pain. | F6, 556  
F: I feel fine with them, except they don’t help my pain! |
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| Life more pleasant    | A consequence where taking the product brings them simple pleasure.         | F10, 1954  
Interviewer: All right. Um, so it’s easier to take. So why is it important to you that this product is easy for you to take?  
F: Well, it just makes life more pleasant, you know! |
| Social activity       | A consequence where individuals have the energy and mobility to participate in social activities with another person for the purposes of enjoyment. Includes previous Relationships code where individuals can connect with others in their life. | M1: 1601  
M: Now, I don’t play golf but it was important at the time because I had a lot of friends that, uh, I met when I played golf and I played with a group of people  
Interviewer: Um  
M: and we played and we played like every Tuesday and every Wed, every Monday and every Wednesday  
Interviewer: Uh huh  
M: we played in a group and it was good, a social thing. |
| Side effect (present) | A physical consequence where an unexpected adverse reaction results from taking a treatment. Side effects can be mild such as nausea, skin rash or severe such as liver damage. Side effects also include unintended or harmful interactions. Individuals typically talk about the desire to avoid side effects. | F5, 958  
I prefer [natural] because I don’t want to damage my liver, I don’t wanted to damage my kidney. I don’t want to damage my stomach. You get an aspirin for a headache, but sooner or later you get an ulcer. |
| Side effect (absent)  | Opposite to Side effect (present), often associated with the product attribute Natural source. |        |
| Sleep better          | A physical consequence where an individuals notices an improvement in quality of sleep. | Interviewer: Okay. Um, and so then, you noticed a difference, it works better and so tell me why it’s important that it works better, so that this one works better than Glucosamine alone?  
F: So that I stay more healthy and I can get a good nights sleep and do everything that I need to do. |
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<td><strong>Consequence</strong></td>
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| Mood (positive)  | A psychosocial consequence representing stabilization or elevation of mood. | F3 lines 905-911  
F: it’s, um, I’m so happy because, you know, I can do so many things, you know, and uh, emotionally I’m, you know, in a good mood  
Interviewer: Uh huh  
F: you know, those are so important when you, when I have pain it’s, I’m so down, I don’t want to do anything and I, you know, I’m depressed. |
| **Value**        |                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                   |
| Family           | A value where one believes in the importance of providing for and spending time with family. | F5, line 1528  
F:…For now, to live a life is to enjoy my family.                                                                                       |
| Healthy          | A value where individuals would like to lead a healthy life into old age. Includes previous Resist Aging (delaying the effects of aging) codes. | F2 lines 1640  
F: Well, I want to age as good a health as I can possibly, because nobody knows what tomorrow’s going to bring. And I would like to, if I could control my pain to a level where I don’t have to take all this pain medication. |
| Independence     | A value where individuals can carry out daily activities on her/his own without external assistance or mobility aids. Individuals also describe attaining a sense of freedom with independence. Synonymous with autonomous. | F5, lines 849  
I: Free to travel without assistance – what do you mean?  
F: I don’t need, I don’t want a wheelchair. Somebody has to bring me to places. I want to be able to go on my own.  
F13, lines 1162  
Interviewer: Right. So walking more effectively, normal mobility, um, you know, what does that mean to you, to have normal mobility?  
F: Freedom.  
Interviewer: Freedom. Can you give me an example, what do you mean by freedom?  
F: Not have to depend on the cane or walker |
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| Natural way of living | A value where individuals strive to live in a natural way on different respects. | F5 lines 1014.  
I: Right, ok. So you said, the fact that it’s natural helps.  
F: I always eat natural and healthy, from the time I was a kid.  
I like vegetables and fruit. And I will live on vegetables, and fruit and fish.  
F8, lines 1545  
F: Because I want to live a, um, like a pharmaceutical free life, more or less. |
| Quality of life | A value where one believes he/she is achieving a higher quality of life in physical and psychosocial facets of life. Quality of life includes the ability to spend more on essentials, maintain balance in work, family and recreation (e.g., vacations)(M4, 918), and achieving peacefulness in life (M4, 1546). Also includes previous **Meaningful Life** (attaining an interesting, purposeful life), **Happiness**, **Life more pleasant** codes. | M1, 2377  
Interviewer: Um, so then, but to you, what does it mean to you to spend more on essentials? And why is it important that you have more to spend on essentials?  
M: I think that’s just a natural thing, you know, that’s just part of your desire for life and what you want from it.  
Interviewer: Um  
M: I mean, to me that’s just part of living  
Interviewer: Um  
M: to want more there, to be able to live, to better the quality of your life, however you do it is better. |
### Table 13: Themes and Supporting Quotes from Semi-Structured Interviews.

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<th>Topic</th>
<th>Theme</th>
<th>Supporting Quotes</th>
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| **Scientific Evidence**| - Most people did not use scientific evidence when selecting an NHP. | “Interviewer: So, uh, what is your view on the topic of scientific research, supporting Glucosamine?  
F: Um, I guess it’s important. I just never, I just never studied it myself on it. I just never looked into. I was thinking about, maybe I’ve got to start checking into it more, myself, I just never bothered. Like, um, I just never thought of it really. I just like, well I guess it must work good or they wouldn’t be selling it, right.” (High Evidence, F8). |
|                        | - When asked, participants often mentioned that they valued scientific evidence or would be interested in learning more about scientific research supporting a product. | “Interviewer: have you ever looked for, um, scientific research?  
F: No I never did.  
Interviewer: How important is scientific research?  
F: Very important because, because again that’s knowledgeable people who are scientists and they’re doing the research.” (High Evidence, F19). |
|                        |                                                                      | “F: I do not investigate these things. I take them. A lot of it is dependent on my mood. I’ll give it a shot. I’ll try it.” (Low Evidence, F2). |
|                        |                                                                      | Interviewer: Have you searched on line about products or, you know, read any, um, newspapers, research, articles about these products?  
M: No I didn’t.  No I didn’t read on this.  
Interviewer: So for you, is it important to you to have read research studies on Glucosamine?  
M: Yah, I think so, now that I’m taking I should do some research on it. I do believe that. (High Evidence, M3). |
| Topic         | Theme                                                                 | Supporting Quotes                                                                                                                                                                                                                                                                                                                                 
|--------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
| Scientific   | - Most people did not use scientific evidence when selecting an NHP.  | “Interviewer: Have you ever looked up scientific research studies for natural health products, like glucosamine, chondroitin?  
F: No.  
I: Ok. So, um, what was the reason that you didn’t need to look up research studies?  
F: Well, I guess for something that is good for me, I don’t have to research. I don’t need to research for work. Just personal.” (Low Evidence, F5).  
“Interviewer: So, um, for you, how important is scientific evidence when you’re making a decision to use natural health products?  
F: Well, I think it would be very important.  
Interviewer: Uh huh. And also, have you, you know, have you read scientific studies about some of the products that you take?  
F: No” (Low Evidence, F6).  
“M: Hum, well, um, I’m certainly, you know, interested in hearing about any research that studies this, um, but I guess I have not had sufficient initiative to go out and find the research, um, so how important is the research? You know, moderately important, I guess based on my actions.” (Low Evidence, M4).  
“Interviewer: What would you say is your position, you know what, how important is scientific evidence?  
F: Well, if I don’t understand it, I would believe somebody whom I believed in told me.  
Interviewer: Um, who would that be?  
F: Well, friends, family.” (Low Evidence, F16).  

