How do homeopathy users perceive homeopathy?

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ABSTRACT

Life expectancy has steadily increased over the last two centuries due to improvements in living standards, education, science and medicine. However, instead of basing health decisions on the best scientific evidence available, millions of people are currently using unsupported complementary and alternative medicines (CAM). The use of CAM is rising worldwide despite the lack of robust scientific evidence for their safety or efficacy. The central concern around the use of CAM is that users might delay or forgo the use of conventional medicine potentially leading to severe health deteriorations. Homeopathy, one of the most widely used CAM, is particularly interesting as its purported mode of action is deemed impossible by current scientific knowledge. Moreover, multiple systematic reviews have come to the conclusion that homeopathy is no more effective than a placebo. Homeopathy proponents, however, claim that homeopathic remedies are an effective medical treatment, which could lead to misinformed consent of potential homeopathy users.

This research project investigates how homeopathy users perceive homeopathy, especially with regards to its scientific basis. The central question addressed in this thesis is: do homeopathy users in New Zealand use homeopathic remedies because they believe the remedies to be scientifically proven to work? A sequential explanatory mixed methodology was used to answer this question, starting with collection and analysis of quantitative data via a survey. The survey results informed the design of follow-up semi-structured interviews with self-identified homeopathy users.

According to the survey results, more than half of the respondents were homeopathy users. Of those respondents who were homeopathy users, 78% believed that homeopathic remedies were scientifically proven to work. This is in contrast to non-users who mostly did not believe homeopathy had a scientific basis. Interview results challenged initial findings and showed that most homeopathy users were aware of the lack of scientific evidence behind homeopathy, but used the remedies regardless. Rather than scientific
evidence, it was revealed that participants valued personal, anecdotal, and traditional evidence when deciding to use homeopathy. The discussion argues that current communication efforts focused on the lack of scientific support for homeopathy fail to reach users. In dismissing users’ experiences and perceptions, science communicators risk increasing distrust in scientific evidence and potentially strengthening users’ beliefs by compounding an adversarial relationship. In order to limit risks and complications from avoiding conventional medicine, future research into health communication must be developed with users’ experiences and perceptions in mind.
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<td>Advertising Standards Authority</td>
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<td>CAM</td>
<td>Complementary and Alternative Medicine</td>
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<td>FDA</td>
<td>Food and Drug Administration</td>
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<tr>
<td>GP</td>
<td>General Practitioner</td>
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<td>HRI</td>
<td>Homeopathy Research Institute</td>
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<td>PUS</td>
<td>Public Understanding of Science</td>
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<td>RCT</td>
<td>Randomised Controlled Trial</td>
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<td>UMR</td>
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INTRODUCTION

For the past year or so, I have had lower back pain at regular intervals. It comes and goes without a specific pattern and sometimes even travels down to my right leg. Not knowing the cause, or how to treat it, I first talked to family and some friends to see if they knew anything, or had dealt with anything similar. I also searched online to look for potential solutions. Finally, I went to the doctor.

Although this particular situation is specific to me, the process of gathering information before making a health decision—combining friends’ and family’s experience, personal investigation, and finally trusted medical advice—is a common trajectory. I make, or at least try to make, my health decisions based on the best scientific evidence available, filtered through the lens of a professional best able to interpret that evidence, such as a doctor. I do this because I value scientific evidence, and I value expertise. But what do others value when making health decisions?

***

The use of complementary and alternative medicines (CAM) has been increasing in the past decades. Among the hundreds of CAM therapies available, the five most used are acupuncture, chiropractic, herbal medicine, homeopathy, and osteopathy. Their increasing popularity, despite the paucity of scientific evidence, has brought concerns about their safety and efficacy to the fore (Barnes, 2003; Markman, 2002); especially for those five principal therapies as they are widely used and practitioners claim to be able to both diagnose and cure patients.

Whilst four of these five therapies have foundations that could explain their potential effectiveness, one stands out due to its principles being incompatible with the best current scientific knowledge. Chiropractic and osteopathy treatments use manipulative technique as does physiotherapy. Acupuncture has been shown to trigger endorphin release, and herbal medicine may contain pharmacologically active ingredients. Homeopathy, however, involves diluting primary ingredients to such an extent that it is statistically
impossible for any active ingredient to be left in the final remedy. Furthermore, any effectiveness attributed to homeopathic remedies has been shown to be no more than the placebo.

Homeopathy and other CAM are often referred to as pseudoscientific, meaning that they appeal to scientific authority but do not themselves follow any scientific principles. Indeed, despite not being scientifically supported, many homeopathy proponents advocate for homeopathy’s effectiveness, often claiming that there is scientific evidence to support their health benefits. As a result, many websites and products’ labels contain misleading information and unfounded health claims, a recurrent issue among CAM therapies (Fears, Griffin, Larhammar, Ter Meulen, & van der Meer, 2017; Owens, Baergen, & Puckett, 2014; Ryan, 2017). Unfortunately, it may be difficult for the public to differentiate pseudoscientific claims, potentially leading consumers to believe that the remedies have been shown to be effective.

Belief in the effectiveness of CAM therapies, potentially enhanced due to misleading claims, has resulted in the absence, or delay, of proper treatment and led to severe health deteriorations. Multiple fatalities have been directly linked by the use of CAM therapies, including cases where patients only (and unsuccessfully) used CAM when conventional medicine was far more likely to succeed or cases where patients delayed the use of conventional treatment until it was too late (“Alternative medicine treatment put four-year-old boy in A&E”, 2016; Graveland, 2017; Joyce, 2018). A particularly high-profile case was that of Steve Jobs, whose death is an example of the use of CAM therapies likely delaying the use of conventional and scientifically supported treatments (Greenlee & Ernst, 2012). Whilst it is impossible to be certain that Jobs would have lived longer had he chosen to follow a conventional treatment earlier, for other cases, CAM’s role in patient death is more clear. In Australia in 2002, a nine-month-old child who only received homeopathic treatment for her atopic dermatitis, a relatively minor and easily manageable skin condition, died soon after she was finally presented to hospital (Smith, Stephens, Werren, & Fischer, 2013). This death can be confidently attributed to the delay in receiving conventional treatment due to the treatment being denied her, based on her parents’ beliefs in the effectiveness of homeopathy. It is important to note, however, that
most CAM users seem to be using CAM therapies as complementary to conventional medicine rather than alternatives to it.

***

This research project aims to better understand what type of evidence people value when making decisions around the use of homeopathy. There is a paucity of research investigating why people decide to use homeopathic remedies, as well as almost no data available around the use of homeopathy in New Zealand. So far, international research has been focused on assessing the effectiveness of the remedies, and on evaluating the extent of homeopathy and other types of CAM usage. The thesis is the first research study of its kind to look beyond the traditional surveys investigating the extent of homeopathy use, to instead meet homeopathy users and actually discuss their beliefs, understandings and perceptions of homeopathy as scientifically supported. With no scientific evidence that homeopathic remedies are more effective than the placebo, why do people decide to use these remedies? What type of evidence do people value when making the decision to use homeopathic remedies? Are people aware of the lack of scientific evidence?

This research project followed a mixed methodology, combining the collection of quantitative data in a public survey followed by in-depth interviews with homeopathy users. The methodology was developed to be transferable to any other type of pseudoscientific therapies. Other projects exploring the use of other pseudoscientific therapies could use an outline similar to this thesis.
OUTLINE OF THE THESIS:

This thesis starts with a review of the literature around the definition of science, public understanding of science and the evolution of different models of science communication, before exploring pseudoscience, to give a sufficient foundation for the research. Ultimately this research project fits under the large umbrella of public understanding of science and how people interact with science in their everyday lives.

The second chapter provides background and context to homeopathy, a type of unconventional medicine chosen as an exemplar for this research project to illustrate the wider issue of pseudoscientific therapies facing science communication. Homeopathy was chosen due to the persistent controversy around its use, with the scientific consensus being that there is no evidence that the remedies are working better than placebos whilst homeopathy proponents continue to make claims about the effectiveness of homeopathic remedies. The chapter includes a brief history of homeopathy from its beginning to its use today. The controversy around homeopathy is also introduced before finishing with an introduction to the placebo effect, the phenomena that explains the perceived effectiveness that people can experience when using homeopathic remedies.

The third chapter presents the methodology used for this research project. The chapter starts by providing some background information about mixed methodology in general before focusing on the design used in this research. This research project called for the use of a sequential explanatory mixed methodology, starting with collection of quantitative data, data used to then collect follow-up qualitative data.

The fourth chapter presents the quantitative step of the study, including data collection method, design, results and discussion. A survey questionnaire was designed to get background information about the use of homeopathy in New Zealand and investigated if respondents perceived homeopathy as scientifically supported. Survey answers were collected both online and via street-intercept survey in four main New Zealand cities (two on each main islands).

The fifth chapter consists of the qualitative phase of the study, including data collection through semi-structured interviews. These interviews serve as a follow-up to the data from previous (fourth) chapter, going more in-depth for a better understanding of the
survey results. The chapter presents the design, methods, results and discussion of semi-structured interviews conducted with 20 self-identified homeopathy users living in the Otago region. Interview participants were recruited via the survey.

Finally, the thesis ends with a general discussion, bringing the quantitative and qualitative results together to answer the research question: Do people use homeopathic remedies because they perceive them as scientifically supported? The main results are discussed as well as the revealing contrasts between the survey and interview data. The discussion also presents limitations of the current research project, suggestions for future communication efforts around homeopathy, and recommendations for future science communication research.
CHAPTER 1: LITERATURE REVIEW

1. WHAT IS SCIENCE?

This thesis investigates if and how homeopathy is perceived to be scientifically supported by its users. Therefore, it is important to have a sound understanding of what is meant when the term “science” is used in this thesis. Science is not a discipline; but a principle that encompasses multiple disciplines, from physics and chemistry to biology and social sciences. Those disciplines look at different aspects of the world, accumulating knowledge and allowing the construction of theories describing the most likely ways in which the world works (Ruse, 1982).

There are multiple ways to define science, and the beginning of this chapter outlines three of these. The first explains what science is according to its methodology. The second discusses the role of the sociological framework in the definition of science. Finally, the third addresses the evolution of scientific language within the academic context. Clarifying these aspects of science will allow to define the construct as it will be used throughout this thesis.

1.1 SCIENTIFIC METHOD

One popular view is that science is, first and foremost, a method (Chalmers, 1999; Lakatos, 1970; Popper, 1972). According to this perspective, science is defined by the methods and processes through which knowledge is acquired. Knowledge obtained following a scientific method is science, while knowledge obtained without following a scientific method is not. Exactly what this method is, however, has been a point of contention for centuries.

In the fourth century B.C., Aristotle introduced logic, establishing the early principles of science. To him, reasoning from true premises would automatically lead to true conclusions and all knowledge comes from the senses, which could classify him as an early empirist (Matthews, 1992; Smith, 2016). Despite the many critics of empiricism
(Bealer & Strawson, 1992), the movement persisted over time and matured alongside science to become an important parameter of modern science in the 17th century. During this same period arose the major opponent to empiricism, namely rationalism, which extolled knowledge as pre-existing or innate and not primarily the result of experience (Descartes & Cottingham, 2013; Markie, 2015). In the late Renaissance, Francis Bacon, considered the father of modern empiricism, reaffirmed scientific knowledge as the result of sensory experience (Nisbet, 1967).

Bacon introduced a new system of logic based on inductive methodology. Following inductive reasoning, observations allow the development of hypotheses, which act as predictive models of how the world works. The conclusions resulting from induction are not true or false, but strong or weak, depending on the observations. The method developed by Bacon is often considered the start of modern science, consisting of testing and elaborating hypotheses using observation, measurements and experimentation (Horton, 1973).

The dominant argument against inductive reasoning arose in the 18th century. David Hume was concerned about the use of a finite number of observations to generate theories about the world, to acquire true knowledge. While knowledge is created by making inferences beyond direct experience, inductive reasoning is still the result of the human mind, not a characteristic of the world (Vickers, 2014). Nevertheless, induction was the most popular scientific method at the time. Following on from Hume’s critics of induction, Karl Popper argued that the scientific method needs to be able to prove theories wrong, that is, scientific theories must be falsifiable. Finding one falsifying case and thus disproving a theory is an easier task than looking for every single case and confirming it (the latter being impossible). Since conclusions based on induction can never be proved correct, falsificationism allows for at least the rejection of incorrect theories (Grattan-Guinness, 2004). With falsificationism, Popper brought a way to use deductive reasoning as a method for science.

No different from other philosophers’ attempts to define science by its method, Popper’s view on the scientific method received many criticisms from contemporary philosophers Kuhn, Feyerabend, and Lakatos (Agassi, 2014; Feyerabend, 1993; Kuhn, 1996; Lakatos, 1976). One of the main concerns of Popper’s scientific method was that, if followed to
the letter, it would impede the growth of science as a discipline. For example, according to Popper, if a theory is experimentally disproved, it should be rejected, and for a new theory to be accepted it has to include all previous working theories. If those conditions had been followed, many of today’s accepted theories would probably have been killed prematurely (Chalmers, 1999; Maxwell, 1972). Despite the many criticisms against Popper’s and others’ attempts to define “the” scientific method, there is still no unique scientific method defined within the scientific community (Wagensberg, 2014). Nonetheless, the hypothetico-deductive method, a more practical version of Popper’s falsification method, is the one used in most scientific disciplines (Kelleher, 2015; Langridge, Roberts, & Pope, 2015; Lawson, 2000).

1.2 SOCIOLOGICAL FRAMEWORK OF SCIENCE

The public usually encounters science through some form of science communication (see section 2.2) such as news reports, museum exhibitions, documentaries, or textbooks (Lucas, 1991). These are what Bruno Latour calls “readymade science” (Latour, 1987); pieces of knowledge about the world presented as a final product. Readymade science is formed through the scientific process; a combination of how science is performed, its method, and its sociological framework. The sociology of scientific knowledge studies the construction of scientific knowledge from a social perspective. Emerging in the late 1960s, this field of study is complex and discusses important questions such as how scientific facts are socially constructed and validated. Robert King Merton (1973), Latour and Woolgar’s book Laboratory Life (1979), and Steve Shapin (1994) are among many influential works in the field, scrutinising the construction of scientific knowledge as a social activity. Investigating the history of the social construction of science (and ‘truth’), however, could be a thesis of its own, therefore only three social components of science are briefly introduced here.

First, the direction of science is highly context-dependent and a product of its time. As scientific research requires external funding, public opinion can influence what areas of science are advanced. For example, the Cold War was described as a “technological race for military advantage” (p. 239), because after WWII, national security was seen as
primarily dependant on technological superiority (Kevles, 1990). As a result, physicists in the United States saw their research funding increase twenty-fold between 1938 and 1953 (Kaiser, 2002). This boost in physics research allowed for the perfection of technologies such as the radar, leading to the development of new applications such as the microwave, a technology that is now part of our everyday life (Parker & Vollmer, 2004).

The second social component of science is the fact that it is impossible for any one person to be an expert in all fields. Yet, for a given problem in science, the answer often involves many fields of expertise. This makes collaboration and social interaction essential to science (Liben-Nowell & Kleinberg, 2007). Collaboration between scientists from different fields is categorised as multidisciplinary, interdisciplinary or transdisciplinary depending on the dynamic of the team (Finholt & Olson, 1997; Stokols, Hall, Taylor, & Moser, 2008). Sometimes scientists do not actively work jointly but benefit from previous work done by scholars in another field. For example, the knot theory developed by mathematicians during the 19th century appeared to be an important piece for understanding the interaction of DNA strands during cell replication (Sumners, 1992).

Finally, to be part of science, new data has to be accepted via the peer review process. The process requires peers from given scientific fields to assess scientists’ work for robustness (Bornmann, 2011). More importantly, the peer review system means that what counts as science is determined by social interactions within the scientific community (Hyland, 2004). Different degrees of trust and authority can be conferred during the peer review process depending on whether the scientists are early career or well-established academics (Fletcher & Fletcher, 1997, 2003). The reviewed data, once approved, can then be used to build theoretical frameworks onto which more data can be built, and becomes part of the current paradigm, constituting the “normal science” of the time (Kuhn, 1996).

The impact of the social context, the collaboration of scientists working on similar projects, and the process of peer review shows how deeply socially determined science is. Understanding these characteristics is fundamental to understanding the picture of science encountered by the general public who are presented with so-called readymade science.
While science is highly social, modern scientific articles make it nearly impenetrable to the public. The style of the scientific language encountered in academic journals is a relatively recent development; it is only since the end of the 19th century that scientific writing has become so formalised and structured (Harmon, 1989; Sollaci & Pereira, 2004). Until the 17th century, scientific writing was just another topic of literature; there were writers, some of whom were writing about science and others who were not (Freddi, Korte, & Schmied, 2013; Montgomery, 1996).

In the mid 17th century, Robert Boyle, a trained chemist, made an important contribution to the evolution of scientific writing by writing in a way accessible to an uneducated audience (Fulton, 1932). He did this by writing about deep scientific concepts with direct language in simply constructed sentences, using detailed descriptions of the experiments to get the reader as close to the process as possible. He also used the first-person singular in order to give a personal feel to his writing, making it more engaging to the reader (Lareo & Montoya Reyes, 2007). His book *The Sceptical Chemist* written in 1661 along with *On the Origin of Species* by Charles Darwin (1859) are good examples of this style of scientific literature. In his book, Darwin describes in detail the different species encountered during the Beagle expedition, as well as his reasoning and feelings. *A Brief History of Time* by Stephen Hawking is a more contemporary example of this approach (1988).

The first scientific journals were published in 1665 (*Journal des Savants* in France and *Philosophical Transactions* in England), but it is only by the end of the 19th and through the early 20th century, along with the professionalisation of science, that a distinction started to arise between the language used in scientific writing and in other literary pursuits (Beer & Lewis, 1963; Montgomery, 1996). The increase of scientific research and sophistication of methods and theories led to the need for new vocabulary (i.e., jargon) and the creation of specialised scientific journals where “men of science”, soon to be called scientists, wrote articles for their peers using technical language, making scientific writing less accessible due to the increasing need to use jargon (Barton, 2003; Beer & Lewis, 1963; Ross, 1962). Moreover, while the author was previously the subject of the action, doing the experiments and sharing their personal experience with the reader,
the new wave of scientific writing required the author to be as invisible as possible, allowing the experiment itself to become the focus (Ding, 1998, 2002). Progressively, the passive tense entered scientific writing and the use of first-person singular pronouns disappeared, along with contextual information surrounding the experiments, as scientific writing should only deliver “objective” and “pure” information about experiments (Ding, 1998; Freddi et al., 2013). As a result, science is portrayed and perceived as “a model of rationality and detached reasoning” (p. 300) where the search for truth and objectivity became the foundation of scientific authority (Hyland & Salager-Meyer, 2008).

Modern scientific writing displays unique linguistic features. As described previously, the extensive use of the passive tense is a trait of scientific writing as it allows impersonalisation of the text. Another feature is the high density of the writing. Nominalisation, the process of turning verbs into nouns, can contribute to high text density and also allows for the creation of technical terms that are context specific. For example, take the following extract: “Asthma is a disorder in which the respiratory passages narrow significantly. This narrowing causes the person to wheeze and become short of breath”. In this example, the word “narrowing” is a nominalisation of the verb “narrow” and reflects the events that happened in the first sentence. Using the nominalisation allows the author to continue the discussion of the topic without having to repeat the information (the respiratory passages narrow significantly) (Fang, 2004). Technicality is also a feature of scientific writing. The technicality comes from the use of ‘regular’ technical vocabulary, the creation of technical terms through the process of nominalisation, and from the ‘technicalising process’, consisting of using vernacular words within a scientific context, giving them new meanings (Ahmad, 2012; Fang, 2004; Halliday & Martin, 1993). Cookies, for example, is a technical term used in computing to describe a small amount of information that websites store on computers whilst in a colloquial context it refers to small sweet baked food, usually round-shaped.

1.4 WHAT IS SCIENCE, IN THE FRAME OF THIS THESIS

Defining science is a complex inquiry and many theses could be dedicated to it. Due to length constraints in this thesis this brief review has focused on a few elements essential
to defining science.

In this thesis, “science” will be understood to primarily describe the process of the acquisition of knowledge about the world following Popper’s theory, but with some modification to better represent the current practice of the discipline. According to Popper, in science, “the best we can say of a hypothesis is that up to now it has been able to show its worth, and that it has been more successful than other hypotheses although, in principle, it can never be justified, verified, or even shown to be probable” (Popper, 2005, p. 317). Following the falsificationist movement, scientists acknowledge scientific theories as fallible and continuously try to enhance them to better explain the world. Falsificationism, or hypothetico-deductive method (Grimes, 1990; Lawson, 2004) is “a cyclic pattern of reasoning and observation used to generate and test proposed explanations (i.e., hypotheses and/or theories) of puzzling observations in nature. The goal of the method is to derive useful knowledge – in the sense that causes are determined such that reliable predictions about future events can be made” (Lawson, 2015, p. 471).

Science evolves as a result of the development of new techniques and changing social contexts (Law, 2004; Longino, 1983), an aspect missing from the falsificationism model. Hence, while basing the definition of science on Popper’s method, the sociological aspect of science cannot be forgotten. Scientists, like everyone, can be subject to cognitive biases or make mistakes. This is why the process leading to new knowledge has to be peer-reviewed and acknowledged by other members of the scientific community before acquiring the status and authority of being “science”.

Taking the above into consideration, in this thesis, the term “science” therefore refers to an evolving enterprise, producing new pieces of knowledge about the world, acquired via the process of falsification, verified through a socially complex review system, and represented as objective. Public perception of science lies at the heart of this thesis. The following point will thus explore how we perceive science, before defining what non-science, or pseudoscience, is. This will lead to the next chapter dedicated to the exemplar used in this thesis: homeopathy.
2. **How do we perceive science?**

The military achievements of science, materialized in the atomic bomb that ended the Second World War, as well as other advances in science in the 20th century (pesticides, antibiotics, vaccines) contributed to American citizens having a very high interest in science and technology (Gregory & Miller, 1998). The increasing amount of science in citizens’ everyday lives, combined with the launch of the first satellite (Sputnik) by the Soviet Union in 1957, highlighted the importance of the “strategic role of scientific knowledge in society” (DeBoer, 2000, p. 585; Gregory & Miller, 1998). The professionalisation of science education became increasingly important and the US set the target of having scientifically literate citizens (DeBoer, 2000).

While the concept of scientific literacy was initially focused on education, it began to associate with science and its social aspect by the end of the 1970s (DeBoer, 2000). Miller described the characteristics necessary to be a scientifically literate citizen as: knowledge of basic textbook science facts, basic knowledge of scientific methods (e.g., experimental design and probability), appreciation of the social benefits that result from science and technology, and the dismiss of superstition such as astrology (Bauer, Allum, & Miller, 2007). Many studies measuring the public’s scientific literacy (see following point) have been designed based on Miller’s characterization (Gauchat, 2011). However, a more contemporary description of scientific literacy by Rennie, Goodrum, and Hackling (2001) represents my understanding of the concept: “scientifically literate persons are interested in and understand the world around them, are sceptical and questioning of claims made by others about scientific matters. They participate in the discourse of and about science, identify questions, investigate, draw evidence-based conclusions, and make informed decisions about the environment and their own health and well-being” (p. 494).

The following section explores the evolution of paradigms prevailing in the public understanding of science movement as well as some of the models used in science communication.
2.1 The Public Understanding of Science Movement and Science-Society Relationship

The field of public understanding of science evolved through the use of three different paradigms from the 1960s to today. Those paradigms evolved from a literacy paradigm focusing on public knowledge of scientific facts, to an understanding paradigm focused on public attitudes towards science, to the current ‘science-in-society’ paradigm, aiming to get the public actively engaged with science matters. Evolving in different political contexts, the three paradigms intertwine but target issues related to public understanding of science in their respective times (Bauer et al., 2007; Bauer, 2009).

The importance of science education arose following the industrial revolution in the late 18th and early 19th century. As society entered a new era governed by science and technologies, it became crucial for citizens to have a minimum of scientific knowledge to “provide continuing momentum to the industrialising process” (Stephens & Roderick, 1983, p. 18) as well as being able to participate in policy decision-making involving science (Bauer, 2009; Stephens & Roderick, 1983). To do that, the focus went into science education with the inclusion of science in the school curriculum during the 19th century in Europe and the US. Concerns about the success of science education programs and the importance of having scientifically literate citizens arose in the late 1950s (DeBoer, 2000). The literacy paradigm, born in the 1960s, extols scientific literacy is as important as knowing how to read and write (Bauer et al., 2007) and stems from the view that there is a knowledge gap that needs to be filled. This perspective is generally known as the information deficit model (see 2.2) (Lewenstein, 2003). In 2007, Roberts wrote about the two visions of scientific literacy as the extremes of a continuum. The first vision focuses on learning the processes and products of science while the second vision targets knowledge about “science-related situations in which considerations other than science have an important place at the table” (Roberts, 2007, p. 730).

From the 1960s to the mid 1980s the scientific literacy paradigm was the only one used in the field, but by 1985 the paradigm of the public understanding of science (PUS) arose. While the public understanding of science model still aims to increase scientific literacy, it focuses on the public’s attitudes towards science (Bauer et al., 2007). Indeed, how can science institutions keep public support if the public does not know, or does not
understand what they are doing (McNeil, 2013)? Surveys under the scientific literacy paradigm were exclusively investigating science knowledge, whilst under the public understanding of science paradigm, surveys looked at knowledge in relation to attitudes towards science. The assumption held being that “the more you know, the more you love it” (Bauer, 2008a; Bauer, 2009; Miller, 2001). This approach is also part of the information deficit model (see 2.2). Different studies have looked at results from public attitudes towards and interest in science surveys in order to determine if the aphorism “the more you know, the more you love it” works (Allum, Sturgis, Tabourazi, & Brunton-Smith, 2008; Evans & Durant, 1995). While under some conditions there is a correlation between knowledge and general attitude towards science, the idea of a causal linear relationship between science knowledge and attitudes is too simplistic. Results showed that while people with a higher level of scientific knowledge might have more positive attitudes towards science in general, when you delve into specific scientific issues the relationship no longer holds. Whereas for the less-informed public, the results strongly depend on which research area was targeted and how the questions were asked (Evans & Durant, 1995). In 1995, Evans and Durant concluded that instead of trying to understand the relationship between the public understanding of science and their attitudes in general, surveys should focus on specific issues and use the level of public interest as indicator of their attitudes. Other findings highlight the importance of contextualising scientific knowledge, an aspect missing from the PUS paradigm and already pointed out by different studies in the 1990s (Jenkins, 1994; Lévy-Leblond, 1992; Wynne, 1991). In his paper “About misunderstandings about misunderstandings”, Lévy-Leblond (1992) pointed out that “the contextual and social nature of scientific knowledge contrasts with the individual and non-contextual nature of opinion polls, and it is for this reason that such polls cannot be trusted as giving a fair estimate of current technical and scientific literacy” (p. 18).

Around the mid 1990s emerged a third paradigm in response to the different critiques raised against the PUS research method, known as ‘Science-in-Society’ (Bauer, 2009; Bauer et al., 2007). Both the literacy and PUS paradigms used the deficit model. As will be developed in section 2.2, under this model, scientific knowledge is communicated though a one-way transmission, assuming a deficit of information from the public. In the new paradigm, the deficit comes from the scientists who are not communicating their
science appropriately to the public (Bauer et al., 2007). Instead of transmission of information, the science-in-society paradigm advocates for a dialogue between scientists and the public (see 2.2). In order to get the public more involved, it is the duty of scientists to make their science accessible, relevant and engaging. The scientific information also has to undergo recontextualisation, or reframing, in order to be relevant to the receiver (Jenkins, 1994; Wynne, 1991). The science-in-society paradigm is also confronted by the issue of lack of trust from the public (Bauer, 2008b; Gauchat, 2011). Presenting scientific knowledge as certain instead of an area of expertise, as well as not taking ‘local’ knowledge into account while dealing with public issues, can lead to a crisis of trust. Wynne (1992) used the example of the Chernobyl contamination and its consequences for farmers in Northern England to relay this point. Following the Chernobyl caesium fallout, scientists first advised farmers from Cumbrian hills that there would be no effects at all for their land and sheep. A few weeks later, however, a ban was placed on any slaughter or movement of animals within Cumbria, affecting thousands of farms. Multiple scientific errors (use of wrong models, unsuccessful experiments), some of which could have been avoided if local farmers’ knowledge had been acknowledged, left the farming community sceptical about the events. This shows that when people do not accept science it is often linked to a lack of trust or credibility in the scientists, not a lack of understanding (Wynne, 1992). Despite the limitations of current measurements of trust, the relationship between ‘science’ and the public appears to be exacerbated by intermediaries such as the media (Saltelli & Funtowicz, 2017; Schäfer, 2016) According to the UK House of Lords, in order to rebuild public trust, public engagement has to increase and that could be achieved via, among other avenues, deliberative polling, internet dialogues, citizens’ juries and consultations at local level (House of Lords Select Committee on Science and Technology, 2000).

