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Beyond Numbers: Cracking The Epistemic Code Hampering Homeopathy's Integration to Modern Medicine

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Abstract

This study investigates the barriers to integrating homeopathic medicine into the present evidence-based medicinal norm. This paper seeks to expand the existing evaluation criteria for assessing homeopathy's medical performance. Central to this investigation is appointing mechanistic reasoning and the Bayesian theorem as suitable assessments of homeopathy; This determination derives support from a concerted analysis of homeopathy's decline in credibility, chief precepts, and assessment under the evidence-based medicine (EBM) system.

The present EBM structure is a hierarchical model dependent on primarily statistical evidence, especially from RCTs. However, this hierarchical reliance is largely contested in this study, which suggests that there is a need for comprehensive evaluation that considers all forms of clinical evidence, besides statistical studies.

Therefore, there is a pressing need to extend evaluation criteria to include concepts such as mechanistic reasoning and expert clinician judgment when determining the efficiency of homeopathy.

Keywords: Epistemology, Evidence Based Medicine, Homeopathy, Mechanistic Reasoning, Medical Philosophy

Introduction

Homeopathy, a form of alternative medical treatment, has grown in popularity throughout the 21st century. It reached its peak popularity in Western countries in the 19th century.[1,2] However, as medicine advanced and the criteria for medical efficacy changed, many homeopathic schools closed.[3] Homeopathy has experienced a recent resurgence in popularity, credited to both the affordability and accessibility of treatment, along with its healing philosophy.[4]

Nearly 200 years old, homeopathy has survived the modernization of medicine with little change to the practice itself. Homeopathic practitioners believe that the body can naturally cure itself with assisted stimulation from diluted natural substances (mainly plants and minerals). In small quantities, homeopathy uses natural substances to trigger an innate bodily response with similar symptoms to that of an illness. For instance, if a fever induces congestion, a substance that naturally induces congestion would be given to trigger an innate bodily response to the symptom, thereby treating the fever. Rather than providing an outright cure for disease, homeopathy aims to stimulate natural healing through its medicinal philosophy for restoring the vital force and providing highly individualized treatment.[5,6]

The National Center for Complementary and Integrative Health (NCCIH) differentiates homeopathic medicine from conventional medicinal practices by grouping it under the umbrella of complementary and alternative medicine (CAM).[7] Alternative medicine is defined as practices not taught by allopathic medical schools. Allopathic medical schools give preference to pharmaceutical treatment and physical intervention to remedy disease; homeopathy involves a less invasive treatment plan primarily focused on remedies subject to serial dilution and vigorous shaking.

Homeopathy, when practiced on its own, is considered alternative, but when supplemented by conventional treatment, it is complementary. Either way, the practice takes a backseat to traditional allopathic treatment options. Hesitance in integrating homeopathy with mainstream medicine rests largely upon the lack of evidentiary support showing homeopathic treatments' effectiveness. Several reviews examining the scientific evidence behind homeopathic treatment have shown the medical practice to be baseless and ineffective. In 2010, the House of Commons Science and Technology Committee declared that homeopathy was "non-evidential," with no support backing its effectiveness in treatment.[8] Controversy surrounding the efficacy of homeopathic treatment is primarily due to a lack of sufficient standardized data reproducing its effectiveness in a controlled clinical setting, as many studies lead to mixed or inconclusive results.[9]

Research on the efficacy of homeopathic treatments is conducted through randomized controlled trials (RCTs). RCTs test the effectiveness of homeopathy in a controlled clinical setting, aiming to produce replicable and statistically viable data. Meta-analyses can then be performed on multiple RCTs to assess the statistical viability of a practice in common medical contexts. When systematically reviewed in a meta-analysis, multiple RCTs reveal homeopathy's effectiveness to be statistically implausible, despite some isolated studies indicating otherwise.[10,11] These larger analyses of RCTs builds into the greater, 'non-evidential' standing of homeopathy in social and academic contexts.

It has been established that homeopathy treats an individual rather than the disease, so the effectiveness of this medical philosophy should be tested through a study design considering the treatment's healing rationale. The apparent conflict within studies assessing homeopathy's overall effectiveness do not negate the underlying rationale behind the medicine. The fundamental approach of homeopathy centers on treating individuals based on their unique symptoms and constitution rather than exclusively addressing the disease. While conflicting research outcomes might cast doubt on the broader efficacy of homeopathy, they do not inherently challenge its core principle of individualized treatment and serial dilution.

