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EDITORIAL

How Skepticism (not Cynicism) Can Raise Scientific Standards and Reform the Health and Wellness Industry

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Superstition and pseudoscience extend back to the dawn of civilization. In Mesopotamia—the birthplace of writing and recorded history—illnesses were "treated" by offering amulets and incantations to the evil spirits believed to have inflicted disease in retribution for the "sins of mankind" (Retief & Cilliers, 2007). The Ancient Greeks thought that gladiator blood could cure epilepsy and infertility; they at least had the good manners to wait until a gladiator had fallen in battle before rushing to the field to drink from the open wounds (Moog & Karenberg, 2003). In Ancient Rome, surviving gladiators would use a tool called a strigil to scrape sweat and dirt from their bodies to sell in vials to women of the upper classes to use as face cream (Finan, 2021). Beliefs remained steeped in superstition throughout the Middle Ages. In 14th century Japan, urine therapy was often used to "treat" asthma, diabetes, hypertension, and cancer (Savica et al., 2011). The practice endured well into the Renaissance. Later, traveling medicine men toured the Old West, espousing miraculous healing properties of oil they claimed had been extracted from the Chinese water snake. It wasn't until the emergence of analytical chemistry in the early 1900s that the tincture was inspected and found to contain no active ingredients, forever synonymizing the term "snake oil" with deceptive marketing and health care fraud (Figures 1 and 2).

These "therapies" appear primitive when viewed through the lens of modern science. We are fortunate to benefit from technologies our ancestors could never have imagined, enabling us to determine, often to a high degree of accuracy, which interventions are useful and which are not. But pervasive mis/disinformation, lax consumer regulations, and blunted critical faculties have allowed health and wellness snake oil merchants to endure, even thrive. Today, they sell ineffective fad diets, supplements, exercises, complementary and alternative medicine, garments, gadgets, and other quick fixes, many marketed on baseless claims and pseudoscience. The products and services that find their way into mainstream practice could have devastating consequences for population health, clinical practice, and high-performance sports (Tiller et al., 2023). Moreover, while some vendors suffer consequences for their misleading claims (see Table 1), most do not. As scientists, we have a responsibility to help reform what has become a harmful health and wellness paradigm.

According to Laplace's Principle, "The weight of evidence for an extraordinary claim must be proportioned to its strangeness" (Gillispi et al., 1999). Carl Sagan said it more pointedly: "Extraordinary claims require extraordinary evidence." Commercial health and wellness claims, tending to be both extraordinary and supported by little-to-no evidence, violate the principles of Laplace and Sagan at nearly every turn. The most appropriate way to navigate the industry is, therefore, with a healthy dose of skepticism. However, skepticism should not be confused with cynicism (to routinely dismiss assertions out of hand) or contrarianism (to hold a contrary position by default); nor should we allow the misunderstood and stigmatized form of skeptic, due to its common prefixes "climate change" and "vaccine," to discredit its true meaning.

To be skeptical in science is to judge the validity of claims based on objective, empirical evidence, or at the very least, to withhold judgment until such evidence is at hand (Normand, 2008). "It is a capital mistake to theorize before one has data," wrote Arthur Conan Doyle as everyone's favorite detective, "Insensibly, one starts to twist facts to suit theories instead of theories to suit facts." Essentially, skepticism is about asking important questions to discern an "objective truth." But the competency with which we achieve such objectivity depends on how well we understand and mitigate our biases; how well we understand and prioritize the scientific method above the conclusions we subconsciously desire; and the depth and reach of our scientific, media, and social media literacy. Note that humans do not have these skills ingrained. Logic and reason evolved for navigating hypersocial groups and for pattern recognition, not for unraveling the tangled web of consumerism, bad science, and social media that has emerged from the rapid cultural shift of the past few decades. Being a responsible skeptic, therefore, requires a comprehensive set of critical thinking skills that, like any other, can only be acquired through diligent study, refined and honed through frequent use.