2.2 Making science public

The popularisation and communication of science (science communication for short) aims to share scientific discoveries and interesting facts with the public, while also supplying a context for the scientific information. By doing so, science communication provides information which allows the public to make informed decisions in politics and
in personal matters, and, also participate in science and enter into conversation with scientists (Treise & Weigold, 2002). Evaluation of the popularising strand of science communication has traditionally been done through surveys looking at levels of science literacy (Miller, 2001; see Miller, 1998 for a review of the history, rationale and structure of measure of scientific literacy). Yet, according to Lévy-Leblond (1992), science literacy is not measured with the appropriate tools and the purported lack of science literacy highlighted by survey research should be treated with caution (see previous section). Nevertheless, there is still an acknowledged low level of science literacy and it could be due to the inadequacy of the main model of science communication (Weigold, 2001).

Multiple models of science communication exist and four of them are described here. The information deficit model is the main and oldest model, used in an attempt to counter the lack of public scientific literacy found in PUS surveys. According to this model, the public’s knowledge gap can be filled with information from scientists. It proposes that providing more information to the public will increase their science literacy and help them make informed decisions. This model is a one-way top-down transmission of information where the public is the “lay” recipient and scientists are the knowledge providers. The inefficacy of the one-way transmission of information advocated by the deficit model was brought to light by different survey results. Comparison of survey results from the US and the UK have shown low levels of scientific knowledge, with no major changes between results from the 1950s and 1990s (Sturgis & Allum, 2004). And results from a US national survey published in 2000 showed that less than half of the respondents understood the term DNA, or knew that electrons are smaller than atoms, or understood that lasers do not work by focusing sound waves (National Science Board, 2000).

The contextual model does not see the public as “empty containers” (Lewenstein, 2003), but instead acknowledges that the reception of information differs from person to person depending on the context, and their responses are shaped accordingly (Lewenstein, 2003; Sturgis & Allum, 2004; Weigold, 2001). Under the contextual model, science communication messages are constructed to be relevant in specific contexts (Miller, 2001). A major criticism of this model is that it does not actually differ from the deficit model in that it still uses a one-way transmission of information from the scientists to the “lay” public (Lewenstein, 2003).
A response to these models came in the form of the lay expertise model which reverses the previous models and promotes a bottom-up transmission. According to this model “lay” knowledge, or local knowledge, might be as relevant as scientific knowledge to solve certain problems. While local knowledge is important in some cases (see Wynne, 1991 for an example), the main criticism of this model lies in its very foundation, which is relying on lay knowledge more than scientific knowledge. By doing so, this model becomes an “empowerment of local communities” with political purposes rather than a model aiming to increase the public understanding of science (Lewenstein, 2003, p. 5).

Under the science-in-society paradigm (see previous section), science communication switches from the one-way transmission of information to a two-way dialogue. This new model is referred to as the interactive science model, the public participation model, or the public engagement model (Lewenstein, 2003). This model is a reaction to the trust crisis brought, in part, by the deficit model describing the public as lay and uninformed while scientists are the knowledgeable elite. The public participation model aims to regain trust by involving the public in scientific issues (Bauer et al., 2007). One of the concerns around the participatory model is, however, that the participation process does not automatically improve decision-making (Haywood & Besley, 2014). Promoting the transparency of scientific information could instead lead to aggravated controversy where different parties dismantle each other’s arguments instead of deliberating effectively. As a result, the participation process might become a political matter (Jasanoff, 2003). To counter this problem, the development of critical science literacy (see below) is of great importance. Additionally, the participation process has to be well thought out to ensure it does not become another version of the deficit model (Nisbet & Scheufele, 2009).

Besides increasing the public’s ‘textbook knowledge of science’ (Priest, 2013), science communication should aim to develop critical science literacy (Hine & Medvecky, 2015; Priest, 2013). Critical science literacy is the knowledge of how science works. It is “about increasing the capacity of individuals to understand, assess, and make sense of science and scientific claims rather than being about increasing the amount of science or scientific claims individuals know” (Hine & Medvecky, 2015, p. 9). To do that, ‘science in the making’ has to be more present in the public sphere, instead of only showcasing ‘readymade science’. By doing so, the public would get a better understanding of how
science works in the construction of scientific theories. Ideally, a public with critical science literacy should be able to evaluate the quality of scientific claims (Hine & Medvecky, 2015). In the era of the internet, where anyone can make claims about any subject, it is important for the public to have the ability to discern well founded scientific claims from unsubstantiated ones (Priest, 2013).

Finally, while people can choose not to study science, they cannot ignore it as it is part of their everyday life and a minimum level of understanding is necessary to make informed decisions (Fischhoff, 2013). Beyond the use of different models, science communication has to diversify its means to reach more people. While the goal of science communication was for a long time to reach the ‘general public’ or at least as many people as possible, it is now clear that the public is segmented and that each segment demands a different approach. In 2001, Weigold divided the public into three groups: the ‘science-attentive’ who are attentive to science policy, the ‘science-interested’ who have interest in science and technology but lack the aptitude to comprehend the terminology and processes of science, and the ‘non-attentive’ public. More recently, a team from Switzerland segmented the Swiss population into four groups depending on their perception of science; the ‘sciencephiles’ who have extensive knowledge of science and are highly interested, the ‘critically interested’ who also have strong interest for science but with less trust, the ‘passive supporters’ who have less interest, knowledge and trust, and the ‘disengaged’ who are not interested and have very little knowledge about science (Schäfer, Füchslin, Metag, Kristiansen, & Rauchfleisch, 2018). Acknowledging the fragmentation of the public according to their interest could initiate more relevant science communication practices.

The present research project focuses on the public’s perception of the scientific basis of homeopathy. Currently, the communication of information available for homeopathy falls into the deficit model, with ‘facts’ being reported through scientific reports later relayed to the public via the media. As a result, there is a persistent dichotomy of ‘orthodox’ versus ‘other’ where the discourse held by homeopathy proponents becomes ‘pro-homeopathy’ versus ‘anti-homeopathy’, describing scientific evidence around homeopathy as “opinions”. Whilst there might be some grey areas around some complementary and alternative therapies’ effectiveness, it is not the case with
homeopathy where multiple systematic reviews have shown a lack of effectiveness over the placebo. The concept of placebo will be discussed in chapter 2.

3. What is pseudoscience?

Defining science is a complex task (see section 1). Likewise, it is difficult to define non-science or more specifically pseudoscience. Finding a clear distinction system between science and pseudoscience is known as the “demarcation problem” and has been a struggle for many philosophers and sociologists (Popper, 1963). With a more practical perspective, “boundary-work” focuses on how science functions as a social activity (Gieryn, 1983).

In the mid 20th century, Popper and Kuhn suggested using their respective definitions of science as a basis to resolve the demarcation problem. According to Popper, the falsification criterion was necessary and sufficient to distinguish science from pseudoscience. Popper used the example of astrology to construct his argument. Since astrology makes vague predictions that astrologers can always rescue, it is impossible to refute any of their theories. Consequently, for Popper, astrology theories are not falsifiable and thus astrology is not a science (Popper, 1963). Kuhn recommended using puzzle solving as the criterion for demarcation. Using the same example, for Kuhn astrology is not a science because astrologers follow rules explained by tradition instead of trying to solve puzzles and problems raised while practicing astrology (Kuhn, 1970; Popper, 1963). Popper and Kuhn criticised each other’s criterion as not providing a clear distinction between science and pseudoscience and allowing for some pseudoscience to be considered as science and vice versa (Hansson, 2015).

Following on the contention between Popper and Kuhn’s criteria, Lakatos (1977) attempted to distinguish science from pseudoscience with the criterion of scientific progress. Lakatos sees science as a ‘research programme’, claiming it is possible to distinguish between scientific research programmes and pseudoscientific ones by looking at their theories. While scientific research programmes discover new facts and lead to new theories and novel predictions, pseudoscientific programmes are degenerative and fabricate theories to accommodate known facts (Lakatos, 1977). Following on Lakatos,
Thagard introduced a demarcation based on progress. According to Thagard (1978), “A theory or discipline which purports to be scientific is pseudoscientific if and only if:

1. it has been less progressive than alternative theories over a long period of time, and faces many unsolved problems; but
2. the community of practitioners makes little attempt to develop the theory towards solutions of the problems, shows no concern for attempts to evaluate the theory in relation to others, and is selective in considering confirmations and disconfirmations” (p. 227).

From Popper to Thagard, the different proposals of demarcation all use single traits (falsification, puzzle solving, progress) to distinguish science from pseudoscience. However, science and pseudoscience appear to be too complex to be characterised from each other according to any unique criterion. As a result, none of the propositions can be accepted as sufficient to plainly differentiate science from pseudoscience (Curd, Cover, & Pincock, 2013).

The complexity of the demarcation problem calls for a multi-criteria approach, allowing for a clearer way of distinguishing between science and pseudoscience. Many (non-exhaustive) lists consisting of 5 to 10 criteria characterising pseudoscience have been published (Derksen, 1993; Glymour & Stalker, 1990; Grove, 1985; Gruenberger, 1964; Langmuir & Hall, 1989; Mahner, 2007), but again, none have been unanimously accepted as solving the demarcation problem. Still, one commonly cited list was suggested by Hansson in 1983 (as cited in (Hansson, 2015)):

1. **Belief in authority**: It is contended that some person or persons have a special ability to determine what is true or false. Others have to accept their judgments.
2. **Unrepeatable experiments**: Reliance is put on experiments that cannot be repeated by others with the same outcome.
3. **Handpicked examples**: Handpicked examples are used although they are not representative of the general category that the investigation refers to.
4. **Unwillingness to test**: A theory is not tested although it is possible to test it.
5. **Disregard of refuting information**: Observations or experiments that conflict with a theory are neglected.
6. *Built-in subterfuge*: The testing of a theory is so arranged that the theory can only be confirmed, never disconfirmed, by the outcome.

7. *Explanations are abandoned without replacement*. Tenable explanations are given up without being replaced, so that the new theory leaves much more unexplained than the previous one.

According to Shermer (1997), another characteristic of pseudoscience is that “claims are presented so they appear scientific even though they lack supporting evidence and plausibility”. Two decades earlier, Thagard (1978) was going even further, saying that a feature of pseudoscience is that it openly proclaims itself as science (Thagard, 1978). By doing so, pseudoscience claims the authority of science without any scientific evidence to endorse their assertions (Allchin, 2004). Hence, more than purely theoretical, the importance of the demarcation is also social. Not only is it important to have a scientifically literate public (see section 2), it is also important for the public to be able to differentiate sound science from pseudoscience claims (Thagard, 1978).

Boundary-work focuses more on the social dimension of demarcation between science and non-science by focusing on the practical differences between science and other intellectual activities. It has been described as “the attribution of selected characteristics to the institution of science (i.e., to its practitioners, methods, stock of knowledge, values and work organization) for purposes of constructing a social boundary that distinguishes some intellectual activities as ‘non-science’” (Gieryn, 1983, p. 782). Boundary-work is a conceptual tool aiming to validate some knowledge or activities and delegitimise others. An important characteristic of boundary-work is that it acknowledges the evolving nature of science. Science can be misperceived as being definite and filling a specific, never changing, “niche”, however, the boundaries of science are moving (Boulding, 1980). The boundaries are flexible, variable depending on the context, evolving and ambiguous (Gieryn, 1983).

Similarly, boundary-work does not provide a clear demarcation between science and pseudoscience but offers a more practical approach to the problem. Boundary-work is carried out by the scientists to defend the demarcation between science and non-science entities. The need for such boundaries increases when science and its current boundaries are threatened or questioned. In the recently published book *Pseudoscience: The*
Conspiracy Against Science, Beall (2018) describes the need for boundary-work following the growth of “predatory journals” within science publishing. Predatory journals are publishers who are exploiting the pay-to-publish model for their own profit and do not provide quality peer-review of the content (Beall, 2010). As a result, more and more pseudoscience gets disseminated.

Pseudoscience is found in diverse fields from physical sciences (astrology) to applied sciences (alternative medicine) and religious and spiritual beliefs (creation science) (Lindeman, 1998; Martin, 1994; Thagard, 1978). For this thesis, the focus will be on one type of pseudoscience: homeopathy. Homeopathy is a practice belonging to the larger group of complementary and alternative medicine (CAM). The use of homeopathic remedies is global and its status varies depending on the country. In India, for example, homeopathy is a recognised medical system whilst in the UK, the Royal London Hospital for Integrated Medicine, founded in 1849 as the Homoeopathic London Hospital, recently decided to stop providing NHS-funded homeopathic remedies (Gallagher, 2018). Before delving into the thesis’ methodology and data chapters, the next chapter will provide some background information about homeopathy.
CHAPTER 2: THE EXEMPLAR OF HOMEOPATHY

1. HEALTH SYSTEM

The health system is commonly defined as “all the activities whose primary purpose is to promote, restore and/or maintain health” (World Health Organization, 2000, p. 5). While the practices included within the dominant health care system differ between countries, they can be classified into two groups: conventional and unconventional medicines (Bodeker, 2001).

Conventional medicine diagnoses and treats health conditions with treatments offered by conventional healthcare providers such as dentists, doctors, nurses and pharmacists. Also known as modern medicine, Western medicine, biomedicine, orthodox medicine or allopathic medicine, conventional medicine evolved in parallel with the development of science (Wiseman, 2004). Conventional medicine not only relies on scientific principles to diagnose and treat health conditions, but also embeds science into the teaching curriculum so that practitioners develop critical thinking skills. These skills give practitioners the ability to adapt to changes in their field (Bynum, 1994). Indeed, while conventional medicine is commonly described as objective, universal and neutral, in practice, conventional medicine is also the result of social processes. Gordon (1988) described conventional medicine as “culturally and historically specific and far from universal […] a product of western culture and society” (p. 20).

Unconventional medicine, as the name implies, includes all practices that do not fall within the parameters defined above. The term commonly used to contain these modalities of treatment is complementary and alternative medicine (CAM) (Ng, Boon, Thompson, & Whitehead, 2016). It is sometimes referred to as natural or holistic medicines but will be referred to as CAM throughout this thesis (Zollman & Vickers, 1999a). CAM includes practices such as Chinese herbal medicine, which includes using plants, mineral, animal or human products to treat diseases (Huang, 1998); acupuncture,
inserting needles into the body to stimulate healing (Deadman, Al-Khafaji, & Baker, 1998); and reiki, a therapy based on the claim of the existence of a universal life force, called “Qi” that can be transferred from a practitioner to a patient without making any physical contact (Nield-Anderson & Ameling, 2000). As with many practices classified under CAM, no scientific research has been able to show the effectiveness of reiki greater than that of the placebo effect (VanderVaart, Gijsen, de Wildt, & Koren, 2009). However, other practices within the CAM group have been shown to have an effect higher than that of placebo. For example, acupuncture has been shown to be at least as effective as prophylactic drug treatment for acute migraine attacks (Linde et al., 2016).

It is important to note that these two groups are not static. The status of conventional medicine is highly connected to the development of the scientific literature and, as described earlier, the literature is in constant evolution. This evolution makes it conceivable to find practices currently labelled as “alternative” or “complementary” that could become part of conventional medicine in the future. Some practices like acupuncture, chiropractic and osteopathy that are classified as CAM, are starting to show evidence of effectiveness in treating particular conditions like dental pain, headache, and neck pain respectively, although there are still issues around the design of these experiments (Bryans et al., 2011; Franke, Franke, & Fryer, 2015; Kaptchuk, 2002a).

1.1 COMPLEMENTARY AND ALTERNATIVE MEDICINE

Complementary and alternative medicine is defined as “a broad domain of healing resources that encompasses all health systems, modalities, and practices, and their accompanying theories and beliefs, other than those intrinsic to the politically dominant health system of a particular society or culture in a given historical period. CAM includes all such practices and ideas self-identified by their users as preventing or treating illness or promoting health and well being” (Zollman & Vickers, 1999, p. 693). CAM encompasses up to 400 listed therapies that are not recognised as part of conventional medicine. Inclusion on this list is mainly due to the scarcity of scientific evidence supporting claims of healing effects or due to the intrinsic philosophy which does not follow the scientific principles of conventional medicine (Anlauf et al., 2015; Ernst, 2008;
In New Zealand, there are 78 practices listed on the Natural Health Practitioners New Zealand website including acupuncture, homeopathy, herbal medicine and reiki (Natural Health Practitioners New Zealand, 2016).

Due to the highly diverse nature of CAM therapies, multiple classification systems have been suggested (Furnham, 2000; House of Lords Science and Technology Committee, 2000; Kaptchuk & Eisenberg, 2001; Newman Turner, 1998). The classification proposed by the House of Lords (2000) divides the therapies into three groups. The first group includes the five most commonly used disciplines, all offering individual diagnostic approach. The group is labelled as “professionally organised alternative therapies” and includes osteopathy, chiropractic, acupuncture, herbal medicine and homeopathy. The second group comprises therapies that do not aim to give diagnostic information but work as complement to conventional medicine; aromatherapy, stress therapy and massage are included in this group. The last group contains other alternative therapies that offer diagnostics and treatments but are completely detached from conventional medicine and less widely used than the ones from the first group. Traditional Chinese medicine, iridology and crystal therapy are examples of therapies found in this last group (House of Lords Science and Technology Committee, 2000). Another classification proposed by Kaptchuk and Eisenberg (2001) divides CAM therapies into five groups: professional system (e.g., homeopathy), popular health reform (e.g., nutritional supplements), new age healing (e.g., reiki), mind-body (e.g., hypnosis) and non-normative (e.g., iridology).

While highly diverse, CAM therapies do share some common principles. In contrast to conventional medicine that treats pathology (in which people with different backgrounds, but presenting the same pathology, will be treated with the same drug), CAM therapies purport to customise treatments so that they are very specific to the individual needs. As a result, people showing the same symptoms might be treated with different treatments (House of Lords Science and Technology Committee, 2000). The House of Lords uses the World Health Organisation’s definition of health to explain the difference between conventional medicine and CAM therapies. The definition states that: “Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity” (World Health Organization, 2017). From this definition, conventional
medicine deals with the physical side of health, looking for the eliminating or alleviation of symptoms. By contrast, CAM therapies focus on the well-being of the patient as a whole instead of targeting specific symptoms or pathology (House of Lords Science and Technology Committee, 2000).

Surveys about CAM therapies are difficult to compare between and within countries as different surveys 1) include more or less therapies in their definition (e.g. some include prayer and yoga; and what is considered CAM today might be different from past and/or future views), 2) have different focus (e.g. visit to a practitioner versus buying a product over-the-counter, and 3) use different timelines (e.g. use in the past 12 months versus 24 months). However, multiple studies seem to indicate a common trend showing an increase in the number of CAM users worldwide (Ernst, 2000; Fisher & Ward, 1994; Goldbeck-Wood et al., 1996; House of Lords Science and Technology Committee, 2000; Pagán & Pauly, 2005; Stoneman, Sturgis, & Allum, 2013). As a result of the lack of consistency in survey methodologies, estimation of CAM users can vary widely as seen in a systematic review of CAM prevalence in EU published in 2012. This report shows that CAM use varies between 0.3% and 86% across countries and studies (Eardley et al., 2012). Still, the use of CAM therapies appears to have steadily increased in Germany between 1970 and 2002. In 1970, 14% of the population reported using at least one CAM therapy within the past 3 months. In 1997 and 2002, the use of CAM rose to 28% and 34% respectively (Frass et al., 2012). In the US, the prevalence of CAM therapy use has increased since the 1950s to reach around 30% in 1990 before stabilising near 40% of adults in 1997, 2002, 2007 and 2012 according to National telephone surveys and National Health Interview Surveys (Barnes, Bloom, & Nahin, 2008; Barnes, Powell-Griner, McFann, & Nahin, 2004; Clarke, Black, Stussman, Barnes, & Nahin, 2015; Eisenberg et al., 1998; Kessler et al., 2001). Survey results from 2005 showed that up to 70% of Australian respondents used CAM in the past 12 months, while a systematic review from surveys published between 2000 and 2011 indicated that between 30% and 40% of UK adults use CAM (Posadzki, Watson, Alotaibi, & Ernst, 2013; Xue, Zhang, Lin, Da Costa, & Story, 2007). Following this increase in CAM use, a systematic review published in 2012 showed that in the UK, US, and Australia the use of CAM appears to have stabilised around 30%, 40% and 50% respectively since early 2000s (Harris, Cooper, Relton, & Thomas, 2012). While there is limited information available for the
use of CAM in New Zealand, a similar trend appears to be followed (Chan & Whitehead, 2008; Gilbey, 2009). The “2006/07 New Zealand Health Survey” reported that one in five adults had visited a CAM practitioner in the previous 12 months (Ministry of Health, 2008).

The increasing popularity of CAM therapies, despite the paucity of scientific evidence, has brought concerns about their safety and efficacy to the fore (Barnes, 2003; Markman, 2002); especially for the five principal therapies (osteopathy, chiropractic, acupuncture, herbal medicine and homeopathy) as they are widely used and practitioners claim to be able to diagnose and cure patients (House of Lords Science and Technology Committee, 2000). As stated above, some results showed that osteopathy, chiropractic, and acupuncture were somewhat effective for some particular conditions like dental pain, headache or chronic back pain (Bryans et al., 2011; Franke et al., 2015; Kaptchuk, 2002a). Herbal medicine could also be “potentially beneficial” for treating sleep disorders, anxiety and depression (Sarris, Panossian, Schweitzer, Stough, & Scholey, 2011, p. 854). Research into the efficacy of these therapies is still in its early stages and the papers call for more high-quality research to confirm their results. (Bryans et al., 2011; Franke et al., 2015; Kaptchuk, 2002a). Importantly, these four therapies all have foundations that could explain their potential efficacy. Osteopathy and chiropractic treatments use manipulative technique as does physiotherapy whereas acupuncture has been shown to trigger endorphin release. Herbal medicine, in particular, may contain pharmacologically active ingredients (Vincent & Furnham, 1997).

In contrast, homeopathy does not, in principle, have such scientific foundations, instead the mechanisms behind its mode of action are incompatible with our best scientific understanding (Stoneman et al., 2013). As with the other CAM therapies, the popularity of homeopathy continues to increase, and this is despite the multiple systematic reviews concluding that “there are no health conditions for which there is reliable evidence that homeopathy is effective” (Ernst, 2002; Mathie, 2015; National Health and Medical Research Council, 2015, p. 6).
2. History of Homeopathy

Until the mid 19th century, treatments offered by physicians mostly consisted of cathartics (laxative), emetics (induce vomiting), sudorifics (induce sweating), and the preparation of powerful drugs like arsenic and mercury. These treatments were often accompanied by other processes with strong effects such as bloodletting and cupping (Bynum, 1994; Rosenberg, 1977). Patients and their families trusted their physician as the provided treatments always provoked strong physical reactions which were taken as an indication of efficacy. At the time, the term “exhibiting a drug” was commonly used to refer to the act of administering a drug, due to the considerable reaction of the patients’ body (Rosenberg, 1977).

In reaction to the highly invasive treatments used by physicians, movements promoting more natural healing techniques developed in Britain and America. The Thomsonian System, using herbs to treat patients, was brought to Britain from America while hydrotherapy (the use of water to relieve pain, formerly known as hydropathy) underwent a resurgence in England as a cheap and easy way to treat many ailments (Brown, 1988; Bynum & Porter, 1987; Marland & Adams, 2009; Rothstein, 1972). Another system arose in Germany, led by the physician Samuel Hahnemann (1755-1843). As he was working on the translation of William Cullen’s *A Treatise on the Materia Medica* (a manual on the pharmacological properties of plants), Hahnemann discovered that the manual claimed that bark from the *Cinchona* tree could be used to treat malaria. Both *Cinchona officinalis* and *Cinchona pubescens* contain quinine, and both were used in the treatment of malaria. Hahnemann was, however, unsatisfied with the justifications behind the medicinal properties which were claimed and decided to investigate the effects of the plant on himself. To do so, he ingested the plant over a period of several days, the effect of which was to develop symptoms very similar to that of malaria, although some of the symptoms could have been due to cinchonism, a side effect of taking large dose of quinine (Coulter, 2001). In 1796, following his personal discovery and on the claim that *Cinchona* bark treated malaria, Hahnemann formulated the principle: *like cures like*. The postulate was based on the conjecture that an ill person could be treated with a substance that would induce the symptoms of the target illness in a healthy person. For example, the symptoms of a cold can be similar to the effects of cutting an onion, namely sore eyes, runny nose,
etc. Thus, a remedy made from onion could be used to treat a patient with a cold as long as they show comparable symptoms. The principle of like cures like, also known as the law of similars, soon became the basis for a new system of medicine: homeopathy. The word “homeopathy”, from the Greek words homeos meaning similar and pathos meaning suffering, was used for the first time in an essay by Hahnemann published in 1807 (Fisher, 2012).

The second central principle of homeopathy is known as potentisation, the process by which remedies are prepared. Once the original ingredient has been determined following the first principle, the remedy is prepared by a series of dilutions of the ingredient in alcohol and distilled water. After each dilution, the solution is energetically shaken, this is called succussion. This combination of serial dilution with succussions at each step is considered essential to the preparation of homeopathic remedies. According to Hahnemann, the high dilution of the substances allows for the minimisation of any side effects or toxicity. Combined with the process of succussion between each dilution, Hahnemann further claimed that it increases the curative properties of the primary ingredient (Bellavite, Conforti, Piasere, & Ortolani, 2005; Loudon, 2006). In 1810, Hahnemann published his first book on homeopathy, Organon der rationellen Heikunde (Organon of the Art of Healing). Organon is a Greek word meaning tool or instrument and often refers to the compilation of Aristotle’s work on logic (Smith, 2016). The book changed titles multiple times to finally settle with The Organon of Medicine and ran to six editions, the last being published in 1921.

The use of homeopathy increased during the 19th century. The increase is attributed to the softer approach of homeopathy practitioners compared to the techniques still being used by orthodox physicians (Ernst & Kaptchuk, 1996; Jonas, Kaptchuk, & Linde, 2003). The popularity of homeopathy especially increased during epidemics, for example during the cholera epidemic faced by Britain in 1854. During that epidemic, patients who were treated by homeopathy practitioners had a higher chance of survival compared to patients treated by conventional physicians (Fisher, 2012; Jonas et al., 2003). The reason for the differing survival outcomes between the two groups was due to the absence of dangerous techniques applied to patients by homeopathy practitioners rather than the presence of an actual effective cure (Gaucher, Jeulin, Peycrus, & Amengual, 1994). Indeed, during the
epidemics, the treatments used by conventional doctors still consisted mainly of bloodletting, purging or administration of emetics, which only weakened patients further (Bynum, 1994; Howard-Jones, 1972). Following on from these seemingly positive results, the practice of homeopathy grew outside of Europe, particularly in the United States (Fisher, 2012; Jonas et al., 2003).

Homeopathy spread into the United States and in 1844 the American Institute of Homeopathy (AIH) was created, followed by the International Hahnemannian Association (IHA) in 1880 as well as numerous homeopathic medical colleges across the country (Jonas et al., 2003; Loudon, 2006). In Britain, the British Homeopathic Society was established in 1843 (becoming the Faculty of Homeopathy in 1944), the British Journal of Homeopathy (BJH) published its first article in 1844 (becoming the British Homoeopathic Journal in 1911 then Homeopathy in 2002) and the first hospital opened in London in 1849. The very first homeopathic hospital was founded in Leipzig, Germany in 1833.

In the early 20th century, homeopathy experienced a decline linked to three main factors. First, the use and implementation of scientific discoveries in conventional medicine such as broad spectrum antibiotics, vaccination and sterile technique became widespread. This inclusion led to the increased effectiveness of conventional medicines, thereby making homeopathy comparatively less attractive. The development of the germ theory of disease increased physicians’ knowledge about the sources of disease and how to cure them, further adding to the efficacy of conventional medicine (Aminov, 2010; Stern & Markel, 2005; Tomes, 1990). Second, the proposed scientific foundations of the homeopathic theory of high rates of dilution leading to a more effective treatment came into question after the discovery of Avogadro’s number. The Avogadro number (6.02 x 10^{23}) is the number of molecules contained in a mass (in grams) of a substance equivalent to its molecular weight. For example, the molecular mass of carbon is 12 which means that there are 6.02 x 10^{23} carbon atoms in 12 grams of carbon. Avogadro’s number is the number of molecules present in a given system and shows that it is statistically very improbable that any molecules of the active ingredient remain in a homeopathic remedy after the serial dilutions (more details in following section) (Jonas et al., 2003; Kolb, 1978). Finally, the discipline of homeopathy suffered internal disagreements about the
preparation and prescription of their remedies. While some homeopathy practitioners wanted to rigorously follow the *Organon* instructions, others were eager to obtain medical education and to become a specialty within orthodox medicine. These disagreements lead to the separation of the discipline into two main schools, the conservative and the progressive (Haller, 2009). One can still find two major schools in contemporary homeopathy: classical homeopathy based on Hahnemann’s principles, which does not attempt to justify its effectiveness with regards to conventional medicine and prescribes single homeopathic remedies based on the patients’ symptoms, and clinical homeopathy allowing for the use of multiple remedies and making clinical evaluations of patients more similar to those of conventional medicine (Fisher, 2012; Jonas et al., 2003).