To explore the epistemic challenges of integrating homeopathy into allopathic medicine, it's worthwhile to also investigate the design, analysis, and reporting of RCTs on homeopathic treatments. This is particularly important because, according to evidence-based medicine, RCTs are considered a superior form of medical evidence compared to mechanistic reasoning and expert clinician judgment.[12] RCTs conducted to test the effectiveness of homeopathy have shown its effectiveness to be statistically similar to that of placebo.[13] Consequently, homeopathy is often deemed ineffective. Given that RCTs are considered the highest form of evidence, this is the main reason for homeopathy's rejection by EBM. However, as I will argue in a later section, exploring other forms of clinical evidence (mechanistic reasoning and expert judgement) is essential to determine whether homeopathic treatment is effective. In the following sections, I will explore how homeopathy works, what evidence-based medicine is and how its implemented, the current determination of homeopathy's validity, and how RCTs evaluating the effectiveness of homeopathic treatments are designed. Then, I will explore how clinical evidence should be analyzed to determine whether homeopathic medicine should be regarded as effective.

Background in Homeopathy

Homeopathic medicine follows the principle of "like cures like" and operates on the belief that a natural substance causing symptoms in a healthy person can be used to treat similar symptoms in an ill person.[14] For instance, the homeopathic remedy *Belladonna* is used to relieve sudden onset high fevers with sweating. The medicine functions to trigger the release of sweat, a natural symptom. Symptoms induced by natural substances serve as a replica of those induced by the disease. The main difference is that the natural substance induces these symptoms in a healthy individual (one not afflicted with disease). In this case, Belladonna would induce sweating even in a healthy individual not afflicted by disease, but the remedy's ability to assist in healing via induction during disease elucidates homeopathy's healing philosophy.

Homeopathy also recognizes the existence of a 'vital force' within the body, a force disrupted in a diseased individual. Homeopathic remedies aim to restore the vital force, by stimulating the body's natural healing capacity through the 'like cures like' approach.[13]

The selection of the appropriate remedy for a patient is determined by a trained homeopathic practitioner who conducts a comprehensive evaluation of the patient's physical, emotional, and mental state as well as their totality of symptoms. The remedies are tailored to each patient's unique constitution, making homeopathic treatment highly individualized.[14,15]

Moreover, homeopathy's effectiveness depends on the appropriate treatment being prescribed to an individual. Under homeopathic remedies, people suffering from the same

disease would be assessed and prescribed an individualized treatment based on the dissimilarity between their symptoms.[12,16] For instance, a family with malaria may share the same disease, as well as the same symptoms. However, one member of the family may be more fatigued, while the other is more irritable. In such a case, both members are evaluated and prescribed individualized homeopathic treatments. Therefore, unlike allopathic medicine, homeopathy treats the disease as experienced by the individual, rather than focusing solely on the disease itself. Treating the individual rather than the disease emphasizes a healing outlook beyond just disease pathology and symptoms, as well as the unique characteristics, circumstances, and needs of the individual afflicted by the disease.[17]

Homeopathic medicines are typically administered in highly diluted solutions, referred to as remedies. The preparation of homeopathic remedies involves a process of serial dilution and succession (vigorous shaking) of the remedy's active ingredients (plant, animal, and mineral-based substances). The concept of succession or 'potentization' is believed to increase the therapeutic potency of the substance while minimizing any potential toxicity and is central to homeopathy, with remedies being diluted to the point where no trace of the original substance remains in the final remedy. The purpose of potentization is to retain the energetic essence of a substance, even if the physical substance has been diluted beyond Avogadro's number (the point at which no molecule of the original substance remains).[18] Vigorous shaking of the remedy following each dilution is believed to be essential in retaining said energetic essence.

Falling under the umbrella of alternative medicine, homeopathy differs from other forms of alternative medicine through its collection of core principles (the law of similars, individualization, restoring the vital force, and potentization). While other forms of alternative medicine may also utilize some of these concepts, such as naturopathy using natural substances and similar patient assessment protocol, or acupuncture's shared belief in the vital force, it is the summation of these principles and the implementation of ultra-high dilutions that makes homeopathy unique (Figure 1). [11,16,19,20]

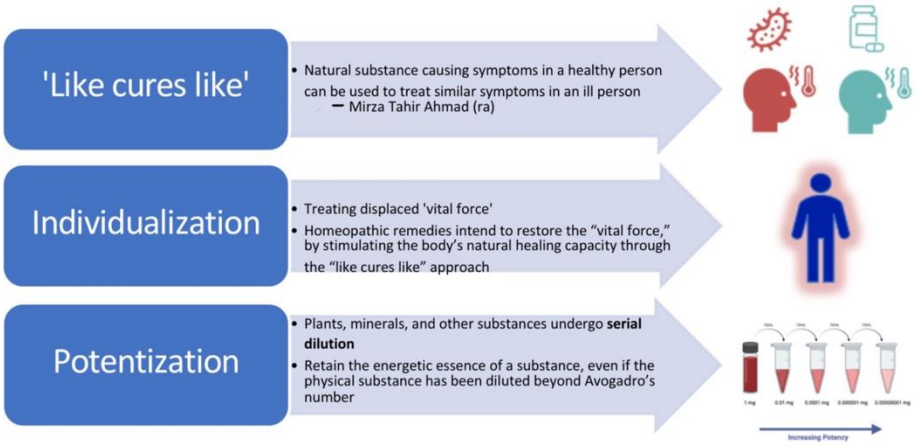

Figure 1: Core principles of homeopathy: "Like cures like," individualization, and potentization. Image by author.