Evidence | - When asked, participants often mentioned that they valued scientific evidence or would be interested in learning more about scientific research supporting a product. |                                                                                                                                                                                                                                                                                                                                                     |
<p>| Scientific   | - Information about scientific evidence was usually obtained from a indirect source (especially through word-of-mouth, from a friend or family member, doctor, or reading in a newspaper/magazine article or watching a segment on TV). |                                                                                                                                                                                                                                                                                                                                                     |</p>
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| Scientific Evidence | - Information about scientific evidence was usually obtained from a indirect source (especially through word-of-mouth, from a friend or family member, doctor, or reading in a newspaper/magazine article or watching a segment on TV). | “F: I never really read so much about research studies. It’s only if it was presented easily like on television or on the news, a very quick kind of capsule version of it, and um, uh. No so much about, not so much about actually Glucosamine. But I, I remember, um, as I said, a couple of years ago there was something about MSM. MSM, um, and there was a hoop-la and they said, well studies have shown that it’s not as, um, effective as once thought, and dut, dut, dut, dut. But, um, I don’t really recall too much. It’s not that I, it’s, it wasn’t really about, I really can’t remember all the details.” (High Evidence, F20).  
“F: Well, something will come up, there’s always studies coming up whether it’s reported in the newspaper or on TV, in fact, there was a segment, I don’t, I think it was on TV, either way, but I didn’t, forgot to watch, on all these cosmetic things” (Low Evidence, F2).  
“M: I have heard of, I haven’t actually read, of studies that, um, refute the benefits of Glucosamine and Chondroitin. I’m aware of those things. I’m a fairly well read person but I know it works for me and I know it works for my parents. Um, and so, I’m sticking with it.” (Low Evidence, M5).  
“M: You know, cause one doctor will say, yes, my patients have really, have been benefited from this. Another one will say, well didn’t you read that study in such and such journal which says, there’s been a blind study with a placebo shows that it had no benefits whatsoever” (Low Evidence, M5). |
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<tr>
<td>Scientific Evidence</td>
<td>- Scientific evidence is not a requirement in the decision-making process; it provides extra information but is not a key factor influencing a participant’s decision.</td>
<td>“Interviewer: Oh, okay. So you read that study, um, but did the study change your, or did it impact your decision to take Glucosamine? F: It confirmed it. Reconfirmed it, as more yes, the right way to go. Interviewer: Okay, so it reconfirmed what you already knew. Um, but if you, um, if you didn’t read the study would it have changed, you know, your decision to take Glucosamine F: No” (High Evidence, F7). “F: Uh, [it’s] not a matter of [scientific evidence] having weight, it’s just, the more information you know about something, the more knowledgeable you are to make a decision whether to take or not take.” (Low Evidence, F2). “Interviewer: Why is it important that you read a study in the paper? M: Well, it wasn’t particularly important. I was just a, another, uh, another nail in the coffin, so to speak, as to why I chose to take them.” (High Evidence, M1). “Interviewer: Do you remember what it said? What did the study say? M: No, I don’t. I don’t really remember. It’s just that it talked about the benefits of taking it. […] Interviewer: Um, and so, why was it important to you that you read something about it? M: It wasn’t important to me. It wasn’t important at all. If I hadn’t read it, it wouldn’t have made a difference, but when I did read it, it confirmed what the other people said.” (High Evidence, M1).</td>
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<tr>
<td>Scientific</td>
<td>- Scientific evidence is not a requirement in the decision-making</td>
<td>“Interviewer: So, these um, studies, um, it’s because, you know, some people find that studies mean a lot to them, other people find that it doesn’t matter very much whether or not there’s studies. For you, um, what would you say? What would be important from the studies? F: Interesting question. Um, if they hadn’t, if the studies were not available, for me to click on and if [the websites] had not mentioned studies, the studies and so on, but they had just explained to me about Glucosamine and the benefits, then I would have been fine with that.” (Low Evidence, F9).</td>
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<td>Evidence</td>
<td>process; it provides extra information but is not a key factor</td>
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<td>influencing a participant’s decision.</td>
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<tr>
<td>Scientific</td>
<td>- Recommendations from friends/family or from a healthcare professional are more important sources of information for participants than scientific evidence.</td>
<td>“Interviewer: So, um, now for you though, how important is scientific research when you’re deciding to take a natural health product? F: Hum, it has some bearing but not, it’s not the be-all, end-all. Interviewer: Okay. As what is the be-all, end-all? F: I would say just basically referencing friends and family.” (High Evidence, F18). “F: Okay, let’s say a study like that will be close to my doctor recommending it. It would be very close.” (High Evidence, F14). “Interviewer: Have you looked at research studies on natural health products, such as Glucosamine and Chondroitin? M: No Interviewer: Okay. Um, so you haven’t. Um, any thoughts on why not? M: Because I’m a creature of habit and my doctor said to take this and my client said to take this […] Interviewer: [Would] scientific research have made a difference M: Not really Interviewer: to you? No. M: No, I go on recommendation.” (High Evidence, M6).</td>
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<td>Evidence</td>
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There were no differences observed between high and low evidence groups regarding the category of scientific evidence.
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| Research | - In general, participants consider research as ‘looking for information’— consulting friends and family, asking for advice from a health food store employee, or looking on the internet were all examples of ‘research’ provided by participants. | “Interviewer: Uh huh, so but for you though, so you know, when you do research, what does that mean? F: Asking the family, going on the internet, checking different sources, Interviewer: Uh, so when deciding to take Glucosamine? F: It wasn’t, this is basically friends and family research. Yah, what worked for them and what didn’t work for them.” (High Evidence, F18).  
“F: So if [my son] says take it, it’s good. He must have went through a lot of research with the people who already took it.” (Low Evidence, F5).  
“F: Well, I research [on the internet] and I go into Glucosamine, yah, just Glucosamine and then it comes up with, like, I could click on pages and pages, and pages and go back and, you know, go on. I mean, I could be hooked on that for a week.” (Low Evidence, F9).  
“Interviewer: So if it was a product that you don’t normally get and it was on sale F: Then I’ve have to do a little bit more research on that. Then I’d have to ask someone in the store how good it is. I would ask, uh, the, um, person in the health food store […] I’ll get some feedback from that individual […] Yes, I mean my research pretty, comprised of the fact of going to a health food store and asking, that’s part of my research. What is, going to the health food store and asking what have you got for joint pain.” (High Evidence, F15). |
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<td>- In general, participants consider research as ‘looking for information’—consulting friends and family, asking for advice from a health food store employee, or looking on the internet were all examples of ‘research’ provided by participants.</td>
<td>“Interviewer: Okay. Uh, and why is that. So, I mean, well what do you mean by research? M: Well, so I know for myself, you know, I’m not just taking word of my friend. I should read it up for myself. Interviewer: What is your idea of research? So what does that mean? M: Well it’s to go on and read and look up what it’s good for and what is in the product, you know. Interviewer: Where would you look? M: Well, I don’t know. Again as I said, I would have to ask somebody to check on the computer to pull up some things.” (High Evidence, M3).</td>
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<td>- Researching NHPs prior to self-selection gives people a sense of autonomy; they feel independent and in control of their health.</td>
<td>“Interviewer: Why is it important to be free of doctors? F: To be myself […] It makes you do research after they’ve told you something, you know, it’s time, and then they want you to monitor you on the new medicine and then before I know it […] I’m being monitored all over the place. And if I can get free, and this is a big one, the kind of orthopaedic area, um, kind of a big area to be free of for a while.” (High Evidence, F14).</td>
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<td>→ The theme of autonomy in this qualitative study was mirrored in the HVMs of the quantitative study, in that there were slightly more participants in the high evidence group who discussed it.</td>
<td>“F: and there are a lot of options out there and so I try to be a little bit informed and to be a little more pro-active when you have a little more control. There was a time when I would believe what doctors would say but sometimes I know a little more than the doctor’s on, in particular instances. […] I took the time and effort to learn a little bit, so, if I’ve done that I don’t want someone taking that away from me and treating me like I’m stupid. I don’t want that. Yah, because, because I’ve been forced to learn. Because I have many ailments. I’ve been forced to do research on my own. You know, I would listen to people, but I also kind of would read a little bit here and there on my own. […] it’s not important to be totally in control because no one ever is, and I know that’s not the question. It’s important to be, again, to be an influence in your health because so much is out of your control, so if whatever you can have control of, it’s empowering.” (High Evidence, F20).</td>
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<td>Research</td>
<td>- Researching NHPs prior to self-selection gives people a sense of autonomy; they feel independent and in control of their health.</td>
<td>“M: Um, so, you know, I guess it’s one of the few ways to deal with it in a, you know, kind of layman’s way, um, without having to, you know, go see somebody, make an appointment and, and you know sort of get the health care system involved […] Um, I don’t know, maybe just the satisfaction of, you know, sort of taking some moderate initiative as opposed to doing nothing at all about it.” (Low Evidence, M4).</td>
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<td>→ The theme of autonomy in this qualitative study was mirrored in the HVMs of the quantitative study, in that there were slightly more participants in the high evidence group who discussed it.</td>
<td>There were no differences observed between high and low evidence groups regarding the category of research.</td>
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| Friends/  | - Friends and family members were often the initial sources of information for participants, and often their only or their most important information source about NHPs. | “F: I take word of mouth sometimes, will grab me faster than something that I’m reading, or hearing on TV or you know something like that.” (Low Evidence, F2).  
“I’ll try something if I hear something word of mouth. I’ll give it a shot and see whether or not it works for me.” (Low Evidence, F2).  
“Interviewer: Um, or, I mean, unless, you know, something else is more important than word of mouth.  
F: No, word of mouth plants the seed.” (High Evidence, F7). |
<p>| Family    |                                                                      |                                                                                                                                                  |</p>
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<td><strong>Friends/Family</strong></td>
<td>- Friends and family members were often the initial sources of information for participants, and often their only or their most important information source about NHPs.</td>