### 2.1 Use of Homeopathy Today

Since homeopathy is a form of CAM, it is usually subsumed into the general CAM category, which makes literature specific to homeopathy’s prevalence limited. In 1997, a commission report to the European Parliament and Council focusing on homeopathy claimed that three out of four Europeans knew about homeopathy and that 29% of them were using it (Commission of the European Communities, 1997). In Italy, a nation-wide survey published in 2002 showed that homeopathy was the most commonly used CAM therapy, with 8.2% of the adult population having used homeopathy in the past three years (Menniti-Ippolito, Gargiulo, Bologna, Forcella, & Raschetti, 2002). More recently, results from a 2012 survey indicated that 2.1% of US adults had used homeopathy in the past 12 months, an increase compared to 1.7% and 1.8% in 2002 and 2007 respectively (Dossett, Davis, Kaptchuk, & Yeh, 2016). Finally, a systematic review of the prevalence of visits to CAM practitioners estimated that around 1.5% of the adult population visited homeopathy practitioners (based on results from the US, UK, Canada, Australia, Israel, and Germany) (Cooper, Harris, Relton, & Thomas, 2013). While those numbers might appear minimal they are significant when considering the risks faced by patients replacing conventional treatments with homeopathic ones.

Surveys from the US and Germany have shown that homeopathy users are more likely to be well-educated, middle-aged and female (Dossett et al., 2016; Ernst, 2016; Steel et al.,
These characteristics are consistent with CAM users, with multiple surveys finding CAM users to be: early to middle-aged, female, and better educated. It is important to note, however, that women are also more likely to seek help from conventional/orthodox medicine than men. Nonetheless, the trend is further amplified when looking at CAM use, suggesting that gender is indeed a factor worth considering (Bishop & Lewith, 2010; Green & Pope, 1999). Additional findings about CAM users more generally include that they tend to be earning more than average and suffering from poorer self-reported health (Stoneman, Sturgis, & Allum, 2013).

3. Controversy Around Homeopathy

The main controversy surrounding homeopathy revolves around the potentisation process, which has to be followed for the preparation of any homeopathic remedy. As briefly described previously, the potentisation process includes two parts. Firstly, the tincture (primary ingredient in solution) is diluted in a solvent made of alcohol and water. Secondly, the solution has to be shaken vigorously (succussion) after dilution. The potentisation process is the combination of serial dilutions, each followed by succussion. While the dilution process intends to reduce the side effects of the remedy, the succussion process aims to increase efficacy (Bellavite et al., 2005). The potency of a remedy will depend on how many times it has been potentised (diluted and shaken). A dilution of 1 to 10 ($10^{-1}$) will be labelled as 1X while a dilution of 1 to 100 ($10^{-2}$) will be 1C. Additionally, following on Hahnemann principles, the more dilute and shaken a solution is, the stronger, so a potentisation of 20C ($10^{-40}$) is considered stronger than a 10C ($10^{-20}$).

Statistically, homeopathic remedies with a potency higher than 12C, equivalent to a dilution of $10^{-24}$, will not contain any molecules from the tincture (Grimes, 2012). Despite this, the dilution advocated by Hahnemann for most homeopathic remedies is 30C which is equivalent to a dilution of $10^{-60}$. These high dilutions of active ingredients alongside the health claims made by homeopathy proponents led the scientific community to question the effectiveness of homeopathic remedies. Homeopathy proponents responded to the high dilution criticism with a different hypothesis which explained how, despite the serial dilution, their remedies could be effective. This hypothesis claimed that water
had a memory and could remember the ingredients present in the primary tincture (Bellavite, Marzotto, Olioso, Moratti, & Conforti, 2014; Chaplin, 2007; Milgrom, 2006; Rao, Roy, Bell, & Hoover, 2007; Rey, 2003). Numerous suggestions for ways water could have a memory have been studied, including the epitaxy phenomenon (Rao et al., 2007), the formation of hydrogen-bonded clusters (Bellavite et al., 2014), and the silica hypothesis (Anick & Ives, 2007; Chaplin, 2007). Epitaxy involves the transfer of information from one material to another without the need of any transfer of matter. So the tincture could hypothetically ‘imprint’ water with the original ingredients, meaning that homeopathic remedies would be effective due to the solution’s structure rather than its composition (Mastrangelo, 2006). The hydrogen-bonded clusters hypothesis assumes that early on in the process of dilution small clusters of ingredients are going to form. The molecules of solvent will then form hydrogen bonds with each other, creating a shell around the ingredient’s clusters. Following succussions, some of the ‘solvent shell’ might break and leak the ingredient’s clusters but they will re-form. The formation of “holes” and “shells” of specific shapes could potentially be the foundation of homeopathic remedies (Anagnostatos, Vithoulkas, Garzonis, & Tavouxioglou, 1991; Anagnostatos, 1994). According to the silica hypothesis, the difference between homeopathic remedies and controls (solvent) lies in different levels of dissolved silicates. It has been shown that silica from the glass vials dissolves during the process of succussion and instead of being considered contaminants, silicates are suggested to play a major role in homeopathic remedies. The conjecture is that silicates could be combined to form “remedy-specific patterns” that could then act as templates and disseminate the remedy-specific pattern (Anick & Ives, 2007).

Except for the silica hypothesis, none of the explanations about the memory of water involved physical entities, making them hard to study. During the past decade, homeopathy proponents have developed new hypotheses claiming that even after serial dilutions some of the primary ingredient still remains in the remedies. In 2010, Chikramane et al., used commercial samples of homeopathic remedies made from metal (copper, gold, platinum, silver, tin, and zinc) and stated that the succussion process was generating nanoparticles of the primary ingredient and that those nanoparticles and their aggregates were present in highly diluted samples. Following that discovery, Chikramane et al., (2012) postulated that the nanoparticles levitate thanks to air bubbles formed during
the succession process (froth floatation hypothesis), which could facilitate their capture and transfer to the next potentisation, explaining the presence of the primary ingredient in highly diluted homeopathic remedies. Finally, the most recent hypothesis combines the presence of silica and nanoparticles (Bell, Schwartz, Frye, Sarter, & Standish, 2015; Temgire, Suresh, Kane, & Bellare, 2016). According to this hypothesis, nanoparticles of the primary ingredient are encapsulated by silicate coatings, then levitate and form a monolayer during the succussion process due to extensive foaming, facilitating their transfer to the next potencies (Temgire et al., 2016).

While there is still no consensus about what is present in homeopathic remedies, the point remains moot as the main issue is that claims of effectiveness reported by homeopathy advocates have failed to be confirmed by any clinical trials.

The literature around homeopathy is abundant and the aforementioned controversy has been sustained over multiple decades. Homeopathy advocates continue to claim the effectiveness of homeopathy while the scientific community keeps reaching the opposite conclusion: the effects of homeopathy are not greater than the placebo. The placebo effect(s) is the outcome measured after administration of an inert drug (the placebo) to a patient. In any medical procedure the psychosocial context (psychological factors combined with social environment) surrounding the patient has an impact on their physical and mental wellness (Colloca & Benedetti, 2005). In clinical practice, it is imperative to be able to differentiate the effect of a treatment on its own, independent from its psychosocial context. This is why research methodologies include double-blind, randomized, placebo-controlled trials which allow the effects from the placebo to be dissociated from the effects of the remedy itself (Finniss, Kaptchuk, Miller, & Benedetti, 2010; Price, Finniss, & Benedetti, 2008). The following section will focus on the importance of the placebo effect (See 4. Homeopathy as placebo).

When looking at systematic reviews on the effectiveness of homeopathy in treating specific conditions, one can find three different patterns. First, there are reviews reporting that homeopathy is effective and recommending its use for conditions like insomnia, childhood diarrhea and hyperactivity disorders (Frei et al., 2005; Jacobs, Jonas, Jiménez-Pérez, & Crothers, 2003; Naudé, Stephanie Couchman, & Maharaj, 2010). So far, all of these studies have been criticised for lacking appropriate research methodology by having
small samples, too short of a time period or not including controls, making it impossible to check for the placebo effect. Second, some systematic reviews highlight the effectiveness of homeopathy for conditions like influenza, fibromyalgia and postoperative ileus (Barnes, Resch, & Ernst, 1997; Mathie, Frye, & Fisher, 2015; Perry, Terry, & Ernst, 2010), but do acknowledge caveats in their methodologies and ask for further, better designed studies to confirm their findings and accordingly, do not make any recommendations. Finally, most reviews fail to show the effectiveness of homeopathic remedies to be any higher than that of placebos, meaning that the apparent efficacy of the homeopathic remedies is not linked to the treatment in itself but to the psychosocial context around its administration (Ernst & Pittler, 1998; Mathie et al., 2017; National Health and Medical Research Council, 2015).

Globally, limitations of the available homeopathic research (small sample size, short time period, poor measurement, lack of repeats, absence of controls), makes it impossible to provide sound evidence for the effectiveness of homeopathic remedies (Ernst, 2002; Jonas, Anderson, Crawford, & Lyons, 2001; Mathie et al., 2017). In 2005, a comparative study of placebo-controlled trials of homeopathy and conventional medicine concluded that “[…] there was weak evidence for a specific effect of homeopathic remedies, but strong evidence for specific effects of conventional interventions. This finding is compatible with the notion that the clinical effects of homeopathy are placebo effects” (Shang et al., 2005, p. 726). However, that study has been criticised for its lack of transparency and failing to follow guidelines for systematic review (Fisher, 2012; Lüdtke & Rutten, 2008; Rutten & Stolper, 2008). One review at odds with others was the 2006 report commissioned by the Swiss Federal Office for Public Health, which came to the opposite conclusion; “[…] effectiveness of homeopathy can be supported by clinical evidence and professional and adequate application be regarded as safe” (Bornhöft et al., 2006, p. 19). Again, the report has been greatly criticised for using an inappropriate method of analysis, inclusion of low quality evidence, possible conflicts of interest, and misinterpretations of evidence (Shaw, 2012).

More recently, a report by the United Kingdom House of Commons Science and Technology Committee stated that the committee “[…] reached the conclusion that homeopathy was not efficacious and any perceived effectiveness was in fact solely due
to the placebo effect” (2010, para. 123). The same conclusion was reached in 2015 in a report by the Australian National Health and Medical Research Council (NHMRC), stating that “there is no reliable evidence that homeopathy is effective for treating health conditions” (2015, p. 27). These global reports received their share of criticism too. Shortly after the publication of the NHMRC report, the Homeopathy Research Institute (HRI) based in the UK, as well as the Australian Homoeopathic Association (AHA), sent their response, expressing concerns about the review process. While the homeopathic institutions agree that there is a lack of high quality, large scale research which makes it difficult to assess the efficacy of homeopathic remedies, they do not accept the NHMRC conclusions due to methodological issues (more details see AHA, 2015; HRI, 2014).

Although there is a clear consensus within the scientific community on the absence of reliable evidence supporting the effectiveness of homeopathic remedies, homeopathy is still one of the main CAM treatments. In their information paper (2015), the Australian NHMRC also concluded that: “Homeopathy should not be used to treat health conditions that are chronic, serious, or could become serious; people who choose homeopathy may put their health at risk if they reject or delay treatments for which there is good evidence for safety and effectiveness and people who are considering whether to use homeopathy should first get advice from a registered health practitioner. Those who use homeopathy should tell their health practitioner, and should keep taking any prescribed treatments” (p. 27). Indeed, in 2002, belief in the effectiveness of homeopathy led to delay in the use of conventional medicine, resulting in the death of Gloria Sam, a nine-month-old baby. The infant had developed eczema (a minor skin condition) but instead of receiving the common anti-inflammatory corticosteroid cream, she was treated solely with homeopathic remedies, leading to severe deterioration of her condition. This eventually led to septicaemia and her death (Smith et al., 2013). The Gloria Sam case is an extreme example of the risk faced by people who believe homeopathy to be effective, and so delay the use of conventional medicines.

In New Zealand, Green MP Steffan Browning signed and shared an online petition asking the World Health Organisation (WHO) to test and distribute homeopathic remedies to contain the Ebola outbreaks in West Africa (Gulliver, 2014a). The petition, entitled “WHO: End the suffering of Ebola crisis. Test and distribute homeopathy as quickly as
possible to contain the outbreaks” claimed that homeopathy was an effective treatment that could be used to prevent and treat epidemics. The New Zealand media shared the story, which was quickly followed by other members of the party declaring they did not support the petition, and the Prime Minister himself declaring that suggesting the use of homeopathy could treat the Ebola virus was “barking mad” (Gulliver, 2014b). In this case, a public figure endorsing homeopathy could potentially reinforce the confusion around homeopathy and its effectiveness. In September 2016, the Food and Drug Administration (FDA) in the U.S. shared a press release warning against the use of homeopathic teething tablets and gels. The press release was following a ‘safety alert’ from 2010 where the FDA had previously warned consumers against the use of homeopathic teething tablets as they might pose risks to children due to the inconsistency of their composition (FDA, 2010). The FDA has since been watching for side effects and is still investigating possible adverse events such as seizures, constipation, or difficulty breathing in children after using the products (FDA, 2016).

4. HOMEOPATHY AS PLACEBO

The use of the word placebo, as we know it today, dates from the end of the 18th century when it started being used in medical contexts. At the time it was described as a treatment aiming to please patients rather than treat them and could be made of bread pills or coloured water (Kaptchuk, 1998). Nowadays, a placebo is defined as “a sham medical or therapeutic treatment that appears similar to an actual treatment and evokes expectations of benefit” (Geuter, Koban, & Wager, 2017, p. 168). Interest in the placebo effect increased after World War II with the adoption of the randomised controlled trial (RCT), which resulted in the observation that patients improved despite receiving a placebo treatment. The concept of placebo was firstly described in 1955 by Henry Beecher in his publication “The Powerful Placebo” where he described that about 35% of patients responded to placebo treatment for various conditions including headaches, wound pain, anxiety and the common cold (Beecher, 1955). Whilst having some flaws, Beecher’s study highlighted the need for double-blind RCT for sound scientific evaluation of medical treatments (Kaptchuk, 1998). Some of the “Powerful Placebo” also turned out to be due to the natural history of the disease (the course an illness would take if no treatment
is taken), concurrent interventions or regression to the mean (Barnett, van der Pols, & Dobson, 2005; Kelkar & Ross, 1994). Regression to the mean occurs when natural variation appears as a real change; an initially large measurement becomes closer to the mean when re-measured, for example (Barnett et al., 2005).

For many decades, placebo stayed in the shadow of RCT. It was seen as a nuisance and was valued only as a comparison marker to evaluate the ‘true’ effectiveness of medical treatments. Only recently has interest grown, with scientists striving to understand the mechanisms behind the placebo and its potential benefits as part of the treatment effect (see Figure 2-1). A placebo was often described as an inert substance (or procedure) and what followed after the administration of the placebo was described as the placebo effect. There are actually multiple placebo effects, and some of the mechanisms are only now starting to be studied. All of the mechanisms are neither mutually exclusive nor the sole mechanisms involved. Table 2-1 below, provides a summary of the different components involved in the placebo effect.

![Figure 2-1. The placebo effect is complex and comprises different factors that, combined with the drug effect contribute to the total effect of treatment. Reprinted from International Review of Neurobiology, Volume 138, Zion, S. R. & Crum, A. J., Mindsets Matter: A New Framework for Harnessing the Placebo Effect in Modern Medicine, Page 140, Copyright (2018), with permission from Elsevier.](image-url)
Table 2-1. Components of the placebo effect: biological mechanisms, psychological processes, and social and contextual factors.

<table>
<thead>
<tr>
<th>Biological mechanisms</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Body’s healing properties</td>
<td>Biological properties of the body that facilitate healing, including homeostatic mechanisms, immune, and inflammatory responses. These contribute to the natural history of a disease, but can also be targets of placebo effects</td>
</tr>
<tr>
<td>Neurophysiology</td>
<td>Dopamine, endogenous opioids, and endocannabinoids are three of the major neurotransmitter systems implicated in moderating the placebo effect</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Psychological processes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Implicit learning</td>
<td>The nonconscious acquisition of knowledge. Classical conditioning, a form of implicit learning, is implicated in certain instances of the placebo effect</td>
</tr>
<tr>
<td>Expectations</td>
<td>A belief about the future based on a prediction of what is most likely to happen. Expectations underlie certain instances of the placebo effect and drive neurobiological mechanisms</td>
</tr>
<tr>
<td>Mindsets</td>
<td>A lens or frame of mind that orients an individual to a particular set of beliefs, associations, and expectations, and functions to guide attentional and motivational processes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social and contextual factors</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Development and culture</td>
<td>Our caregivers and social environment influence the psychological processes that underlie the placebo effect. These processes are continuously shaped throughout life by the ideas, institutions, and interactions that constitute the culture in which we live</td>
</tr>
<tr>
<td>Patient-provider relationship</td>
<td>The patient–provider relationship shapes the mindsets a patient holds about health, illness, and treatments, and affect the quality of care a patient receives. This relationship is influenced by the warmth and competence of the provider and is further shaped by characteristics like empathy and trust</td>
</tr>
</tbody>
</table>
Observational learning and social influence
Learning through direct observation of others undergoing treatment (i.e., other patients) as well as interactions with individuals who yield influence over the patient (i.e., physicians and nurses) may both powerfully drive placebo effects

Treatment characteristics
The specific characteristics of the treatment that is provided to the patient. This includes factors like the shape, color, and branding of the treatment, the method of administration, and the physical environment in which the treatment is administered


Placebo effects can be looked at from neurobiological and/or psychological viewpoints. For the purpose of this thesis, focus will be on the psychological aspect of the placebo. In a 2010 review from the *Lancet*, nine mechanisms were listed as contributing to placebo effects: expectations, conditioning, learning, memory, motivation, somatic focus, reward, anxiety reduction, and meaning (Finniss et al., 2010). From these, the two most studied processes are expectations and classical conditioning, which are discussed below (Wager & Atlas, 2015).

Classical conditioning, sometimes referred to as Pavlovian conditioning, was first studied by Ivan Pavlov in the classic experiments where he trained dogs to salivate at the sound of a bell. During that experiment, Pavlov associated a biological stimulus (food) with a neutral stimulus (the bell) and the result of that association was the production of saliva, since the dogs were receiving food. The conditioning was complete when the dogs started to salivate when exposed to the neutral stimulus only. Similar experiments have been done in the medical context where, for example, multiple sclerosis patients were given an immune suppressant in a flavored syrup and later displayed an immune response similar to the one they experienced when receiving the drug, but this time with syrup only (Giang et al., 1996). More generally, classical conditioning can derive from years of association between positive outcomes and pills or white coats, for example. Those positive associations, in turn, can influence and be influenced by expectations (Tracey, 2010).
Expectation, or expectancy, is linked to “belief about the nature and likelihood of future states” (Zion & Crum, 2018, p. 144). Studies have shown that expecting a specific outcome can trigger cognitive, emotional and behavioural changes that will increase the chance of that event happening (Zion & Crum, 2018). For example, research focusing on placebo analgesia have shown that patients who had a positive expectation of the treatment (placebo) experienced an analgesic effect whilst those with a negative expectation did not experience any analgesic effect (Bingel et al., 2011). Another study compared the placebo response in patients who knew they were getting a treatment (placebo as saline injection), therefore had expectations, to patients who were not aware they received the treatment and thus had no expectations. The patients who consciously received the placebo experienced a reduction of pain equivalent to getting 6-8 mg of morphine while the other patients did not experience any pain reduction following the administration of the placebo (Levine & Gordon, 1984; Levine, Gordon, Bornstein, & Fields, 1979). The placebo effect caused by patient expectation is very likely to happen in the context of homeopathy use and CAM use in general. The patient’s mindset is also connected to expectation. Crum and Zion (2018) described mindset as “a more general psychological construal that orients an individual to a number of mindset-consistent expectations” (p. 146) and argue that patients often have pre-existing mindsets about their health before entering the medical context. As a result, the information patients receive will be interpreted via their “lens of mindsets” and that will influence their expectations. Again, this could explain why some people who had negative encounters with conventional medicine in the past seem to be attracted to CAM and perceive them to be effective.

Conditioning, expectation and mindsets do not exist on their own, but rather are formed and evolve within a patient’s social environment. The social context, also referred to as psychosocial factors, can ultimately influence the magnitude of the placebo effect (Howe, Goyer, & Crum, 2017; Zion & Crum, 2018). Among others, the patient-provider relationship and observational learning are two factors that could help explain the appeal to homeopathy and CAM in general. The patient-provider relationship builds on the patient’s perception of the provider as having benevolent intentions, and the ability to enact those intentions. In a study published in 2017, the influence of the patient-provider relationship was investigated with 160 healthy participants undergoing an allergy screen
The aim of the experiment was to observe if the likeableness and credibility of the provider would influence participants’ expectation of an inert cream for allergic reactions. The results showed that visiting the likeable and credible practitioner (positive expectations) reduced participants’ allergic reactions whilst the negative or neutral expectations did not have any influence (Howe et al., 2017). Another characteristic that intertwines with the perception of credibility and likeability is trust (Cook et al., 2004). Trust can come from the belief in the competence of the practitioner (reliance), but also from the belief that the practitioner has the patient’s best interests at heart (dependence). The importance of building a trusting relationship between patient and provider is often implicit, however, research on the clinical benefit of trust specifically is sporadic (Prévost, Zuckerman, & Gold, 2016).

Observational learning is learning that occurs via the observation of others’ behaviours. It was first suggested to play a role in the placebo effect in 2002 and was first experimentally tested in 2009 (Bootzin & Caspi, 2002; Colloca & Benedetti, 2009). The study, involving 48 healthy female volunteers, showed that observing another subject could trigger placebo analgesic responses of comparable magnitude to the ones induced by conditioning. A similar study conducted in 2013 showed that, rather than inducing a placebo effect, the observational learning could induce a “nocebo” effect (Świder & Bąbel, 2013). Nocebo effects are nonspecific side effects experienced by patients taking an inert treatment (Barsky, Saintfort, Rogers, & Borus, 2002). Another study published in 2014 compared the impact of observational learning face-to-face with video recordings and found that both types of observation (live versus recorded) had similar magnitude of placebo effect (Hunter, Siess, & Colloca, 2014). More research is needed to explore the full potential of observational learning in placebo analgesia. Explicit social influence, in general, could also modulate placebo effects. People who drink water labelled as caffeinated, for example, will exhibit increased motor functions and be more alert, even though the water does not contain any caffeine (Crum, Phillips, Goyer, Akinola, & Higgins, 2016). Additionally, the effects were strengthened if the participants had heard reports of positive effects of the product. These results are especially relevant in regards to CAM and homeopathy use with consumers sharing their positive experiences, potentially influencing others by modulating their expectations both via observational learning and social influence.
All the mechanisms known to produce a placebo response in adults have not been studied in children yet, however, it has been shown that children can experience a placebo effect mediated by ‘placebo by proxy’ (Grelotti & Kaptchuk, 2011; Kossowsky & Kaptchuk, 2015; Whalley & Hyland, 2013). The concept of “placebo by proxy” is relatively recent (Grelotti & Kaptchuck, 2011) and suggests that “patients’ response to therapy is influenced by the behaviour of others whose behaviour is altered by knowing that the patient is receiving therapy” (Whalley & Hyland, 2013, p. 341). If parents feel optimistic about a treatment that has been given to their child (patient), the child’s environment will become less stressful due to their parents change of attitude (parents might smile more, be more encouraging, pay more attention to the patient, etc.). As a result, the patient’s psychological context might be improved by placebo by proxy then triggering a placebo effect (Grelotti & Kaptchuck, 2011).

In animals, the most studied mechanism contributing to placebo effect is classical conditioning (or Pavlovian conditioning). Following the same idea that the original experiment undergone by Pavlov, it is possible to trigger a placebo response in animals after a conditioning period. For example, in 2010 Guo, Wang, & Luo showed that mice could develop placebo heat analgesia after being administered morphine for 4 days. The daily morphine injections were paired with visual (light) and tactile (grid floor) cues. When the mice received a saline injection on day 5, followed by exposition to the visual and tactile cues, they displayed the same behaviour as when administered with morphine, suggesting that they developed placebo analgesia (Keller et al., 2018). Other studies have been published investigating the placebo effect in rats (Herrnstein, 1962) and dogs (Munana et al., 2010). Measure of the placebo effect in companion animals, however, can be subject to exaggeration due to the use of proxy. Studies of the placebo effect in companion animals often require veterinarians and/or owners to fill forms about the improvement, or lack of improvement, of the animal’s condition. This leads to a “caregiver placebo effect” where there are “improved ratings of outcomes in companion animals in the absence of improvement in objective measures” (Gruen & al., 2017, p. 2). Compared to the extent of data available for adults, research focusing on placebo effect in children or non-human animals is still in its infancy and more research needs to be done to get a better appreciation of its magnitude. It is clear, however, that placebo effect can occur in adults, children and animals.
Despite the absence of evidence that homeopathy is any more effective than placebo, there is an increasing number of homeopathy users worldwide. Whilst more and more research is showing the power of placebo effects, it mainly focuses on pain management and additional research is needed to identify the limits of placebos. It is in this context of apparent confusion around homeopathy, alongside the lack of data regarding its use in New Zealand, that this thesis aims to gain a better understanding of homeopathy users’ perception of homeopathy, in New Zealand.
CHAPTER 3: METHODOLOGY

INTRODUCTION

This research project explores homeopathy users’ perspectives on the effectiveness and scientific validity of homeopathy. To achieve this goal, this project includes two parts and the use of both qualitative and quantitative analysis, following a sequential explanatory mixed methods design. This chapter describes the rationale for the use of mixed methods and the design used in this project. Mixed methods were used in order to test hypotheses based on international literature, but also to explore the New Zealand context in more depth. While the project is presented as two components, the work should be considered in whole.

Since 1989 multiple authors have defined mixed methods, focusing on different aspects of mixed methods research (Greene, Caracelli, & Graham, 1989; Hesse-Biber, 2015). The recent definition published by Creswell and Plano Clark (2017, p. 5) highlights the core characteristics of mixed methods: “In mixed methods, the researcher

1. Collects and analyses both qualitative and quantitative data rigorously in response to research questions and hypotheses,
2. Integrates (or mixes or combines) the two forms of data and their results,
3. Organises these procedures into specific research designs that provide the logic and procedures for conducting the study, and
4. Frames these procedures within theory and philosophy.”

Mixed methods research involves the collection of both qualitative and quantitative data, allowing different aspects of the research question to be addressed with the intent of providing a more comprehensive picture of the research (Creswell, 2014; Creswell & Plano Clark, 2011). The present research project aims to answer the questions “Do people use homeopathic remedies in New Zealand?” and “Do people perceive homeopathy as scientifically supported?” using quantitative data. Additionally, the project aims to
explore more in-depth the reasons behind people’s belief (or lack thereof) in the scientific basis of homeopathy, which requires a qualitative approach.

An advantage of using a mixed methods approach is the acquisition of new knowledge that exceeds the sum of the individual quantitative and qualitative components (Creswell & Plano Clark, 2017). Other advantages include corroboration of results and compensation of one method’s weaknesses via the strength of the other (Johnson & Onwuegbuzie, 2004).

**PHILOSOPHICAL ASSUMPTIONS**

Whilst not being explicitly named, mixed methods approaches have been present in the social sciences since the early twentieth century. In 1934, Fry wrote “Time and again the really creative part of a social inquiry is deciding how different approaches should be combined to yield the most fruitful results” (p. 136). Shortly after, quantitative approaches started dominating the social sciences and it is only towards the end of the century that mixed methods were further developed and became more commonly used (Johnson & Gray, 2010). With the emergence of mixed methods research, now commonly accepted as a third methodological movement (adding to the quantitative and qualitative movements), there arose the issue of finding a research paradigm able to legitimise its use (Johnson & Gray, 2010).

Mixed methods introduced new paradigms that pacified the “paradigm wars” (1970s-1980s). These disagreements primarily focused on the differences and incompatibility of the qualitative and quantitative approaches (Johnson & Onwuegbuzie, 2004), resulting in an “incompatibility thesis”, wherein qualitative and quantitative research and methods were presented as distinct and mutually exclusive. Indeed, postpositivism, the dominant quantitative paradigm, argues that social science research should be time- and context-free, whilst constructivism, associated with qualitative approaches, rejects that idea and highlights the importance of research being value-bound (Johnson & Onwuegbuzie, 2004). Purists battled against the combination of paradigms to suit mixed methods research and instead argued for their respective paradigms (postpositivism or constructivism) as best suited for mixed methods research. The aim of mixed methods,
however, is not to focus on the differences between the qualitative and quantitative paradigms, but to find an approach that would draw on their strengths and compensate for their weaknesses within a single study (Johnson & Onwuegbuzie, 2004). For instance, in undertaking mixed methods, this research collected both “context-free” nation-wide data via a quantitative survey and value-bound data via qualitative in-depth interviews. In doing so, each method compensates for the weakness of the other, with the quantitative data providing pure, numerical evidence to accompany the qualitative data’s lack thereof, and the qualitative data adding value-rich information that the quantitative data is lacking.