Homeopathy is categorized as an alternative medicine because its principles and administrative practices differ significantly from conventional allopathic medicine. Allopathic medicine is firmly grounded in evidence-based medical practices, relying on the highest levels of medical evidence for its treatments. Because homeopathic medicine lacks substantial scientific evidence supporting its effectiveness, it remains outside the umbrella of allopathic treatments.

Many studies on homeopathy yield mixed or inconclusive results, with some pointing to the placebo effect as a significant factor in the perceived benefits of homeopathic remedies.[21] Additionally, the ultra-dilution or potentization of homeopathic remedies raises concerns regarding the medicine's credibility and its physiological effects. Extreme dilution of homeopathic remedies to the point where the original substance no longer exists, challenges the fundamental principles of conventional pharmacology. Skeptics argue that the remedies contain nothing but water or sugar and, therefore, should have no therapeutic effect.[22]

Homeopathic practitioners argue that, although the active ingredient may not be physically present after potentization, it can leave an imprint of its presence among other water molecules. Proponents often cite the theory of molecular memory and frequency imprinting to support their claims.[23]

Regardless, a preconceived dismissal of homeopathy's active ingredients bleeds into some inherently fallacious assessments of the treatment. For instance, a meta-analyses comparing different homeopathic treatments against one-another is backed by a predetermination that serial dilution 'equalizes' all homeopathic medicines, making even different homeopathic remedies comparable.[6]

Prescribing an overall measure of efficacy for all homeopathic remedies challenges the treatment's core principles, which prioritize individualized approaches over standardized medical protocols. For instance, a meta-analysis on the effectiveness of the homeopathic remedy *Ignatia* against acute depression in women produced desired results, while another testing *Arsenicum Album* for the treatment of liver disease demonstrated inefficacy.[7] In such cases, the findings in both studies do not directly contradict one another since the study subjects differ in disease constitution and remedy type. Furthermore, even within the cohort of participants with depression or liver disease, each one should have been treated as an individual, rather than being prescribed the same dosage or variation of Ignatia or Arsenicum Album. However, when determining a measure of "efficacy" for homeopathic treatments, both these remedies are assessed against one another instead of individually. This is evidenced by a meta-analysis comparing multiple different remedies in the same study.[24,25]

Skeptics argue that despite these differences, both studies test the same form of treatment: homeopathy, which has a single medical philosophy, curation design, and course of individualization.[26] Serial dilution is characteristic of homeopathic medicine, regardless of the ingredients involved. Therefore, despite different homeopathic remedies containing different ingredients, the process of creating all homeopathic medicine involves serial dilution, by virtue of the medicine's nature. Such judgement is not applied to other forms of medicine, perhaps because allopathic remedies do not excessively dilute their active ingredients.

It is the dilution to the point of nonexistence that leads skeptics to overlook the difference in active ingredients and physician considerations when prescribing individualized treatment. Although skeptics assume that diluted active ingredients don't play a relevant role in

the overall constitution of the medicine, herbal remedy or 'active ingredient' preparation does precede serial dilution and is the primary substance whose 'energetic essence is required for healing. Homeopathy's active ingredients include plants, minerals, insect and reptilian venoms, along with other natural substances. Furthermore, despite all homeopathic remedies falling under the same healing philosophy, individual remedies differ in their degree of dilution and active ingredients.

Therefore, although homeopathic medical studies may not directly conflict with one another, they are considered conflicting when determining the overall efficacy of homeopathic medicine.[16] In a sense, this would be as if one casted an overall assessment of efficacy for all of allopathy instead of evaluating individual medications on a case-by-case basis. Even so, skepticism doesn't clarify whether ineffectiveness is due to incorrect evaluation of the patient or the remedy itself.

An appropriate design for assessing homeopathy would consider its unique healing philosophy, thus accurately reflecting the practice under study. To achieve this, we must assess the mechanistic underpinnings that contribute to the treatment's effectiveness. Homeopathy's healing philosophy emphasizes individualization and potentization. These practices rely on the practitioner's assessment of the individual and the resulting design of the medicine prescribed. Furthermore, such a study would not conflate different homeopathic medicines; instead, it would elucidate the effectiveness of the mechanisms giving rise to homeopathy's healing capacity.