Unfortunately, there has been little emphasis on critical thinking in the overcrowded curricula of our educational institutions. When critical thinking is taught, it is rarely before students reach university. Then, it is often paired indiscriminately with Research Methods, despite data showing that Research Methods failed to reduce the prevalence of false beliefs, particularly those related to pseudoscience (Dyer & Hall, 2019). It is also the case that while many of the most prominent skeptics have been revered scientists (e.g., Carl Sagan, Richard Feynman, Stephen Jay Gould), a grasp of scientific facts and concepts is only weakly related or completely unrelated to pseudoscientific beliefs (Goode, 2002; Johnson & Pigliucci, 2004). Thus, even a science education may be insufficient to provide immunity against mis/disinformation and bias. This may explain why it is troublingly common for clinicians to become homeopaths, physiotherapists to become chiropractors, and nutritionists/dieticians to advocate ineffective supplements and

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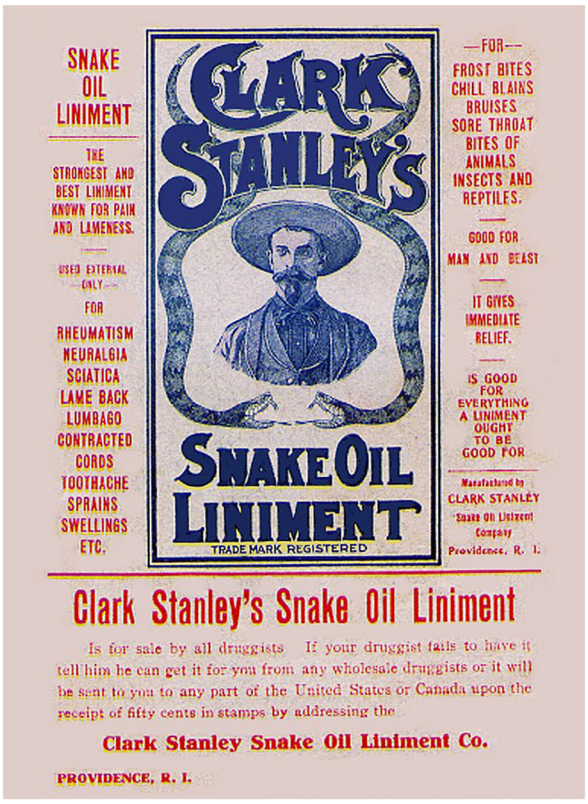


Figure 1 — An advert for Clark Stanley's Snake Oil Liniment, circa 1890. Stanley sold his snake oil preparation across the West until federal investigators, acting on the *Pure Food and Drug Act of 1906,* found that it contained mineral oil, a fatty oil believed to be beef fat, red pepper, turpentine, but no actual snake oil. Image in the public domain.

fad diets. We must avoid a similar fate by not assuming we are immune to flawed and misinformed beliefs. Critical thinking skills are not for *other people*.

For most individuals, a degree of self-directed study of skepticism and critical thinking is probably warranted. Fortunately, there are numerous resources, several of them essential, that can be used to sharpen critical faculties, including books (e.g., Carl Sagan's *The Demon-Haunted World*, James Randi's *Flim Flam*, Michael Shermer's *Why People Believe Weird Things*, Ben Goldacre's *Bad Science*); magazines (*Skeptical Inquirer*, *The Skeptic, Free Inquiry*); lectures (by Steven Novella, Susan Blackmore, Stephen Jay Gould); podcasts (*The Skeptic's Guide to the Universe*; *Geologic*; *Body of Evidence; Point of Inquiry*); and debates (those pitting theology against secularism usually offer lucid examples of good and bad logical construct). Engaging in skeptical discussions with friends and colleagues is another practical way to identify and mitigate weaknesses in forming reasonable arguments.

As competent skeptics and critical thinkers, we can challenge the current health and wellness model, particularly its reverence for fitness influencers and disdain for legitimate experts. We must first ensure we are not inadvertently promoting or giving platforms to unproven/disproven ideas. Try and cleave space for doubt in your preconceptions and subject them to intense scrutiny before disseminating them to clients, colleagues, and students. This shortens the reach and shelf life of biased or erroneous advice. Second, proactively challenge baseless claims and pseudoscience when they arise in the "public square." The clinical oath *primum non-nocere* (first do no harm) not only compels scientists and practitioners to administer reasoned and evidence-based advice but also to rally in removing absurdity and falsehood from circulation so it cannot contaminate decision making. Misinformed beliefs can be challenged through corrective messaging (debunking), and this is most effective when messages are rational, fact-based, and