Three paradigms are available to mixed methods researchers: a “best” worldview, a dialectical perspective, and flexibility of worldviews. Some authors argue that there is a best worldview for mixed methods research, classically either a pragmatism or a transformative approach (see Creswell & Plano Clark, 2017). Pragmatism is outcome-orientated which focuses on the product of the research, rather than the methods, in a social context (Creswell & Plano Clark, 2011; Shannon-Baker, 2016). Whilst having a lot of support (Feilzer, 2010), pragmatism has also been criticised for being “vague and methodologically unsatisfactory” (Bergman, 2008, p. 14). In contrast, the motivation behind the transformative approach involves addressing issues of social inequalities, social justice and minority groups (Mertens, 2012). This approach consequently has the limitation of only being applicable to a specific type of social research (Hall, 2013). The second option requires researchers to have a dialectical perspective. A dialectical position views the tension created by different paradigms as beneficial, and aims to facilitate dialogues between different realities (Greene & Hall, 2010). Finally, researchers could have the flexibility to choose the worldview depending on their study and mixed methods design. In this stance, the type of mixed methods design is informed by, and also might inform, the selection of worldviews (Creswell & Plano Clark, 2017). Depending on what best fits their study, researchers can use more than one paradigm/worldview. The use of multiple paradigms is also referred to as the complementary strengths stance (Greene, 2007). This third option was chosen as best suited for this research project with the design of the mixed methods informing the selection of worldviews.
The first part of this project was quantitative and followed a postpositivist approach whilst the second part, consisting of qualitative data collection, fit under a constructivist worldview. Despite using different worldviews, the overarching philosophical assumptions of this research project fall within pragmatism. Pragmatism is a philosophy supporting multiple outcome-orientated approaches, with focus on the product of the research, rather than the methods, in a social context (Creswell & Plano Clark, 2011; Shannon-Baker, 2016).

**MIXED METHODS RESEARCH DESIGNS**

There are numerous mixed methods research designs available to researchers as there are many ways to combine qualitative and quantitative methods. Similar to the mixed methods research definition, there are many typologies available to describe the different designs. To avoid confusion, only the latest typology from Creswell and Plano Clark (2017) will be presented. The three core mixed methods designs are the convergent design, the sequential explanatory design, and the sequential exploratory design (see Figure 3-1) (Creswell & Plano Clark, 2017). Convergent design implies that both studies (qualitative and quantitative) are happening at the same time, with the results being brought together for comparison. In sequential designs, however, one study follows the other. The sequential explanatory design usually starts with quantitative data collection that will be analysed to inform the second phase involving qualitative data collection. The qualitative data collection aims to explain results of interest from the first quantitative phase (Creswell & Plano Clark, 2011; Ivankova, Creswell, & Stick, 2006). In the sequential exploratory design, the qualitative data collection happens first, followed by quantitative data collection designed with the help of the qualitative data results. This research project used a sequential explanatory mixed methods design, starting with a quantitative survey, followed by qualitative interviews.
The objective of sequential explanatory design is to use a qualitative phase to expand on results collected in a quantitative phase. This design can also be used to identify groups based on the quantitative results and sample the populations of interest through the follow-up qualitative data collection (Creswell & Plano Clark, 2017; Ritchie, 2003).

Following a sequential explanatory design, this research includes two phases. The first phase comprises a survey (quantitative method) followed by a second phase, using in-depth interviews (qualitative method). The two phases ask for different worldviews. The survey was designed to address specific hypotheses based on the literature and collected empirical data, whilst the in-depth interviews were built on the survey findings and explored the participants’ views in more detail. Consequentially, the research starts with a postpositivist perspective during the quantitative data collection then shifts to a
constructivist perspective during the qualitative data collection. Figure 3-2 shows the basic procedures followed in a sequential explanatory design.

Figure 3-2. Basic procedures in a sequential explanatory mixed methods design. Adapted from Creswell & Plano Clark, 2011.
The key to mixed methods is the integration of qualitative and quantitative data. While implementing a sequential explanatory design, integration happens at two different stages. First, quantitative results from the first phase are used to develop the qualitative data collection method and/or design. The quantitative results pinpoint results that require further investigation or groups of interest that should be focused on during the qualitative phase. The second integration happens once the qualitative data collection is complete. The integration of both qualitative and quantitative results helps build an overall picture and explain the research question in more depth.

**Validity in Mixed Methods Research**

The question of validation in mixed methods research is still an on-going discussion among academics (Collins, 2015; Dellinger & Leech, 2007; Onwuegbuzie & Johnson, 2006; Teddlie & Tashakkori, 2009). Again, to avoid confusion, the focus will be on the recent work published by Creswell and Plano Clark (2017).

Creswell and Plano Clark define validity in mixed methods research as “employing strategies that address potential threats to drawing correct inferences and accurate assessments from the integrated data” (2017, p. 251).

Looking at sequential explanatory designs, one can find three main threats to the validity of the design. The first is to fail to identify important results from the quantitative phase that require further investigation. The second threat is to not use the qualitative phase to address apparent contradictions within the results from the quantitative phase and the third possible threat is to have a disconnect between the initial results and the follow-up data collection. Strategies to overcome these threats are first; to be aware of them and consider all possible explanations of quantitative results. This was done in the present study by involving a third party at the analysis and discussion stages of the quantitative results, to ensure all possible avenues were explored. Second, to design qualitative questions that probe into the contradictory quantitative results, this was done by developing a qualitative questionnaire based on the quantitative results of interest. Third, to use the quantitative sample to select participants for the qualitative phase, which was done in this project. Finally, Dellinger and Leech (2007) recommend the researcher
position themselves in relation to their research project to increase validity in the mixed methods.

**My Role in this Research**

I first came to New Zealand in 2012 to finish my Master’s degree in biology. It was at that time that I discovered the field of Science Communication and became interested in the area of Public Understanding of Science. After finishing my Master’s in Belgium, I decided to move to New Zealand to study science communication with the aim of exploring the place of science in society. Do people value science? Are people using scientific knowledge in their everyday life? And more specifically, do people value scientific evidence when making health decisions? This last question became important to me at the time when I started thinking about embarking on a PhD journey.

In 2015, homeopathy made news headlines in Australia and New Zealand following the release of an Australian report concluding that homeopathic remedies were not more effective than placebos. The large number of online comments rejecting the report’s conclusion sparked my interest in New Zealanders’ perceptions of homeopathy and I quickly discovered the lack of research around homeopathy use in New Zealand. One of the few datasets available was from a 2012 survey where more than half of the respondents believed homeopathic remedies to be “scientifically proven to work”. As a scientist, those results were intriguing, since there is a clear consensus for the lack of robust scientific evidence for homeopathy’s effectiveness. That is why the main focus of my PhD project was to look at homeopathy users’ perception of homeopathy and its scientific basis.

I do not consider myself either pro or anti homeopathy but rather context dependent. While I personally do not intend to use homeopathic remedies and would not recommend them, I am not against the use of homeopathy for self-limiting disease conditions (conditions that resolve spontaneously with or without specific treatment) where there is no available treatment.
USING MIXED METHODS RESEARCH TO EXPLORE THE USE OF HOMEOPATHY IN NEW ZEALAND

The purpose of this study was to explore the use of homeopathy in New Zealand with a focus on homeopathy users and their perception of homeopathy as scientifically supported, or not. A sequential explanatory mixed methods design was used that involved collecting quantitative data first and then expanding on the results with in-depth qualitative data. In the first, quantitative phase of the study, survey data was collected from New Zealanders via street-intercept surveys as well as an online survey to assess whether use of homeopathic remedies relates to belief in their scientific basis. The second, qualitative phase was conducted as a follow-up to the quantitative results to help explain why and how users of homeopathy perceived homeopathy as scientifically supported, or not through in-depth interviews.

Integration of the qualitative and quantitative phases happened at different stages as previously described. First, the analysis of the survey data informed the design of the interviews. Second, the survey sample was used to select participants for the interviews. Finally, both data sets were combined in the discussion chapter to give a more in-depth answer to the research question. The individual qualitative and quantitative methods will be described in their respective chapters.
Figure 3-3. Mixed methods research design followed in this research project.
CHAPTER 4: HOMEOPATHY USE IN NEW ZEALAND – SURVEY

INTRODUCTION

This chapter presents the first phase of the sequential explanatory mixed methods exploring the use of homeopathic remedies in New Zealand. Quantitative data was collected using a survey to examine the extent to which homeopathic remedies are perceived to be scientifically proven to work. It also addresses the lack of information about homeopathy users in New Zealand. The chapter presents the results and discussion of the study.

AIM

In 2011, a nation-wide survey looking at New Zealanders’ beliefs found that 51% of the respondents (n=1000) believed the statement “homeopathic remedies are scientifically proven to work” to be true (UMR, 2012). Since 2011, homeopathy has been in the New Zealand media on several occasions (Bridgeman, 2013; Davison, 2014; “Ad ‘unduly glamorised homeopathy outcomes’”, 2014) and the Australian NHMRC published the results from a systematic review assessing the effectiveness of homeopathy which concluded that there is no evidence that homeopathy is more effective than placebo (2015). Despite the regular occurrence of homeopathy in the media, the literature specific to the prevalence of homeopathy in New Zealand is either very limited or absent (Duke, 2005; Holt & Gilbey, 2009). Therefore, the overall aim of the survey was to assess if people use homeopathy in New Zealand and if they believe the remedies to be scientifically supported. Ultimately, the survey allowed for a profile of self-identified

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1 UMR Research recruits survey participants via their panel SAYit, comprising more than 25,000 respondents (personal communication, 2019).
homeopathy users, their attitudes towards homeopathy and conventional medicine, and their perception of homeopathy’s effectiveness.

The survey was designed with three main goals:

1. gather information which would allow the development of a profile of self-identified homeopathy users in New Zealand, including demographic and usage characteristics,
2. to act as a comparison of respondents’ beliefs that homeopathic remedies are scientifically proven to work matches results from the 2012 UMR survey, and
3. to serve as basis for recruiting participants for semi-structured interviews.

Hypotheses addressed by the survey:

1. consistent with observation in other countries (Stoneman et al., 2013), homeopathy users will predominantly be women of middle age and higher education (H1),
2. given the occurrence of homeopathy in mainstream media following the release of the Australian NHMRC review, a limited number of people will perceive homeopathy as scientifically proven to work compared to the 2012 UMR survey (H2),
3. the use of homeopathy is driven by dissatisfaction with conventional medicine therefore homeopathy users will use homeopathic remedies more often and perceive it as more effective than conventional medicine (Furnham & Smith, 1988; A. Shaw, Thompson, & Sharp, 2006; Sirois & Gick, 2002) (H3), and
4. people who visit a homeopathy practitioner will perceive homeopathy as more effective compared to people who access homeopathic remedies over the counter (Dossett et al., 2016) (H4).

4.1 Method

The study sought to quantitatively explore who is using homeopathy in New Zealand and whether those users perceive homeopathic remedies as scientifically supported. For this
reason, a questionnaire (both in street-intercept and online) was used to gather data on homeopathy use. This method of data collection enabled data to be gathered from a wide geographical area and age group.

**SAMPLE AND SAMPLING STRATEGY**

Data collection was achieved using a non-probability convenience sampling method. This sampling strategy was preferred as the most suitable way to collect responses with the time and funding limitations of a PhD research project. Also, convenience sampling has been shown to be useful for exploratory research projects (Kothari, 2004). Ultimately, the survey was aimed at homeopathy users living in New Zealand, however, there was no exclusion of people living outside New Zealand. The only criteria necessary to take part in the survey was to be aged 18 or over.

The questionnaire was designed as an online-based survey using the SurveyMonkey® online survey software. SurveyMonkey gave the opportunity to use a mixed-mode survey technique, reaching respondents via street-intercepts, online snowballing, and online targeted. A mixed-mode survey was used to improve the survey coverage, and all respondents were presented with the same survey to ensure measurement equivalence (Lavrakas, 2008; Leeuw, 2005). The online survey software allowed for multiple responses, and this option was used for the street-intercepts to allow multiple participants to respond to the survey using the same iPads. For the online survey, however, the option was turned off to ensure participants could only take the survey once.

**SURVEY DESIGN**

The questionnaire was designed to be convenient for the respondents and included a maximum of 15 closed questions that could feasibly be completed in under 10 minutes. As with the UMR survey (2012), no definition of homeopathy was provided. When participants spontaneously asked what was homeopathy, the researchers were advised not to clarify the term. This means that participants’ self-identification as homeopathy users (or non-users) was dependent on their personal understanding of homeopathy.
A short introduction to the survey included the main purpose of the study, the researchers’ affiliation and contact details, and the statement “I agree to take part in this survey”. The respondents gave their informed consent by selecting “Yes” under the statement. Participants who selected “No, I don’t want to participate” were immediately directed to the end of the survey.

The survey was titled “Perception of homeopathy by homeopathy users in New Zealand” and consisted of two parts plus demographic questions (see Figure 4-1).

1. The first part categorised the respondents into three groups: homeopathy users, non-users, and exclusion. This section also allowed for comparison between this research and the UMR survey as it included the same question about belief in the scientific basis of homeopathic remedies.

2. The second part assessed homeopathy users’ perceptions and attitudes towards homeopathy.

![Diagram of the survey structure](Figure 4-1. Structure of the survey “Perception of homeopathy by homeopathy users in New Zealand”.)
Part 1: Use of homeopathy and UMR question (Q1-2)

The first question “Do you use homeopathic remedies?” separated participants into three groups. The first group included respondents who self-identified as using homeopathic remedies (users), the second group included respondents who did not use homeopathic remedies (non-users) and the third group included respondents who did not know (exclusion). The survey ended for respondents from the third group (exclusion) while respondents from the first (users) and second (non-users) groups went onto the UMR question “How strongly do you believe that homeopathic remedies are scientifically proven to work?” (Q2). After the UMR question, self-identified homeopathy users continued onto part 2 of the survey while non-users were directed to the demographic questions.

Part 2: Homeopathy-users profile (Q3-10)

The second part contained eight questions designed for self-identified homeopathy users. The first question of part 2 (Q3) asked users where they obtain their homeopathic remedies from. This question was used to differentiate the users’ main source of homeopathic remedies, and determine what proportion of respondents visit homeopathy practitioners or self medicate with over-the-counter remedies.

Q4 asked for the conditions under which participants would use homeopathic remedies. This question ranged from minor (e.g., bruising) to life-threatening (e.g., cancer) conditions. This question was included following concerns over the use of homeopathic remedies to manage severe illnesses (Mashta, 2009; Smith, 2012; Unlu, Kirca, & Ozdogan, 2017).

Q5 was taken from a previous survey of homeopathy users in the UK and looked into why respondents use homeopathic remedies (e.g., “more effective than conventional medicine”) (Reid, 2002). The agree-disagree 6-point Likert scale ranging from “strongly agree” to “strongly disagree” was slightly modified from the original 5-point Likert scale to include “unsure” as an additional option.
Q6 added a layer to the question of the scientific basis of homeopathy by assessing how well informed respondents felt about homeopathy. It intended to determine whether the perceived level of information a respondent had impacted their perception of scientific basis of homeopathy.

Q7 and Q8 looked into the frequency of use of homeopathy and conventional medicine together, then individually. The questions were designed to help answer one of the hypotheses by looking at the use of homeopathic remedies in combination or as a rejection of, conventional medicine.

The final two questions (Q9 and Q10) looked into the respondents’ perception of the effectiveness of both conventional medicine and homeopathic remedies.

**Demographic questions (Q11-15)**

The final five questions sought demographic information about both users and non-users. Gender, age, education qualification, ethnicity and place of residence were asked. The ethnicity question was taken from the 2010 survey “Science and the General Public” (Nielsen, 2010). The age and education level questions were also taken from the 2010 Science and the General Public survey with slight modifications reducing the amount of age brackets and adding the option “Prefer not to answer” instead of “I don’t know” for the education qualification question.

The questionnaire was pilot tested with members of the public (users and non-users) and fellow researchers in Dunedin, New Zealand. The final survey questionnaire can be found in Appendix A.

**DATA COLLECTION**

Two researchers from the Department of Science Communication at the University of Otago, Dunedin, undertook street-intercept survey using iPads in Dunedin (one day), Christchurch (two days), Wellington (two days), and Auckland (four days) between the 28th of May and the 10th of June 2016. Data collection occurred in main streets of these
cities between 10AM and 6PM. In Auckland, two days were spent in main streets and two days in a suburban mall (details in Appendix B). The survey was also shared via email, using the snowball method starting from the departmental mailing lists from the University of Otago. Additionally, the survey was shared on targeted health-related forums based in New Zealand (see Appendix B). The collection of data via the online survey took place between the 15th of June 2016 and 31st of August 2016.

DATA ANALYSIS & MANAGEMENT

Collected data were stored on the SurveyMonkey website on a password protected account and on a password protected computer in a locked office at the University of Otago.

Data preparation

1) Coding: Survey responses were coded into numerical values to be able to run statistical analysis using the Statistical Package for Social Science (SPSS) 24.0.

2) Combination of categories: For four survey questions (Q2, 3, 7, and 8), it was decided to combine categories to reduce the information and make clear distinctions between categories:

- Q2, “How strongly do you believe that homeopathic remedies are scientifically proven to work” went from eight categories to four.
- Q3, “How do you access homeopathic remedies?” went from six categories to three.
A hierarchy was also put in place for Q3 since it allowed for multiple answers. For example, if respondents answered both (1) (I am a homeopath) and (2) (I visit a homeopath), they were coded as (1) since this question aimed at distinguishing between respondents who visit homeopathy practitioner from those who do not.

- Q7 and Q8, “On average, how often do you use homeopathy medicine?” and “On average, how often do you use conventional medicine?” went from seven categories to four.
3) Exclusion of categories: The category “other” from Q3, “How do you access homeopathic remedies” was excluded as it contained a mix from over the counter to making their own remedies to unrelated answers. The “unsure” and “don’t know” categories (Q4, 5, 9, 10) were excluded from analysis as well as the “prefer not to answer” and “other” categories from the demographic questions. The category “I use neither homeopathy nor conventional medicine” was also excluded (Q6). All these categories were removed from the statistical analyses as they were not relevant to the questions.

The description and details of all categories can be found in Appendix C.

Test of independence – Chi-square

Chi-square (χ2) statistic was used as a test of independence to test relationships between variables.

Pearson correlations

Pearson’s rank correlation was used to assess the degree of association between variables (linear relationships).

4.2 RESULTS & DISCUSSION

The key results from the survey show that homeopathy is still perceived as scientifically proven by more than half the population surveyed, a number similar to the UMR survey from 2012 (H2). Consistent with the literature, homeopathy users are predominantly middle-aged women (H1) who may be pushed towards homeopathy due to negative past experiences with conventional medicine (H3). Finally, homeopathy users who visit a homeopathy practitioner tend to perceive the remedies as more effective compare to users who get their remedies over the counter (H4).

This results section will start with an overview of the survey respondents’ demographic characteristics. The four hypotheses will then be addressed individually, starting with the demographic characteristics of homeopathy users, followed by New Zealanders’ perception of homeopathy with regard to its ‘scientific’ basis, the use of homeopathic
remedies in relation to dissatisfaction with conventional medicine and finally the access to homeopathic remedies. Each of those subsections will be discussed individually.

4.2.1 **SUMMARY OF RESPONSES DISTRIBUTION**

In total, the survey collected 530 respondents (300 street-intercepts and 230 online\(^2\)). An additional four participants agreed to take part but failed to complete the survey. All questions of part 1 and 2 were compulsory. Online respondents are believed to be predominantly from the snowball method as a peak in responses was observed after each of the two email iterations, whilst there was no activity after sharing the survey on the health-related forums based in New Zealand.

Just over half of respondents self-identified as homeopathy users (52%, n=277) in Q1. A minority of respondents answered that they did not know what homeopathy was (13%, n=71) and a third answered that they did not use homeopathic remedies (34%, n=182).

From the 530 responses, 85 were excluded (see Figure 4-2). Exclusion criteria included respondents who answered “I don’t know” to Q1 (Do you use homeopathic remedies?), and respondents who did not answer Q2 (How strongly do you believe that homeopathic remedies are scientifically proven to work?). After exclusion, 445 responses remained for analysis of which 59% (n=264) self-identified as homeopathy users.

\(^2\) There were no significant differences in responses between the two groups (street-intercepts and online).
Demographics

In contrast to parts 1 and 2 which were compulsory, it was decided to allow respondents to skip demographic questions. Voluntary completion of demographics questions by respondents was over 98%.

From the 445 respondents, close to two thirds were female (64%, n=281) and one third were male (36%, n=158). Respondents were from all age groups from 18 to 75+, with close to a quarter in the 45-54 age bracket (24%, n=107). They were also spread across all levels of education qualification, with more than half of the respondents holding a university degree (62%, n=271). The majority of respondents identified as New Zealand European (76%, n=337) and 15% (n=67) identified as ‘other’. Other included European (per se or as French, Swedish, etc), Australian, North American, Indian, South African. A minority identified as Māori (4%, n=16) and as Pacific Island (1%, n=6).

Respondents were from all regions of New Zealand except Gisborne and Marlborough. Almost half of the respondents (44%, n=193) were from the Otago region, followed by Auckland, Wellington and Canterbury with 16%, 13% and 13% respectively. This repartition can be explained by the occurrence of street-intercept surveying in those four
regions and the snowballing online survey that started at the University of Otago, Dunedin.

4.2.2 WHAT ARE THE DEMOGRAPHIC CHARACTERISTICS OF HOMEOPATHY USERS?

Based on statistics from other countries, the first hypothesis assumed that homeopathy users in New Zealand would predominantly be women of middle age and higher education (H1).

The survey results show that a higher proportion of female respondents (72%) use homeopathic remedies compared to males (38%). A chi-square statistic was conducted and there was a significant difference in the relationship between the use of homeopathic remedies and gender ($\chi^2 = 45.257$, df = 1, n=441, $p = .001$, Figure 4-3).

Results also showed significant differences between the use of homeopathic remedies and respondents’ level of education ($\chi^2 = 15.757$, df = 4, n = 421, $p = .0033$, Figure 4-4). For most education levels a higher proportion of respondents self-identified as homeopathy users except for postgraduate where the trend disappeared.

Results showed no significant differences for the other demographic factors (age, ethnicity and location). However, age was suggestive as, proportionally, the age ranges of 35 to 64 years old were more likely to use homeopathic remedies (see Figure 4-5).
Figure 4-3. Use of homeopathic remedies by gender, where gender both equal 100% (n=441). Black bars represent users; white bars represent non-users.

Figure 4-4. Use of homeopathic remedies by education level (n=436). Black bars represent users; white bars represent non-users.
Additionally, a multivariate analysis was performed using a logistic regression to assess the influence of demographic variables on the use of homeopathy. The results indicated a collective significant effect between the demographic factors and the use of homeopathy ($F(5,445) = 523$, $p < .001$, $R^2 = .174$). Gender ($t = 1.409$, $p < .001$) and education ($t = .271$, $p = .003$) were also individually significant predictors in the model (see Table 4-1).

Table 4-1. Independent predictors of homeopathy use. Results from multivariate logistic regression analysis.

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>95% C.I.for EXP(B)</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>1.409</td>
<td>.215</td>
<td>42.937</td>
<td>1</td>
<td>&lt;.001</td>
<td>4.093</td>
<td>2.685</td>
<td>6.238</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>-.148</td>
<td>.072</td>
<td>4.234</td>
<td>1</td>
<td>.040</td>
<td>.862</td>
<td>.749</td>
<td>.993</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>.271</td>
<td>.091</td>
<td>8.880</td>
<td>1</td>
<td>.003</td>
<td>1.312</td>
<td>1.097</td>
<td>1.568</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td>.008</td>
<td>.045</td>
<td>.032</td>
<td>1</td>
<td>.859</td>
<td>1.008</td>
<td>.923</td>
<td>1.101</td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td>-.001</td>
<td>.020</td>
<td>.005</td>
<td>1</td>
<td>.946</td>
<td>.999</td>
<td>.959</td>
<td>1.039</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-2.949</td>
<td>.582</td>
<td>25.659</td>
<td>1</td>
<td>&lt;.001</td>
<td>.052</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The survey results showed that homeopathy users in New Zealand are predominantly middle-aged women. While this supports previous studies with regards to age and gender of users of complementary and alternative medicine (CAM), the results also indicated that people were less likely to self-identify as homeopathy users if they held a postgraduate degree, contrasting with the previous studies that found homeopathy and/or CAM users tend to be more highly educated (Dossett et al., 2016; Harris et al., 2012).

The difference in the relationship between education and self-identifying as homeopathy users could be due to the specificity of this survey. This survey targeted homeopathy specifically compared to most research in the field which generally looks at the broader use of CAM. The surveys looking at broader CAM use may have brought respondents to self-identify as homeopathy users by conflating it with other types of CAM. This conflation could be due to herbal remedies and homeopathy being set under the larger umbrella of naturopathy (Lloyd, 2009). Homeopathy in particular may be confused with herbal remedies (or phytotherapy) and naturopathy, in general.

Moreover, whilst demographic characteristics remain the “go to” predictors of use, some research has suggested that this may not be sufficient or substantial enough (Lindeman, 2011; Sirois, Salamonsen, & Kristoffersen, 2016). A study focusing on acupuncture showed that spirituality and paranormal beliefs increased the attraction to CAM therapies (Clobert, Saroglou, & Van Pachterbeke, 2015). Going further, a Finnish study showed that paranormal beliefs and individuals' thought process (deliberate versus intuitive reasoning) could be stronger predictors of CAM beliefs than demographic factors or world views\(^3\) (Lindeman, 2011). Hence when predicting health and wellbeing behaviour, factors other than demographic need to be considered. In a 2016 review looking at how to improve health related decision-making, Betsch et al. (2016) highlighted the importance of culture in health communication. While this factor was not included in this survey, the survey did include some demographic questions for comparison with the existing literature. A thorough survey including predisposing factors (e.g., gender), enabling factors (e.g., income), need factors (e.g., chronic disease) and personal health

\(^3\) The characterisations were unconventional, feminine, environmentalist, exotical and natural (Lindeman, 2011).
practices (e.g., smoking) (Leach, 2016b) as well as paranormal beliefs and spirituality (Clobert et al., 2015; Jeswani & Furnham, 2010) and ‘intuitive thinking’ (Lindeman, 2011) would be extremely valuable to get a better profiling of New Zealand consumers of homeopathy (and CAM).

Among the demographic factors included in the survey, location and ethnicity were not representative of the New Zealand population as a whole. Therefore while the results of this survey have yielded results consistent with previous work, a representative sample of the population with regards to ethnicity and location could increase the predictive power of our model. However, even though the sample is not classically representative, the results for the belief in the scientific basis of homeopathy are largely consistent with the UMR survey (see below). This gives some confidence that the current results are indicative of the wider New Zealand demographic.

4.2.3 Do New Zealanders perceive homeopathy as scientifically proven to work?

Following on the occurrence of homeopathy in mainstream media after the release of the 2015 NHMRC review, we hypothesized that a smaller proportion of people would perceive homeopathy as scientifically proven to work compared to the 2012 UMR Survey (H2).

From the 445 respondents, more than half answered that they believed that homeopathic remedies were scientifically proven to work (56%, n=248). This result is consistent with (in fact marginally higher) than the UMR survey in which 51% of the 1000 respondents said they believed that homeopathic remedies were scientifically proven to work (see Figure 4-6). The full distribution of responses about the belief in the scientific basis of homeopathic remedies (Q2) across the eight categories can be found in Appendix D.
As expected, when looking at the relationship between use of homeopathic remedies and belief that they are scientifically proven to work, respondents who self-identified as homeopathy users were more likely to perceive homeopathic remedies as scientifically proven to work ($\chi^2 = 156.04, df = 3, n=445, p < .001$, Figure 4-7). Almost 80% of self-identified users perceive homeopathic remedies as scientifically proven to work (78%, n=207) compared to 23% (n=41) of non-users.
The survey results showed that more than 51% of respondents believed that homeopathic remedies were scientifically proven to work, despite the publication of the Australian NHMRC review and multiple news article published between 2013 and early 2016 in the New Zealand press that stated otherwise (Berry, 2016; Bridgeman, 2013; Gulliver, 2014a; “Fight Ebola with homeopathy”, 2014; McLennan, 2015; NZME, 2014). In 2014, news articles also covered the backlash suffered by a New Zealand Green MP following claims over homeopathy which suggests a social disapproval for homeopathy, making the results all the more contrasting (Davison, 2014; Gulliver, 2014a). The backlash happened after the MP signed and shared an online petition asking the World Health Organisation (WHO) to test and distribute homeopathy to contain the Ebola outbreaks in West Africa (see chapter 2, p. 49, for more details).