For instance, if a certain potency of Ignatia works for one individual, it may be ineffective if prescribed to another without considering their constitution. This relationship regarding the efficiency of homeopathy is backed by the treatment's medical philosophy. Therefore, it is unfair to reject homeopathy as a medical treatment in its entirety based on a few cases of ineffectiveness, especially when the source of the ineffectiveness can't be pinpointed.

While some randomized control trials (RCTs) support the effectiveness of homeopathic treatment, studies testing homeopathy against allopathic medicine have shown that it is inferior. These non-inferiority trials on homeopathic medicine aim to evaluate whether a specific form of homeopathy is significantly less effective than the conventional alternative when it comes to treating an ailment.[27] Although some non-inferiority trials do not find statistically significant differences between homeopathy and conventional treatment, this does not provide evidence for the superiority of homeopathy or its overall efficiency as a stand-alone treatment. Additionally, although homeopathy, like conventional medicine, may produce desired results to a certain degree, it cannot be deemed effective on its own until compared to placebo trials.

To reach a conclusion regarding homeopathy's effectiveness, multiple homeopathic remedies were tested against placebo in controlled trials. Upon statistical comparison to placebo, RCTs of homeopathy failed to demonstrate a greater degree of efficacy some of the time.[28] This means that in this specific RCT, homeopathy failed to demonstrate greater effectiveness than the placebo control group. Nonetheless, the focus on this study's results, which demonstrate a relatively inferior degree of effectiveness, elucidates why homeopathic efficacy in a traditional clinical setting is often attributed to the placebo effect, given that the treatment did not perform better than a placebo in controlled trials. The reasoning behind this

assumption is twofold: the first being ineffective standardization of homeopathy's efficacy in RCTs. Additionally, there is mixed clinical data demonstrating statistical differences between the effectiveness of homeopathy and placebo, leading skeptics to associate homeopathy with placebo treatments and conclude that homeopathy lacks evidentiary support for its effectiveness. Regardless of homeopathy's capacity to providing desired results in traditional clinical settings, its inability to reproduce these results to a degree of statistical significance within controlled trials renders the practice ineffective.

Furthermore, research comparing homeopathic treatments and conventional allopathic medicine aims to provide statistically significant data elucidating the efficacy of homeopathy. While some RCTs suggest the effectiveness of homeopathy, those pitting homeopathy against allopathic medicine show that homeopathy is inferior to conventional medicine. Non-inferiority trials further delve into this discrepancy by evaluating whether homeopathy significantly lags behind conventional treatments in treatment efficacy. While certain non-inferiority trials fail to identify statistically significant differences between homeopathy and conventional medicine, this absence of evidence doesn't validate homeopathy or establish its overall efficacy.[29,30]

The focus on studies where homeopathy displays inferior effectiveness intensifies the association with the placebo effect. This association contributes to skepticism surrounding homeopathy's effectiveness in traditional clinical settings, especially when it consistently fails to outperform placebos in controlled trials.

Consequently, skepticism snowballs into a lack of regulation and research funding for homeopathy. The House of Commons Science and Technology Committee has called for a re-evaluation of the funding provided to homeopathy-related regulation and research, arguing that the lack of strong evidence supporting homeopathy's effectiveness should render the practice unviable and discourage unnecessary tests, treatments, and interventions.[31] According to this view, efforts to fund homeopathic research or regulate its treatment are unworthy of resource allocation.

In 2018, NHS England decided to defund prescription homeopathic remedies that were previously accessible through government programs and routine primary care (see figure). [31,32] Although the decision to defund homeopathy aims to increase cost-effectiveness and prevent patients from using an 'inefficient' remedy, the reasoning behind it should be evaluated to determine whether such a decision is rational, especially when it has such a cascading influence on quality control and patient accessibility. The argument negating homeopathy as an effective treatment rests on the presupposition that homeopathy lacks evidence and therefore should not be given the same status as conventional medicine. This conclusion may be partially attributed to limited research funding, as few researchers are willing to invest time in studying treatments that receive minimal financial support. As a result, a smaller pool of studies remains for meta-analysis, thereby creating a positive feedback loop in which limited funding contributes towards a lack of 'evidence'.

When referencing the "non-evidential" status of homeopathy, the House of Commons refers to statistical evidence. However, this is not the only form of evidence by which homeopathy can be evaluated. Judgement based solely on statistical significance limits a full understanding of homeopathy's mechanisms and the reasoning behind treatment efficiency in a conventional clinical setting. Therefore, an exploration of non-statistical forms of medical

evidence is necessary, along with an analysis of how such evidence contributes to the overall aims of evidence-based medicine.

