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**Evidence-based vs. complementary and
alternative medicine: It's about
epistemology (not about evidence)**

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About the Swiss Skeptics

Swiss Skeptics – Association for Critical Thinking is an independent nonprofit organization based in Zurich, Switzerland. The Swiss Skeptics promote a scientific worldview, and, more specifically, critical thinking as a tool for making rational inferences about the world.

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Abstract

Complementary and alternative medicine (CAM) is oftentimes criticized from the point of view of evidence-based medicine (EBM) on the grounds that there is not enough evidence to support the claims of the CAM measures in question. That criticism is misguided: There is plenty of evidence to support CAM measures, but that evidence is produced within the epistemological framework of CAM rather than the epistemological framework of EBM. The real problem, therefore, is not a lack of evidence for CAM, but the *defective epistemology* of CAM: CAM epistemology is less reliable and less valid than EBM epistemology. This problem of CAM epistemology extends to the challenge of CAM regulation. CAM regulation is desirable in order to assure a certain level of quality of CAM services and providers, but at the same time, CAM regulation can signal that the medical claims of CAM are true, and therefore, that CAM epistemology is valid. Unless policymakers truly believe this to be the case, CAM should be regulated in a manner that makes its defective epistemology clear to all healthcare participants.

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1 Introduction: The popularity of complementary and alternative medicine shouldn't be ignored

It is abundantly clear that diagnostic and therapeutic measures that are subsumed under the category of complementary and alternative medicine (CAM) are very popular¹. For example, around two in five people in the United States are users of CAM [1], and CAM is similarly popular in other Western countries [2, 3, 4, 5]. The ongoing and, partly, rising popularity of CAM is intriguing and important for at least two reasons. *First*, the great progress in public health during the 20th century can, without much doubt, be ascribed to the advances of scientific, evidence-based medicine (EBM). For example, the development of vaccines alone can be regarded as one of the most effective medical interventions that humankind has ever come up with [6, 7, 8, 9]. It is, then, remarkable, that CAM is as popular as it is, since CAM does not have nearly an impressive a track record as EBM. Overall, CAM treatments have so far not been able to demonstrate efficacy or effectiveness for any one indication – but, of course, this is a conclusion from the perspective of EBM, and, as such, it is contestable from the point of view of CAM.

Second, the great popularity of CAM is increasingly spilling over into public healthcare policy². CAM is not regarded by policymakers and regulators as a fringe phenomenon – which it most certainly is not – , but rather as an increasingly standard part of healthcare that is desired by large parts of the population. Consequently, CAM is being adopted by mainstream healthcare systems, with the blessing of both policymakers and the medical profession. Perhaps the clearest indication of this spillover effect is the rise of so-called *integrative medicine*, a branch of research and applied healthcare that aims to, as the name implies, integrate EBM and CAM into a holistic form of medicine [11, 12].

The popularity of CAM, then, has great real-world impact, since our healthcare systems are, to some degree, adopting CAM. But how exactly does the popularity of CAM come to be? While there is no smoking gun to answer that question, there are several possible factors that have contributed to the rise of CAM. One of the more important reasons for the popularity of CAM is that many people feel disaffected by «regular», evidence-based medicine. Many people perceive the modern healthcare industry to be driven primarily by pecuniary interests,

¹Throughout this paper, I use CAM to denote complementary and alternative medicine, and EBM to denote evidence-based medicine.

²«Public healthcare» here means any legally regulated healthcare system. That is any form of healthcare which is guided by laws, regardless of the nature of the brokers and providers of healthcare services (private or public). «Private healthcare», in this understanding, refers to brokers and providers of healthcare services that are not regulated by laws. For example, if a man gets the flu, whether and how his wife will take care of him and nurse him back to health is entirely a private manner.

and not necessarily by the desire to help people. This feeling is expressed with the subjective experience of many patients that they are not receiving attention and empathy, but rather, that they are being «processed» in an increasingly commodified system [13, 14, 15]. When they turn to CAM practitioners, patients feel they are being taken more seriously, and their overall experience is one of greater autonomy and of a less paternalistic [16, 17, 18] relationship with healthcare professionals. Add to that the problems of pharmaceutical research that have been subject to public scrutiny in recent years, such as the non-publication of trial results [19, 20] or the switching of outcome variables during trials [21], and it's understandable why people turn to CAM and, to some degree, away from EBM.

Even though this mollifying quality of many CAM experiences³ helps to explain the popularity of CAM, it does not resolve all practical challenges of dealing with CAM within public healthcare. The challenge of CAM within public healthcare is twofold. The *first* question that arises is which CAM diagnostic and therapeutic measures should be regulated at all; not everything that could be conceivably understood as CAM is automatically something that should be subject to regulation. For example, prayer is sometimes regarded as a CAM practice [22, 23], and prayer is probably better taken care of within a theological, not a legal setting. *Second*, it is not altogether clear *how* those CAM services that are deemed to be in need of regulation in principle should be regulated in practice. Most European countries, for example, have some level of homeopathy⁴ regulation, but the nature of that legislation differs greatly between countries [25].