<td>“Interviewer: And so why was it important to you that, um, friends of the family have recommended it? M: Well again, it’s like, it’s a trusted source, someone you know, who has benefited. It doesn’t mean that you will benefit from it but it means that they’re giving you what I feel is an honest, um, you know, account of their experience with this product. And so that would mean it’s okay while, as opposed to just reading some testimonial, anonymous testimonial on an e-mail or internet. These are people I know, people who’s opinions I trust and would be further incentive for me to get out there and find out more about the product and then ultimately go to the health food store and say, you know, what do you know about this. And which brand would you recommend.” (Low Evidence, M4).</td>
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<td>“F: and I think somebody recommending something, the same like the Bromelain, I think somebody personally that you know recommending something is, uh, probably one of the most important things, yah.” (Low Evidence, F16).</td>
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<td>“Interviewer: How did you hear about Glucosamine? M: I heard about it from somebody who actually had arthritis and they were taking it.” (High Evidence, M3).</td>
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<td>“Interviewer: Okay. And so you, okay, but you went with Glucosamine because your friend recommended it? F: Yah, that’s the only reason.” (High Evidence, F8).</td>
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<td>“M: Like I said, if my friend didn’t tell me that it worked, I wouldn’t know […] I didn’t do a search, no. I just take my friend’s word for it.” (High Evidence, M3).</td>
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<td>“F: Like if I hadn’t heard about it, I would never have thought about taking it.” (Low Evidence, F16).</td>
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<td>“I would take recommendation of a friend or a relative rather than something I read about…I think, I think it’s because it’s human contact.” (Low Evidence, F16).</td>
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<td>Friends/</td>
<td>- Friends and family members were often the initial sources of</td>
<td>“F: Um, yah, when I first, you know, when I first started taking Glucosamine about ten years ago I took the brand that my friend, colleague, you know, brought the container in and well, I just went ahead and bought the same brand.” (Low Evidence, F9).</td>
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<td>Family</td>
<td>information for participants, and often their only or their most</td>
<td>“Interviewer: Now, how did you first find out about these products? M: Um, after I was diagnosed I spoke to an older gentleman at my tennis club. Um, I have a year round club at ? that I belong to and he told me about Glucosamine and then I subsequently, you know, glanced at it on the internet and, you know, thought, hey, it’s worth a try. And then I started buying it.” (Low Evidence, M4).</td>
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<td>important information source about NHPs.</td>
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<td>- Trust was a key element of participants’ relationships with their</td>
<td>“F: If my son says take it, I’ll trust him.” (Low Evidence, F5).</td>
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<td>friends and family members that enabled them to put their faith in</td>
<td>“F: The only reason was that my friend told me it helped her and I trust her judgment with things because she’s suggested other things in the past for me to take about different things” (High Evidence, F17).</td>
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<td>recommendations from others.</td>
<td>“F: and she told me, see you know how it had relieved her pain and uh, I was just very impressed. Um, that, you know, we, I valued her opinion. I value, you know, I value that it’s not just somebody who is mouthing off about something.” (Low Evidence, F9).</td>
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<td>→ When considering advice from F/F, there are subtle elements of the</td>
<td>“F: That’s how persuasive my friend is. I never, like I guess some people always have that one friend that you go out with and it’s like you’re, you know, you get in things that you shouldn’t have but she said this would really work on me, should work on me, so that’s why it’s the reason why I tried it. […] she’s pretty, um, a kind of take charge type of person […] she had [arthritis] for a lot longer than I’ve had cause she’s older than me. Um, so I figured well, I could take her word for it […] I don’t want to hurt her feelings. As well as, um, she said it’s a very good medication, so I’ll try it.” (High Evidence, F8).</td>
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<td>relationship itself that may also push people towards following</td>
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<td>recommendations of F/F. For example, people may not want to hurt</td>
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<td>their friend’s feelings by not taking their advice.</td>
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<td>Friends/</td>
<td>- First-hand benefits of using an NHP as recounted by friends and</td>
<td>“Interviewer: So from first hand benefit. Um, and why is that important to you, that your mom has seen first hand benefits?</td>
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<td>Family</td>
<td>family of participants provided them with a sense of evidence of</td>
<td>F: I guess it’s like evidence of, at least of, an advantage to the Chondroitin and the Glucosamine rather than a lack of benefit.</td>
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<td>product efficacy and safety (more so than scientific evidence). In</td>
<td>Interviewer: And so, why is it important that there is evidence of benefit?</td>
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<td>fact, experiences of friends and family were the best source of</td>
<td>F: So why would I take it otherwise, you know, that’s, yah.” (High Evidence, F10).</td>
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<td>evidence for participants.</td>
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<td>“Interviewer: Okay. Now what did your friend tell you?</td>
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<td>F: Well, she said that she has arthritis herself. Um, she takes it and it helps and if it helped her I thought it would help me.” (High Evidence, F17).</td>
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<td>“Interviewer: Before you take something you don’t know that it’s going to offer pain relief, right? So, well what is it about the product itself,</td>
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<td>before knowing that it works, you know, that makes you take it?</td>
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<td>F: Because I have had known that it works. I’ve heard other people say that it works.” (High Evidence, F7).</td>
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<td>“Interviewer: So she said that it works and so why is it important that she said it works?</td>
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<td>F: Because, because it helps. If it works, I don’t want to just take anything that’s not going to work. It’s like, if I hear someone telling me,</td>
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<td>oh, I tried this and it doesn’t work for anything, I’m not going to bother trying it… if it worked, like I said, if it works for her, it’s</td>
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<td>probably going to work for me too.” (High Evidence, F8).</td>
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<td>“M: Well, the reason why I said, it’s helped my friend? they take it and they recommend it to me that it ?? when they take it and the pain will go</td>
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<td>away and you know it’s that effective” (High Evidence, M3).</td>
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<td>Friends/</td>
<td>- First-hand benefits of using an NHP as recounted by friends and family of participants provided them with a sense of evidence of product efficacy and safety (more so than scientific evidence). In fact, experiences of friends and family were the best source of evidence for participants.</td>
<td>“Interviewer: Why was it important that it helped your friend with her pain and joint? F: Uh, because of, when you see someone suffering and suffering with the pain, you relate to one within yourself. That’s how, you start, okay, if this it, what did you do. Or, you know, what measures, preventative measures could be taken.” (Low Evidence, F12).</td>
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<td>Family</td>
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<td>“F: if somebody tells me, somebody that I know, well go back to Glucosamine, if I’m in pain, and says to me, I found something that’s great, it’s taking my pain away, I’m all ears. What is it? So tell me, I’ll try it. Because I have the pain.” (Low Evidence, F2).</td>
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<td>“F: Well, ya, I figured if it helped her maybe it will help me.” (Low Evidence, F6).</td>
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<td>Medical</td>
<td>- Two groups of participants were observed: 1) Those who followed the advice of their physician alone, 2) Those who consulted additional information sources either before or after seeing their doctor, or because they felt that their doctor would not recommend NHPs.</td>
<td>1) “I figured if he was taking it, if the doctor was taking it, if it’s good enough for him it’s good enough for me.” (High Evidence, M1). “I want to show him that I respect what he is recommending me to do, come back and say, yes, this is the, what I’m trying it isn’t helping me and I’m improving or not, and then, you know, he can make another recommendation.” (Low Evidence, F4).</td>
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<td>Doctor</td>
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<td>2) “So, I mean, um, I, I, it’s not that I do not listen to my doctors or I don’t, um, value their input, it is that I view it as a consulting opinion that they are giving to me […] I use that to, as a screening board to sort of do my own research […] I can’t rely solely on my GP’s, um, opinion.” (Low Evidence, M5).</td>
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<td>“F: Uh, this I just when the doctor said Glucosamine to her I went and searched. So when I was reading the internet it gave me the information that how, it’s not, um, there’s no harm.” (Low Evidence, F12).</td>
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There were no differences observed between high and low evidence groups regarding the category of F/F.
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| Medical    | Trust was a key element of participants’ interactions with their doctor, and their respect for the doctor's experience/knowledge base enabled them to put their faith in recommendations from their MD. | “M: he’s family doctor, and has been for thirty years. I mean, I trust what he says to me, what he tells me. I don’t think I’ve ever questioned anything he ever says to me.” (High Evidence, M1). \[15]  
“F: I value what knowledge you are giving me and I will try something. […]”  
Interviewer: Yah. So you trust their knowledge and their education.  
F: Oh, definitely.” (Low Evidence, F4). \[15]  
“M: Well, I mean, you do want the comfort of knowing that, uh, a qualified professional is giving you advice and guidance. So, I mean, I, I would probably be foolish to ignore the advice of, you know, experts in her field.” (Low Evidence, M4). \[15]  
“F: And all the, I mean I do hear that there have been studies and that, that’s there’s no effectiveness, but I don’t believe that because I’m taking it and it’s been effective for me.  
Interviewer: Um, so you, you also have come across studies?  
F: Well, I’ve heard of studies. I mean my doctor mentioned the studies. You know, and that there was a study and one group took Glucosamine and, I don’t know whether it was Glucosamine and Chondroitin together, but there was not, and another group took a placebo and it, you know, I’ve heard of these studies.” (High Evidence, F15). \[15]  
“F: at the time [doctors] couldn’t really talk about too many alternative things. Now they do. But there was a time where he could, you know, I can’t say this. Because there haven’t been no real studies. But now they are a lot of studies” (High Evidence, F20). \[15]  
“F: But I know a lot of people, there’s anecdotal evidence but they are not a lot of studies, kind of thing. Uh, but there’s a lot of anecdotal evidence and or they’ll say, you know, one of my patients does really well with it.” (High Evidence, F20). |
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<td><strong>Medical Doctor</strong></td>
<td>- The doctor served as a substitute source for participants to obtain information about scientific evidence, if they knew that their doctor was knowledgeable about research, rather than looking into scientific evidence themselves.</td>
<td>“Interviewer: So why is it important to you that you heard about it from your GP? F: Um, well I trust her. She’s fairly young and she does keep up with research and journals and she is very well connected with people at the U of T and different hospitals […] she always has my best interest in mind.” (High Evidence, F11).</td>
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<td><strong>Medical Doctor</strong></td>
<td>- Participants who discussed their doctor quoting scientific evidence usually recalled the information from their physician as being negative or neutral.</td>
<td>“F: And [the doctor] said, well it’s not a product that really works. The doctor, he told me it’s, I could take a placebo pill, it would the same way, so it would be, I guess […] he didn’t say it was bad. Don’t take it, it’s going to do negative things. He just said, it has no value.” (Low Evidence, F2). “I brought it up in the conversation […] and then [the doctor] mentioned, well, it’s been tested with individuals in the past with no effect.” (High Evidence, F15).</td>