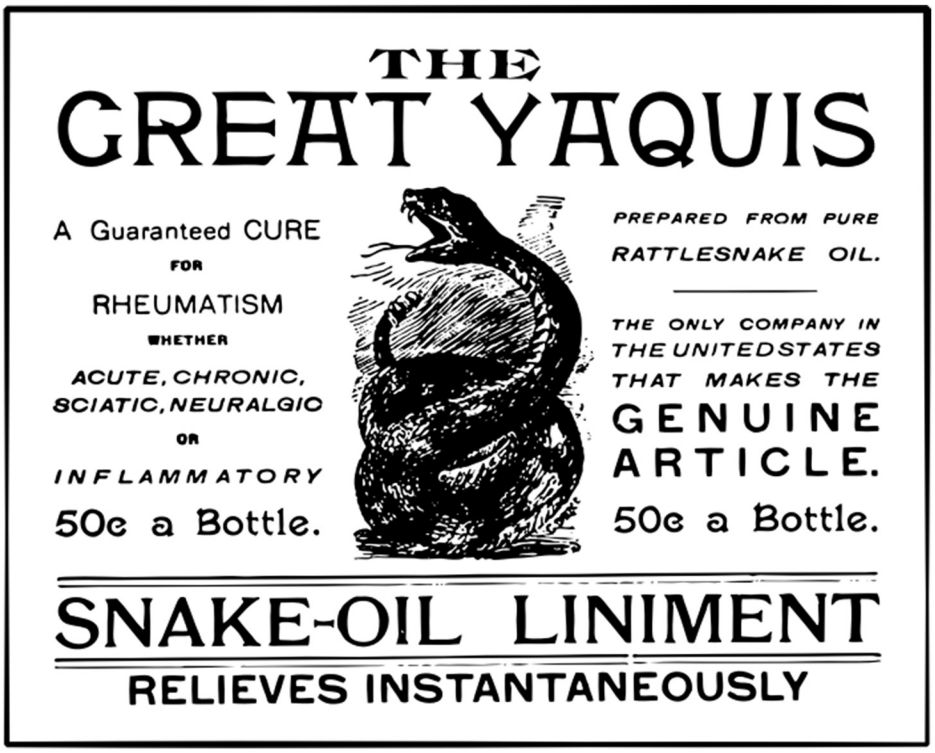


Figure 2 — Other liniments, like this from The Great Yaquis, claimed to be pure rattle snake oil. Image in the public domain.

Table 1 Manufacturers Facing Consequences for False and/or Misleading Health and Wellness Claims

Product	Created	Manufacturer	Claim(s)	Consequence(s)
Perkins' Metallic Tractors	Circa 1795	Elisha and Benjamin Perkins	Cures inflammation, rheumatism, and pain in the head and face	Expelled from the Connecticut Medical Society for being "a user of nostrums"
Clark Stanley's Snake Oil Liniment	Circa 1890	Clark Stanley	Cures pain and "lameness," among many other ailments	Fined $20 (Pure Food and Drug act of 1916) for "misbranding and false representation"
Activia Yogurt	1987	Danone	Relieves irregularity; prevents colds and flu	Fined $21 million by FTC for deceptive advertising; class-action lawsuit
Multivitamin supplements	Circa 1994	Greenlife Wellness/ Naturecare Wellness	Promotes general health	Closed by Insolvency Services (United Kingdom) for false claims; manipulative sales tactics
Vitamin Water	2000	Coca-Cola	Promotes healthy joints; reduces risk of eye disease	Fined $2.7+ million in class-action lawsuit for misleading claims
SENSA dietary supplement	Circa 1996	Alan Hirsch	Promotes satiety, promotes weight loss	Fined $26.5 million by FTC for misleading advertising
Power Balance bracelet	2006	Power Balance	Improves balance and agility	Corrective messaging; court-ordered consumer refunds for misleading advertising
New Balance "toning" sneakers	2010	New Balance	Increases calorie expenditure; increases muscle activation; tones muscles of the lower limbs	Class-action lawsuits ~$5 million for false advertising
Shape-Ups "toning" sneakers	2010	Sketchers USA	Promotes weight loss; strengthens and tones muscles	Fined $40 million by FTC for deceptive advertising claims
Green Coffee Bean capsules	Circa 2012	Applied Food Sciences Inc.	Promotes weight loss; promotes fat loss	Fined $3.5 million by FTC for baseless weight loss claims
Premium Green Coffee pills	Circa 2015	Sale Slash LLC	Promotes weight loss	Fined $43+ million by FTC for misrepresenting product effectiveness; fake endorsements
Luminosity "Brain Training" program	2007	Lumos Labs	Prevents Dementia/Alzheimer's; improves work/school performance	Fined $2 million by FTC for deceptive advertising

Note. FTC = Federal Trade Commission.