The regulatory conundrum around CAM arises from two basic facts. On one hand, regulators, policymakers, and medical professionals are, as argued above, aware of CAM's popularity and prevalence. The mere fact that CAM matters to many people means that CAM cannot be ignored from a regulatory point of view. On the other hand, regulators, policymakers, and medical professionals are, to some degree at least, aware of the fact that CAM is categorically different from EBM. If diagnostic and therapeutic CAM treatments worked from an EBM perspective, then they would not really be categorized as CAM, but instead as EBM. This basic dilemma of CAM regulation – CAM popularity vs. CAM's status

³I am not trying to paint too positive a picture of CAM here. Even though an oft-heard apologetic moniker for CAM is «What's the harm?», CAM is not without risks, some of which, demonstrably, translates into collateral damage. More on that in a future paper.

⁴Homeopathy is a CAM that is based on two assumptions: *similia similibus curantur* (like cures like) and «potentisation» through dilution. In the homeopathic belief system, homeopathic remedies cure diseases whose symptoms are the same symptoms caused by some substance. In order to create the homeopathic remedy, that substance is diluted in water. Most homeopathic remedies are diluted to such a degree that the few remains of the original substance cannot have an active bio-chemical effect; many homeopathic remedies are diluted to such a high degree that they do not contain any amount of the original substance, not even singular molecules [24].

as \neg EBM⁵ – leads to pragmatic solutions. These solutions usually take the form of a middle ground: There is *some* regulation for CAM, but that regulation is simpler than the regulation for EBM, and as such, it is more in line with the belief systems underlying CAM than with the belief systems underlying EBM. Pragmatic regulatory solutions to that tune are politically very sensible. CAM is a reality of modern healthcare, and it makes a lot of sense to incorporate CAM into public healthcare so as to have high quality standards and ways to monitor and, if necessary, to impose sanctions on CAM providers who do not abide by the rules. But pragmatic regulation of CAM can also have downsides; such is the nature of pragmatism. The biggest downside of pragmatic regulation of CAM is, obviously, the fact that CAM and EBM are not regulated equally. The rules governing, say, the introduction of a new EBM medication are generally different from and stricter than the rules governing the introduction of a new CAM medication. That is not without consequence.

1.1 Sending the wrong signal: How CAM regulation can imply that CAM is equal to EBM

Ceteris paribus, the existence of some CAM regulation is probably preferable to the complete absence of CAM regulation. Without any form of regulation, it would take consumers a considerable amount of work to separate the good from the bad and the bad from the worse CAM providers. The existence of some CAM regulation, pragmatic though it may be, will usually promote standards of quality and give prospective patients cues as to which CAM services from which providers are more reputable, at least in the sense of adhering to some fixed and quantifiable standards. CAM regulation, then, almost certainly has some positive impact that is greater than zero.

However, at the same time, that kind of pragmatic CAM regulation carries with it the risk of signaling and implying things that go beyond the purported pragmatic scope of the regulation in and of itself. CAM that is subject to some form of regulation receives an air of legitimacy through that very regulation – as it well should, but only to a degree. The legitimizing function of CAM regulation is supposed to discriminate between reputable and less-than-reputable CAM services and providers. This form of legitimation indeed works: By being subject to a set of rules, some CAM services and providers gain reputation and legitimacy relative to CAM services and providers that do not fulfill the criteria set out by these rules. However, the legitimizing function of CAM regulation does not stop there: As well as discriminating reputable from less-than-reputable CAM, CAM regulation also implies that CAM and EBM are *equally* reputable and legitimate.

⁵Read as «not-EBM».

It is only natural, and indeed logical, that the public should perceive CAM regulation as this function of double legitimation. If regulation is supposed to discriminate between good and bad medical services and providers, and both EBM and CAM are governed by such regulation, then, the direct conclusion is that both the regulated EBM services and providers and the regulated CAM services and providers belong to the category of good, legitimate medicine, as opposed to the bad, unregulated one. Is the public wrong in assuming that regulation of CAM implies the same as regulation of EBM? No, of course not: *Any* regulation of medicine implies legitimacy in the sense that one can have reasonable confidence that the medical claims subject to the regulation are true. It is completely rational for a member of the public to understand regulation of CAM as well as regulation of EBM in such a manner. Ultimately, then, CAM regulation can imply that CAM is equal to EBM.

A country in which such a double-edged regulatory constellation – CAM regulation that separates good CAM from bad CAM, but also implies an equivalence between CAM and EBM – is very prominent is Switzerland. In 2009, Swiss voters accepted a federal initiative that demanded a stronger integration of CAM into public healthcare⁶. The constitutional article that was adopted is the following one:

The Confederation and the Cantons shall within the scope of their powers ensure that consideration is given to complementary medicine.

Even though the constitutional article is fairly vague, policymakers and regulators have taken it as a call to action. Ever since its adoption, regulators and policymakers have made great strides towards implementing CAM into public healthcare. One of the most important steps so far is the decision by the federal council to include a range of CAM procedures⁷ into the set of diagnostic and therapeutic procedures that are covered by the basic Swiss health insurance. The federal council has explicitly stated that this measure is taken even though there was not sufficient evidence for the efficacy and effectiveness of the CAM procedures in question [26].