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<td></td>
<td>There were no differences observed between high and low evidence groups regarding the category of MD.</td>
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<td><strong>CAM Provider</strong></td>
<td>- Trust was a key element of participants’ relationships with their CAM provider, and their respect for their HCP’s experience/knowledge base enabled them to put their faith in recommendations from their CAM provider.</td>
<td>“F: so if [my Naturopathic doctor] says it’s good, I’m taking it, that’s all. Cause I don’t, I haven’t read up on it. […] if you are with a doctor and he says it’s good, then you just have to trust them.” (High Evidence, F10).</td>
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<tr>
<th>Topic</th>
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<th>Supporting Quotes</th>
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<td>CAM Provider</td>
<td>- Trust was a key element of participants’ relationships with their CAM provider, and their respect for their HCP’s experience/knowledge base enabled them to put their faith in recommendations from their CAM provider.</td>
<td>“M: if you’re a doctor in natural medicine, you’d obviously have to believe in it. Right. So, there’s no question about, um, I’m not saying you would recommend it. You may not recommend it so, but if, so if you said to me, uh, you know, take Glucosamine that would be enough for me. Interviewer: Okay. You would trust M: Natural medicine, you should know what you’re doing.” (High Evidence, M1).</td>
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<tr>
<td>CAM Provider</td>
<td>- Although the majority of participants in the low evidence group did not discuss seeing CAM providers, it seemed as though they would value a CAM opinion.</td>
<td>“M: I have not, you know, I never, I didn’t see a naturopath for this, um, it was strictly through my GP and just word of mouth what I heard. And generally away from food, um, and sometimes away from other herbal products, um, I mean, I’ve had almost no contact whatsoever with naturopathic professionals other than in a pharmacy and a one time counsel I had which was not related to this product at all. Um, so, it struck me over the years that I probably should be seeing a naturopath to sort of be able to give me more professional advice about how to take herbal products and when to take them.” (Low Evidence, M5). “F: You’re working in this field and you say, you know, there’s a pill out there called Glucosamine. I really think you should try it, that it might help you [...] you know, I’ll try it.” (Low Evidence, F2).</td>
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More people in the high evidence group received advice from a CAM provider than those in the low evidence group.
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| **Other HCP** | - Trust was a key element of participants’ relationships with a HCP (physiotherapists, vets, and nurses were discussed in particular), and it was their respect for the HCP’s experience/knowledge base that enabled them to put their faith in recommendations from these people. | “F: I decided because I thought if [the pharmacist and the physiotherapist] recommended it must be good. [...] I just trusted them and I thought if they recommend I mean it must be something that will help me.” (High Evidence, F19).  
"F: I believe that [the vet] believed [that Bromelain] was a good thing. They weren't just saying it. They were trying, I think they work for horses and they, this was something that I felt they had experience of. ... I think they were very pleased to have a natural health product that they could give their horses." (Low Evidence, F19). |
| **Pharmacist** | - Trust was a key element of participants’ relationships with a pharmacist, and their respect for the pharmacist’s experience/knowledge base enabled them to put their faith in recommendations from these HCPs. Participants value a pharmacist’s opinion when making a decision to use NHPs. | “M: I trusted him, mostly for his knowledge. Cause he’s a pharmacist.” (High Evidence, F19).  
“M: I rely on the pharmacist to give me information concerning anything that I’m going to take.” (High Evidence, M1).  
“M: sometimes I would ask a pharmacist. Uh, not only for medication but for herbal products because a lot of pharmacists now are, are familiar with herbal remedies as well. Um, so a pharmacist would be one other source” (Low Evidence, M5). |
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| HCP         | Information obtained from HCPs was often the only source of information for participants, or served to confirm what they had heard through word-of-mouth. | “F: I trusted [the physiotherapist and the pharmacist] and I started using it and when I need it I take it and that’s about it. I did not, um, look for or ask other people what do you think, did you use it. No, I did not do any other research.” (High Evidence, F19).  
“Interviewer: You would trust the, um, the health care provider, so whether it was a family doctor, your radiologist, pharmacist, 
M: Any, yah, any, any person that might supposedly have a better knowledge of it than myself. 
Interviewer: Right. And you would go with that information first, rather than actual reading material. 
M: Yah” (High Evidence, M5).  
“F: I do listen to professionals because they know far more than I do.” (High Evidence, F19). |
| Health Food Store | Advice from an employee at a health food store was often obtained in conjunction with information from other sources, and was less widely used by participants. | “I think, more on word of mouth from people or from trusted staff at a health food store than articles, simply because frankly it’s much easier to get the advice or information from a person than it is to sift through tens of thousands of things you pull up on Google.” (Low Evidence, M5).  
“M: Um, I guess I had done some reading initially and spoke to my then GP who suggested trying, not this specific brand, but suggested trying Glucosamine and um, Chondroitin. Uh, and uh, this particular brand came to me because I had a health food store that I frequent and they recommended this particular brand. It’s okay.” (Low Evidence, M5). |
| Internet    | The internet was rarely used as a sole information source. It was discussed as being a useful tool for learning more about a product, and was a common source of scientific evidence for those participants who consulted scientific research. | “Interviewer: Okay. You find the internet very useful. Um, and why do you say that? Why is the internet very useful? 
F: Because you can find a lot of information in a very short period of time and get a wide range of answers […] It’s fast and there’s access to a lot of different experts. It’s amazing the information you can get off the internet, university studies and stuff like it’s amazing what you can find, what you can track down.” (High Evidence, F7). |
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<th>Topic</th>
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<tr>
<td>Internet</td>
<td>- The internet was rarely used as a sole information source. It was discussed as being a useful tool for learning more about a product, and was a common source of scientific evidence for those participants who consulted scientific research.</td>
<td>“F: I do a lot of research on the internet. Everything, a lot of health, a lot of health matters […] To be more informed, more knowledgeable. Uh, just to make sure that there’s nothing harmful in what they’re selling.” (Low Evidence, F13).</td>
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<td></td>
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<td>“Interviewer: Right. And so, um, how much does this information that you gather on the internet, how did that influence your decision? F: Um, I think, I read and heard and I just want confirmation on certain things and it’s just one avenue to take, of other opinions.” (High Evidence, F15).</td>
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<td></td>
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<td>“F: I like to make an informed decision, uh, even though the chiropractor really swayed me, uh, cause I kind of made up my mind, from him, uh, um, but uh, but I do also like to follow up and read up about stuff or go on the internet and that sort of thing. I enjoy it. I enjoy information like that.” (High Evidence, F20).</td>
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<td>“Interviewer: Why is it important in your decision making process, though that you read about something first? M: Right. Well it kind of re-enforces, um, your, uh, decision to keep taking these supplements, you know, provides a certain level of, you know, peace of mind and you know psychological comfort to get that re-enforcement. Um, and oftentimes on these sites, you know, you’ll get, you know, physicians or whatever, you know, adding their input and that adds credibility and you know, so, um, you know, it’s good re-enforcement, I would say, for the decision to, um, take the supplement.” (Low Evidence, M4).</td>
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<tr>
<td>Media</td>
<td>- The media was rarely used as a sole information source. Newspapers and magazines were often sources of information used by participants, along with TV. (Note that there may have been slightly more emphasis on TV/advertisements in the low evidence group.)</td>
<td>“F: I did get the heads up from my doctor and I did get the heads up from reading it in a health magazine.” (High Evidence, F4).</td>
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<td>“F: the articles were fairly objective about, you know, what was good for you. F: And what you should be doing, so it all makes, adds up to making you believe that they are a firm that you could have confidence in.” (Low Evidence, F16).</td>
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<td></td>
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<td>“F: Oh, TV would be also something I would it would peak my interest to maybe look into it further.” (Low Evidence, F2).</td>
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<tr>
<td>Media &amp; Internet</td>
<td>- Participants often sought reliable, objective sources of information when making a decision to use NHPs. (Note that there may have been a few more participants who mentioned that they value reliable information sources in the high evidence group).</td>
<td>“F: But don’t believe everything you read […] I try to look at the source of the literature a little bit more […] more sort of trustworthy and uh, more objective.” (High Evidence, F20).</td>
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<td></td>
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<td>“Interviewer: About the sites, so about F: Oh, um, I guess maybe they didn’t have enough, some of them didn’t really have enough medical or scientific explanations […] maybe they were too general.” (High Evidence, F11)</td>
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<td>“F: I think the article read […] just in some studies that say that this product is better, has some good, not product but this item, this Glucosamine, has proven to do this…in the magazines as well. Cause they’re medical magazines, um, not too much of those. I’d like to see more of those […] Yah, I’d like to see more of that type of thing in there.” (High Evidence F14).</td>
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<td>“Interviewer: Right. How easy was it for you to find, um, scientific research on Glucosamine? F: Not that easy. Not that easy. A lot of times it’s, the articles are brief and fluffy, you know, not enough in there. I’d like to see more.” (High Evidence F14).</td>
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<tr>
<td>Topic</td>
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<td>Supporting Quotes</td>
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| Media & Internet | Participants often mentioned that they never heard or read of any negative effects of taking NHPs (especially Glucosamine and Chondroitin), but that if they did learn of a particular safety issue or had heard of one prior to taking the NHP, (namely a side effect) that it may affect their decision to take it. | “F: I don’t know of any side effects, I’ve not heard of any or read of any with Glucosamine and Chondroitin.” (High Evidence, F15)  
“M: No, from what we read there’s no side effects, so you know […] It’s safer because, like I said, there’s no side effects.” (Low Evidence, M2).  
“M: if it said that Glucosamine over a much longer time would affect your liver, I would stop taking it. Or if affected your heart or affected your lungs […] I would stop taking it. It seemed like it confirmed that it was not harmful for me.” (High Evidence, M1).  
“M: And I’ve asked, you know, whoever I’ve seen, you know, what their opinions were, you know, about these supplements and the general consensus seems to be that, you know, they work for some people and um, for other people they don’t but it’s probably, you know, not harmful to take it in any case. So, you know, the general feedback seems to be neutral to somewhat positive on the benefits of taking them, these supplements. […] I have never heard of anyone having any problems from taking it. I mean, you know, there’s never been anything in the media. I’ve never heard it from a health care professional or otherwise that would cause me any concern or reason to believe that there were any side effects, so, um, you know, I’m quite positive that they’re safe.” (Low Evidence, M4). |
6.2 Figures