Similar to the previous result, the relatively high proportion of respondents categorising homeopathy as scientifically supported could be linked to the absence of definition of “homeopathy” in the survey. With the known confusion around the term, a proportion of respondents may be conflating commodities such as ‘natural remedies’ (Ernst, 2016; European Academies’ Science Advisory Council, 2017). This confusion could be
reinforced as some natural remedies, such as St. John’s Wort, have been shown to be clinically effective for mild depression (Tester, 2016).

Our results are largely consistent with those of the UMR survey, and the proportions of ‘believers’ and ‘non-believers’ are similar between the two, although a trend towards the more extreme positions was noticed in the present survey (more of both “certain it’s not true” and “certain it’s true”). This shift could be due to confirmation bias. Work by van der Schee and Groenewegen (2010) on public trust in CAM in the Netherlands indicated that both positions (for and against) tended to be reinforced by negative media coverage, leading to increased confidence in individuals’ positions. These biases can be further perpetuated as people with certain belief sets tend to be attracted into insular communities, leading to the creation and reinforcement of confirmation bias (Zollo et al., 2017). This phenomenon is also known as “filter bubbles” or “echo chambers” (Cacciatore, Scheufele, & Iyengar, 2016; Pariser, 2011; Sunstein, 2009).

Among respondents who use homeopathy, 20% answered that they do not believe that homeopathic remedies are scientifically proven to work. This could indicate that these people are aware of the lack of scientific evidence behind homeopathy, but nevertheless, choose to use it. Alternatively, this could stem from an active rejection of ‘science’ or of the concept ‘scientifically proven’ by respondents, as has been discussed in the literature around disengagement with science (Burns & Medvecky, 2016; Michael, 1996). These results led to a line of questioning in the semi-structured interviews, as from the survey results only it is not clear what the rationale behind this stance is.

Focusing on scientific evidence, a case study on osteoarthritis found that scientific evidence was not a necessary condition for patients to choose ‘natural health products’ to treat their condition (Tsui, Boon, Boecker, Kachan, & Krahn, 2012). Depending on their ‘experience’ with CAM (how long they have been using CAM), users valued the scientific evidence behind CAM therapies differently (Verhoef, Mulkins, Carlson, Hilsden, & Kania, 2007). As the same question as the 2012 UMR survey was used in this
research project, the focus was on scientific proof rather than ‘scientific evidence’
however, one could assume that from a public perspective, the results would be similar.
In the UK, Stoneman et al. (2013), looked at the use of CAM and discovered that the non-
use of homeopathy did not appear to be linked to the scientific evidence or absence thereof, but rather to the “lack of familiarity and/or opportunity” to use the remedies. The
semi-structured interviews allow for further investigation of why some respondents
decide to use homeopathy despite the absence of scientific evidence and what others
perceive as ‘scientifically proven’.

4.2.4 Is the use of homeopathic remedies related to dissatisfaction with
conventional medicine?

Multiple factors have been proposed as predictors for the use of CAM (Sirois & Gick,
2002) but very few specifically investigated the practice of homeopathy (Avina &
Schneiderman, 1978; Furnham & Smith, 1988). Besides demographic factors, the use of
CAM could be driven by patients’ dissatisfaction with conventional medicine, which was
the third hypothesis (H3) (Furnham & Smith, 1988; Shaw et al., 2006). To verify this, the
survey included multiple questions to assess if the use of homeopathic remedies in New
Zealand is linked to discontent with conventional medicine. Those questions were part of
the second section of the survey that only targeted homeopathy users (n=264).

4.2.4.1 Descriptive statistics

Frequency of use

Looking at the use of homeopathic remedies and conventional medicine, most
respondents use conventional medicine more often (44%) or as often (28%) as

4 While scientific proof and scientific evidence are not equivalent, there is a conceptual relation
between the two. In this survey, it was decided to keep the phrasing “scientifically proven to
work” to allow for comparison with the 2012 UMR survey.
homeopathy with only a minority using homeopathy more often than conventional medicine (18%) or using homeopathy only (2%).

**NEGATIVE EXPERIENCE WITH CONVENTIONAL MEDICINE IN THE PAST**

To the question “why do you use homeopathic remedies”, 62% of respondents agreed with the statement “conventional medicine has caused unpleasant side effects in the past” and a third of respondents agreed that “conventional medicine has proved ineffective in the past” (34%) while slightly more neither agreed or disagreed with that statement (41%).

**EFFECTIVENESS**

With regards to effectiveness, respondents mostly perceive conventional medicine and homeopathic remedies equally from very effective (both 13%) to pretty effective (55% vs 49%) and somewhat effective (28% vs 35%). Only two respondents said that homeopathic remedies were not effective at all (both were also certain that homeopathic remedies are not scientifically proven to work).

**4.2.4.2 Correlations**

Table 4-2 shows the correlations among the different variables described above. All of the correlations were significant, respondents who agreed with the statement “conventional medicine has proved ineffective in the past” also tended to agree with the statement “conventional medicine has caused unpleasant side effects in the past” and tended to use homeopathic remedies more often than conventional medicine. There was also a small correlation to respondents’ perception of homeopathy as more effective than conventional medicine.
Table 4-2. Pearson’s correlation between variables described in 4.2.4.1.

<table>
<thead>
<tr>
<th></th>
<th>CM has proved ineffective in the past</th>
<th>CM has caused unpleasant side effects in the past</th>
<th>Use of CM and HR</th>
<th>Effectiveness of CM</th>
<th>Effectiveness of HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM has proved ineffective in the past</td>
<td>Pearson Correlation</td>
<td>.297</td>
<td>.293</td>
<td>-.326</td>
<td>.180</td>
</tr>
<tr>
<td></td>
<td>Sig.</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>.004</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>258</td>
<td>249</td>
<td>257</td>
<td>252</td>
</tr>
<tr>
<td>CM has caused unpleasant side effects in the past</td>
<td>Pearson Correlation</td>
<td>.297</td>
<td>1</td>
<td>-.217</td>
<td>.293</td>
</tr>
<tr>
<td></td>
<td>Sig.</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>258</td>
<td>247</td>
<td>255</td>
<td>250</td>
</tr>
<tr>
<td>Use of CM and HR</td>
<td>Pearson Correlation</td>
<td>.293</td>
<td>.355</td>
<td>1</td>
<td>-.396</td>
</tr>
<tr>
<td></td>
<td>Sig.</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>249</td>
<td>247</td>
<td>250</td>
<td>245</td>
</tr>
<tr>
<td>Effectiveness of CM</td>
<td>Pearson Correlation</td>
<td>-.326</td>
<td>-.217</td>
<td>-.396</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig.</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>0.317</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>257</td>
<td>255</td>
<td>250</td>
<td>253</td>
</tr>
<tr>
<td>Effectiveness of HR</td>
<td>Pearson Correlation</td>
<td>.180</td>
<td>.293</td>
<td>.557</td>
<td>-.063</td>
</tr>
<tr>
<td></td>
<td>Sig.</td>
<td>.004</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>0.317</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>252</td>
<td>250</td>
<td>245</td>
<td>253</td>
</tr>
</tbody>
</table>

CM = Conventional medicine; HR = Homeopathic remedies.

Survey respondents who reported having had a negative experience with conventional medicine in the past were more likely to perceive homeopathic remedies as more effective than conventional medicine. They also used homeopathy more frequently than conventional medicine. However, this relationship was not very strong, and more depth (as part of the semi-structured interviews) is needed to accurately assess this potential connection.
In a qualitative study focusing on the use of CAM therapies for asthma in the UK, Shaw et al. (2006) discovered that only a minority of respondents were going for CAM therapies first, and that all users were using CAM in combination with their prescribed medications. The main factors for use of CAM therapies were the perceived lack of side effects and wish for natural treatments. These two features associated with CAM are commonly referred as “pull factors”, pulling people towards CAM usage in contrast to “push factors” that push users away from conventional medicine (Ernst, 2005).

While the initial movement towards CAM has long been associated with a dissatisfaction with conventional medicine (push factors), recent literature indicated that while CAM users are being pushed away from conventional medicine, more importantly, they are pulled towards the perceived positive aspects of CAM (Gyasi et al., 2016; Shorofi, 2011; Sirois, 2008). In this survey, while 62% of respondents agreed with the “push” statement “conventional medicine has cause unpleasant side effects in the past”, the “pull” statement that homeopathic remedies are “a more natural treatment” got the highest agreement rate with more than 80% of users. Although there are limitations to the results, they could indicate the same trend for users in New Zealand being pulled towards homeopathy more than pushed away from conventional medicine.

4.2.5 DOES THE ACCESS TO REMEDIES INFLUENCE USERS’ PERCEPTION OF HOMEOPATHY’S SCIENTIFIC BASIS?

Finally, people’s perception of homeopathic remedies’ effectiveness could vary depending on how they access the remedies (i.e., through a practitioner compared to over the counter) (Dossett et al., 2016). The final hypothesis sought to understand the relationship between various modes of accessing homeopathy and user perception (H4). Additionally, the access to homeopathic remedies was looked at in relation to how well informed users feel about homeopathy and their belief in the scientific basis of homeopathic remedies. These questions also focused on homeopathy users (n=264).
**4.2.5.1 Descriptive statistics**

**ACCESS TO HOMEOPATHIC REMEDIES**

The most popular way to access homeopathic remedies was over the counter at pharmacies (56%), followed by visits to a homeopath (25%) and getting the remedies via friends or relatives (20%). Half of the “other” (14%) included health food stores and on the internet.

**BELIEF IN SCIENTIFIC BASIS OF HOMEOPATHIC REMEDIES**

Eleven percent of homeopathy users answered that they were certain it’s not true [that homeopathic remedies are scientifically proven to work], 11% believed it’s not true but were not certain, 40% believed it’s true but were not certain, and 38% were certain it’s true. In total close to 80% of homeopathy users believed that the remedies are scientifically proven to work (78%, n=207).

**INFORMED LEVEL**

When asked how well informed they feel about homeopathy, two thirds of the respondents felt fairly well informed (54%) to very well informed (11%) while one third felt not very well informed (32%). Only 2% of respondents felt not at all informed and 1% answered ‘I don’t know’.

**PERCEIVED EFFECTIVENESS OF HOMEOPATHY**

As described previously, regarding effectiveness, most respondents perceived homeopathic remedies as pretty effective (49%) or somewhat effective (35%). Only 12% thought homeopathic remedies were very effective (similar number to conventional medicine), 1% not at all effective and 3% don’t know.
4.2.5.2 Correlations between Access & Belief, Access & Information, Access & Effectiveness, and Information & Effectiveness

ACCESS TO HOMEOPATHIC REMEDIES & BELIEF IN THE SCIENTIFIC BASIS OF HOMEOPATHY

There was no correlation between the two variables; the way respondents access homeopathic remedies (visiting a homeopath vs getting remedies from the pharmacy, friends or relatives) and their belief about the scientific basis of homeopathic remedies ($r(206) = -0.171$, $p = .014$, Figure 4-8).

![Figure 4-8. Belief in scientific basis of homeopathy by mode of access to homeopathic remedies. Black bars represent respondents who visit a homeopath (100%, n=67), white bars represent respondents who access remedies via the pharmacy, friends or relative (100%, n=139).]

ACCESS TO HOMEOPATHIC REMEDIES & INFORMED LEVEL

Respondents accessing homeopathic remedies from a homeopathy practitioner felt better informed about homeopathy ($r(203) = 0.292$, $p < .001$).

ACCESS TO HOMEOPATHIC REMEDIES & PERCEIVED EFFECTIVENESS OF HOMEOPATHY

Respondents accessing homeopathic remedies from a homeopathy practitioner also perceived homeopathic remedies to be more effective ($r(206) = 0.328$, $p < .001$).
Informed level & Perceived effectiveness of homeopathy

Respondents feeling better informed about homeopathy also perceived it to be more effective ($r(254)=.406$, $p < .001$).

In regards to access to remedies, only one in four users visited a practitioner. Those results are comparable with the NZ 2006/07 health survey where 20% of CAM users had visited a CAM practitioner in the last 12 months and an American survey focusing on homeopathy (2012) where 81% of users were not visiting a practitioner (Dossett et al., 2016; Ministry of Health, 2008).

There was a significant correlation between the way users access homeopathic remedies and their perception of homeopathy’s effectiveness, with people visiting a practitioner feeling more informed and perceiving homeopathy as more effective compared to users who get their remedies via the pharmacy for example. While not looking at perceived effectiveness, those results are also similar to the American survey where participants who visit a practitioner scored a higher perceived ‘helpfulness’ (Dossett et al., 2016). This higher perception of effectiveness could be linked to the patient-practitioner relationship found in homeopathic consultation (Dossett et al., 2016; Koithan, Embrey, & Bell, 2015). The characteristics of that patient-practitioner relationship (openness, compassion, and trust) could potentially ‘enhance’ the placebo effects (Kaptchuk, 2002b). The prominence of the patient-practitioner relationship could also potentially explain why users who visit a practitioner feel better informed than those who do not.

4.3 Conclusion

The present survey established the first profile of homeopathy users in New Zealand. While the survey only scratched the surface of homeopathy use, it provides strong basis for follow-up studies looking at homeopathy or other types of CAM use in New Zealand.

Negative past experience with conventional medicine, especially experiencing negative side effects, could be a driver for people to try homeopathy. However, recent literature shows a shift in motivations, with people being pulled towards CAM more than being pushed away from conventional medicine (Gyasi et al., 2016; Shorofi, 2011; Sirois,
2008). More research needs to be done to establish the primary and secondary motivators leading people to use homeopathy in New Zealand, and also what motivates people to visit a practitioner versus buying remedies over the counter.

In summary, in this survey respondents self-identified as homeopathy users depending on their personal understanding of homeopathy. Similarly, what respondents inferred by ‘scientifically proven’ is open to interpretation, some of which may be far from the views held by the scientific community. While it was intentional to leave respondents scope for interpretation in the survey, the second part of the mixed methods specifically addresses those two concepts (homeopathy and science) via qualitative data collection.
CHAPTER 5: HOMEOPATHY USERS’ INTERVIEWS

INTRODUCTION

This chapter presents the second phase of the sequential explanatory mixed methods, exploring whether homeopathy users perceive homeopathic remedies to be scientifically supported and whether that belief influences their use of the remedies. The chapter analyses qualitative data collected in semi-structured interviews conducted based on results from the survey “Perception of homeopathy by homeopathy users in New Zealand” (see chapter 4). The study involves interviews with self-identified homeopathy users from the Otago region, New Zealand.

AIM

The survey results (see chapter 4) suggests that homeopathic remedies are widely used in New Zealand, with 52% of survey participants self-identifying as homeopathy users. The survey also revealed that the majority of respondents who identify as homeopathy users perceive homeopathic remedies to be “scientifically proven to work” (78%, n=207) while others use homeopathic remedies despite not believing them to be scientifically supported (22%, n=57). Interviews were chosen as a qualitative data collection method to follow-up on results from the 2016 survey.

The primary aim of the semi-structured interviews was to determine whether the participants’ belief in the scientific basis of homeopathy (or lack thereof) influences their use of homeopathic remedies. The interviews also investigated participants’ understanding of the term “homeopathy” as the survey did not allow for distinction between genuine homeopathy users and those who misidentified homeopathy with other therapies. The survey did not define homeopathy in order to remain consistent with most surveys on complementary and alternative medicines, including the 2012 UMR survey.
5.1 RESEARCH DESIGN AND METHOD

An interview guide was developed to include topics and issues identified in the quantitative phase as well as some probe questions. All questions were open-ended and the interviewer was allowed to add follow-up questions and change the wording if necessary to reflect the vocabulary of the interviewee. The interview guide (see Appendix E, part B) was developed to organically lead discussion around homeopathy use, effectiveness, risk perception, information seeking, and trust. The final part delved into participants’ understanding of science and their perception of homeopathy as scientifically supported, or not. The guide was reviewed by a group of researchers (n=6) at the University of Otago, Dunedin, and a pilot interview was conducted with an academic before interviewing self-identified homeopathy users (n=20).

Focus groups are often described as providing richer answers due to the group dynamic, however, in this case, in-depth interviews were chosen as they allow sensitive topics to be addressed without the influence of peer pressure which could affect participants’ responses (Gill, Stewart, Treasure, & Chadwick, 2008). Semi-structured interviews were preferred over structured interviews as they allow for control of the themes covered during the interview, while also giving the interviewer freedom to modify their order of questioning and vocabulary where necessary to improve narrative flow and the interviewer-interviewee relationship (Barriball & While, 1994; Doody & Noonan, 2013). Furthermore, a semi-structured method allows for the use of probe questions to explore deeper into participants’ answers or to clarify unclear responses (Doody & Noonan, 2013).

SAMPLING STRATEGY

The number of interviews required in qualitative research depends on many factors such as time frame, budget, research topic, population characteristics, and research design. Ideally, the researcher will reach data saturation but it is impossible to predetermine how many interviews will be necessary to reach that point. A number between 19 and 30 is suggested to be adequate according to Baker, Edwards, and Doidge (2012). Accordingly,
up to 30 participants aged 18 years or over, living in New Zealand, self-identifying as homeopathy users, and willing to take part in a face-to-face interview were sought.

**RECRUITMENT PROCESS**

The sequential explanatory design of the mixed methods allowed for a sample of homeopathy users to be recruited through the first part of the mixed methods; the 2016 survey. A convenience sampling method was used in which survey participants were invited to enter their email address if they were willing to participate in the second part of the research project, i.e., the interviews.

In total, 143 survey participants (27% of all survey participants) provided their email address and 70 of them self-identified as homeopathy users. More than half of the 70 homeopathy users (n=41, 59%) were from the Otago region and represented the full range of beliefs in the scientific basis of homeopathy from “Absolutely certain it’s true” [that homeopathic remedies are scientifically proven to work] to “Absolutely certain it’s not true”. This sample was thus selected for face-to-face interview as respondents covered the full range of beliefs and their shared geographical location suited the time and funding limitations of a PhD research project.

In February 2017 all 41 survey participants residing in the Otago region were sent an email inviting them to participate in a face-to-face interview (see Appendix F). The invitation email was sent on three occasions, every two-weeks apart. Participants who replied and were still willing to take part in the interviews were sent a second email with more information about the interview process (expected length, location, time) as well as an information sheet about the research project. Participants then replied with their availability and a final email was sent to confirm the date and time of the interview. Twenty-four hours before the interviews, a reminder was sent to participants. All emails and the information sheet can be found in Appendix F. Participation was voluntary.

Twenty survey participants responded and agreed to take part in the interviews. Sixteen people did not reply to the recruitment emails, two people were unavailable, one person
had moved to the North Island, one person asked to be removed from the contact list and one email address was invalid.

**DATA COLLECTION**

All interviews took place during April and May 2017 at the Centre for Science Communication in the Owheo Building on the University of Otago campus, Dunedin. Once in the interview room, the researcher thanked the participant for their time and reminded them of the interview process (see Appendix E, part A). Before starting the interview, participants were asked to read and sign a consent form (see Appendix G). Once the participant confirmed that they were still willing to take part in the interview, the recorder was turned on and the interview started. In total, 20 interviews were recorded, lasting between 15 and 45 minutes, with an average of 24 minutes.

**DATA MANAGEMENT AND ANALYSIS**

Recorded interviews were stored on a password-protected computer in a locked office at the University of Otago, Dunedin. The researcher transcribed all interviews within two days of the interview taking place. During one interview, a technical error in the recording equipment occurred which resulted in only two thirds of the interview being recorded. As soon as this issue arose, the researcher wrote down the remainder of what was discussed during the interview and sent the Word document to the interviewee for confirmation. All of the interviews were transcribed verbatim by the researcher to be as close to the oral conversation as possible, a second researcher then checked the transcripts against the recordings for accuracy of transcription.

Thematic analysis was used to identify, analyse and report themes within the data (Braun & Clarke, 2006). Specifically, thematic analysis was used to provide a detailed and nuanced account of participants’ experience about the research question (Braun & Clarke, 2006; DeSantis & Ugarriza, 2000). Themes are ideas, expressions, or aspects that are common across interviews; explored as individual entities focusing on different aspects of the interviews, but are also used to weave the information together as a whole (Turner,
In this research, themes were used to capture the common underlying factors contributing to participants’ assessment of the effectiveness of homeopathy and the importance of scientific evidence in their choice to use the remedies. The interviews were coded and analysed using the QSR NVivo software as it provides confidentiality and a fast platform to analyse data (Jones, 2007).

Themes were identified following a data-driven approach wherein an inductive method was used and data was coded without trying to fit it in predetermined categories. Initial codes were generated by analysing each individual transcript, then codes were collated into themes. The themes were developed in relation to the research question: do participants perceive homeopathy to be scientifically supported and does this influence their decision to use the remedies? Additionally, another theme collected codes relevant to participants’ understanding of homeopathy. A ‘miscellaneous’ theme was used to code extracts that were not relevant to the research question. Finally, all themes were reviewed to verify there was no overlap between themes and that they were all coherent and consistent (Braun & Clarke, 2006).

Paragraphs were defined as units of analysis, and allowing for multiple coding of individual paragraphs. Units of meaning could be argued as more appropriate in semi-structured interviews (Campbell, Quincy, Osserman, & Pedersen, 2013), however, the difficulty of reaching intercoder reliability would be greater, especially with coders who have different background knowledge of the topic.

**Validity and reliability**

The validity of the interviews was enhanced on multiple levels. First, the interviews were semi-structured which allowed for consistency between participants, but also allowed for the questions to be checked against the objectives of the research. Second, a single interviewer (myself) was trained by an experienced qualitative researcher (academic staff member) before the interviews.

To assess the level of reliability of the coding scheme (Campbell et al., 2013; Freelon, 2010), a researcher external to the project, but with interview coding experience, was
given the interview guide, the refined coding scheme (including definitions and examples of the coded themes to ensure consistency) and one interview transcript (the coding scheme did not include any examples coming from that interview). This external researcher used the interview guide and coding scheme to code the interview, and their results were compared with those of the primary researcher for intercoder reliability. The average percentage of agreement for the five themes was 98% with the lowest agreement amount being of 93% and the highest 100%. Scott’s pi (n) were between 0.82 and 1 with an average of 0.93. Both Cohen’s κ and Krippendorff’s α were between 0.815, 0.817 and 1 respectively with an average higher than 0.9 (Freelon, 2010). After discussion, the coding scheme was refined by slight modifications to one theme’s definition to make it more explicit. The 20 interviews were then coded following the final coding scheme.

5.2 FINDINGS & DISCUSSION

The key findings from the interviews indicate that, in contradiction to what the survey results might suggest, almost all participants do not believe that homeopathic remedies are scientifically proven to work. In addition, scientific evidence does not influence most participants’ decision to use homeopathic remedies. The interview results also suggest that the confusion in use of the terms homeopathy and natural remedies is widespread.

This section presents the findings from 20 face-to-face semi-structured interviews undertaken with survey respondents who self-identified as homeopathy users. First, a succinct profile of interview participants is provided, then the remainder of the section describes, illustrates, and discusses the key themes identified in the interviews. Half way through the interviews, it became evident that the point of data saturation was reached. The remaining interviews still took place, however, as they were planned and would provide individual nuances within the main themes.

5.2.1 PROFILE OF INTERVIEW PARTICIPANTS

All 20 participants were from the Otago region and between 18-74 years of age, with eight (40%) between 45 and 54 years old. Sixteen interview participants were females
and four males. Sixteen participants identified as New Zealand European, three as European and one as North American.

From the 264 survey participants who self-identified as homeopathy users, 78% (n=207) said they believe the statement “homeopathic remedies are scientifically proven to work” to be true. The ratio of believer/non-believer of 8/2 was also found in the sample of interview participants with sixteen participants who answered the survey question with “believe it’s true” and four participants who did not believe homeopathic remedies were scientifically proven to work. Participants were spread amongst the eight categories of belief, however, 10 of out the 16 “believers” were from the “absolutely certain it’s true” category. In total, 50% (n=10) of the interview participants were strong believers compared to only 15% (n=41) of survey respondents who self-identified as homeopathy users.

The greater proportion of interview participants with the strongest belief in homeopathy may be due to chance, or to motivation. Multiple factors can influence people’s willingness to participate in interviews (curious about the topic, willing to share their personal experience, altruism) (Clark, 2010). Given the controversial nature of homeopathy, the interviewee pool may be self-selecting for people more confident in their position (Clark, 2010).

5.2.2 FINDINGS FROM INTERVIEWS WITH PARTICIPANTS WHO SELF-IDENTIFIED AS HOMEOPATHY USERS

Two key themes were identified “effectiveness” and “science” (Table 5-1). An additional key theme “understanding” was identified to address the potential confusion around the term homeopathy. Finally, two additional themes “usage” and “motivation” were identified to complement the themes “science” and “understanding” respectively. The first theme presented in this analysis will be “science”, exploring participants’ beliefs in the scientific basis of homeopathy. This will be followed by a discussion of how participants’ beliefs influence their use of homeopathy (“usage”). Then “understanding” will be addressed, looking at participants’ understanding of the term homeopathy, followed by its influence on the participants’ motivation to use homeopathic remedies.
(“motivation”). Finally, the theme “effectiveness” will be presented, investigating and discussing how homeopathy users assess homeopathic remedies’ effectiveness. Themes’ definitions can be found in Appendix H.

Table 5.1. Themes, sub-themes, categories and additional themes from the interviews with self-identified homeopathy users.

<table>
<thead>
<tr>
<th>Key Themes</th>
<th>Sub-themes</th>
<th>Categories</th>
<th>Additional Themes</th>
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<tr>
<td>1. Science</td>
<td>Unknown</td>
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<td>Usage</td>
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<td></td>
<td>Indifference</td>
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<td>Sceptic</td>
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<td>Non-believers</td>
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<td>Money</td>
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<td>2. Understanding</td>
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<td>Motivation</td>
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<td>Conflation</td>
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<td>3. Effectiveness</td>
<td>Personal</td>
<td>Placebo effect</td>
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<td>Anecdotal</td>
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1. Science

The theme “science” was defined as the participants’ belief that homeopathic remedies are supported by scientific evidence. Exploration of the theme “science” demonstrates that participants’ belief in the scientific basis of homeopathy is nuanced, contrary to what could be projected from the survey results, which had a clear believer/non-believer distinction. The sub-themes “unknown”, “indifference”, “future”, “confusion”, and “sceptic”, further contribute to the theme of “science” by exploring the difference in participants’ beliefs regarding the relationship between science and homeopathy.
**Unknown**

The first sub-theme “unknown” captures participants who answered that they did not know if there was any scientific evidence behind homeopathic remedies. The two youngest interview participants described growing up using homeopathic remedies and, as a result, having “never questioned it” (*Participant 4, Male, 25-34*). Whilst one of them was aware of the controversy around the remedies, the other one had never considered whether the remedies were scientifically proven to work as “*it is part of [their] culture*” (*Participant 18, Female, 18-24*).

**Indifference**

The sub-theme “indifference” was defined as participants acknowledging the absence of scientific evidence behind homeopathy, but ultimately not letting this influence their decision to use the remedies. The following quotes illustrate two participants’ positions.

*Oh science says it doesn't work. I know a lot of medical doctors and scientists would say that it doesn't work because it hasn't been scientifically proven but that doesn't bother me* (*Participant 5, Female, 35-44*).

*It's like my daughter saying that it's only water; ‘it's been proven mum, it's been proven!’ I think sometimes that's all very well saying that science's proven something but whether it's a placebo effect or what, who knows? But I certainly still trust my own reactions so science can be perfectly correct but if something works, despite that evidence, why not use it?* (*Participant 6, Female, 55-64*).

Additionally, one participant argued that scientific evidence is not always necessary for natural products, following the assumption that natural therapies and remedies are safe to use. The following quote shows the participant’s preference for natural remedies, even if there is no scientific evidence.

*Because it's a natural remedy and so it doesn't necessarily have to have the scientific tick of approval. I would much rather have a go at naturals first whether it's been proven or otherwise* (*Participant 14, Female, 45-54*).
The sub-theme “future” illustrates that some participants attribute the absence of scientific evidence to the lack of research or to technology not being available yet. The following quote illustrates how, according to one participant, there has not been enough scientific research on homeopathic remedies.

*I’d say my understanding at the moment is that a lot of it hasn’t been scientifically proven and that a lot of it just hasn’t been studied but that there is starting to be more funding available for studies* (Participant 7, Female, 25-34).

Another participant felt like there was no consensus about homeopathy’s effectiveness, though they added that this might change in the future. Some participants believe that the lack of scientific evidence could be addressed if more research was done or when new technologies become available. The following quotes illustrate those positions.