⁶A popular initiative in Switzerland is a direct-democratic procedure. If 100'000 Swiss citizens sign a petition for a constitutional change, that proposed change is brought to a national vote. In order for it to pass, an absolute majority of voters needs to adopt it, as well as a majority of Swiss cantons; cantons are the Swiss equivalent of US states. The CAM initiative that was adopted in 2009 actually wasn't the original popular initiative, but a so-called counter-proposal by the federal council, the governing organ of the Swiss executive branch. The counter-proposal contains less strong wording than the original initiative.

⁷The procedures in question are homeopathy, anthroposophy, phytotherapy, and traditional Chinese medicine.

In the Swiss regulatory case, the regulation implies an equivalence between CAM and EBM, even though the notion of such an equivalence is not appropriate from the point of view of EBM, as the federal council itself declared. This has led to criticism over the years, as the measure was first proposed, then provisionally implemented, and then fully implemented⁸. The main line of criticism was that such regulation of CAM is inappropriate because it allows CAM to play by different rules than EBM in terms of evidence.

This line of criticism is understandable, but – and this is the main argument of the present paper – it is misguided. The legitimizing function of CAM regulation is not problematic because CAM does not have enough evidence from the point of view of EBM. The legitimizing function of CAM regulation is problematic because it implies that the kind of evidence accepted within CAM as evidence is equivalent to the kind of evidence accepted within EBM as evidence. The main problem, then, is not that CAM regulation accepts a lower standard of evidence for CAM, but rather, that CAM regulation is legitimizing the *epistemology* of CAM by implying that it is as valid as the epistemology of EBM.

2 A question of epistemology, not evidence

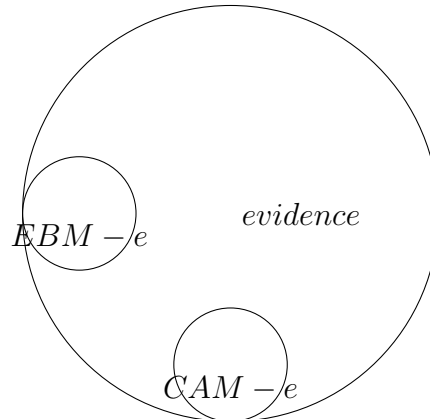
The standard criticism of CAM is, for the most part, directed at the level of evidence in support of different CAM procedures: There's either no evidence to support the claims of various CAM procedures, or there's evidence indicating that the claims of various CAM procedures are false [27, 28, 29]. This line of criticism is perfectly valid from the point of view of EBM. If one believes that the criteria for assessing the efficacy and effectiveness of diagnostic and therapeutic measures should be the criteria of EBM, then it follows that CAM mostly fails to demonstrate efficacy and effectiveness – hence the conclusion that CAM procedures are lacking in evidence for supporting their claims, or that there is evidence that goes against the claims of CAM procedures.

However, that conclusion is unambiguously wrong. It confounds two things that are separate: The *status* of evidence in the sense of EBM and the *nature* of evidence in and of itself. Dismissing CAM by pointing out a lack of evidence carries with it the direct connotation that evidence in and of itself is synonymous with evidence in the sense of EBM. That is wrong. Evidence in the sense of EBM is only *one subset* of the whole set of evidence. Another subset of evidence is CAM evidence. This logic is depicted visually in Figure 1.

There are many possible forms of evidence. The two forms of evidence that are of interest here are EBM evidence and CAM evidence. EBM evidence and

⁸At the time of the writing of the present paper, the full implementation was not yet decided, but it was imminent.

Figure 1: The relationship between EBM and CAM evidence as subsets of all evidence.



EBM-e stands for evidence produced within the epistemological framework of EBM. CAM-e stands for evidence produced within the epistemological framework of CAM.

CAM evidence are both subsets of the whole set of evidence, but they are distinct from each other, since there is no overlap between them. Logically, it is true that *some* evidence is EBM evidence, but is false to say that *all* evidence is EBM evidence, because that is quite obviously not the case. How does this relate to criticism of CAM? Concluding that there is no evidence to support CAM is wrong – there is, in fact, *plenty* of evidence that supports CAM, but that evidence is not EBM evidence, but CAM evidence. Simply stating that CAM lacks in evidence, then, is an obvious *non sequitur*, because CAM is plentifully supported by CAM evidence. Furthermore, there is no *a priori* reason why CAM should have to be supported by EBM evidence as well – such a demand is actually gravely fallacious from an *epistemological* point of view.

Within the CAM framework of generating evidence in order to justify beliefs, it is *perfectly logical* to abide by the epistemological rules of that very framework. In the very same manner, it is perfectly logical to abide by the epistemological rules of the EBM framework when it comes to generating evidence in order to justify beliefs within the EBM framework. It is, on the other hand, *perfectly fallacious* to demand that justifications for CAM beliefs be supported by evidence generated within the framework of EBM (and, for that matter, vice versa).