6.2.1 Figure 1: Letter of approval to recruit participants from the North York Seniors Centre

Emily Jaarsma  
Director, Active Living Centre  
North York Seniors Centre  
21 Hendon Ave  
North York, ON, M2M 4G8  
Tel: (416) 733-4111 ext:20  
Email: ejaarsma@nyseniors.org  
Date: July 23, 2008

Dear Ms. Tsui:

Re: Approval for use of North York Seniors Centre as a recruitment centre for your osteoarthritis natural health product study

Further to our discussion, I am pleased to support your MSc study on osteoarthritis and natural health products by allowing recruitment of your interview participants at the North York Seniors Centre (NYSC).

You may display approved flyers in designated areas of the NYSC and include an advertisement via the NYSC monthly email bulletin to circulate to our membership of approximately 300 seniors.

Subject to availability, you may use a room for your interviews at no cost.

On completion of your study, I ask that you share the results and any published materials with NYSC and the study participants.

Yours sincerely,  
Emily Jaarsma
6.2.2 Figure 2: U of T Ethics initial approval

The following consent documents (received January 26, 2009) have been approved for use in this study:
- Recruitment Poster
- Study Information Letter
- Consent Form

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events should be reported to the Office of Research Ethics as soon as possible.

Please ensure that you submit an Annual Renewal Form or a Study Completion Report at least 30 days prior to the expiry date of your study.

Best wishes for the successful completion of your project.

Yours sincerely,

Daniel Gyewu
Research Ethics Coordinator
6.2.3 Figure 3: U of T Ethics amendment approval

University of Toronto
Office of the Vice-President, Research
Office of Research Ethics

PROTOCOL REFERENCE #23773
June 11, 2009

Dr. Heather Boon
Pharmaceutical Sciences
Leslie Dan Faculty of Pharmacy
144 College SL
University of Toronto
Toronto, ON M5S 3M2

Ms. Teresa Tsui
Pharmaceutical Sciences
Leslie Dan Faculty of Pharmacy
144 College SL
University of Toronto
Toronto, ON M5S 3M2

Dear Dr. Boon and Ms. Tsui:

Re: Your research protocol entitled, "Natural Health Product (NHP) Decision Making in Osteoarthritis" (Amendment received June 8, 2009) by Dr. H. Boon (supervisor), Ms. T. Tsui (Master's student)

We are writing to advise you that a member of the Health Sciences Research Ethics Board has granted approval to an amendment (received June 8, 2009) to the above referenced research study under the REB's expedited review process. The amendment will add recruiting at community seniors organizations in addition to the North York Seniors Centre.

The following documents (received June 8, 2009) have been approved for use in this study: Advertising Posters and Screening Questions.

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events should be reported to the Office of Research Ethics as soon as possible.

Best wishes for the successful completion of your project.