*Based on what I’ve heard and what I’ve read I don’t think it’s been proven but I don’t think it’s been disproved, that’s where I’m up with (...) there are things that science is starting to prove that they haven’t before and that’s great* (Participant 19, Female, 35-44).

*There has been some science that have shown recently in the last five years perhaps, that there is such a thing as memory in water. Basically, there is such a thing as memory, that it is different they have been able to detect through this very new technology that there is something there. (...) There is something that is within the theories that Hahnemann’s got and his believes that he came up with, that works and I just think it's one of those things that perhaps research will eventually catch up with it, I'm not sure* (Participant 9, Female, 55-64).

*Scientifically we don’t have the tools yet to see what’s happening. We’re starting with some quantum stuff to get a sense of how physics operates differently in quantum level and things like that and particularly water, you know how powerful water is? I imagine one day it will become clear, but we don't know yet, that there are ways of transmitting the energy which very clearly, for me, it's an energy thing* (Participant 2, Female, 45-54).
Confusion

The sub-theme “confusion” describes participants whose answers indicate confusion with regards to whether they believe homeopathy to be scientifically supported. When asked if homeopathy was scientifically supported, one participant answered that they believed homeopathy was “measurable and scientifically tested”. When asked to elaborate, their reasoning drew from non-scientific evidence and concluded with the admission that they did not know if research had been carried out.

That is just my feeling because I think there's such a big body and especially in the European tradition it's been there for so long and I mean it's just really that the pharmaceutical industries there is so much more money in it really there is really no money in producing homeopathy it's only really money in practicing so yeah it's not like with other stuff I can't just say oh I can refer to this and this paper no I can't (Participant 20, Female, 55-64).

When asked in a follow-up question if they had looked for scientific evidence they answered: “It's a bit as I said with Weleda products, they definitely work because it's just historically they have been applied for so long. Can I tell you whether someone has done the research, no I can't really” (Participant 20, Female, 55-64).

Another participant first argued that science could not explain everything: “Doesn't matter how many scientists throw their test tubes at it, there are just things out there that you can't prove scientifically and I think homeopathy unfortunately is one of them” (Participant 16, Female, 45-54). Then when asked if they thought homeopathy was scientifically supported, they answered: “Well yeah because it works. I'm pretty sure I'm right. The whole sort of argument towards it's got no molecular structure in it, therefore it can't work, there is nothing physically left of that substance in what they're taking but THERE IS because the energy of it is still there” (Participant 16, Female, 55-64).

In contrast, one participant who was aware of the lack of scientific evidence behind homeopathic products, added: “I use one remedy that has been shown to work and there is evidence that it works” (Participant 11, Female, 55-64). That participant explained that they had been using one homeopathic remedy without knowing it was homeopathic. This participant’s reasoning for continuing use was that the specific remedy works because the ingredient used to make it has been shown to shorten the duration of colds.
**Sceptic**

Finally, the last sub-theme “sceptic” was defined as participants who were sceptical about science. This sub-theme is further divided into three categories, “scientific institutions”, “non-believers” and “money”.

**Scientific institutions:** Some participants expressed doubt in scientists such as general practitioners (GPs) and pharmacists when asked what it meant for “something to be scientifically proven”. The following quotes illustrate some of the participants’ doubts about doctors and Western medicine.

> I don't always trust my doctor, medical doctor”. [Why?] “Because doctors always tend to push you into drugs whereas my body doesn't tolerate very many drugs very well so I have to go down the natural route. He's getting better at now researching natural remedies for me but he was very reluctant to do that to start with (Participant 5, Female, 35-44).

> I'm very anti fluoride and very anti amalgams and I've done a lot of readings and research about that. To me you don't even have to do research about fluoride you just would not go there, common sense tells you that without even reading anything. But the medical profession is just protecting itself and it won't move on it, so it's made me question Western medicine and pharmaceuticals more as I've got older (Participant 9, Female, 55-64).

> What often comes about is what is fashionable or what the doctor prescribes today a few years down the track they go ‘oh actually when we said that that would be that and you’d be fine, actually, no, you weren’t’. (...) I don’t care what other people do, I don’t force my views on anyone else but scientific of today may not be the scientific of tomorrow (Participant 13, Female, 35-44).

**Non-believers:** A couple of participants sighed when asked if they believed that homeopathic remedies were scientifically proven to work. They said that the scientific community or “non-believers” might not believe that homeopathy is scientifically supported but for them it is. The following quote illustrates one participant’s view that scientists are sceptics followed by a quote from another participant who parallels the homeopathy believer/non-believer dialectic to the anti-vaccine movement.
I’ve read George Vithoulkas’s book and to me, he outlines enough of a scientific proof, why it works and he sets out to prove from a scientific perspective the basis for homeopathy. (…) It would probably not satisfy many scientists because they would be as I was, prejudiced. According to the book, it satisfies me. Whether it would satisfy Peter Gluckman and all the other sceptics I would doubt it (Participant 1, Male, 65-74).

I guess the non-believers and pharmacies are obviously the ones that want to discredit homeopathy the most. (…) It’s just like the anti vaxxers versus the vaxxers. The vaxxers would say we’ve actually scientifically proved vaccinations works and the other ones will come up with an equal thing to say well no. There does have to be a link somewhere when you’re looking at the high rate of autism coming out for kids I mean what is the link? (Participant 13, Female, 35-44).

Money: Some participants were suspicious of the lack of scientific evidence proving homeopathy’s efficacy and argued that money was involved. During one interview, the participant said that there was no scientific evidence behind homeopathic remedies. When asked “why is there no scientific evidence?”, they responded:

Why is there none? Cause it costs so much money to do a proper clinical trial. The only reason why a company would undertake to spend millions of dollars or a million dollars on a clinical trial would be to sell their own product and there are probably no patents on anything so any clinical work that you fund would actually fund everyone else’s product as well (Participant 17, Male, 45-54).

For that participant, a lack of resourcing might explain the lack of evidence behind homeopathy. Another participant also talked about money when explaining why they keep using homeopathic remedies despite some of their “GP friends” telling them about the lack of evidence. The following quote illustrates their view.

I read a lot about pharmaceutical companies and there is a huge amount of leverage that they have and there is a huge amount of money involved in the pharmacology and of course we’re not going to test things if we’re not gonna earn large amounts of money for the research and we’re [homeopathy community] not going to also be able to compete with the money they pour into research, the money they pour into advertising (Participant 3, Female, 45-54).

George Vithoulkas is a Greek teacher and practitioner of homeopathy who has written numerous books on homeopathy.
It was assumed, based on the survey results, that for most homeopathy users, the perceived scientific evidence behind homeopathy played a role in their decision to use homeopathic remedies. The interviews, however, showed that most participants were aware of the lack of evidence, believed evidence would come in the future, or were sceptical of science. Ultimately, none of the participants used scientific evidence as a basis for their decision to use homeopathic remedies.

**Science and Usage**

Comparison of patterns of homeopathic remedy use from participants falling in the *Unknown, Indifference, Future, Confusion, and Sceptic* sub-themes indicates that there are no noticeable differences between them. All participants tended to use homeopathic remedies first, turning to conventional medicine if needed. They also used homeopathic remedies primarily for minor conditions.

The first common trend among participants can be seen in the pattern of homeopathy and conventional medicine use. All participants explained that they use homeopathic remedies first, then use conventional medicine or visit their GP if they do not get better. Whilst preferring to use homeopathic remedies, all participants use them to complement, not fully replace conventional medicine.

*You try something gentle first and then you call in the big guns if it's not working* (Participant 3, Female, 45-54).

*You've just got to be sensible with what you do, you have your die hard people that would try absolutely nothing else. Like I said, you got to be realistic, there is just some things that you have to go to the more conventional stuff, especially if you're looking at infections and things* (Participant 13, Female, 35-44).

The second common trend relates to the conditions for which participants use the remedies. All participants identified minor conditions like colds, bruises, and headaches as examples of ailments they would use homeopathic remedies for. Some participants also described using homeopathy for stress relief, emotional stability, insomnia, and panic attacks. Finally, a couple of participants indicated that they used homeopathic remedies for chronic conditions. One participant described her attempts to use homeopathy to treat
her children’s eczema, which she did not pursue as the treatment did not prove to be effective.

*I found them reliable for the conditions I deemed them reliable for, within that range of minor or non life-threatening, it's probably the best way to say it, where it's non life-threatening (Participant 3, Female, 45-54).*

*If it was life threatening then I would probably go with what has been proven to work. But under the general colds, flus, cuts and aches and pains, then I just believe that the natural is fine (Participant 8, Female, 45-54).*

These results indicate that participants’ perception of the scientific basis of homeopathy was more of an afterthought or *post hoc* justification initiated by the interview questions, rather than a strong influencer in their decision to use homeopathic remedies. Perception of the remedies being “natural”, however, might be an important factor in the participants’ decision to use homeopathy. This will be addressed in the next section.

### 2. Understanding

In homeopathy or complementary and alternative medicine (CAM) surveys, it is rare to find a description or definition of what homeopathy is, a limitation that can lead to over- or underestimation of participants’ use of therapies (Thomas & Coleman, 2004). Acknowledging that limitation, it was nevertheless decided to not define homeopathy and keep consistent with existing CAM surveys. Additionally, the absence of definition allowed the survey to be consistent with the 2012 UMR survey. However, this means that a significant proportion of respondents may have misinterpreted the question and did not appropriately refer to homeopathy as such. To address the lack of definition in the survey, the interviews assessed participants’ understanding of the term homeopathy.

The theme “understanding” was defined as the participants’ description of homeopathy, regardless of the accuracy of their description. The theme is further divided into two sub-themes: “appropriate” and “conflation”. The sub-themes allow for distinction between participants who knowingly use homeopathic remedies from those who think they use homeopathy, but may be confounding homeopathy with natural remedies or other types of CAM.
**Appropriate**

The first sub-theme “appropriate” refers to instances where the participants were specifically and appropriately referring to homeopathy’s principles during the interview, namely the idea of ‘like cures like’ or the process of serial dilutions.

Across the interviews, 12 participants appropriately described homeopathy by referring to the principles of ‘like cures like’ and/or, ‘potentisation’ (serial dilution). Most mentioned “very small quantities” or “high dilutions” while some talked about the “memory of water”. The following quotes show two ends of this spectrum with some participants having a deep understanding of the principles while others gave more superficial descriptions.

*It's a potentising of certain elements, trace elements and so the more it gets diluted the more potent it becomes and fundamental principle is to likes cures likes (Participant 20, Female, 55-64).*

*The way I see it's like a portion of something but it's like so diluted when it's given to you that it can't be harmful to you but it can help you (Participant 18, Female, 18-24).*

**Conflation**

The second sub-theme “conflation” was defined as descriptions of homeopathy that were not specific to its principles. Eight participants either did not provide details specific to homeopathy or assimilated homeopathy with natural remedies and talked about “natural” or “non-chemical” remedies. Additionally, three participants who described homeopathy’s principles also referred to homeopathy as being natural. The following quotes are some participants’ descriptions of homeopathy.

*It's a cocktail of naturally sourced chemicals for the lack of a better word, that are produced by plants and that actually work on the causes of what is ailing you rather than trying to stick a band aid over the symptoms (Participant 5, Female, 35-44)*

*I would say it's not using drugs. My understanding is that they work, the idea of homeopathy is working with the body to help it kind of heal itself. Using natural plants and minerals and elements to try to obtain optimal health (Participant 7, Female, 25-34).*
For me, it's looking not just at what's been presented but the symptoms and then finding remedies to match that so a more natural and holistic approach to looking at illnesses (Participant 13, Female, 35-44).

Two participants also added the element of being outside of the conventional system. One described homeopathy as: “Something that isn't prescribed by a doctor probably but is helpful for mental and physical health” (Participant 6, Female, 55-64).

Finally, some descriptions clearly showed the confusion around the term homeopathy. For example: “I consider Chinese medicine to be homeopathy or quite homeopathic” (Participant 3, Female, 45-54).

Understanding and Motivation

Whilst all participants use homeopathic remedies for similar conditions, their understanding of homeopathy might influence their motivation to use the remedies. Comparison of participants’ motivations to use the remedies show that, again, there is no distinct pattern between the “true” homeopathy users and participants who use natural remedies in general.

Half of the participants (six “appropriate” users and five “conflation” users) were motivated to try homeopathic remedies because conventional medicine did not help them. For some participants, that also led to a lack of confidence in conventional medicine. The following quotes illustrate participants’ explanations of why they started using the remedies.

It was not long after I had my second child and I was having a lot of health issues that the convention methods just were not doing anything for me and a friend of mine, we were in a rural community, and a friend of mine said have you ever tried homeopathy? (Participant 16, Female, 45-54).

The first time I went [to see a homeopath] I had something called fibromyalgia or something like that and my doctor said look this is predominantly something women start getting over 45 and there is nothing you can really do about it. It will come, it will go, there will be good times and there will be worse times and she said basically just live with it. And that's when I went to Charlie [pseudonym] and she gave me just a very very short course of tablets and she cleared it and I actually never had it back since (Participant 9, Female, 55-64).
I don't think that regular medical drugs cure anything, they just fix the symptoms, they don't fix the disease and so medicine hasn't come up with many cures for very many illnesses whereas homeopathy actually has, can cure diseases rather than just dampen down the symptoms. I came to homeopathy because I was facing a lifetime of taking drugs and I didn't want to be that way so I thought it was worth a shot and it worked so I'm a convert (Participant 5, Female, 35-44).

For a couple of those participants, an additional motivation to use homeopathy followed a bad experience with conventional medicine. For one participant, “side effects of allopathic medicine” (Participant 1, Male, 65-74) in general, and for another, a bad experience with an anti-depressant led them to look for alternatives. The following quote illustrates the position of a third participant, who explained their motivation to use homeopathy using an example of a relative’s bad experience.

I don't think they [pharmaceuticals] are in the business of making people well. I mean they're not gonna make money by people getting well. My mom is a really good example of that actually she had perfectly fine blood sugar levels and she had to go on blood pressure pills and she ended up with type two diabetes in the space of a month (Participant 13, Female, 35-44).

These participants’ motivations to use homeopathy seem to have come from being pushed away from conventional medicine rather than pulled towards homeopathy. Four participants started using homeopathy as an alternative to conventional medicine because it is “natural” or not “processed pharmacy”. Whilst there is still a negative connotation around conventional medicine, these four participants did not refer to any dissatisfaction or bad experience with conventional medicine. Rather than being pushed away from conventional medicine like the previous participants, these participants more importantly appear to be pulled towards homeopathy. The following quotes illustrate how homeopathy is used as an alternative medicine.

It would have been around pregnancy my first pregnancy. I was sort of looking out alternatives for pain relief (Participant 20, Female, 55-64).

The most important for me would be that the product is natural rather than a manufactured and if it works for me great (Participant 14, Female, 45-54).

For two participants, the motivation to try homeopathy either followed a suggestion or a recommendation:
Somebody suggested it [homeopathic remedy] but it worked and it continues to work so I keep on using it (Participant 6, Female, 55-64); a pharmacist recommended it for a cold (Participant 7, Female, 25-34).

Two other participants explained that they were willing to try anything, in general or at specific time of high stress. In the following quote, a participant explains why he used homeopathy.

*When I was using it, I was in a relatively fragile emotional state and physical state and I was willing to try anything at the time and I guess now I'm not really there anymore so things aren't quite as stressful or bad as they used to be. There are things in my life around my emotional health that probably aren't as great as they could be and maybe I could try some other things like for example meditation is something that I used to do and I don't anymore* (Participant 17, Male, 45-54).

Finally, for one of the two participants who grew up using homeopathy and did not question their use, using homeopathy is neither motivated by being pushed away from conventional medicine nor from being pulled towards homeopathy.

Additionally, across the interviews, participants described homeopathy as a “safer option” compared to conventional medicine. A few participants talked about the lack of, or negligible number of side effects as a motivation to use homeopathic remedies. According to Matute et al. (2015), the lack of side effects “might be one of the reasons why many people prefer alternative medicine even when they know that they are not supported by evidence” (p. 7). As a result of the perceived lack of side effects, people tend to use CAM more often which leads to an increased perception of effectiveness (Blanco, Barberia, & Matute, 2014; Matute et al., 2015). The following quotes are from one participant who described homeopathy as natural and one participant who correctly describes homeopathy’s principles.

*There is not the side effects the same where there is with other medication. Sometimes you can have a side effect and often that's a good sign but it's not like where you end up with the pharmaceutical side effects* (Participant 13, Female, 35-44).

*I look at normal medicine, I want to search exactly what’s in it and everything, where I think [homeopathy] is just a much more natural sort of way of fighting. I think there is potential risks for everything that you do but I think it's a lot less than*
if you went to your doctor and got normal drugs or medication (Participant 18, Female, 18-24).

These results add nuance and depth to the survey results (see chapter 4) where 80% of homeopathy users agreed with the ‘pull’ statement that homeopathic remedies are “a more natural treatment” compared to 62% agreeing with the ‘push’ statement that “conventional medicine has caused unpleasant side effects in the past”. Combined with the literature, this suggests that whilst the initial movement towards CAM in the late 1990s was associated with a dissatisfaction with conventional medicine (push factors), current CAM users are mainly pulled towards CAM (Gyasi et al., 2016; Shorofi, 2011; Sirois, 2008). The interviews add the element of “random”, with some participants neither being pushed away from conventional medicine nor pulled towards homeopathy, but rather stumbling upon the remedies because of a third party or being willing to use any remedies.

3. Effectiveness

Another aspect of the interviews focused on participants’ assessment of homeopathy’s effectiveness. Scientific method can be used to measure the effectiveness of drugs, allowing those that have an effect to be distinguished from those that are not more effective than placebo, or do not have an effect at all. So far the interview results have shown that scientific evidence was not part of participants’ decision-making process when determining whether to use homeopathy. However, as a participant said “If it wasn’t effective, I wouldn't use it”.

The theme “effectiveness” was defined as participants’ explanations of how they know that homeopathy works. Three sub-themes represent the main types of evidence raised by the participants: “personal”, “anecdotal” and “traditional”. The sub-theme “personal” further includes the sub-section “placebo effect”.

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Personal

The sub-theme “personal” was defined as participants referring to their own experience with homeopathy to argue for homeopathy’s effectiveness. All participants mentioned that homeopathy works or has worked for them. The following quotes illustrate some participants’ experiences.

*Because it works. It's been working for me and it's just my personal experience and I never questioned it like whether it worked or not (…) At the same time, based on my life experience it's working and it's working for me (Participant 4, Male 25-34).*

*It's not proven that it works but it worked for me (Participant 8, Female, 45-54).*

*I guess I trust my own reaction to things. I know that it's worked in the past and so will carry on using it (Participant 6, Female, 55-64).*

*I know it's helped me and I know it worked for me because of how it's made me feel and how I recovered (Participant 19, Female, 35-44).*

Currently, there is no robust scientific evidence behind homeopathy and the remedies have not been shown to have effects greater than the placebo effect (National Health and Medical Research Council, 2015). The participants’ perceived effectiveness of homeopathy is, therefore, likely due to the placebo effect, regression to the mean and spontaneous improvement (Barnett et al., 2005; Kelkar & Ross, 1994; National Health Medical Research Council, 2015). The sub-theme “personal” further includes the category “placebo effect”.

Placebo effect:

The interviewer did not introduce the word ‘placebo’ during the interviews to avoid influencing participants’ responses. However, ten participants referred to the placebo and used the terms “placebo” or “placebo effect”, and an additional four participants referred to the idea of placebo without using the word e.g., “I wonder if it's the idea of if you think it's gonna work, it will work” (Participant 18, Female 18 – 24). Three different attitudes towards placebo were found among those 14 participants; “tool”, “maybe”, and “rejection”. “Tool” represents one participant’s argument that homeopathic remedies have been shown to be as effective as placebo, and therefore they are using them as such.
“Maybe” reveals that some participants acknowledge that homeopathic remedies may only be as effective as placebos. “Rejection” describes participants acknowledging that some of homeopathy’s effectiveness is due to placebo, but reject it as the main explanation for homeopathy’s effectiveness.

One interviewee explained their use of homeopathic remedies to “hook into the placebo effect” with their children; she used homeopathy as a placebo ‘tool’. The following quote illustrates their thought process.

   I was very clear about what it [homeopathic remedy] would do and of course it did, because I told the children how it works and so therefore it did work that way. I would actually use it for anything that happened. It would work because I told them it would work for whatever it was that happened (Participant 2, Female, 45-54).

The interviewee said that they knew homeopathic remedies were not scientifically proven to work more than placebos. The following quote demonstrates how they use the remedies as part of a ‘ritual’ to help their children self-manage pain.

   Certainly for the children they [homeopathic remedies] were very reliable and very consistent. The children believe they worked and they had their own sort of like, I made little crochet bag that it was in and you know its little flower and radiradira and so the children associated that with being helped whenever they were distressed (…) To develop strategies for managing and coping with that sort of things [broken limbs] I think it's really important to be able to sort of frame it in the way of being offered something. I find it very very effective with the children (Participant 2, Female, 45-54).

Both participants who said they did not know if homeopathy was scientifically supported then ‘thought out loud’ and acknowledged that homeopathy’s effectiveness might be due to the placebo effect; for them it is a ‘maybe’. Ultimately, it does not matter to them as long as they get better. The following quotes show their reflections.

   They [scientists] say that it's just mental programming, you think that it will work and it works. What should I care then? I mean I am for the result; I'm not trying to find why it is working (Participant 4, Male, 25-34).

   I think they are effective but then again I wonder if it's the idea, if you think it's gonna work, it will work, so that kind of power of like positive thoughts to getting you better cause I felt like I got better (Participant 18, Female, 18-24).
These two positions; actively using homeopathic remedies as placebos for children (tool) and acknowledging that homeopathic remedies might be placebos (maybe), show an understanding that perceived effectiveness might be context-dependent rather than linked to a specific remedy. A placebo intervention is “designed to simulate a therapeutic context such that the effect of the intervention (placebo effect) is attributable to the way in which this context affects the patient’s brain, body and behaviour” (Finniss et al., 2010, p. 687; Price et al., 2008).

Participants’ acceptance of homeopathic remedies as placebos aligns with other studies showing that people are willing to take a remedy knowing that it is only a placebo (Kaptchuk et al., 2010; Ortiz, Chandros Hull, & Colloca, 2016). Most people welcome the use of placebos as there is a “lack of harm” as well as “potential benefit” (Ortiz et al., 2016). The ethics behind their use, however, is beyond the scope of this thesis (Bishop, Aizlewood, & Adams, 2014; Hull et al., 2013; Ortiz et al., 2016).

Some participants talked about the placebo effect as something they were aware of and agreed might play a role in explaining part of the effectiveness of homeopathic remedies, but noted, importantly, that the remedies’ effects were more than the placebo; leading to a ‘rejection’ of the placebo as explanation for homeopathy’s effectiveness. The following quotes illustrate some participants’ recurring argument that children and/or animals cannot experience the placebo effect, therefore, the (perceived) effectiveness must be specific to homeopathic remedies. Additionally, a couple of participants have a negative perception of the placebo effect as being something that is “all in your head”.

*It [placebo] can have a powerful effect but the best patients are animals and children for homeopathy and they don’t have any beliefs either way about it, they’re just, you give them a remedy and the kids go and play again or the animal is off so I think it works independent of belief or lack of it (Participant 1, Male, 65-74).*

*For people it's the placebo effect, well, my father uses it on his animals as well. And animals have no idea what's going into them so they can't know if you give them something to help with a specific symptom and they get better. I guess it's not the dogs or the animals 'oh I'm gonna feel better cause I've taken this'. Dad says that for a person certainly you can say oh well it could be in their head but for an animal they've got no idea. My friend, she does it with the horses and she's had amazing results and people that have tried vets and things for various ailments of their horses and so forth, she's got results where the vets haven't. That's not in the horse's
head cause a horse has no idea, dogs they've got no idea, cats same thing they've got no idea so as much as people go it's all in your head, well they love to test on animals cause animals you know supposedly should be able to tell us what's gonna happen to us well if it's good enough for animals to be ok then (Participant 13, Female, 35-44).

I think when you try them [remedies] on animals, animals don't have a preconceived idea that they've got anything on their leg. They've got no idea what you've put under the bandage, either it heals or it doesn't. If you get acupuncture and things like that, I can take my dogs to the acupuncturist, he will be limping and then I'll walk out, he will be walking soundly. I mean he can't lie, there might not be specific science but the proven results for me is enough (Participant 15, Female, 45-54).

I've got one very good quite powerful example I think that showed what I believe it was showing that it was working. (...) Something happened and I'm pretty sure it's not the placebo effect because I don't think he [son] was old enough to even register that (Participant 17, Male, 45-54).

This argument demonstrates that these participants mistakenly believe they understand the concept of placebo (Price et al., 2008; Rommelfanger, 2017; Sümegi, Gácsi, & Topál, 2014; Weimer et al., 2013). This could be due to a bias known as the ‘illusion of explanatory depth’ (IOED). IOED is likely to emerge when “people mistake their mastery of the abstract characteristics of the concept for a belief that they understand the concrete aspects of the concept deeply, when their understanding is far shallower” (Alter, Oppenheimer, & Zemla, 2010, p. 437; Rozenblit & Keil, 2002). While IOED and other overconfidence biases often have minimal impact on people’s lives (e.g., understanding of mechanism of earthquakes or overconfidence in cooking abilities), sometimes IOED does hamper decision-making as people think they have enough knowledge to make an informed decision (Alter et al., 2010). Exploring participants’ understanding of the placebo effect was not within the scope of these interviews and hence the idea was not pursued in depth, however, it is possible that many participants would have been unable to explain the basic principles involved the placebo effect.

After personal experience, participants also used anecdotal and traditional evidence to argue for the effectiveness of homeopathy. These two types of evidence are likely to reinforce the placebo effect as they create expectation, which is known to be a big component of the placebo effect (see chapter 2, p. 50, for more details).
**Anecdotal**

The sub-theme “anecdotal” was defined as participants using anecdotal evidence to argue for the effectiveness of homeopathic remedies. In 2008, a qualitative study (n=7) from New Zealand mentioned that CAM patients valued anecdotal evidence (Chan & Whitehead, 2008). Anecdotal information is known to influence people’s health decision-making as it is more relatable than statistical information (Dohan, Garrett, Rendle, & Abramson, 2016; Fagerlin, Wang, & Ubel, 2005). The body of literature around the use of narratives in health communication has been growing over the past decade and has become an increasingly preferred method of health communication over statistics and logic-based information (Graaf, Sanders, & Hoeken, 2016).

The following quotes show how some participants used the term “anecdotal evidence” whilst others described anecdotal evidence by sharing success stories they had heard, including stories from people they personally knew.

*People say to me there is no research to prove it but I think if we don't listen to anecdotal evidence as well, I think anecdotal evidence from people I trust is invaluable or as valuable as some of the advice I get from my GP. (...) I mean there's the research that gets channelled through universities and pumped out by universities and professional people and there is the research that's done by mum, mum and dad at home or people who work in the community and they work alongside people and they know it works (Participant 3, Female, 45-54).*

*I've got one very good quite powerful example I think that showed what I believe it was showing that it was working. My son, when he was about two years old, had come to a cricket game with me and he was in the changing room and he slipped and bashed his face on the chair and I could see that there was this big welt bruise coming up on his face and I gave him homeopathic drops right then and within about five minutes the bruise had almost gone away (Participant 17, Male, 45-54).*

*A friend told me about how people recovering from surgery, homeopathy helped them recovering a lot better and doctors have noticed the difference but it's anecdotal (Participant 19, Female, 35-44).*

Anecdotes played a large part in many participants’ arguments for homeopathy’s effectiveness. The anecdotes followed the classic story structure with a main character (someone they knew, or someone they could relate to) facing a challenge (health issue) followed by a resolution (health problem relieved with homeopathy). The use of narrative
implies a causal relationship between two events that are most likely unrelated (Dahlstrom, 2014). Narratives are known to be persuasive tools, and exploration of their importance in health communications is becoming an increasingly popular research subject (Dohan et al., 2016; Greene, Hibbard, & Sacks, 2017; Shen, Sheer, & Li, 2015). Anecdotes in particular, and anecdotal reasoning, have been shown to have more influence on people’s health decision-making than statistical information as they are more easily mentally processed (Fagerlin et al., 2005; Schwarz, Newman, & Leach, 2016).

**Traditional**

The last sub-theme “traditional” was defined as participants justifying homeopathy’s effectiveness using traditional evidence. A product or treatment can be considered ‘traditional’ after 75 years of use (or three generations), according to the guidelines for Natural Health Products Evidence Requirements (Ministry of Health, 2015). The following quotes illustrates that, according to some participants, if the remedies have been used for a long period of time, they must work.

> There is a lot of historical evidence I suppose which is the same for a lot of functional food type product as well as is that people believe that they worked and they’ve been using it for centuries so they probably do, to some extent (Participant 17, Male, 45-54).