This line of reasoning might not be intuitive at first, especially if you are of the opinion that EBM is preferable to CAM. But it is crucial to untangle the epistemological dimension of the CAM and EBM debate from the more practically methodological one. Mainstream criticism of CAM is operating with strong, but implicit and fuzzy epistemological assumptions, and it is focused on the methodological demand for EBM evidence as *pars pro toto* for evidence in and

of itself, whereby the problem with CAM lies with its failure to produce EBM evidence, and the proposed meta-solution to the problem at hand is simply to continue demanding that the methodological trappings of EBM be implemented for CAM, in order to produce EBM evidence [30, 31]. These demands are, as argued above, *perfectly fallacious*, because EBM evidence is perfectly meaningless within the epistemological CAM framework. No matter what kind of EBM evidence you produce, it has *no relation whatsoever* to the beliefs specified within the epistemological CAM framework. The opposite is true as well: CAM evidence is perfectly meaningless within the EBM framework, because it has no relation whatsoever to the beliefs specified within the epistemological EBM framework.

Now, you might interject that it is acceptable to isolate specific CAM treatments, strip them of their epistemological CAM framework, and try to assess their efficacy and effectiveness within the epistemological EBM framework. Of course, this is something that is doable, and, in my opinion, something that should be done. However, the moment you engage in an EBM examination of CAM treatments, you are no longer dealing with CAM treatments, but with EBM treatments. This is a crucial point: Isolating CAM treatments and producing EBM evidence as an assessment of those treatments is epistemological EBM activity – analyzing CAM treatments within the epistemological EBM framework has *no bearing whatsoever* on the validity of those treatments within the epistemological CAM framework. This has a fairly straightforward real-world consequence. For example, you can perform as many high-quality double-blinded studies for homeopathic treatments as you wish, and all of them could demonstrate that the treatments that were tested were ineffective, but all of that evidence is EBM evidence, and therefore, it is *meaningless* within the epistemological CAM framework. Or, put differently: Testing homeopathy within the epistemological framework of EBM can never impact the epistemic status of homeopathy within the epistemological framework of CAM.

2.1 The epistemological traits of CAM and of EBM

If CAM and EBM differ categorically in terms of epistemology, then it is necessary to briefly sketch out both epistemological frameworks for the sake of comparison. The starting point for that endeavor is the juxtaposition in Table 1.

In the first row of Table 1, the *ontological premises* of EBM and CAM are summarized as realism for EBM and hyper-relativism for CAM. The ontological premise refers to the differing basic ideas of the nature of existence that EBM and CAM operate with. The *realist* position of EBM states that there is a physical reality outside of our representations of it [32, 33], meaning that there is an objective reality, and we are, epistemologically, trying to understand something about it. CAM on the other hand operates with what I call a *hyper-relativist* onto-

Table 1: Main traits of CAM and EBM epistemologies.

	EBM	CAM
ontological premise	realism	hyper-relativism
knowledge	justified belief	justified belief
truth status of beliefs	probabilistic	fixed
belief justification	inferential	declarative
justification methodology	critical thinking	atomistic experience

logical premise. The hyper-relativist premise is related to relativism. Relativism broadly states that the truth content of propositional statements can never be objectively assessed, because the assessment will be very different for different people, groups, cultures, and so forth. In a nutshell, then, relativism is the position that truths are fundamentally relative to their respective frames of reference [34, 35]. This general relativist position has been extended to ontology [36, 37, 38], with the argument that ontology is fundamentally relative to language. What I call ontological *hyper*-relativism is an extension of the relativist understanding of ontology. It is not, however, just a relativist argument that is more emphatically expressed, but rather, a qualitatively stronger relativist argument. While regular relativist ontology holds that no ontological position can be truly objective because any ontological position is inherently relative to the language used to express it, the hyper-relativist position states that *any* ontological position is as valid as *any other*. In other words, regular ontological relativism is stressing the indeterminacy, or *uncertainty*, of ontological beliefs, while hyper-relativism posits that all conceivable ontological beliefs are *certain*. With the ontological premise of hyper-relativism, then, every ontological belief is regarded as certain, and ontological beliefs are regarded as *not* being mutually exclusive – there is, in principle, an infinite amount of ontological beliefs regarded as certain (or as certainly true), but that infinite amount of differing certitudes is not a problem within the position of hyper-relativism.

The second row in Table 1 is a summary of how the concept of knowledge is understood within EBM and within CAM epistemology. Here, I believe that *both* epistemologies share the same notion of knowledge as *justified belief*. But what exactly is «justified belief» supposed to mean? In traditional epistemology, knowledge is usually defined as *justified true belief*. In that sense, knowledge has three components: A belief about the world, a justification for that belief (a reason to hold it), and, finally, the objective truth of that belief. In less abstract wording, knowledge is approximately understood as accepting facts for the right reasons. However, this tripartite epistemological notion of knowledge has been shown to be faulty for some time now [39], because there are empirical situations

in which all three conditions can be met, but the resulting knowledge is just a lucky guess. Because the understanding of knowledge as justified true belief poses some challenges, I resort to using just two of those parts, justified belief, in order to describe the understanding of knowledge within the EBM and CAM epistemologies. It might, *prima facie*, sound counter-intuitive to omit the condition of truth from a definition of knowledge. However, knowledge as justified belief is an apt description of *epistemic rationality*. Without requiring the extremely strong condition of truth to be met, knowledge as epistemic rationality is much closer to practical, real-world epistemology: In many, if not in most real-world instances, it might be very difficult to ascertain the objective truth of our beliefs⁹, and in all those instances, the best we can do is justify why we hold the beliefs that we hold. In this regard, both the epistemology of EBM and the epistemology of CAM are operating with the notion of knowledge as justified belief. Sometimes, CAM is criticized as operating with the notion of knowledge as random, unjustified beliefs. Such criticism is wrong, I believe, because knowledge within CAM epistemology is not a completely random free-for-all. However, CAM epistemology differs from EBM epistemology both in terms of the truth status of beliefs as well as the justification mechanisms of beliefs.