Evidence Based Medicine

Evidence-Based Medicine (EBM) is a systematic approach to clinical decision-making that integrates the best available evidence from scientific research, patient values, and clinical expertise. Under the EBM model, the most reliable form of evidence is the randomized control trials (RCTs), followed by systematic reviews, meta-analyses, cohort studies, and expert opinion, in descending order (Figure 2).[33]

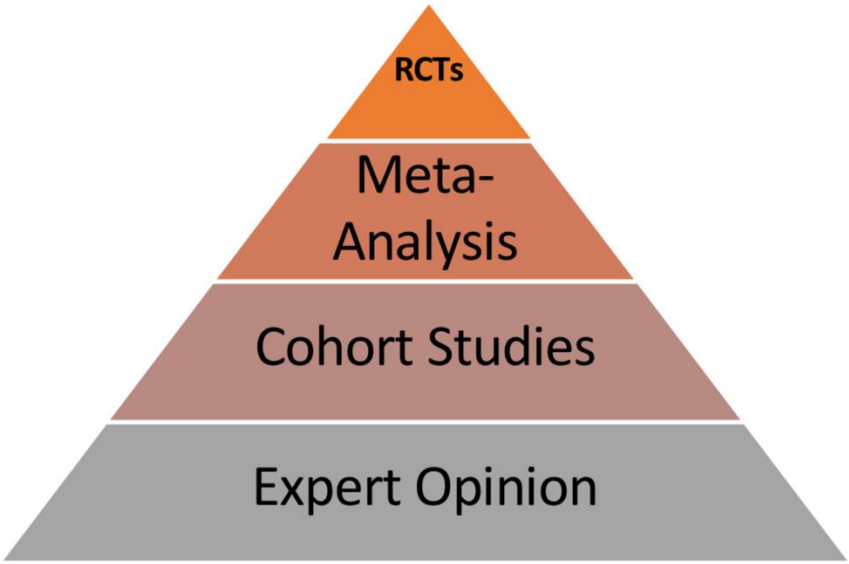

Figure 2: Hierarchy of evidence in evidence-based medicine, ranging from randomized controlled trials (RCTs) to expert opinion. Image by author.

At the peak of this hierarchy are systematic reviews and meta-analyses, which provide an overview of the existing evidence and lead to more precise estimates of treatments effects. RCTs are considered the 'golden standard' for EBM.[34] They test treatment efficacy through the random allocation of patients to treatment or control groups, thereby allowing for a robust assessment of treatment effects while minimizing bias. Cohort studies follow RCTs in evidential strength because they observe associations in naturally occurring populations over time. Expert clinician opinion rests at the bottom of the hierarchy and is often relied upon when strong research-based evidence is lacking.

The hierarchical structure of EBM aligns with a preference for statistical evidence, justifying its order. Treatments yielding the highest form of empirical evidence occupy the peak of EBM hierarchy, while treatments with the least empirical evidence are ranked at the bottom. All other forms of evidence occupy intermediary positions, based on the quality of empirical evidence they provide.[32] Statistical evidence derived from systematic reviews and RCTs is characterized by high methodological rigor, reducing the likelihood of bias and error. By

employing standardized control designs and statistical analysis, these forms of evidence are considered more reliable. Statistical evidence itself allows for the quantification of treatment outcomes and an estimation of effect size, helping clinicians better understand the clinical significance of a given treatment.

Unlike anecdotal or expert opinion-based evidence, statistical evidence offers generalizability across diverse study populations, making it applicable to a broad range of patients. However, generalizability can be problematic if the statistical evidence is not representative of diverse populations, in which case expert opinion-based evidence may be more appropriate. Moreover, statistical evidence presented through meta-analysis allows for the comparison of multiple studies under common clinical conditions. Physicians can therefore assess how a particular remedy has performed across a wide range of patients before determining its relevance for the individual they are treating. This provides a more comprehensive view of a treatment prior to its application in a clinical setting. Furthermore, the EBM hierarchy aims to ground clinical decisions in the most scientifically sound evidence, achieved through rigorous methodology, ability to quantify outcomes, and broad generalizability.

The EBM hierarchy, with its emphasis on statistical evidence from RCTs and systematic reviews, presents significant challenges in appropriately assessing the evidentiary status of homeopathic medicine. This hierarchical model marginalizes homeopathy and fails to capture the nuances and underlying principles of this alternative medical practice.