Yours sincerely,

Mariana Richardson
Research Ethics Coordinator
6.2.4 Figure 4: U of T Ethics renewal letter

UNIVERSITY OF TORONTO

PROTOCOL REFERENCE #23773

March 1, 2010

Dr. Heather Boon
Pharmaceutical Sciences
Toronto General Hospital
University Health Network
200 Elizabeth St. EN14-207
Toronto, ON M5G 2C4

Ms. Teresa Tsui
Pharmaceutical Sciences

Dear Dr. Boon and Ms. Tsui:

Re: Your research protocol entitled, “Natural Health Product (NHP) Decision Making in Osteoarthritis” by Dr. H. Boon (supervisor), Ms. S. Tsui (Master’s student)

ETHICS APPROVAL

Original Approval Date: February 17, 2009
Expiry Date: February 16, 2011
Continuing Review Level: 1*
Renewal: 1 of 4

We are writing to advise you that you have been granted annual renewal of ethics approval to the above-referenced research study through the REB’s delegated process. Please note that all protocols involving ongoing data collection or interaction with human participants are subject to re-evaluation after 5 years. Ongoing projects must be renewed prior to the expiry date.

Please ensure that you submit an Annual Renewal Form or a Study Completion Report 15 to 30 days prior to the expiry date of your study. Note that annual renewals for studies cannot be accepted more than 30 days prior to the date of expiry, as per federal and international policies.

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events should be reported to the Office of Research Ethics as soon as possible. If your research has funding attached, please contact the relevant Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your project.

Yours sincerely,

Marianna Richardson
Research Ethics Coordinator

Do you have osteoarthritis?

Do you use any of the following natural health products to treat your osteoarthritis?

- Bromelain
- Chondroitin
- Glucosamine
- MSM

You may be eligible to participate in an interview to understand how people make decisions about natural health products.

Participants who complete the interview will be compensated.

Please contact Teresa:
(416) 978-6951
nhp.study@gmail.com
Osteoarthritis – Natural Health Product study
Please contact Teresa at (416) 978-6951
nhp.study@gmail.com

Osteoarthritis – Natural Health Product study
Please contact Teresa at (416) 978-6951
nhp.study@gmail.com

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nhp.study@gmail.com
6.2.6  Figure 6: Screening Questions for Recruitment

Factors Influencing Consumer Choice of Natural Health Products (NHPs) in Osteoarthritis

Thanks for calling today.

1. Have you experienced symptoms of osteoarthritis in the last 3 months?
   • Yes – continue with questions
   • No - “Thank you very much for your call, but you do not qualify for the study. Goodbye.”

2. Do you currently (or did you previously) work outside the home? If so, what is/was your occupation?
   • If the caller’s work falls into one of the professions excluded from the sample (health care providers - including physicians, pharmacists, nurses, naturopathic practitioners and students training for these professions – and employees of pharmaceutical and NHP sectors) recruiter says, “Thank you very much for your call, but you do not qualify for the study. Goodbye.”

3. Have you ever attended the naturopathic clinic at North York Senior Centre?
   • If “yes”, they will have to be excluded from the study. Recruiter says “Thank you very much for your call, but you do not qualify for the study. Goodbye.”

4. Have you used natural health products such as herbal medicines or supplements to treat your osteoarthritis in the last year?
   • Yes – continue with questions
   • No - “Thank you very much for your call, but you do not qualify for the study. Goodbye.”

I am going to read a list of products, please let me know if you have used any of the following in the last year (See Table 1c).
Table 1c: List of NHPs in alphabetical order
(Read first column to participants during screening telephone call -- for file use only)

<table>
<thead>
<tr>
<th>NHP</th>
<th>Level of evidence supporting use</th>
<th>Ever used</th>
<th>Participant’s evidence category – to circle one (to be transferred to Table 4)</th>
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</thead>
<tbody>
<tr>
<td>Bromelain</td>
<td>Traditional/insufficient evidence</td>
<td></td>
<td>High Use of NHP in evidence level A or B only</td>
</tr>
<tr>
<td>Chondroitin</td>
<td>A</td>
<td></td>
<td>or C or traditional/insufficient evidence only</td>
</tr>
<tr>
<td>Glucosamine</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSM</td>
<td>C</td>
<td></td>
<td>Low Use of NHP in evidence level A or B and C or traditional/insufficient evidence or C or traditional/insufficient evidence only</td>
</tr>
</tbody>
</table>

If the caller falls within a category with enough participants (See Table 3 below): “I already have a lot of people like yourself who would like to participate. I would like to put your name on a waiting list so I can call you if someone else can not participate.”

If the caller does qualify for the study: “I would like to invite you to participate in a 1 hour interview. We are able to offer you a $50 honorarium for your participation.”

If the caller declines: “Thank you very much for your time. Goodbye.”

If the caller accepts: “You will be participating in a 1 hour interview, which will be audio taped, during which you will be asked about your use of natural health product pain aids to treat your osteoarthritis symptoms. I would like to forward you a copy of the consent form and study information letter in advance, as well as a map of the location of the interview. How would you like to receive this information, by mail or email? Please provide me with a contact address.

I would like to schedule you for an interview. The interview will take place at (location – default is the NYSC). What dates/times are you available during the week of (X)? May I have your phone number so that I can call you to remind you about the interview 2 days prior?
When you arrive for the interview, the interviewer will review your rights and responsibilities as a participant, and she will obtain written, informed consent from you at that time. You will be given a copy of the consent form to keep for your records.

You will receive a $50 honorarium for participating in the research. The honorarium will be paid by a gift card, and you will receive it on the same day after you have completed the interview.

If you find you are unable to attend the interview, or have any questions about the research in the meantime, please contact me at (phone and email of research coordinator).

Thank you and goodbye.”
Dear Name:

What is the purpose of this study?
The magnitude of natural health product (NHP) use by North Americans has been increasing over time. NHPs are products derived from ingredients found in nature that are sold over the counter for medical purposes (3). With over 30% of individuals using NHPs for osteoarthritis-related pain, it is important to understand why individuals self-medicate with NHPs for this condition. This project aims to understand how people make decisions about NHPs. This project is part of a Masters thesis and we are aiming to recruit between 20-25 participants.

Who is eligible for this study?
To participate in this study you must be under the age of 80 years and have a diagnosis of osteoarthritis of any joint for at least the last three months. You must have taken a natural health product with the ingredients glucosamine, chondroitin, MSM or bromelain to treat your osteoarthritis

When and where will the study take place?
We will collect data for this study through your participation of a semi-structured interview held at the North York Seniors Centre.

Who is being asked to take part and what will they do?
We are interested in how individuals with osteoarthritis like you make decisions about NHPs. We will interview you and our interview will last up to 1.5 hours long. This interview will be recorded and transcribed verbatim.

What do I do if I do not want to participate?
Your participation in this study is voluntary. If you choose to withdraw from this study at any time, there will be no consequence.

What are the risks and benefits of the study?
The study has minimal risk and your participation is voluntary. You are not required to answer any questions that you do not want to and your decision to participate or not participate will not affect your personal or professional life. At any time in the study, you have the right to withdraw from the study with no adverse consequences.
A potential benefit is that you may find the interview interesting. You will be contributing to the research of NHP self-medication decision-making. After completing the interview, you will be offered a $50 gift card from one of these five places of your choice: 1. Loblaws, 2. Metro, 3. Chapters, 4. Tim Hortons, 5. Cadillac Fairview. Please inform Teresa at least 48 hours before your interview date which gift card you would like to receive and it will be available to you after the interview.

If you withdraw from the study before completing the interview, unfortunately we can not offer you the gift card.

A potential risk is that you will be asked to think deeply about why you have chosen specific NHPs and this could be exhausting for some individuals. At any time during the interview, please let me know if you would like to take a break and resume the interview if you choose to continue.

Is the study confidential?
Yes. All the data collected will be kept strictly confidential by the research team. Your name will not be used at any stage of the data analysis process. You will be given a unique identifier code to ensure your privacy. If any names are mentioned in the interview, they will be removed from the transcriptions. All data will be kept on a secure computer and access to the computer will require a password that is only known by the Research Coordinator and her supervisor. The completed interview schedules, transcriptions and audiotapes will be stored in a secure locked cabinet. No information will be released or printed that would disclose any personal identity.

Quotations from the interview transcripts may be used in the final report. To ensure confidentiality, no names or identifying information will be presented in the quotations. The final report may be submitted for publication in a peer-reviewed journal.

What if something new comes up during the study that may affect my participation?
You will be notified if anything comes up during the course of this research which is not included in this information sheet that may affect your decision to participate in the study.