The third row in Table 1 describes the *truth status of beliefs* within EBM epistemology as *probabilistic* and within CAM epistemology as *fixed*. This difference is rather simple. But first, it is necessary to explain what exactly the «truth status» of beliefs is supposed to mean. Above, I have argued that both within EBM epistemology and CAM epistemology, knowledge is understood as epistemic rationality in the sense of justified beliefs. The objective truth of those beliefs, I argue, is not a necessary condition, neither within EBM nor within CAM epistemology. However, that does not, of course, mean that beliefs have no relation to truth whatsoever. On the contrary: What makes a belief a belief is the very idea that one holds a proposition that is uttered to correspond to reality (no matter your ontological model of reality). Beliefs, in this sense, are honest *truth claims*¹⁰.

Within EBM epistemology, the truth status of a belief is *probabilistic*. This means that a justified belief within EBM does not imply that the holder of that belief regards it as certainly true. Instead, the justification of a belief results in a probabilistic assessment of its truth status. This probabilistic assessment can take

⁹This is a valid basic ontological challenge that is, I believe, correctly addressed within ontological relativism.

¹⁰The whole notion of beliefs is somewhat murky on semantic grounds. In everyday language, we use the term in quite a different manner than we do in the context of epistemology. In everyday language, we think of beliefs as, roughly, faith in truth claims, without any justification for those truth claims. Epistemologically, those can also be beliefs, but they are most certainly not *justified* beliefs. Epistemologically, the term «belief» is without connotation, while the everyday language use of «belief» has a negative, or a religious connotation.

any value between 0 and 1. Also, and crucially, a probabilistic truth status also means that the truth status can change, conditional on additional justification. The truth status of beliefs within CAM epistemology is very different. It is not probabilistic, but *fixed*. This means two things. First, beliefs within CAM epistemology, in contrast to beliefs within EBM epistemology, do not change. Second, and somewhat obviously, they are fixed in one way specific way: They are regarded as true.

In order to make better sense of the logic of the differing truth status of beliefs, one has to take into account the differing nature of *belief justification* within EBM and within CAM epistemology, as summarized in Table 1. Belief justification within EBM epistemology is *inferential*. This means that belief justification within EBM works by stating some premises and deriving conclusions from those premises. Oftentimes, this is done experimentally. For example, the very idea of clinical trials is one of drawing conclusions from a set of premises¹¹. The nature of belief justification within CAM epistemology, on the other hand, is *declarative*. CAM belief justification is a classic example of a *performative speech act* [41]: The propositional content of the speech act that is uttered becomes true by means of uttering it. This might sound a bit confusing at first, but performative speech acts are omnipresent in everyday life. A classical example is marriage: When, for example, a priest says «I hereby declare you husband and wife», the propositional content of that utterance has become reality through the act of uttering it. Similarly, the belief justification in CAM epistemology is declarative in nature: Through the act of declaring a belief as justified, it becomes so. This is, of course, a consequence of the ontological premise of hyper-relativism. If any one ontological model of reality that is expressed is regarded as true, then the nature of the justification of beliefs based on such an ontological premise is declarative as well.

The final row in Table 1 contains a summary of the *justification methodology* within EBM epistemology and within CAM epistemology. Justification is the process whereby evidence is produced, and the justification methodology describes the logic of that process. The justification methodology applied within EBM can be described as *critical thinking*. Critical thinking means a metacognitive skill applicable to the evaluation of truth claims [42]. That skill consists of three components: Minimization of logical fallacies, minimization of cognitive biases, and a probabilistic epistemology. The last component might sound a bit repetitive in the context of the general discussion of EBM epistemology, because, above, I have already argued that the truth status of beliefs within EBM epistemology is

¹¹Very basically summarized: The premise of a clinical trial is that if an intervention X has an effect, that effect will be observable in a test group, but not in a placebo group. For a more thorough discussion of the inferential nature of EBM, cf. [40].

probabilistic. Critical thinking as a methodology is an expression of the inferential nature of belief justification within the EBM epistemology: Critical thinking is a way to increase the reliability and the validity of the inferences that are being made. The justification methodology within the epistemology of CAM is *atomistic experience*. This means that, within CAM, justification takes the form of purely individualistic, subjective experience: A belief is regarded as justified if the belief holder honestly feels the belief to be justified. Belief justification as atomistic experience is a direct consequence of hyper-relativism, just as its declarative nature is. Perhaps it sounds unnecessary to specify that the justification mechanism within CAM is atomistic experience, since it has already been described that the nature of belief justification within CAM is declarative. However, those two components are not synonymous, but rather two separate necessary conditions. For example, some belief holders might have atomistic experience that, in principle, justifies their beliefs, but they withhold from declaring the truth of their beliefs. Also, and more importantly, anyone can declare the truth of their alleged beliefs, but they would be lacking *honest* atomistic experience – they would be *pretending* to hold the beliefs they declare to be true. This is a fairly important point in real-world terms, because in the field of CAM, there are practitioners who are almost certainly being dishonest in their declarations, but those practitioners are only a subset of all CAM practitioners. There is nothing to suggest that the majority of CAM practitioners are dishonest.