EBM- One Size Fits All

One of the primary shortcomings of the EBM hierarchy is its failure to account for the highly individualized nature of homeopathic treatment. The EBM model places a strong emphasis on RCTs and statistical evidence as the highest forms of evidence, while marginalizing other forms of knowledge and reasoning. However, understanding homeopathy's healing capacity requires methods aligned with its own theory of illness and treatment philosophy.[35] Homeopathy operates on principles such as the 'law of similars' and individualization. If a study design does not reflect these principles, its results will not accurately represent how homeopathy is practiced in real-world settings.

Furthermore, homeopathy's individualized healing philosophy is not adequately captured by population-based meta-analyses or RCTs. Homeopathy's core principles focus on treating each patient as a unique individual, tailoring remedies to the patient's specific symptoms and characteristics rather than simply addressing a diagnosed disease or condition. This personalized approach contrasts with the generalized focus of RCTs and systematic reviews, which aim to establish standardized treatments applicable to broad patient populations. Therefore, population-based studies, which view illness and healing primarily through the lens of statistical viability, may not be the most appropriate method for assessing homeopathy.

For example, a meta-analysis of non-individualized homeopathic treatments contradicts homeopathy's healing philosophy. In such an RCT, the study participants receive a 'standard' homeopathic treatment for their illness.[36] However, since homeopathy is rooted in individualized treatment, subjecting a study group to non-individualized remedies is akin to an

optometrist prescribing the same pair of glasses for all their patients. An optometrist who generalizes their lens prescription neglects to consider each patient's unique visual acuity, refractive error, and other factors that affect vision.

One might argue that the cases of the optometrist and a general homeopathic prescription are dissimilar, in that the individual prescribed homeopathy is still receiving a "standard" homeopathic remedy for their specific illness. In the context of a non-individualized, double-blind homeopathy trial, for example, a patient experiencing a headache might be prescribed the "standard" homeopathic treatment appropriate for their symptoms.[24] However, non-individualized homeopathic RCTs fail to account for the unique medical conditions of the individuals involved in the study.

The purpose of this analogy is to challenge the validity of evaluating homeopathy using the same standards applied to allopathic medicine. Non-individualized RCTs assess the effectiveness of a one-size-fits-all homeopathic treatment, which assumes that homeopathic prescriptions are based solely on the totality of symptoms.[30] This assumption is misleading. While the prescribed remedy may correspond with the patient's illness, it fails to consider other confounding factors that contribute to the individual's overall health and condition. For example, the role of the optometrist in measuring refractive power and prescribing the appropriate lenses is not analogous to a homeopathic practitioner who, in non-individualized trials, only considers the patient's physical symptoms when prescribing treatment. The latter fails to consider the holistic, patient-centered evaluation required for effective homeopathic treatment. Moreover, there is an inherent contradiction in 'standardizing' homeopathy. The one-size-fits-all approach is incompatible with the logic behind homeopathic practice and ultimately weakens the very effectiveness of the therapy being studied. Finally, double-blind RCTs and meta-analyses cannot adequately capture the context-dependent nature of homeopathic prescriptions, which go beyond general symptom assessment.

Additionally, double-blind placebo-controlled trials disrupt the 'entanglement' between the patient, practitioner, and remedy needed to achieve the therapeutic effect under investigation[33]. According to the Patient, Practitioner, Remedy (PPR) entanglement hypothesis, the homeopathic process involves the practitioner making two distinct but complementary observations. The convergence of these observations curates the remedy's prescription.[25]

The local observation encapsulates the practitioner's observation of the patient in a homeopathic consultation. During this assessment, the practitioner examines and records the patient's symptoms, physical characteristics, emotional state, and other relevant psychosocial factors. This observation focuses on the patient and their specific presentation of the disease or condition. The local observation highlights that, for a homeopathy practitioner to abide by homeopathy's healing philosophy, they must recognize that different individuals present illness uniquely, even though the illness itself may remain the same.[35]

The global observation pertains to the practitioner's self-awareness while assessing their patient. This requires the practitioner to recognize their 'inner state' while consulting with a patient and reflect upon their thoughts, feelings, and intuitions that arise from the consultation. Additionally, the practitioner assesses the dynamics of the relationship with the patient, noting the patient's degree of trust and the quality of communication. These observations are considered "global" because they encompass the broader context of the therapeutic encounter and the interplay between patient and practitioner. The PPR

entanglement hypothesis posits that both observations are necessary for homeopathy's effectiveness. The practitioner uses the information gathered from these observations to guide the selection of the homeopathic remedy that best matches the patient's overall state.[36]

In a broader sense, the hypothesis also claims that the full homeopathic effect emerges from a holistic interaction between the patient, practitioner, and remedy, which must remain entangled, rather than arising from the remedy alone. The very act of isolating and measuring the effects of the homeopathic remedy apart from its therapeutic context is fundamentally incompatible with the holistic and entangled nature of homeopathy. This further elucidates how homeopathic therapy is a process and not just a medical remedy, which is why the reductionist view of RCTs may not be well-suited to evaluate the treatment.[34]