Some participants referred to homeopathy as being used for thousands of years, however, homeopathy has existed for less than 300 years. For those participants, the traditional evidence might play an even larger role as their timeline is erroneous; “Homeopathy, it's been around for thousands of years, if it didn't work why would we still be using it?” (Participant 3, Female, 45-54). “It's been used for thousands of years so that's scientifically proven enough for me, scientifically proven by millions of humans!” (Participant 5, Female, 35-44).

Use of traditional evidence to argue for the effectiveness of therapies is widespread among CAM (Weir, 2016). Wiese (2016) and Leach (2016a) debated the value of traditional evidence, with Wiese highlighting the uniqueness of many CAM therapies and difficulty in obtaining evidence that was high-quality according to the evidence-based
medicine ranking. The hierarchy ranks meta-analyses and systematic reviews of randomised-controlled trials higher than anecdotal experience or expert opinion (Merlin, Weston, & Tooher, 2009; Wiese, 2016). Wiese argues that classic evidence-based medicine cannot accommodate for complex needs the way CAM can; that traditional evidence is the strongest type of evidence for most CAM; and that, therefore, “there is a place for traditional CAM evidence, providing treatment has been shown to be safe through systematic accounts over time” (Wiese, 2016, p. 144).

As a response, Leach argues for caution with regards to the use of traditional evidence, in any context (Leach, 2016a). As outlined in his response to Wiese, there are many issues regarding the credibility of traditional evidence, like confirmation bias, bandwagon bias, or halo effect. Confirmation bias makes us selective of the evidence we seek. If people engage in a specific behaviour for a health-specific purpose and the desired effect occurs, they will likely assimilate that effect to their previous behaviour. The possibility that the result might still have occurred without any ‘trigger’ is not necessarily intuitive (Nickerson, 1998). The bandwagon bias occurs when people “show a tendency to do or believe a thing only because many other people believe or do that thing, to feel safer or to avoid conflict” (Scopelliti et al., 2015, p. 2472). The halo effect, also known as the guru effect, happens when an early positive perception/experience influences subsequent perception (Pullman, 2013).

5.3 CONCLUSION

The interviews were the second part of the sequential explanatory mixed methods research project looking at the use of homeopathy in New Zealand and investigating whether homeopathy users perceive homeopathy to be scientifically supported. The results show that, contrary to what the survey results suggested, most homeopathy users are aware of the lack of scientific evidence behind homeopathy, but either do not use scientific evidence as a basis for decision-making or have justifications for why there is no evidence yet (not enough research, technology not available yet, sceptical about science and/or scientists). However, the justifications appear to be more of an afterthought, or a reflexive response to inquiry, and ultimately scientific evidence is not
a strong factor in participants’ decision to use homeopathic remedies. Rather, the decision to use homeopathy is primarily influenced by personal experience, friends’ success stories, and the perceived prevalence and safety of the remedies.

During the interviews, more than half of the participants acknowledged the placebo effect, however, most of them disregarded it as the main explanation for their perceived efficacy of homeopathy. This rejection was mainly supported by misinformation or misinterpretation of the placebo effect and the persistent negative framing of the placebo as being entirely psychological.

Finally, the results indicate that there is a misunderstanding of the term homeopathy, with a significant proportion of participants confounding homeopathy with other CAM remedies. This is an important finding highlighting the potential for a very significant weakness in the standard survey designs involving CAM. Currently, most CAM surveys (and possibly other forms of CAM communication) do not define the therapies, but rather assume that participants have a good understanding of the different therapies, likely leading to some misrepresentation, at least with regards to homeopathy use. This also further reinforces the utility of a mixed methods design for this project, as the interviews provide an explanation of the high proportion of survey respondents who self-identified as homeopathy users (52%). It also follows that the 2012 UMR survey results probably do not fully represent the general public’s belief around the scientific basis of homeopathic remedies, as some of the 2012 respondents may also have interpreted the term homeopathy to refer generally to natural remedies.

The following chapter will discuss the entirety of the results from the sequential explanatory mixed methods, bringing together quantitative and qualitative results to present a more comprehensive understanding of the use of homeopathy in New Zealand.
GENERAL DISCUSSION

The increasing popularity of complementary and alternative medicine (CAM) despite the paucity of scientific evidence for their effectiveness raises concern about user safety (Barnes, 2003; Markman, 2002). Of the five most used types of CAM, four have potential physical and scientific foundations explaining how they might work, namely acupuncture, chiropractic, herbal medicine, and osteopathy (see chapter 2, p. 40). The fifth, homeopathy, does not. The potentisation process, unique and central to the preparation of homeopathic remedies, leads to a near statistical impossibility that any of the active ingredient is present in the final remedy. As a result, multiple systematic reviews have independently reached the conclusion that there is no evidence homeopathy is more effective than a placebo effect (House of Commons Science and Technology Committee, 2010; National Health and Medical Research Council, 2015). Frequently, homeopathy users interviewed in this thesis, and elsewhere, state that it is not known how homeopathy works. This claim of unknown causality provides important insight into the role of evidence in health decision-making, which has been expanded on in chapter five of this thesis. Moreover, the claim is used to justify an already held belief, and reinforce pre-existing cognitive biases by assuming that it works.

The literature around the use of homeopathy and homeopathy users in New Zealand is very limited (Duke, 2005; Holt & Gilbey, 2009). A nation-wide survey published in 2012 reported that 51% of New Zealanders (n=1000) believed the statement “homeopathic remedies are scientifically proven to work” to be true (UMR, 2012). Following those results, this study aimed, using a mixed methodology combining a survey and semi-structured interviews, to investigate whether homeopathy users were using homeopathic remedies because they believed the remedies to be scientifically supported, and if so, what motivated their beliefs. To be able to explore that question, two other questions needed to be addressed first: Do New Zealanders use homeopathic remedies? And do homeopathy users perceive homeopathy to be scientifically proven to work?
DO NEW ZEALANDERS USE HOMEOPATHIC REMEDIES?

Not as often as they think they do.

According to the survey results of this study (see chapter 4), 52% of respondents were using homeopathic remedies. That is a high proportion of homeopathy users compared to results from surveys conducted in countries such as Italy (8.2%) or Australia (6%) (Menniti-Ippolito et al., 2002; Xue et al., 2007). The wording of the survey question may have contributed to the particularly high proportion of homeopathy users identified, as it read “Do you or would you use homeopathic remedies?” (emphasis added). A follow-up question asking where respondents sourced their homeopathic remedies, however, allowed for differentiation between respondents who use homeopathic remedies and those who do not as one option was “I don't use homeopathic remedies”. In total, only 12% of ‘potential homeopathy users’ said they were not currently using homeopathic remedies, which still leaves a very high proportion of self-identified homeopathy users (40%).

Another factor that may explain this high proportion of users could be the specificity of the survey. CAM surveys usually provide respondents with a list of therapies to choose from, whilst homeopathy was the only option in the present survey. Some respondents may have mistakenly classified themselves as homeopathy users by answering “yes” to the question “Do you use homeopathic remedies?”, when in fact they were referring to use of natural remedies or CAM in general. Additionally, in order to be consistent with other CAM surveys, especially the above mentioned UMR study (2012), the term homeopathy was not defined in the survey. As a result, survey respondents self-identified as homeopathy users according to their personal understanding of the term. To address this potential mistaken self-identification, participants were asked to describe ‘homeopathy’ during the interview component of the study. Twelve of the 20 participants appropriately defined homeopathy while the others confused homeopathy with natural remedies in general. Assuming the same proportion of misidentification in the survey, the number of homeopathy users would be closer to 23%, which is still relatively high compared to Australia (6%) and Italy (8.2%) (Menniti-Ippolito et al., 2002; Xue et al., 2007). However, a selection bias might have occurred, in that respondents who agreed to be interviewed may have been more confident in their knowledge and use of homeopathy.
than the general survey population (Clark, 2010). If this is the case, the error in self-
identification is potentially much greater in the general survey population.

Considered alone, the survey may have greatly overestimated the extent of homeopathy
use in New Zealand. This highlights a very important caveat in nearly all CAM survey
results to date, since the majority are designed as ‘check lists’ and do not include any
measure to assess potential confusion around the therapies investigated. There is a very
real chance that most CAM surveys overestimate CAM use, or at the very least there may
be considerable conflation between the use of different CAM. This is a significant finding
and one that should be considered in the design of future surveys so that the error inherent
in self-identification is minimised. Specifically, future CAM surveys should include
definitions for each therapy studied, open-ended questions asking respondents to describe
the therapies, or should follow up with interviews or focus groups to minimise the risk of
overestimation. This also reinforces the importance of using mixed methodology, which
allows for the comparison of survey and interview data, as was possible in this project.

**DO HOMEOPATHY USERS PERCEIVE HOMEOPATHY AS SCIENTIFICALLY PROVEN TO
WORK?**

They say they do, but that’s not what they mean.

Looking at the survey results, there was a clear divide between people who self-identified
as homeopathy users and largely believed that homeopathic remedies were scientifically
proven to work (78%), and those who were not using homeopathic remedies and primarily
did not believe that homeopathic remedies were scientifically proven to work (77%). This
could lead to the interpretation that the perceived scientific basis of homeopathy
influenced homeopathy users’ and non-users’ decision-making. It could be concluded that
non-users based their decision on the absence of scientific support behind homeopathy
whilst users’ decisions to use the remedies might be driven or reinforced by their belief
in the scientific basis of homeopathy. During the interviews, however, it became evident
that the majority of participants (all of whom self-identified as homeopathy users) were
aware of the lack of scientific evidence behind homeopathy, which was markedly
inconsistent with their survey answers. The difference in survey respondents’ beliefs
appeared to be mostly due to their interpretation of the question. Participants who said they believed homeopathic remedies to be scientifically proven to work seemingly read the question as “are homeopathic remedies proven to work for you?”, as opposed to whether or not the remedies had been proven through scientific testing.

When considered alone, the survey results misleadingly suggest that the majority of people using homeopathic remedies believe there is scientific support or are not aware of the absence of scientific evidence supporting the effectiveness of homeopathic remedies. This leads to postulation that the problem is one of communication of information concerning the lack of scientific support behind homeopathic remedies; the subsequent assumption being that more, better, clearer science communication regarding homeopathy is needed, and that a better educated public would stop using homeopathic remedies. The central problem with the solution of ‘simply more communication of the data’ is that it leads back to the deficit model, which considers the public as empty vessels that need filling with more information in order to be able to make informed decision. This early approach to science communication has subsequently been shown to be ineffective a long time ago (see chapter 1, p. 29), yet the suggestion of a need for “more” science communication was still a recent suggestion made at the Euro Science Open Forum 2018, following the panel discussion “Homeopathy: the need for robust evidence to inform consumer choice” (Osterath, 2018). This indicates that the misconception that unscientific decision-making is caused simply by a lack of information is ongoing and needs to be addressed.

Following the survey with interviews has again highlighted the potentially misleading nature of the survey results, and the need to treat such data with caution. This is an important point, as this is the first time a survey specifically investigating homeopathy use and the perception of homeopathy as ‘scientific’ has been followed by qualitative data from interviews with homeopathy users. The process provided a better understanding of the survey results, again, highlighting the benefit of using a mixed methodology approach in this type of research.
**Does being ‘scientifically proven’ matter at all?**

*Maybe for a small proportion, but for most it doesn’t.*

At first glance, it appears that the perceived scientific basis of homeopathy might influence decision-making. Data from the interviews, however, showed that scientific evidence, or lack thereof, was not a factor influencing participants’ decisions to use homeopathic remedies, and most participants were aware of the lack of scientific evidence. Indeed, there does not seem to be miscommunication around this issue, but rather missed opportunity for communication since the target audience (homeopathy users) does not seem to value scientific evidence as it is currently delivered or as a basis for decision-making on this topic. On the contrary, for many participants, the fact that “science says it doesn’t work” is dismissive of their personal experience; after all, the participants are using homeopathic remedies because they feel that it is working. As a result, participants either suggested explanations for the reported lack of scientific evidence (not enough research, technology not available yet) or became sceptics of science, believing instead that “big pharma” was trying to hide homeopathy’s effectiveness. Whilst participants who hoped to see scientific evidence in the future are still engaged with science, to the extent that they are waiting for confirming evidence, many participants who expressed scepticism about scientific evidence and its authority appeared to be unengaged. The lack of engagement is likely due to a number of factors, one being that ‘science’ is dismissive of their personal experience. The public being unengaged or even sometimes disengaged is one of the dominant themes in science communication research as it is viewed as a failure of the discipline (Burns & Medvecky, 2016). Consideration of the target audience and how they interact with the current content should drive the development of new communication strategies. This idea will be further developed later in the discussion.
IF SCIENTIFIC EVIDENCE DOES NOT INFLUENCE USERS’ DECISION TO USE THE REMEDIES, WHAT DOES?

The placebo, three ways.

The placebo effect is extremely complex and involves many components, most of which still require further research. Interestingly, but not surprisingly, the three types of “evidence” participants used to argue for the effectiveness of homeopathy can be connected to at least three processes which are known to contribute to the placebo effect. Anecdotes contribute to the placebo effect via the patient-provider relationship, participants’ personal experience contributes via the process of conditioning and anecdotes, personal experience and traditional evidence contribute to the placebo via expectation of effectiveness.

The power of anecdotes comes from their narrative structure (see chapter 5, p. 117), a form of information delivery that capitalises on innate human cognition (Gottschall, 2012; László, 2008). More importantly though, their power also comes from the relationship that exists between the receiver and the provider of the message, which magnifies its impact. An anecdote shared by someone with whom no affinity is shared does not have the same impact as one shared by someone who is known and trusted. Throughout the interviews, participants justified the effectiveness of homeopathy using anecdotes that were shared by people whom they personally knew, arguing that someone they trust would not recommend something if it was not working.

Interpersonal relationships are extremely important, especially within a health decision-making context (Elwyn et al., 2012). Over the past decade, more and more studies have focused on the importance of relationships in the placebo effect. It has been shown that a positive, trusting relationship between a patient and their provider will induce a stronger placebo response than a relation lacking that bound (Wampold, 2018). During the interviews, this appeared through the participants’ relationships with their friends and relatives. This underlying relationship factor also appeared during the survey, where respondents who visited a homeopathy practitioner perceived homeopathic remedies to be more effective than respondents who accessed their remedies over the counter (chapter 4, p. 89). This phenomenon is known as the “patient-provider relationship” (also known
as patient-practitioner or patient-clinician relationship) (Kelley, Kraft-Todd, Schapira, Kossowsky, & Riess, 2014; Wampold, 2018), and is characterised by patients trusting their practitioner such that the remedy prescribed, in this case homeopathy, becomes more trustworthy itself, thus eliciting a placebo effect. A recent study looked at the influence of shared patient and provider beliefs and trust on patients’ pain perception. Not surprisingly, their results showed that the more a patient felt ‘similar to’ (shared values) and trusted their provider, the lower their perceived pain (Losin, Anderson, & Wager, 2017). This highlights the importance of trust in triggering a placebo response and the strength that anecdotes have if shared by someone trusted.

Conditioning also contributes to the placebo effect experienced by homeopathy users. Participants experienced health improvement after taking homeopathic remedies due to the placebo effect combined with the natural course of the disease and potential regression to the mean or concurrent treatment, but attributed this improvement to the homeopathic remedy. Following that positive experience, participants used homeopathy again and continued to perceive the remedies as effective, thus leading to repeated use of the remedies. Whilst the participants are likely to have experienced a placebo effect, reinforced by compounding factors such as natural course of the disease and potential concurrent treatment, each event of health improvement following the use of homeopathy will reinforce that perceived causal relationship, further reinforcing the power of the placebo via conditioning.

Finally, the three types of evidence participants used to argue for homeopathy’s effectiveness all contribute to the placebo effect via the process of expectations. When participants hear anecdotes from friends or relatives describing their recovery after using homeopathy, they develop expectation that the remedies will be effective for them as well. Indeed, knowing that a remedy has worked for someone else can trigger an expectation that the remedy will be effective if used for the same condition. Similarly, participants develop the same expectation when referring to traditional evidence; if the remedies were not effective, people would have stopped using them a long time ago. These expectations reinforce the placebo effect, and thus influence participants’ personal experience when using homeopathy, which then contributes to conditioning and reinforces expectations around the effectiveness of homeopathic remedies.
It is worth noting that the placebo effect is not unique to homeopathy; the exact same processes play an important role in any other health context. The fundamental difference is that for homeopathy (and some other CAM), the only effect is the placebo whereas drugs known to be effective in clinical trials are tested specifically to ensure they have an effect beyond the placebo, known as a ‘drug effect’. The drug effect means that the health improvement is specific to the drug used, and will be superior to the results expected if the patient was only treated with a placebo. This is the critical difference that needs to be addressed and understood by homeopathy users and other CAM users. The power and extent of the placebo is truly astonishing. Some surgery procedures have even been shown to be no better than placebos, one famous example being knee arthroscopy, where a placebo procedure provides the same pain relief as the ‘real’ surgery (Thorlund, 2017). The danger of homeopathy, however, resides in patients’ beliefs that the therapies are more effective than they actually are. Misunderstanding the limitations of homeopathy can have serious implications for users. Believing that homeopathy “really works” can indeed lead users to delay the use of conventional treatments, which could result in severe health deteriorations, or even death, as was the case for Gloria Sam in Australia (Smith et al., 2013).

Whilst the placebo effect was not introduced during the interviews, some participants voluntarily mentioned it and acknowledged that it might explain some of the effectiveness of homeopathic remedies. Most of them, however, argued that children and/or animals could not experience placebo effect, and therefore rejected it as the main explanation for homeopathy’s effectiveness. For these participants, there is a clear misunderstanding of the placebo effect. While the literature specific to children or animals is not as developed as the literature targeting adults, children and animals are known to experience placebo effects as well (see chapter 2, p. 50 for a brief introduction to the placebo effect literature; Weimer et al., 2013 for a review on children; Keller, Akintola, & Colloca, 2018 for a review on rodents). Participants’ understanding of the placebo effect was not further explored during the interviews as it goes beyond the scope of the current research project. Future work directly investigating homeopathy users’ understanding of the placebo effect and addressing their potential rejection of placebo as explanation of the perceived effectiveness of homeopathic remedies would be a fitting complement to this project. That would allow for better insight into the scale of the misconception around placebos.
Interestingly, there are very few studies looking at patients’ understanding of the placebo effect, with most studies focusing on patients’ willingness to take part in placebo-controlled clinical trials involving the potential prescription of a placebo (Chen, 2009; Ortiz et al., 2016; Sugawara et al., 2015; Sugawara et al., 2018). Only a handful of studies have attempted to investigate patients’ knowledge of placebos (Fässler, Gnädinger, Rosemann, & Biller-Andorno, 2011; Hughes et al., 2017). In one study, an open question asked survey participants to explain the term ‘placebo’ and 63% (n=414) gave an appropriate explanation. The authors, however, did not provide an exemplar of what they deemed an appropriate answer. Furthermore, definitions of “pharmacological action” versus “nonspecific action” (another term for the placebo effect) were included in the questionnaire which makes it difficult to assess participants’ actual understanding (Fässler et al., 2011). A study assessing participants’ baseline knowledge of placebos using a fifteen item true-false questionnaire, found relatively good knowledge among the surveyed population of patients with back pain history (n=210), with 12.07 of 15 questions answered correctly on average (SD=2.35) (Hughes et al., 2017). However, as observed in some of the interview participants, misunderstanding of just one or two key aspects of the placebo effect, such as its effect on children and animals, could be sufficient to disable it as an effective explanatory tool when trying to engage the public in health decision-making. There is thus a clear need to investigate people’s understanding of the placebo effect in order to effectively target the area of confusion around this powerful tool’s strengths and limitations. This research highlights the apparent confusion around the placebo effect in children and animals, and it would be useful to explore whether this confusion is widespread among the population.

**SCIENCE COMMUNICATION AROUND HOMEOPATHY; WHAT’S NEXT?**

The central hypothesis of this research project was that homeopathy users are using homeopathic remedies because they perceive them as scientifically supported. Many websites contain misleading information and unfounded health claims, a recurrent problem among CAM therapies, and for the public it may be difficult to distinguish scientific claims from pseudoscientific claims that are lacking scientific evidence. This confusion could then lead to the belief in the scientific support for homeopathy. In this
study, however, none of the participants referred to information found on the internet to argue for the effectiveness of homeopathy. This has implications for future science communication efforts trying to address the homeopathy controversy. Current science communication tools mainly utilise mass media portals such as the internet (websites, YouTube, blogs), television, and news reports, aiming to reach as many people as possible. Based on this research, it is evident that these efforts are not reaching the target audience of homeopathy users.

The current public health and science communication effort around homeopathy is unlikely to change minds or attitudes towards the remedies as:

1) they follow a deficit model, which is known to be ineffective,
2) they focus on sharing “misunderstood” scientific facts, going against users’ beliefs and experiences which actually very likely reinforces their belief in the effectiveness of homeopathy, and
3) they use mass communication channels lacking personal engagement, which dilutes the effectiveness of the message.

Results from the current research suggest that the communication of more scientific facts will either not reach the target audience of homeopathy users, or will be dismissed as incomplete or as driven by “big pharma”’s commercial agenda. The first problem resides in the persistent use of the deficit model. Whilst total abandonment of the deficit model in science communication is improbable, it must be urgently acknowledged that communication of facts alone is mainly reaching an already engaged audience. According to the survey results, people who self-identified as non-users generally avoid homeopathy because they know that the remedies are not scientifically supported (77%, n=140) (follow-up interviews would be needed to confirm this). Furthermore, according to Schwarz, Newman, and Leach (2016), repeatedly exposing the public to homeopathy with the purpose of preventing misinformation might actually do more harm than good as it could lead people to think that a controversy exists where it does not. This might result in people who were not familiar with homeopathy being exposed to the ‘controversy’. If they discuss it with people around them who believe in the effectiveness
of homeopathy, that might start shaping their own belief and willingness to use the remedies as a reactionary move.

Current communication efforts also focus on sharing scientific information about the lack of effectiveness of homeopathy, sometimes trying to address misinformation about the effectiveness of homeopathy. This type of communication has been shown to be counterproductive with similar issues in the health domain, such as the rise of misinformation related to vaccinations. A recent study trialled three different communication strategies to correct misinformation about vaccines (“myths vs. facts”, visual information, and “fear-inducing” material) and showed that none of the strategies were effective. The result of participants’ exposure to the “fear-inducing” material, for example, induced stronger beliefs in the vaccine/autism link and in vaccine side effects (Pluviano, Watt, & Della Sala, 2017). The reinforcement of misinformation following attempts to openly address it highlights the importance of testing new health communication strategies prior to any public health campaigns. It also highlights the strengths of pre-existing beliefs and the ineffectiveness of the deficit model when trying to change those beliefs. As a result, there is a clear need to avoid messaging that is directly antagonistic to user beliefs and experiences.

Finally, the current communication strategy around homeopathy comes from the use of mass communication. The present research results suggest that people who are using the remedies do not engage with that type of impersonal communication and that it will not influence their perception of homeopathy’s effectiveness. In fact, mass communication may act to the contrary. For many controversial issues like climate change and vaccination, trust appears to be crucial for information to be shared, accepted and integrated, potentially leading to changes in attitude or behaviour (Attwell, Leask, Meyer, Rokkas, & Ward, 2017; Corner et al., 2015; Yaqub, Castle-Clarke, Sevdalis, & Chataway, 2014). Whilst this is not surprising, what is surprising is that it has taken so long to acknowledge that science is not the most important factor shaping the public’s attitude and that simply sharing more scientific facts will not close (nor even advance) the ‘debate’. It is clear from the scientific evidence that humans are the main contributors to climate change and that the impacts of climate change are extremely destructive to the earth. Likewise, it is clear from the scientific evidence that vaccination is one of the most
successful discoveries in medicine, saving millions of lives every single year. Yet, the public is divided on both of those issues. Such controversies will require different strategies to create trusting relationships critically needed to start a dialogue between what appears to be two confrontational sides, when, ultimately the goal of improved health is the same.

Recommendations:
The importance of a trusting relationship and the clear failure of mass (science) communication with regards to homeopathy’s lack of effectiveness lead to the recommendation to focus science communication efforts toward the provider rather than the patient, whom in this case is a homeopathy user. As pointed out by Kelley et al. (2014), whilst interventions focusing on patients might be effective, there are more opportunities to train healthcare practitioners than patients. Indeed “from a purely practical standpoint, there is far more opportunity to implement substantial interpersonal trainings for healthcare professionals than there is to do the same for patients. For example, any intervention aimed at patients would need to be voluntary, simple, and brief. Moreover, to make an impact on healthcare outcomes in the population, training for patients would need to be delivered to all patients with the targeted disorder – a very tall order indeed, given that the ratio of patients to clinicians is extremely large. In contrast, there is ample opportunity for clinicians to receive interpersonal training during their professional and continuing education” (p. 5). This recommendation is further reinforced by the potential counterproductive outcomes that health communications targeting patients can have, a risk that would be mitigated if future science communication efforts focused on providers. In this context, “providers” can either be homeopaths or medical providers such as doctors and pharmacists. The survey results showed that a quarter of self-identified homeopathy users visited a homeopath, and that those respondents perceived homeopathy as more effective than others, reinforcing the importance of the patient-provider relationship. The survey results also showed that only 2% of users are using homeopathy only, meaning that most users are still using conventional medicine. Practicing homeopaths may be reluctant to rebrand their current messaging, so science communication efforts targeting medical providers (like doctors and pharmacists) may be the most effective strategy to mitigate the potential misinformation coming from homeopathy advocates. By acknowledging their patients’ beliefs and not going against
them, medical providers could build stronger trusting relationships, which would allow them to address the limitations of homeopathy in a way their patients are receptive to.

The effectiveness of a strong patient-provider relationship also highlights the importance of acknowledging people’s experience with regards to homeopathy instead of being dismissive and rejecting what they perceive as working as “only placebo”. Whilst homeopathy’s effectiveness is indeed due to the placebo, the “only placebo” rhetoric diminishes patients’ experience and, as a result, is detrimental to both message acceptance and the patient-provider relationship. Increasing providers’ understanding of the placebo effect and the perceived effectiveness patients might experience when using homeopathic remedies could help cultivate a positive patient-provider relationship. A better relationship could also result in the provider acknowledging the patients’ experience whilst still making sure they are aware of the limitations of homeopathy and what medical treatment should be sought. Additionally, “physicians’ words and behaviours cannot be considered in a vacuum” (Necka & Atlas, 2018, p. 165), and it is important for medical providers to be trained in interpersonal communication skills. A better understanding of the power of the placebo effect, combined with superior interpersonal skills would allow providers to acknowledge their patients’ beliefs but also to be aware of how their patients will interpret information (“only placebo”), ultimately encouraging a positive and trusted patient-provider relationship. At this stage, the current communication around homeopathy does not seem to impact people’s perception of its effectiveness and their willingness to use the remedies, for both current and potential users. Training health professionals to better understand their patients’ experiences could be a much needed first step.

Following from the recent research from Schwarz et al. (2016) and Pluviano et al. (2017) and the research results presented here, another recommendation would be a reduction of counterproductive popular media releases utilising the deficit model and framing placebo in a negative light by characterising homeopathy as being “only placebo”. There is an urgent need for more research around health communication, especially looking at the impact of non-supported claims of unconventional therapies. Just as important is research into how to design better public health campaigns to address the misinformation without dismissing patient’s personal experience and causing reactionary responses.
LIMITATIONS

A number of limitations were identified during this research project. The main limitation in the quantitative phase of the project involves the use of a non-probability sampling technique to collect survey data. This was chosen as the best way to collect quantitative data within the time and budget constraints of a PhD project, however, it means that the generalizability, transferability, and recommendations of this research to the wider population has to be treated with caution. Ideally, the survey would have been conducted with a representative sample of the New Zealand population. Higher funding resources would help to tackle this limitation in further research.

A limitation of the qualitative phase of this research is linked to the experimenter effect (Miller & Turnbull, 1986; Gilder & Heerey, 2018). The limitation is two-fold; first, the experimenter can influence the interview participants’ responses through their behaviour. In order to minimise the experimenter’s expectations of participants answers, the researcher did not check individual survey answers before the interviews, that way, the researcher did not know the participants’ beliefs regarding the scientific basis of homeopathy and all interviews started as a ‘blank canvas’. Second, participants, themselves, may adapt their answers to please the experimenter. Participants who volunteered their time to be interviewed about homeopathy at a ‘Centre for Science Communication’ may have ‘expected’ the researcher to be sceptical of its scientific efficacy and they may have adjusted their answers accordingly. During the interviews, only one participant made a comment about the research being carried out at a Centre for Science Communication and, therefore, assumed the researcher was a ‘non-believer’. Potential future research could investigate possible changes in responses if interviews are conducted in the health science division, outside of the university, or at a homeopathy practitioners’ clinic.