2.2 Why the epistemology of CAM is defective

In the previous section, I have sketched out the main traits of EBM and of CAM epistemology. In doing so, it has become abundantly clear that and how those two epistemologies are categorically different. The comparison of EBM and CAM epistemology might be interesting on its own, but the more pressing question is whether one epistemology is superior to the other. Epistemology as the study of knowledge is a very complex branch of philosophy [43], and there is no unified, agreed upon view of what makes a better, let alone a «correct» epistemology. However, it's not very helpful to default to a something like an epistemologically skeptical position [44, 45] and declare all knowledge to be equally uncertain. Even if one went a step further and declared all epistemologies to be inherently wrong (I don't believe that is the case), they would not necessarily be *equally* wrong. In the case of EBM and CAM epistemology, I believe that CAM epistemology is fundamentally flawed and that it produces knowledge that is much less valid and reliable than knowledge produced within EBM epistemology. So, you could posit that EBM epistemology misses the mark by n , and then, CAM epistemology, consequently, misses the mark by nx , where $x > 0$. There are several reasons for this.

In Table 1, the ontological premise of CAM epistemology is described as hyper-relativism. Hyper-relativism means that any *ad hoc* ontological claim is regarded as certainly true and just as valid as any other ontological claim. Another way of understanding this property is as the inability to discriminate among ontological claims. Given that under the hyper-relativist umbrella, there is an infinite number of possible ontological claims, it is inevitable that some claims will not only be competing, but directly contradictory. Consider a fictitious example of ontological claims A and B. Claim A states that disease in a person is the result of behavior of that person in their last life. Claim B states that disease in a person is the result of behavior of that person in their life just *before* the last one. Within CAM epistemology, both ontological claims are true, even though the two claims are mutually exclusive; either $A \rightarrow \neg B$ (if A, then not B), or $B \rightarrow \neg A$ (if B, then not A). The idea of both claims being true at the same time is false from a logical point of view, but, of course, logic is a tool of EBM epistemology, not of CAM epistemology. However, as this minimal example demonstrates, it is impossible to decide within CAM which ontological claims are more probably true than others, and, consequently, it is impossible to discard any ontological claims that have little or no merit. The consequence of this is that within CAM epistemology, the number of ontological claims that are regarded as true – and thus, the number of views of reality – are perpetually increasing, absent of any possibility of discarding some of them. This holds even in cases, such as the fictional one about disease and reincarnation introduced above, where, from an EBM perspective, the logical problems are glaring.

The truth status of beliefs within CAM is a consequence of its hyper-relativist ontological premise. Beliefs are generally regarded as true and true in a fixed, irrevocable manner. This situation is an indicator of the lack of *falsifiability* [46, 47] within CAM epistemology: As opposed to the truth status of beliefs within EBM epistemology, it's generally impossible to argue that a belief is false. Once a belief in the sense of justified belief is introduced, it's impossible to revoke that status; the only thing that is possible is to introduce other beliefs. This is a direct consequence of how beliefs are justified within CAM epistemology. Whereas belief justification within EBM is inferential in nature, in CAM, it is declarative, and, methodologically, it relies on the honest experience of the person who is declaring the belief, not on a process that has the goal of increasing validity and reliability of the beliefs, such as critical thinking within EBM. Within CAM epistemology, an infinite number of justified beliefs can be generated, but, from the point of view of EBM, the way they are generated is very unreliable and hardly valid. The very starting point of belief justification within EBM is the notion that atomistic experience is not reliable source of knowledge, because subjective experience oftentimes leads to conclusions that are demonstrably wrong. That is precisely what *critical thinking* [42] is addressing. *First*, we