Will I be compensated for participating in this study?
You will be offered a $50 gift card upon completing the interview to compensate for your time and travel expenses.

What are my rights as a participant?
If you have any questions about your rights as a participant, please contact: Jill Parsons, Ethics Review Officer, Ethics Review Office, by telephone: (416) 946-5806 or by email: jparsons@utoronto.ca.
Your participation is very important to the study and we hope that you will agree to take part. Please keep the information sheet and a copy of the informed consent for your own records.

Sincerely

Teresa Tsui, ND, MSc student
Tel: (416) 978-6951
teresa.tsui@utoronto.ca

Heather Boon, BSc Phm, PhD
Associate Professor
Leslie Dan Faculty of Pharmacy
144 College St.
Room 635
Toronto, ON, M5S 3M2

Tel: (416) 946-5859
heather.boon@utoronto.ca
Consent Form
Study: Natural Health Product Decision Making in Osteoarthritis.

I have read the attached information letter, and the nature of the study has been explained to me. I agree to participate in the study described. I understand that the interview will be tape recorded. All questions will be answered to my satisfaction.

I understand that any information that I provide for the study will be kept confidential by the research team. I understand that all audiotapes and transcripts from the study will be stored in a locked cabinet and any identifying names or information will be removed from the interview transcripts.

I understand that quotations from interview transcripts may be used in the final report, and that no names or identifying information will be presented with the quotations.

I understand that my participation in this study is voluntary and that I have the right to withdraw at any time.

I understand that I will be offered a gift card of $50 for my participation from one of five agreed-upon companies.

Date: ________________ (to be dated by participant)
  (month, day, year)

Signature of participant: ________________________________________________________

Printed name of participant: ____________________________________________________

Date: ________________ (to be dated by individual obtaining consent)
  (month, day, year)
Factors Influencing Consumer Choice of Natural Health Products

Introduction:

- The purpose of this interview is simply to understand how you view and perceive products in dealing with your osteoarthritis symptoms.
- There are no right and wrong answers.
- Some of the questions may seem obvious or repetitive; however I am required to ask them as part of the interview process, even if it seems to be a repeat since I cannot assume what your answer will be.
- Do you mind if I tape record the interview as a back up for my notes to ensure accuracy?
- I want to remind you one more time before we begin that you can refuse to answer any question and that, if you feel uncomfortable or no longer wish to continue at any time, you may do so without giving a reason.
- Do you have any questions before we get started?

Part I: General Questions concerning osteoarthritis.

1. In the screening process for this interview you confirmed that you have had osteoarthritis for the last year. Would you be able to say for how long a time you have been experiencing symptoms associated with osteoarthritis?

Provide space to write down the answer to this open-ended question.

2. On a scale of 0-10 where 10 = worst, on average, how bad have your arthritis symptoms been in the past month?

Provide space to write down the answer to this verbal analogue rating of pain.

3. Over the telephone, you mentioned that you have used some of the following NHPs for the treatment of osteoarthritis (interviewer to show participant list and to get confirmation). Please tick all those that apply:
Table 2: List of NHPs in alphabetical order – presented to participants during interview

List of Natural Health Products

Initials: Date:

(Please tick all those that apply)

<table>
<thead>
<tr>
<th>NHP</th>
<th>I have used this for my osteoarthritis symptoms</th>
<th>I have heard of this but never used it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bromelain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chondroitin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucosamine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Starting with the first NHP on the this list that you have used, can you tell me what it is that you like about it, i.e. the reasons why you buy it, and what you do not like about it?
[Interviewer instruction: After having elicited the salient attributes for a remedy, ask the next question:]

5. For the next remedy on the list you have used, can you tell me what it is that you like about it, i.e. the reasons why you buy it, and what you do not like about it?
And the third?
And the fourth?....(until all mentioned remedies are probed)

After doing all the ones they have used, ask about ones they have heard of, but not tried – find out what good things they have heard and why they have not tried it.
Provide a separate page to write down the positive and negative attributes of each remedy. After having completed this, you have a list of attributes from which you can start the actual laddering interview. Only list each attribute once – for example, if taste comes up as an attribute relevant to several remedies, only record it once.
Part II: Laddering

1. Now that you have described to me which attributes of a remedy for your osteoarthritis symptoms are important to you, can you please indicate, which of the factors on the list is the most important to you, which one the second most important, and the third and so forth for each item?

   Interviewer instruction: Hand over list of attributes and ask respondent to write down the rank next to each item.

2. I am now going to ask you some more questions to try and discover what it is about them that make them important to you. I will ask several questions relating to each attribute before continuing on to discuss the next one. Please answer each question even if they seem repetitive so that the results will be valid.

3. Interviewer instruction I: Start with the first item on the list. If an attribute/consequence/value is ambiguous, do the reverse laddering: What do you understand by (attribute X)? Is this a positive characteristic? And what would be the opposite that you would not prefer?

   Interviewer instruction II: If the item on the list is unambiguous, e.g. because it has been mentioned and described before, then proceed directly to laddering.

   Provide a separate page to write down the attribute definitions provided by the respondent.

   Probe fully by asking the question: “Why is that important to you?” or use variations of this question to avoid loss of interest due to repetition:

   Why did you mention that specifically?
   Why does this concern you?
   Why do you think that came to mind?
   What does that mean to you?
   How does that make you feel?
   What would happen if the attribute (or consequence) was not provided/supplied?
   Why is that important?
   Why is that important to you?
Why was it important the last time you bought or preferred product X? Why is it important?

Continue to probe until you have elicited all consequences and values for that attribute and exhausted the ladder or until the respondent is unable to provide a meaningful answer or to provide an answer at all to the probe.

Here is how to deal with problems occurring during the interview:

a) Respondent doesn’t know an answer:
   - Evoking situational context: Try to think about it in relation to the most recent purchase or consumption occasion. Did this consideration play any role there?
   - Negative laddering type a), postulating the absence of a preferred attribute or consequence: What would you miss if that outcome wasn’t there?
   - Negative laddering type b), focusing on the non-preferred attribute or consequence: Why don’t you like pain medicine pills?
   - Age/time regression contrasting: Is there a difference in your decision making compared to just a couple of years ago?

b) The interview touches a sensitive area:
   - Defer to later point in time? If you don’t feel like talking about this right now, we might do so later and for now move on with the next step in the interview process.

c) Unclear or incomplete answers:
   - Reverse laddering: What exactly do you mean? I am not sure I understood? Would you mind explaining to me more closely or describing what you just said in a different way?

d) Forked answers (respondent mentions more than one reason why previous concept is important to him or her):
   - For soft laddering: Write down all concepts, while respondent continues (probably with the most important one). After respondent has finished, check whether s/he has elaborated on all concepts. If not, return to those not elaborated and probe again, reassuring first that these concepts are relevant or important.
   - Independent from laddering style: Reverse laddering might reveal multidimensional meaning of a concept/item. Proceed as under hard laddering.

Continue this process with the next most important attribute and then continue until all attributes have been laddered and the consequences and values for that attribute and exhausted each ladder.

Provide a separate page to write down the consequences and values associated with each attribute on the list. After that you have completed the actual laddering part of the interview.
Part III: Role of evidence in decision making

How did you find out about natural health products you decided to use?

How did you decide which information was useful to your decision?

What were the most important factors that affected your decision to use or not use natural health products?

Tell me about how scientific evidence as a factor influences your decision to use natural health products.

(Adapted from interview guide from (5))

We have now finished the in-depth part of the interview. Thank you very much so far. I would like to ask a few questions about you that will help us better understand the data we are collecting, pointing out again that all answers are voluntary. If you don’t mind I would like to pass on this one sheet to you and ask you to fill it out. Or if you prefer, I can read out the questions and we can fill them out together. If you have any questions, please ask.
Part III: Demographics

1. Please circle your gender: Male   Female

2. In which year were you born? __________________

3. Canadians belong to many ethnic and cultural groups. To which ethnic and cultural groups do you belong? (PLEASE CIRCLE AS MANY AS APPLICABLE)

   A  Aboriginal (e.g., North American Indian, Metis, Inuit)
   B  North American (i.e., Canadian or American)
   C  European
   D  Chinese, Japanese
   E  South Asian (e.g., East Indian, Pakistani, Punjabi, Sri Lankan)
   F  South East Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)
   G  Arab/Middle Eastern (e.g., Armenian, Egyptian, Iranian, Lebanese)
   H  African, Caribbean
   I  Filipino
   J  Latin American (including Central America)
   K  Other (please specify):

4. What is your highest level of education?
   There are 8 choices:

   ___ Grade 8 or less
   ___ Grade 9-13
   ___ Apprenticeship (for example electrician)
   ___ College Diploma
   ___ University Undergraduate Degree
   ___ University Graduate Degree
   ___ Don’t know
   ___ Other (Please specify):

5. Please circle the letter that includes your household net income

   A  Under $25,000
   B  $25,000 - $49,000
   C  $50,000 - $74,000
   D  $75,000 or above

6. Do you have extended health insurance in addition to OHIP coverage? YES
   NO
   If yes, go to question 7. If no, go to question 8.