Furthermore, double-blind RCTs fail to capture the complex nature of homeopathy by inadvertently disrupting the proposed "entanglement" between these three components. By blinding both the patient and practitioner to whether the treatment is the actual remedy, double-blind RCTs disrupt the interconnectedness of the patient, practitioner, and remedy. This disruption may explain why RCTs of homeopathy yield the same or worse results in a controlled research setting yet demonstrate effective patient outcomes in clinical practice.[37]

Moreover, the EBM hierarchy fails to acknowledge the historical and traditional evidence supporting the use of homeopathic remedies. Homeopathy has been practiced for centuries and has a rich cultural heritage, particularly in regions where it has been an integral part of traditional medical systems.[38] This long-standing tradition and the experiential knowledge of homeopathic practitioners are largely disregarded within the EBM framework, which places a heavy emphasis on modern, scientific evidence.

Furthermore, EBM's hierarchal reliance on empirical, measurable evidence fails to adequately address the non-measurable aspects that are fundamental to homeopathic medicine. Concepts such as the "vital force" and the belief that highly diluted substances can retain their therapeutic potency through a process of 'potentization' are central to homeopathic philosophy. These notions challenge the conventional understanding of pharmacology and are difficult to investigate within controlled clinical trials, which are designed to measure quantifiable outcomes.

The consideration of homeopathy's treatment philosophy when assessing its efficacy is not akin to accepting the effectiveness of this philosophy. Rather, through the process of testing these treatments' efficacy, the viability of these healing philosophies is elucidated. This is important because homeopathy's capacity to trigger healing is rooted in these philosophies; one can't separate the remedy from the mechanism through which it is able to heal the patient. Doing so would hamper the very healing process being evaluated.

Another significant shortcoming of the EBM hierarchy is its dismissal of mechanistic reasoning and the underlying principles that guide homeopathic treatment. While RCTs and statistical evidence may provide insights into the effectiveness of a particular intervention, they do not necessarily clarify the mechanisms or rationale behind its therapeutic effects. Homeopathy is grounded in a distinct theory of illness and healing, which emphasizes the body's innate ability to heal itself when stimulated by highly diluted substances. In the next section, this mechanistic reasoning will be further elucidated. Nonetheless, these mechanisms are often overlooked or given low priority within the EBM hierarchy, which prioritizes empirical evidence over theoretical underpinnings.

Mechanistic Reasoning & Bayesian Theorem

A mechanistic perspective may be more appropriate than reductionist scientific reasoning in assessing the effectiveness of homeopathy. This reasoning aims to explain why a medicine works by examining its underlying mechanisms and processes. By breaking down a process into its components and understanding how these parts interact to produce an effect, mechanistic reasoning provides evidence backing the effectiveness/ineffectiveness of the process under study.[39] In this case, the application of mechanistic reasoning would place the burden of proof on understanding the mechanisms by which homeopathy works instead of scrutinizing RCTs.

Homeopathy posits two distinct mechanistic hypotheses. The first states that potentization induces far-reaching, coherent molecular ordering within water molecules, thus "imprinting" them with properties of the initial ingredients. This theory is yet to be widely accepted; however, certain experimental observations support water's ability to retain memory.[23,37] The other, referred to as "patient-practitioner-remedy (PPR) entanglement", is rooted quantum theory, specifically in non-locality and entanglement. The PPR hypothesis claims that the patient, practitioner, and remedy form an entangled system. Any attempt to isolate or observe one component (as in double-blind RCTs) disrupts this entanglement, thereby affecting the therapeutic outcome.[34]

In general, mechanistic reasoning provides a theoretical framework for understanding how homeopathy might work. Unlike RCTs, which treat the prescribed remedy and its context as separate, additive causes, mechanistic reasoning recognizes the complex interplay among the various components of the therapeutic process (Figure 3).