are very prone to committing logical fallacies, meaning that the conclusions we arrive at oftentimes do not follow from the premises we posit. Now, from the point of view of CAM epistemology, logic is moot, and logical fallacies can be regarded as a non-issue. However, the *second* issue that critical thinking tackles cannot easily be disregarded within CAM epistemology: Cognitive biases. Cognitive biases refer to the fact that the heuristics of human cognition can result in systematically biased conclusions, compared with a more objective inferential process. Now, of course, CAM epistemology is not inferential, but declarative in nature, and biased inference-making is not an issue *prima facie*. However, cognitive biases document the fact that our thinking is systematically unreliable. CAM epistemology, of course, *has* to be grounded in human cognition – no CAM proponent would argue to the opposite, I believe. The *modus operandi* of belief justification within CAM, then, is one of atomistic experience, and the thinking about those atomistic experience takes places in our brains. This means that atomistic experience cannot be regarded as certain in the face of our large body of knowledge about errors in human cognition. No matter how strong and convincing our experiences may seem to us, they may be leading us astray. One cognitive bias that exemplifies this well is the phenomenon of *false memories*. One of the essential human experiences, the recollection of past events, is something that we usually put great confidence in. After all, our memories are our memories precisely because we have experienced the content of those memories. However, memories are often partly or wholly not factual, and what we believe to be factually correct memories are in fact *false* memories [48, 49, 50]. The evidence about false memories and many more cognitive biases is so overwhelming that we simply cannot put total confidence in our cognitive abilities under any set of reasonable assumptions – the belief that human cognition is error-free is extraordinarily improbable. CAM epistemology, however, relies on this belief of error-free human cognition. Without such a belief, CAM epistemology cannot work: If belief justification within CAM works in a declaratory manner and is based on atomistic experience, but there is not *absolute* certainty that all honest atomistic experience is error-free, then CAM epistemology falls apart. Since CAM epistemology applies hyper-relativism as its ontological basis, the inability to discriminate between beliefs, and thus the inability to detect cognitive errors that influence some beliefs, is its very foundation. If the possibility that some atomistic experiences are biased by or even wholly the results of errors of cognition is greater than zero, then CAM epistemology will necessarily produce not only an infinite amount of equal beliefs, but also an infinite amount of *erroneus* beliefs – beliefs that are believed to be true, but which are, in fact, the result of cognitive errors.

Herein lies the ultimate defect of CAM epistemology: Disregard for the fallibility of human cognition. In order for CAM epistemology to work, human

cognition needs to be perfectly error-free all of the time. There is nothing to suggest that this belief is in any way close to being true. Quite the opposite: Most everything we know about human cognition points in the other direction, namely that our cognition is riddled with errors most of the time.

To this, you might object by pointing out that this knowledge of human cognition has been produced within the scientific epistemology and that, consequently, it is of no consequence for CAM epistemology. That objection is valid, but only to a degree. The systematic study of the universal errors of human cognition is certainly a scientific enterprise, and as such, it operates with the same epistemology as EBM. However, the knowledge of the fallibility of human cognition is not limited to scientific epistemology, since they are so prevalent in everyday life. The scientific study of human cognition, in that sense, is only documenting and cataloguing the many errors in thinking that we experience on a daily basis. But it is true that, ultimately, cognitive errors can be dismissed within the epistemology of CAM by positing some additional ontological claims that explain away errors in cognition as intuition, inspiration, and so forth.

3 Conclusion: Recommendations for stakeholders

In the preceding section 2, I have laid out why the standard criticism of CAM is inadequate. Saying that there is no evidence for therapeutic and diagnostic CAM measures is misguided. There is plenty of very strong evidence in support of CAM, but it is evidence that is generated within the epistemological framework of CAM, not of EBM. The actual question about CAM, then, is not one of evidence, but one of the underlying epistemology used in order to produce evidence. I have gone on to argue, first, that the epistemologies of EBM and of CAM are very different, and, second, that the epistemology of CAM is defective in that it produces evidence in the sense of knowledge as justified beliefs that is much less reliable and valid than evidence produced within the epistemology of EBM. What are the real-world implications of the epistemological inferiority of CAM? Different stakeholders should take the epistemological situation into account in different ways.

3.1 Policymakers

In section 2, I argue that legislation of any medicine has a double legitimizing function. First, legislation of medicine is a signal that some services and providers meet some level of quality standards and that others do not. Second, legislation of medicine is a signal that the medical claims that are subject to regulation are

true. This puts policymakers in a difficult spot: They have to regulate CAM so as to fulfill the first legitimizing function, but in doing so, they must avoid the second legitimizing function.

A case where this has not worked is Switzerland. In the Swiss regulatory arrangement, as described in subsection 1.1, some CAM practices will be granted the same *de facto* regulatory status as EBM practices when it comes to coverage by basic healthcare insurance. While the Swiss arrangement fulfills the first legitimizing function to some degree¹², unfortunately, it fulfills the second one as well. Essentially, medical doctors are allowed to prescribe diagnostic and therapeutic CAM measures covered by the legislation in the same manner that they are allowed to prescribe diagnostic and therapeutic EBM measures. Given the Swiss government's explicit statement that the CAM families in question cannot be said to be efficacious and effective from the point of view of EBM epistemology¹³, the regulatory *status quo* in Switzerland amounts to a double legitimization of CAM. On the one hand, it's a signal that some CAM practices are more reputable than others. But on the other hand, it is also a signal that the medical claims of the CAM practices subject to regulation are true. In extension, this means that the Swiss regulation is a signal that the epistemology of CAM – or at least, the epistemology of those CAM practices that have so far been approved for the regulatory status in question – is on par with the epistemology of EBM.