7. Does or would your health insurance plan cover remedies for your osteoarthritis symptoms not prescribed by a doctor? YES
NO

8. Have you used natural health products to treat your osteoarthritis for:
   a. Less than 6 months
   b. 6 months or more

9. When selecting a natural health product, how important is the role of scientific evidence supporting its use?

   On a scale of 1-10 where 10 is the most important, please give me a number.

10. How would you rate your average health?

   On a scale of 1-10 where 10 is the best state of health you could be in, please give me a number.

   Thank you very much for your participation. Please feel free to contact me if you have any questions.
6.2.10 Figure 10. Caspi et. al.’s interview guide:

Example Interview Prompts and Clarifying Questions (17).
What led you to decide to use alternative medicine?
What sources of information do you often rely on when making decisions about health care treatments?
What were the things you have considered when deciding to use or not use alternative medicine?
How do you decide who or what you trust related to health care information?
Could you explain what you specifically did when you consulted with friends before making a decision to use or not to use alternative medicine?
What are your expectations of the health care treatments you select?
Do you feel that you make health-related decisions any way differently than other decisions in your life?
When you say that there’s “nothing to lose,” what do you mean?
6.2.11 Figure 11: Everyone Hierarchical Value Map

Cut-Off=5

Quality of life (84%)

Activity of daily living (100%)

Healthy (72%)

Mood (60%)

Social activity (36%)

Mechanism of action (52%)

Decrease in pain (100%)

Decrease in side effect (92%)

Compliance (64%)

Convenience (44%)

Absorption (44%)

Dosage form (60%)

Taste (36%)

Quality brand (48%)

Combination product (48%)

Natural source (60%)

Non-HCP endorsed (56%)

HCP endorsed (48%)

Scientific evidence (52%)

Everyone N = 25
6.2.12 Figure 12: High Scientific Evidence Hierarchical Value Map

Cut-Off=3

Natural way of living

Mood (62%)

Quality of life (92%)

Healthy (85%)

In control (23%)

Independence (54%)

Activity of daily living (100%)

Decrease in pain (100%)

Decrease in side effect (92%)

Mechanism of action (54%)

Taste

Quality brand (54%)

Combination product (38%)

Natural source (62%)

Non HCP endorsed (54%)

HCP endorsed (54%)

Scientific Evidence (46%)

Absorption (46%)

Convenience

Compliance (62%)

Dosage form (62%)

High evidence

N = 13
6.2.13 Figure 13: Low Scientific Evidence Hierarchical Value Map

- Cut-Off=3
- Low evidence
  N = 12

- Natural way of living (33%)
  - Absorption (42%)
    - Dosage form (58%)
  - Mechanism of action (50%)
  - Convenience (42%)
    - Taste (50%)
  - Compliance (67%)
    - Decrease in side effect (92%)
  - Decrease in pain (100%)
    - Activity of daily living (100%)
  - Increase in quality of life (75%)
  - Quality brand (42%)
    - Combination product (58%)
  - Healthy (58%)
  - Non-HCP endorsed (58%)
  - HCP endorsed (42%)
  - Scientific Evidence (58%)
  - Independence (67%)
  - In control
  - Social activity

- Natural way of living (33%)
  - Absorption (42%)
    - Dosage form (58%)
  - Mechanism of action (50%)
  - Convenience (42%)
    - Taste (50%)
  - Compliance (67%)
    - Decrease in side effect (92%)
  - Decrease in pain (100%)
    - Activity of daily living (100%)
  - Increase in quality of life (75%)
  - Quality brand (42%)
    - Combination product (58%)
  - Healthy (58%)
  - Non-HCP endorsed (58%)
  - HCP endorsed (42%)
  - Scientific Evidence (58%)
  - Independence (67%)
  - In control
  - Social activity
6.2.14  Figure 14: Everyone Hierarchical Value Map with added links, direct and indirect links

Cut-Off=5

Everyone
N = 25

Key for HVMs with added links
(direct, indirect links)

→ links from MECanalyst

------> added links that meet the cut-off and in the scientific evidence decision-making chain

Absorption (44%)

Dosage form (60%)

Taste (36%)

Quality brand (48%)

Combination product (48%)

Natural source (60%)

Non-Health Care Provider endorsed (56%)

Health care provider endorsed (48%)

Scientific Evidence (52%)

Quality of life (84%)

Activity of daily living (100%)

Mechanism of action (52%)

Decrease in pain (100%)

Decrease in side effect (92%)

Mood (60%)

Social activity (36%)

Healthy (72%)

Healthy (72%)

Independence (60%)
6.2.15 Figure 15: High Scientific Evidence Hierarchical Value Map with added links, direct, and indirect links

- Natural way of living
  - Mood (62%)
  - Absorption (46%)
  - Dosage form (62%)
  - Taste
- Quality of life (92%)
  - Social activity (54%)
  - Compliance (62%)
  - Convenience
- Mechanism of action (54%)
  - Activity of daily living (100%)
- Decrease in pain (100%)
  - Decrease in side effect (92%)
- In control (23%)
- Healthy (85%)
  - Non HCP endorsed (54%)
  - Scientific Evidence (46%)
- Independence (54%)
- Healthy (85%)
  - Natural source (62%)
  - Quality brand (54%)
  - Combination product (38%)
  - Natural source (62%)
  - Non HCP endorsed (54%)
  - Health care provider endorsed (54%)
- Quality of life (92%)
  - In control (23%)
  - Healthy (85%)
  - Independence (54%)
  - Natural way of living

Cut-Off=3

High evidence N = 13
Figure 16: Low Scientific Evidence Hierarchical Value Map with added links, direct, and indirect links
6.2.17 Figure 17: Calculation of mean constructs per ladder and mean constructs per individual

1. Formulas:

a. To calculate mean number of constructs per ladder
   \[ \frac{(\text{total active links})}{(\text{participants per group})(\text{mean ladders per individual})} + 1 \]

b. To calculate mean number of constructs per individual
   \[ \text{(mean constructs per ladder)} \times (\text{mean ladders per individual}) \]

2. Calculations:

For the **high** scientific evidence group, mean number of constructs per Ladder:
Assumptions: the active chunks at cut off = 1 is 589; total participants = 13 people; average ladders per participant previously calculated = 13.2

a. \[ \frac{(589)}{(13 \times 13.2)} + 1 \]
   \[ = 4.4 \text{ average constructs per ladder} \]

b. \[ 4.4 \times 13.2 \]
   \[ = 57.2 \text{ constructs per individual} \]

For the **low** scientific evidence group, mean number of constructs per Ladder:
Assumptions: the active chunks at cut off = 1 is 431; total participants = 12 people; average ladders per participant previously calculated = 11.9;

a. \[ \frac{(431)}{(12 \times 11.9)} + 1 \]
   \[ = 4.0 \text{ average constructs per ladder} \]

b. \[ 4.0 \times 11.9 \]
   \[ = 47.8 \text{ constructs per individual} \]
References


20. MECanalyst. Cognitive consumer mapping software, user guide. rev. 0.4_en.

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86. Boecker A. Personal communication. 2010.
91. Bellamy N. WOMAC(TM) Osteoarthritis Index Use Guide IX. Queensland, Australia: The University of Queensland, Faculty of Health Sciences, Mayne Medical School.; 2008.


\[\text{(i) Evidence level A or B only. Level A evidence is strong scientific evidence, where level B is good scientific evidence.} \]

\[\text{(ii) Evidence level C or traditional/insufficient evidence. Level C evidence is unclear or conflicting scientific evidence.} \]