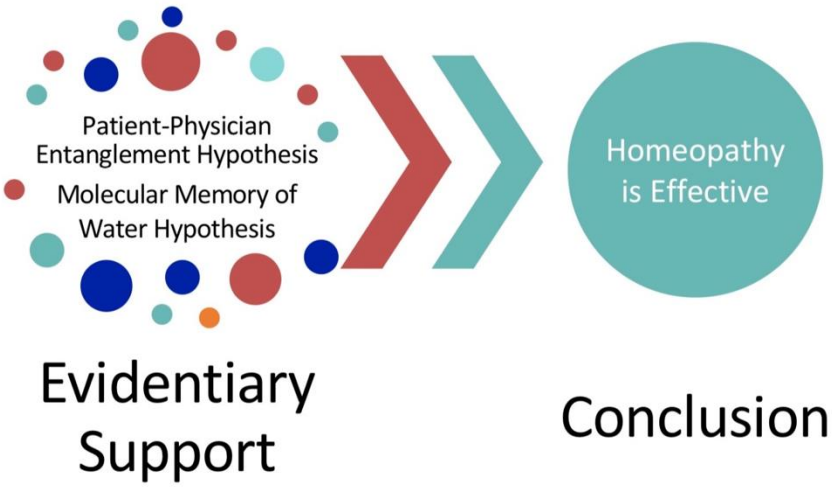

Figure 3: An illustration of how mechanistic reasoning could be applied to elucidate the efficacy of homeopathy through key components/ hypotheses: Patient-Physician Entanglement and Molecular Memory of Water. Image by author.

However, it should be noted that, until now, most of these mechanistic hypotheses concerning homeopathy remain speculative, requiring further experimental validation. The so-called 'memory of water' hypothesis specifically challenges established principles in chemistry

and physics, and its endorsement could lead to drastic shifts in our understanding of matter and energy.

However, some contend that proving a mechanistic hypothesis requires empirical evidence. In homeopathy, mechanistic reasoning serves as a basis for generating potential explanations as well as testable hypotheses. Nevertheless, these hypotheses must ultimately undergo systematic investigation and empirical verification through well-designed experiments and observations. With consistent demonstration of proposed mechanisms supported by evidence, they might contribute to our understanding of homeopathy, thereby potentially facilitating its acceptance within mainstream medicine.

In this case, the Bayesian approach could be used instead of the current EBM framework to assess the effectiveness of homeopathy, along with other alternative medical practices.[40] In the Bayesian method, one begins by taking what is known as a prior probability, or the belief regarding a particular hypothesis, such as whether homeopathy works. When fresh observations are made about this hypothesis, it is updated resulting into another probability-called the posteriori probability-after observation (Figure 4).

$$P(H \mid E) = \frac{P(E \mid H) \cdot P(H)}{P(E)}$$

Hypothesis / Evidence	Satisfies hypothesis H	Violates hypothesis ¬H	Total
Has evidence E	P(H|E)·P(E) = P(E|H)·P(H)	P(¬H|E)·P(E) = P(E|¬H)·P(¬H)	P(E)
No evidence ¬E	P(H|¬E)·P(¬E) = P(¬E|H)·P(H)	P(¬H|¬E)·P(¬E) = P(¬E|¬H)·P(¬H)	P(¬E) = 1−P(E)
Total	P(H)	P(¬H) = 1−P(H)	1

Figure 4: Bayesian theorem applied to hypothesis testing, showing how evidence updates prior probabilities. Adapted from Wikipedia. [41]

Bayesian inference goes further by incorporating not only a priori evidence but also patient experience and expert judgment, which makes it more flexible than merely considering RCTs. Thus, Bayesian inference maintains PPR entanglement. As more information elucidates the mechanistic underpinnings of homeopathy, the effectiveness of a posteriori probabilities can be recalculated using Bayes' theorem. Bayes' theorem, a mathematical formula, elucidates conditional probability. Personalizing these probabilities for each patient, depending on their specific symptom profile, allows homeopathic practitioners to match them with suitable homeopathic medicines.[42] This approach works out individual differences while justifying the avoidance of unnecessary repetition of remedies. The assessment of reproducible symptom

patterns allows practitioners to accurately gauge the effectiveness of their patient assessments while simultaneously preserving the medicine's therapeutic effect.

Conclusion

Integrating homeopathy into mainstream medical practice requires a thorough understanding of how the medicine works and what it involves. However, homeopathy, a highly individualized and philosophically alternative medicine, may not be accurately captured by the existing EBM hierarchy. Despite the utility EBM may have as a systematic tool for recognizing evidence-laden treatment options, it overlooks the relevant complexities related to homeopathy. The EBM hierarchy's narrow focus on statistical significance and empirical data may not be sufficient to capture the complexities and unique principles of homeopathic medicine. A more inclusive, unbiased, and flexible approach that values individualization, mechanistic reasoning, as well as historical and traditional evidence within homeopathy, is needed to develop a nuanced understanding of this alternative medical practice.[43]

To bridge this gap, it is crucial to develop an alternative epistemic framework that is consistent with the underlying principles of homeopathy. Such a framework should envelope a more diverse range of data such as mechanistic and experiential evidence. Collaboration between homeopathic practitioners, researchers, and experts in evidence-based methodology could help establish a more comprehensive and inclusive approach to evaluating the evidence for homeopathic treatments.

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