In Switzerland as well as in general, it is unclear what exactly policymakers' epistemological beliefs are. Four scenarios, or constellations, are possible:

1. Policymakers are fully aware of the epistemological conundrum described in this paper. They fully understand the double legitimizing function described above, and they are fully aware that their legislation can be outright irrational if it signals that CAM epistemology is as valid as EBM epistemology. Even though they are aware of the fundamental problem they

¹²Only prescriptions by medical doctors are covered by the basic healthcare insurance, but not services by CAM practitioners without medical degrees. Interpreted charitably, this rule is supposed to ensure a high level of quality of the whole process. For example, medical doctors are probably less likely than other CAM practitioners to advise using only CAM for grave indications. Interpreted less charitably, however, this rule is discriminatory: There is no *a priori* reason why, say, a homeopath should be less qualified to prescribe homeopathy than a medical doctor who also believes in homeopathy. On the contrary: Medical doctors are usually trained in EBM, and with that perspective, they might not fully comprehend homeopathy and its underlying epistemology. A «pure» homeopath, on the other hand, is much more likely to fully comprehend homeopathy and its underlying epistemology.

¹³In their writing, the Swiss government does not explicitly talk about EBM epistemology. However, it treats the concept of «evidence» as synonymous with the concept of evidence produced within the epistemology of EBM. Treating those two concepts synonymously is incorrect, as depicted in Figure 1.

are creating, they value a pragmatic, bureaucratic solution higher than an epistemologically rational one.

2. As in the scenario above, policymakers are fully cognizant of the epistemological nature of the problem. They are explicitly adopting regulation which signals that CAM epistemology is as valid as EBM epistemology, because that is what they believe.
3. Policymakers are unaware of the epistemological nature of the problem. They are simply creating what they believe to be a fair, pragmatic, bureaucratic solution.
4. A mixture of any number of scenarios 1, 2 and 3.

Scenario number 4 is probably the most realistic one, because not all people who comprise the government and the parliament have the same set of preferences and beliefs. How *should* policymakers handle CAM regulation so as to keep the first legitimizing function (separating the good from the bad CAM services and providers), but without activating the second one (signaling that CAM epistemology is as valid as EBM epistemology)?

In order to avoid false equivalence, CAM has to be treated categorically different from EBM. Of course, this does not mean that diagnostic and therapeutic measures that originated from CAM and that have been tested within the epistemology of EBM should not be offered as EBM diagnostic and therapeutic measures (as long as the results of that EBM testing suggest efficacy and effectiveness). But the vast majority of CAM treatments that only work within the epistemology of CAM should not be regulated so as to place them on an equal epistemological footing as EBM. To that end, it is appropriate to regulate CAM more akin to a combination of *food items* and *wellness programs*. Such a category of less-than-medicine regulation could ensure quality standards without threatening to signal that the medical claims in question are true.

3.2 Scientists and healthcare professionals

The first step for scientists involved in publicly funded EBM research should be to critically review the notion of integrative medicine. As briefly mentioned in section 1, integrative medicine is a medical paradigm that aims to combine EBM and CAM. Integrative medicine is littered with problems [51, 52, 53, 54], the biggest of which is certainly its legitimizing function. Perhaps even more so than CAM regulation, the concept of integrative medicine signals that the medical CAM claims in question are true, and thus, that the epistemology of CAM is sound, which is not the case. Discarding integrative medicine does not mean that

scientists and research institutions should not be allowed to conduct research on diagnostic and therapeutic CAM procedures. Of course they should, but they should do so within EBM epistemology, not within CAM epistemology.

In addition, there is a general need for raising awareness about the epistemological differences between CAM and EBM among healthcare professionals. To many, if not most, healthcare professionals, CAM is not categorically different from EBM, but rather seen as a «gentle» addition to EBM. Increased educational efforts are necessary to help healthcare professionals understand the deep philosophical differences between CAM and EBM, so that they, hopefully, base future professional decisions on that knowledge.

3.3 The media

The media are an important source of healthcare information. Healthcare and healthcare policy, in one form or another, is a topic that is covered a lot in the media, and understandably so – healthcare is relevant for everyone, and it's a politically delicate topic. The media are not a blackbox that uniformly and robotically creates information in the form of text, (moving) images and sound. Media organizations, obviously, consist of individual journalists, and the journalists' role is to tackle the highly complex issue of public healthcare and offer interpretations that are accessible to a wide, general audience. The role of journalists, therefore, is the role of translators and interpreters.

When it comes to reporting on issues surrounding CAM, the media sometimes do a less-than-optimal job. A recurring journalistic trope is the idea of «balanced» reporting on CAM issues. For example, journalists tend to portray the false idea of a causal link between the MMR vaccine and autism as a balanced issue, giving proponents and critics of that notion similar weight, even though the scientific findings clearly do not support the idea that the MMR vaccine causes autism [55, 56, 57]. The journalistic intent behind this form of reporting is understandable: Journalists want to present both sides of a controversial argument. However, in doing so, they are committing the *argument to moderation* fallacy: Defaulting to a balanced mode or representation of arguments implies that the truth lies somewhere in the middle of these two extremes. That is, of course, clearly false as a general *a priori* rule.

When reporting on issues related to CAM, journalists should seek to base their reporting on epistemic grounds. That doesn't mean that journalists should be forced to adopt EBM epistemology in their reporting, but rather that journalists should seek not to be completely neutral facilitators of the epistemic positions of others and instead evaluate questions surrounding CAM epistemically themselves. After all, that is what journalists usually strive to do: Not to mindlessly reproduce information, but to seek truth.

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