An anticipated limitation that could not be mitigated was the lack of involvement of the ‘homeopathy community’ during the design stage of the study. In March 2016, contact was made with the New Zealand Council of Homeopaths (NZCH), the registration body for professional homeopaths in New Zealand. After an exchange of emails, a phone call with the NZCH President, and a meeting with a NZCH member based in Dunedin, an offer was extended to the NZCH committee to work with the researcher on the survey
design. The offer was declined and the NZCH committee asked for one of their members to act as an “expert peer reviewer and co-supervisor” on the research project for any further collaboration to be possible. This offer was declined by the researcher as the NZCH member suggested held a PhD in Cellular and Molecular Biology, which was not relevant to a social science research project of this type and suggests a misunderstanding of social research. Indeed, a request which reinforced the suggestion of misunderstanding of such a research project was the NZCH’s requirement for the present research project to find evidence in favour of the effectiveness of homeopathy for them to be involved. The request persisted despite the researcher describing the project as focusing on how people perceive homeopathy and how they assess its effectiveness, rather than its actual efficacy.

**Recommendations for future science communication research**

This research could be extended by including homeopathy practitioners. Understanding how homeopathy practitioners perceive homeopathy and explain its effectiveness to others would add an additional layer of understanding. Would practitioners give similar explanations as participants from this research project? Are practitioners aware of the placebo effect and do they understand it? This would be particularly interesting to investigate with NZCH registered homeopaths since their official website argues that there is scientific evidence for homeopathic remedies: “*There have been over 500 studies from human, animal, plant and in-vitro scientific papers published in peer review journals to date. They demonstrate that there is an abundance of well-constructed, objective evidence recognising the positive effect of using homeopathy in treating disease as well as maintaining health and vitality*” (https://homeopathy.co.nz/research/ visited on the 1st of August 2018). Better understanding of practitioners’ beliefs and perceptions of homeopathy could help to start a dialogue between scientists (or science communicators) and homeopaths. Currently, there is no consistent standard with regards to homeopathy training in New Zealand, and it is unknown to what extent the limitations of the remedies or mode of action, such as the placebo effect, are discussed in the currently available courses. Whilst using any type of therapy, be it conventional or unconventional, is a personal choice, it is important that the limitations of each treatments’ effectiveness, as
well as potential side effects, are acknowledged to allow for informed consent in health decision-making. Future research needs to investigate homeopathy practitioners’ understanding and perception of homeopathy since they are important actors in the patient-provider relationship with regards to homeopathy use.

Whilst this research did not investigate the impact of homeopathy’s representation in the media on homeopathy users’ attitudes, it appeared that the constant portrayal of homeopathy as ‘not working’ negatively impacted participants as it dismisses their personal experience with the remedies. As a result, it might have pushed the respondents away from ‘science’ or induced a “backfire effect” reinforcing their original opinion (Nyhan & Reifler, 2010). Future research could look into the impact of a positive framing of homeopathy as working as placebo in comparison to the current negative framing of homeopathy as not working. Pre-existing beliefs are very resistant to change, and, as a result, disconfirming evidence of a user’s beliefs is more likely to lead to attitude polarisation than change of attitude (MacCoun, 1998). Furthermore, scientific evidence contradicting someone’s beliefs can lead to questioning of the scientific inquiry that lead to the data or even doubting of whether a phenomenon can be studied scientifically at all (Munro, 2010). Further (science) communication research could look into the impact of changing the way homeopathy is discussed from the negative “it does not work” to the positive “it works as a placebo, and placebo is a powerful tool”. This communication strategy might be more effective as it would not contradict users’ beliefs but rather add an extra layer of knowledge, still fitting with their beliefs. Additionally, research should include participatory means of science communication to address the need for personal engagement with the content. A study similar to that of Pluviano et al., (2017) addressing misinformation around vaccination could be undertaken with the inclusion of participatory activities and additional assessment of the participants’ attitudes after the one-on-one debriefing following up the experiment.

Finally, future research should also investigate medical providers’ understanding of and attitudes toward the placebo effect and how it can explain the effectiveness that some of their patients might perceive. Additionally, because of the complexity of the mechanisms constituting the placebo effect and the still evolving literature around the extent of its health effects, chances are that even the medical providers might benefit from science
communication efforts addressing potential misunderstandings. Research focusing on medical providers’ understanding and attitudes would help to facilitate the design of appropriate science communication tools. This follows the earlier suggestion that targeting medical providers could be a manageable first step towards the reduction of misinformation around homeopathy’s effectiveness.
I want to close this thesis by sharing three side notes with you as a form of epilogue.

***

In 2016, the Advertising Standards Authority\(^6\) (ASA) sent a compliance letter to all homeopaths in the UK, asking them to review all of their marketing information (pamphlets, websites, social media pages) to: “ensure that they do not make any direct or implied claims that homeopathy can treat medical conditions” (ASA, 2016, p. 1). In September 2017, the education and Development Manager of the New Zealand ASA gave a workshop about the ASA Therapeutic and Health Advertising code during the bi-annual New Zealand Council of Homeopaths’ conference. The workshop covered the dos and don’ts of health advertising and how that impacts homeopathy advertising. The workshop also included guiding notes on how to advertise homeopathy using health benefit claims rather than unsubstantiated therapeutic claims (“calm and soothe” instead of “reduce pain”). Despite this research highlighting that homeopathy users do not refer to the internet much when assessing homeopathy’s effectiveness, misleading claims on homeopathy proponents’ websites might still influence some people’s willingness to use and misuse the remedies. On the 14\(^{th}\) of September 2018, misleading, unsubstantiated claims could still be found on many New Zealand based homeopathy websites.

***

This research project was exploratory and aimed to understand what motivates people to use homeopathic remedies despite the lack of robust scientific evidence. During the interviews, I did not try to change participants’ attitudes toward homeopathy and did not advocate for the importance of scientific evidence in health decision-making. After turning off the audio recorder, however, several participants said the interview had

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\(^6\) UK independent regulator of advertising across all media, recognised by the Department for Business Energy and Industrial Strategy and Trading Standards as first line of consumers’ protection against misleading advertising.
sparked their interest and that they were keen to find out more about homeopathy and how/if it worked. Even though the interviews were only exploratory, it would be interesting to follow up with all the participants to see if the interview affected their attitude to homeopathy in any way.

***

Over the past four years, this research project has led to many discussions with friends, colleagues and extended networks. During those conversations, almost everyone always knew at least one person using homeopathic remedies. The number of people able to explain what homeopathy was, however, was close to none, with many confounding it with phytotherapy or natural remedies in general. All these exchanges were very interesting as for most, it was the first time they were exposed to ‘information’ about homeopathy, coupled with explanations of why people might perceive homeopathic remedies as effective. I often receive private messages regarding publications for or against homeopathy, where the person sending the message tells me how they are now able to better understand the ‘controversy’ and feel that they can take part in the discussion. Perhaps the most important is to actually strike up honest, face-to-face conversations about homeopathy and its limitations.


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Merlin, T., Weston, A., & Tooher, R. (2009). Extending an evidence hierarchy to include topics other than treatment: revising the Australian 'levels of evidence'. *BMC Medical Research Methodology, 9*(1), 34. doi:10.1186/1471-2288-9-34


Popper, K. (1972). *The logic of scientific discovery* (L. Hutchinson Ed. 3rd ed.).


Temgire, M. K., Suresh, A. K., Kane, S. G., & Belfare, J. R. (2016). Establishing the interfacial nano-structure and elemental composition of homeopathic medicines based on


APPENDIX A – SURVEY QUESTIONNAIRE

Welcome to the survey
Perception of homeopathy by homeopathy users in New Zealand

This is a survey carried out by researchers from the University of Otago. The research is looking at the use of homeopathy in New Zealand. We are specifically interested in personal use of homeopathic remedies and conventional medicine as well as their respective effectiveness.

The survey should take less than 10 minutes to complete.

Taking part in this survey is voluntary. No identifying data will be collected. However, if you are willing to participate in the second stage of the research, which involves an interview, you will be asked to provide an email address.

This study has been approved by the Department stated above. However, if you have any concerns about the ethical conduct of the research you may contact the University of Otago Human Ethics Committee through the Human Ethics Committee Administrator (ph 03 479-8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.

Thank you for your help!

I agree to take part in this survey
☐ Yes, I agree
☐ No, I don’t want to participate

Contact details:
Dr Fabien Medvecky, fabien.medvecky@otago.ac.nz
Manon Knappen, manon.knappen@postgrad.otago.ac.nz
Centre for Science Communication, University of Otago
Do you or would you use homeopathic remedies?

- Yes
- No
- I don't know
How strongly do you believe that homeopathic remedies are scientifically proven to work?

- Absolutely certain it’s not true
- Fairly certain it’s not true
- Believe it’s not true but not too certain
- Believe it’s not true but not at all certain
- Believe it but not at all certain
- Believe it but not too certain
- Fairly certain it’s true
- Absolutely certain it’s true

End of homeopathy-related questions for “non-users”, redirected to demographic questions (survey p. 7).
How strongly do you believe that homeopathic remedies are scientifically proven to work?

- Absolutely certain it’s not true
- Fairly certain it’s not true
- Believe it’s not true but not too certain
- Believe it’s not true but not at all certain
- Believe it but not at all certain
- Believe it but not too certain
- Fairly certain it’s true
- Absolutely certain it’s true

How do you access homeopathic remedies? (Please select all that apply.)

- I am a homeopath
- I visit a homeopath
- I buy homeopathic remedies at the pharmacy
- I get homeopathic remedies from a friend/family member
- I don't use homeopathic remedies
- Other (please specify)
What do/would you use homeopathic remedies for? (Please select all that apply.)

- Anxiety / Depression
- Autism
- Bruising and injuries
- Cancer
- Cold / flu
- Cramps
- Diabetes
- Insomnia / Trouble sleeping
- Muscle pain
- Pain control
- I don't use homeopathic remedies
- Other (please specify)

Why do/would you use homeopathic remedies?

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree or disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>More effective than conventional medicine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A more natural treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional medicine has proved ineffective in the past</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional medicine has caused unpleasant side effects in the past</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeopathy can cause no harm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How well informed do you feel about homeopathy?

<table>
<thead>
<tr>
<th>Very well informed</th>
<th>Fairly well informed</th>
<th>Not very well informed</th>
<th>Not at all informed</th>
<th>Don't know</th>
</tr>
</thead>
</table>
Which one best describes you?

- I only use homeopathy
- I mostly use homeopathy and occasionally conventional medicine
- I use homeopathy and conventional medicine equally
- I mostly use conventional medicine and occasionally homeopathy
- I only use conventional medicine
- I use neither homeopathy nor conventional medicine

On average, how often do you use homeopathy and conventional medicine?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Yearly</th>
<th>A few times a year</th>
<th>Monthly</th>
<th>Weekly</th>
<th>Daily (Ex: contraception)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeopathy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional medicine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How effective do you think conventional medicine is?

- Very effective
- Pretty effective
- Somewhat effective
- Not at all effective
- Don’t know

How effective do you think homeopathic remedies are?

- Very effective
- Pretty effective
- Somewhat effective
- Not at all effective
- Don’t know
What is your gender?
- Female
- Male
- Other

What is your age?
- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or older

What is your highest education qualification?

What is your ethnicity? (Please select all that apply.)
- New Zealand European
- Maori
- Asian
- Pacific Island
- Prefer not to answer
- Other (please specify)

Where do you live?
Thank you for taking our survey.
Your response is very important to us.

The next step of this research project will be based on one to one and/or group interviews.

If you are willing to participate, please write your email here:
APPENDIX B – SURVEY DATA
COLLECTION DETAILS

1. Street intercept survey

Data collection occurred in main streets of four main cities between 10AM and 6PM. In Auckland (biggest city in New Zealand), two days were spent on a main street and two days in a suburban mall.

<table>
<thead>
<tr>
<th>Town</th>
<th>Location</th>
<th>Date (2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunedin</td>
<td>Intersection of Albion Pl and George Street</td>
<td>28th of May (Saturday)</td>
</tr>
<tr>
<td>Christchurch</td>
<td>Re:Start Mall, Cashel Street</td>
<td>1st and 2nd of June (Wednesday, Thursday)</td>
</tr>
<tr>
<td>Wellington</td>
<td>Lambton Quay</td>
<td>4th and 5th of June (Saturday, Sunday)</td>
</tr>
<tr>
<td>Auckland</td>
<td>Westfield Albany, 219 Don McKinnon Drive</td>
<td>7th and 8th of June (Tuesday, Wednesday)</td>
</tr>
<tr>
<td></td>
<td>Wellesley Street West, near Queen Street</td>
<td>9th and 10th of June (Thursday, Friday)</td>
</tr>
</tbody>
</table>

2. List of New Zealand-based health-related forums

www.topix.com/forum/nz/dunedin


www.ohbaby.co.nz/forum/

www.grownups.co.nz/discuss/
APPENDIX C – SURVEY DATA
MANAGEMENT AND ANALYSIS

Note:  Combined categories are detailed in brackets in the coding table.
Excluded categories are shaded in grey in the coding table.

<table>
<thead>
<tr>
<th>Q1</th>
<th>Do you or would you use homeopathic remedies?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q2</th>
<th>How strongly do you believe that homeopathic remedies are scientifically proven to work?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Certain it’s not true (Absolutely certain it’s not true + Fairly certain it’s not true)</td>
</tr>
<tr>
<td>2</td>
<td>Believe it’s not true but not certain (Believe it’s not true but not too certain + Believe it’s not true but not at all certain)</td>
</tr>
<tr>
<td>3</td>
<td>Believe it’s true but not certain (Believe it’s true but not at all certain + Believe it’s true but not too certain)</td>
</tr>
<tr>
<td>4</td>
<td>Certain it’s true (Fairly certain it’s true + Absolutely certain it’s true)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q3</th>
<th>How do you access homeopathic remedies?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am a homeopath and/or I visit a homeopath</td>
</tr>
<tr>
<td>2</td>
<td>I buy homeopathy remedies and/or I get them from friends/relatives</td>
</tr>
<tr>
<td>3</td>
<td>I don’t use homeopathic remedies</td>
</tr>
<tr>
<td>99</td>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q4</th>
<th>Why do/would you use homeopathic remedies?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>More effective than conventional medicine</td>
</tr>
<tr>
<td>c)</td>
<td>CM has proved ineffective in the past</td>
</tr>
<tr>
<td>d)</td>
<td>CM has caused unpleasant side effects in the past</td>
</tr>
<tr>
<td>1</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
</tr>
<tr>
<td>3</td>
<td>Neither agree or disagree</td>
</tr>
<tr>
<td>4</td>
<td>Disagree</td>
</tr>
<tr>
<td>5</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>6</td>
<td>Unsure</td>
</tr>
</tbody>
</table>

**Q5**  How well informed do you feel about homeopathy?

| 1 | Very well informed |
| 2 | Fairly well informed |
| 3 | Not very well informed |
| 4 | Not at all informed |
| 5 | Don’t know |

**Q6**  Which one best describes you?

| 1 | I only use homeopathy |
| 2 | I mostly use homeopathy and occasionally conventional medicine |
| 3 | I use homeopathy and conventional medicine equally |
| 4 | I mostly use conventional medicine and occasionally homeopathy |
| 5 | I only use conventional medicine |
| 6 | I use neither homeopathy nor conventional medicine |

**Q7**  On average, how often do you use homeopathy?

| 1 | Never |
| 2 | Rarely (Rarely + Yearly) |
| 3 | Monthly (A few times a year + Monthly) |
| 4 | Weekly (Weekly + Daily) |
Q8  | On average, how often do you use conventional medicine?
--- | ---
1   | Never
2   | Rarely (Rarely + Yearly)
3   | Monthly (A few times a year + Monthly)
4   | Weekly (Weekly + Daily)

Q9  | How effective do you think conventional medicine is?
--- | ---
1   | Very effective
2   | Pretty effective
3   | Somewhat effective
4   | Not at all effective
5   | Don’t know

Q10 | How effective do you think homeopathic remedies are?
--- | ---
1   | Very effective
2   | Pretty effective
3   | Somewhat effective
4   | Not at all effective
5   | Don’t know

**DEMOGRAPHIC QUESTIONS:**

D1  | What is your gender?
--- | ---
1   | Female
2   | Male
3   | Other

D2  | What is your age?
<table>
<thead>
<tr>
<th></th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18 to 24</td>
</tr>
<tr>
<td>2</td>
<td>25 to 34</td>
</tr>
<tr>
<td>3</td>
<td>35 to 44</td>
</tr>
<tr>
<td>4</td>
<td>45 to 54</td>
</tr>
<tr>
<td>5</td>
<td>55 to 64</td>
</tr>
<tr>
<td>6</td>
<td>65 to 74</td>
</tr>
<tr>
<td>7</td>
<td>75 and older</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D3</th>
<th>What is your highest education qualification?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Did not attend school</td>
</tr>
<tr>
<td>2</td>
<td>High school qualification</td>
</tr>
<tr>
<td>3</td>
<td>Polytechnic / technical qualification</td>
</tr>
<tr>
<td>4</td>
<td>Undergraduate</td>
</tr>
</tbody>
</table>
APPENDIX D – DISTRIBUTION OF PARTICIPANTS’ BELIEFS IN THE SCIENTIFIC BASIS OF HOMEOPATHY

How strongly do you believe that homeopathic remedies are scientifically proven to work?

<table>
<thead>
<tr>
<th>Detailed</th>
<th>%</th>
<th>Condensed</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Absolutely certain it’s not true</td>
<td>21.3</td>
<td>Certain it’s not true</td>
<td>32.1</td>
</tr>
<tr>
<td>(2) Fairly certain it’s not true</td>
<td>10.8</td>
<td>Believe it’s not true but not certain (1-2)</td>
<td>12.1</td>
</tr>
<tr>
<td>(3) Believe it’s not true but not too certain</td>
<td>7.6</td>
<td>Believe it’s not true but not certain (3-4)</td>
<td>31.0</td>
</tr>
<tr>
<td>(4) Believe it’s true but not at all certain</td>
<td>4.5</td>
<td>Believe it’s true but not certain (5-6)</td>
<td></td>
</tr>
<tr>
<td>(5) Believe it’s true but not at all certain</td>
<td>15.1</td>
<td>Certain it’s true (7-8)</td>
<td>24.7</td>
</tr>
<tr>
<td>(6) Believe it’s true but not too certain</td>
<td>16.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Fairly certain it’s true</td>
<td>15.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Absolutely certain it’s true</td>
<td>9.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
<td>445</td>
</tr>
</tbody>
</table>
APPENDIX E – INTERVIEW GUIDE

SEMI-STRUCTURED INTERVIEW GUIDE

How do homeopathy users perceive homeopathy?

Part A - Introduction

Thanks so much for your time today. I am a PhD student here at the university of Otago. My research is about communication around homeopathy and New Zealanders’ perception of homeopathy. I am not looking for specific answers. I am interested in YOUR perceptions.

Before we start, I need to ask you to sign the consent form (need signature). Just to remind you, the interview will be recorded,

• Your participation is voluntary;
• You can ask the recorder to be turned off at any point, withdraw at any point or choose not to answer a question;
• Your responses will be recorded and stored, but all personal identifying information will be destroyed at the conclusion of the project;
• Anonymised results may be published and will be available in the University of Otago Library.
**Part B – Semi-structured interview**

Start of the interview – recording

<table>
<thead>
<tr>
<th>Question / Probe</th>
<th>Theme</th>
<th>CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>This is an interview about homeopathy use, so to start, I need to confirm if you use homeopathic remedies. It might seem a little redundant to ask, but</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1. have you used homeopathic remedies in the past?</td>
<td>Background</td>
<td></td>
</tr>
<tr>
<td>Q2. Do you remember how you first heard about homeopathy?</td>
<td>Homeopathy</td>
<td></td>
</tr>
<tr>
<td>Q3. How do you personally define homeopathy?</td>
<td>Concept definition</td>
<td></td>
</tr>
<tr>
<td>Q4. When was the last time you used a homeopathic remedy?</td>
<td>Homeopathy use</td>
<td></td>
</tr>
<tr>
<td>P. What prompted you to use it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5. When was the first time you used a homeopathic remedy?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. What prompted you to use it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6. For what conditions do you normally use a homeopathic remedy?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. Do you use homeopathic remedies instead of other medicines or as a complement?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7. How often would you estimate you use homeopathic remedies?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. How often do you use homeopathic remedies compared to other medicines?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. Have you used homeopathic remedies in your family? Kids?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. (If not clear if they still use it) Do you still use it? Why?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q8. Have you recommended homeopathic remedies to your friends or relatives?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. Can you expand on that? What was the remedy and why did you recommend it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9. Now I would like to explore more about how effective you feel homeopathic remedies are for you?</td>
<td>Homeopathy effectiveness</td>
<td></td>
</tr>
<tr>
<td>Q10. How reliable or consistent do you feel homeopathic remedies are as a type of medicine for you?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P. could you tell me more about how you came to feel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q11. Do you feel there are any risks in using homeopathic remedies?

Now I’d like to explore a bit more how you judge risk so..

P. Yes: How do you judge if the risk is worth taking homeopathic remedies?

P. No: How did you judge that there was no risk in using homeopathic remedies?

| Q12. Where do you usually get your remedies? | Homeopathy use |
| Q13. Have you ever visited a homeopathy practitioner? | Visit to practitioner |
| Q14. Where do you get your information about homeopathy from? | Information / Knowledge |
| P. Is there any specific information that you look for? | |
| Q15. What source or sources of information do you trust? | Trust |
| P. What is it about that source (those sources) that makes you trust it/them? | |

Now I’m going to finish up with a few last questions.

Q16. If someone says something is scientific or scientifically proven to work, what does that mean to you?

P. What do you personally think the term science or scientifically proven means?

Q17. Given your personal definition of science, do you think that homeopathy is scientifically proven?

P. Do you think homeopathic remedies are scientifically proven to work?

P. Can you give a specific example?

QF. Is there anything you would like to add before we end the interview? Do you have any questions?

THANK YOU AGAIN FOR YOUR TIME!
APPENDIX F – INVITATION TO PARTICIPATE IN RESEARCH

Perception of homeopathy by homeopathy users in New Zealand

Thank you for taking part in the 2016 survey on the use of homeopathy in New Zealand.

If you recall, we carried out a survey on the use of homeopathy in New Zealand in June 2016. In your survey response you indicated that you were willing to take part in follow-up interviews on the use of homeopathy. The follow-up interviews will take place during March 2017. The interview is expected to take between 45 to 75 minutes* and will be conducted at the University of Otago, Dunedin.

Please contact us by replying to this email or on 022 184 3297 if you are still interested to participate in these interviews, and we can provide you with further details.

If you are unable to attend these follow-up interviews, please let us know and we can remove you from the mailing list.

If you have any further questions, please do not hesitate to ask.

Kind regards,

Manon Knapen

PhD Candidate, University of Otago

Email: manon.knapen@postgrad.otago.ac.nz

Mobile: 022 184 3297

[This project has been reviewed and approved by the Department of Science Communication, University of Otago]
* Original recruitment email sent on the 20th of February 2017. The email was later modified to adjust the expected duration of the interviews to “30 to 60 minutes” instead of “45 to 75 minutes”.

Template email for participants still interested in taking part in the interview:

Thank you for your reply.

Please find attached an information sheet giving more details about the interviews.

The interviews will be held in person in Dunedin (133 Union Street East) between the 20th and 31st of March. Different time slots are available per day; 10.00AM, 1.00PM and 4.00PM. Could you please let us know of a couple of days and times that would suit you best. If none of these options suits you, please let us know of another time/day that would suit you better.

We will contact you to confirm your interview date and time as soon as possible.

Kind regards,

Manon Knapen
PhD Candidate, University of Otago

Email: manon.knapen@postgrad.otago.ac.nz
Mobile: 022 184 3297

Dear [participant’s name],

I am emailing you to confirm your interview date and time for the project “Perception of homeopathy by homeopathy users in New Zealand”. Are you still available to participate in the interview on Monday the 27th of March, at 1.00PM?

The interview will take place in room 118a in the Owheo building, 133 Union Street East. The room is located on the first floor. Signs indicating “Interviews” will direct you to the reception area where I will meet you.

Please confirm that the date and time allocated suit you.

Kind regards,

Manon Knapen
PhD Candidate, University of Otago
Email reminder 24 hours prior to interview

Good morning [participant’s name],

Just a reminder of our interview scheduled for tomorrow afternoon at 1.00PM.

The interview will take place in room 118a in the Owheo building, 133 Union Street East. The room is located on the first floor. Signs indicating “Interviews” will direct you to the reception area where I will meet you.

Do not hesitate to contact me if there are any issues, my phone number is 022 184 3297.

Kind regards,

Manon Knapen
PhD Candidate, University of Otago

Email: manon.knapen@postgrad.otago.ac.nz
Mobile: 022 184 3297
Information sheet for participants

Perception of homeopathy by homeopathy users
INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

What is the Aim of the Project?

This project is investigating how homeopathy users perceive homeopathy in New Zealand. This project is being undertaken as part of the requirements for Manon Knappen’s PhD thesis about the use of homeopathy in New Zealand.

What Types of Participants are being sought?

We are looking for participants who use homeopathic remedies and are over the age of 18. Potential participants have been recruited during a survey undergone in 2016 (Ethics Application D16/061).

The list of participants willing to be interviewed will be stored on a password-protected computer in a locked office at the University of Otago and destroyed when the results of the research project have been written up.

What will Participants be asked to do?

Should you agree to take part in this project, you will be asked to come and meet a researcher at the University of Otago for a face-to-face interview (or via Skype, depending on the logistics). The interview will discuss your views on, interest in and attitudes to homeopathy, and should last between 45 and 75 minutes.

As this research deals with a health topic, it is possible (although unlikely) that you could experience slight discomfort. Remember that you may withdraw from the project at any time or choose not to answer some questions during the interview. You may also decide not to take part in the project without any disadvantage.

What Data or Information will be collected and what use will be made of it?

Participants will have provided their email addresses at the end of the survey undergone in 2016. No more personal details are required. The researcher and supervisors of this project will be the only people having access to this project’s data.
The interviews will be recorded and the data collected will be stored on a password-protected computer in a locked office at the University of Otago. Data obtained during the research project will be retained for at least 5 years in secure storage. Data derived from the research will, in most cases, be kept for much longer or possibly indefinitely. Personal information held on the participants (email addresses); however, will be destroyed when the results of the research project have been written up.

The results of the project may be published though no personal details will be published. The thesis these interviews are for will be available in the University of Otago Library (Dunedin, New Zealand). Confidentiality of the respondents will be strictly conserved unless a written consent has been given directly from the respondent.

**Can Participants change their mind and withdraw from the project?**

You may withdraw from participation in the project at any time and without any disadvantage.

**What if Participants have any Questions?**

If you have any questions about our project, either now or in the future, please feel free to contact either:

*Manon Knapen*  
Centre for Science Communication  
manon.knapen@postgrad.otago.ac.nz

*Dr Fabien Medvecky*  
Centre for Science Communication  
fabien.medvecky@otago.ac.nz  
+(64) 3 479 7848

This study has been approved by the Department stated above. However, if you have any concerns about the ethical conduct of the research you may contact the University of Otago Human Ethics Committee through the Human Ethics Committee Administrator (ph 03 479-8256). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.
APPENDIX G – CONSENT FORM

How do homeopathy users perceive homeopathy?
CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage.

I know that:

1. My participation in the project is entirely voluntary;

2. I can ask for the recorder to be turned off at any point of the interview, or to withdraw from the project at any time without any disadvantage;

3. Personal identifying information such as email addresses and audio recordings will be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;

4. The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) but every attempt will be made to preserve my anonymity.

I agree to take part in this project.

...............................................................................
(Signature of participant)

.............................................................................
(Printed Name)

...............................................................................
(Date)
APPENDIX H – INTERVIEW CODING SCHEME

**Coding instructions:**

If the theme is present, put X in column.

The number of time a theme is present within each paragraph is not recorded. Only presence or absence of the theme is noted. Positive or negative reference to the theme.

Each paragraph can contain multiple theme.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science</strong></td>
<td>Anything related to science, what is science, how does science work, does science matter, references to “scientifically proven”.</td>
</tr>
<tr>
<td><strong>Understanding</strong></td>
<td>Participants’ description of homeopathy, regardless of the actual accuracy of their description.</td>
</tr>
<tr>
<td><strong>Effectiveness</strong></td>
<td>Participants referring to the effectiveness of homeopathy, via use, testimony, history, personal evidence. Participants’ hypothesis about how it works and why/why not.</td>
</tr>
<tr>
<td><strong>Usage</strong></td>
<td>Pattern of use of homeopathic remedies, in combination or instead of conventional medicine, how often, etc.</td>
</tr>
<tr>
<td><strong>Motivation</strong></td>
<td>Why did participants decide to use homeopathic remedies?</td>
</tr>
</tbody>
</table>