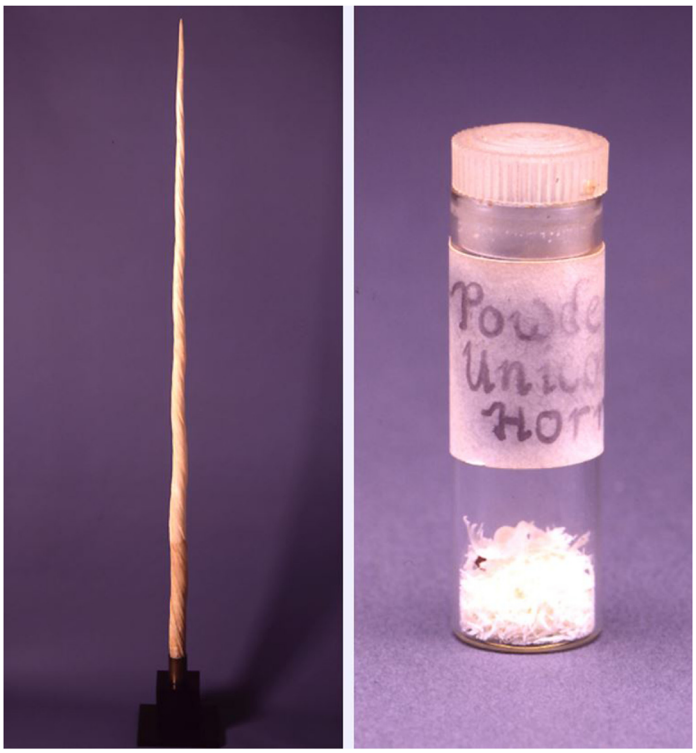
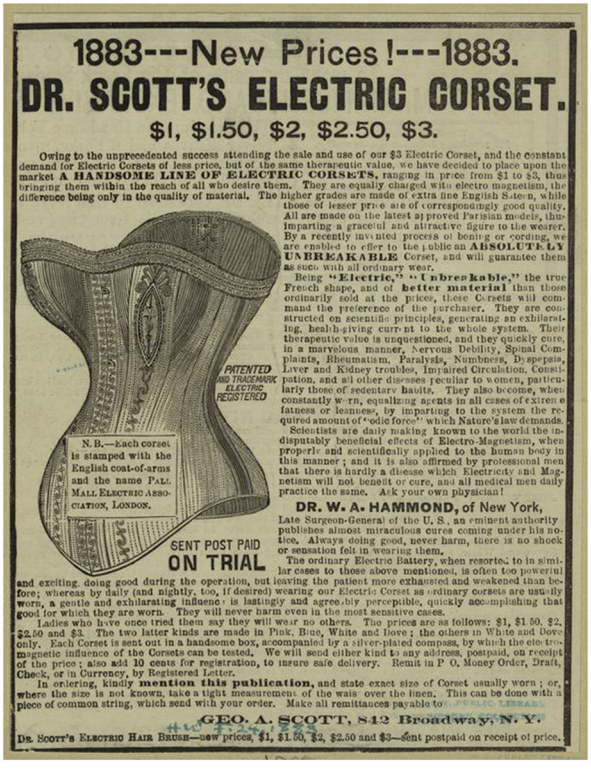


Figure 3 — In addition to traditional snake oil, other nostrums like 'powdered unicorn horn' were sold as cure-alls well into the 1900s. Image courtesy of the U.S. National Library of Medicine.


1883---New Prices!---1883.

DR. SCOTT'S ELECTRIC CORSET.

$1, $1.50, $2, $2.50, $3.

Owing to the unprecedented success attending the sale and use of our $3 Electric Corset, and the constant demand for Electric Corsets of less price, but of the same therapeutic value, we have decided to place upon the market A HANDSOME LINE OF ELECTRIC CORSETS, ranging in price from $1 to $3, thus bringing them within the reach of all who desire them. They are equally charged with electro magnetism, the difference being only in the quality of material. The higher grades are made of extra fine English Sateen, while those of lesser price are of correspondingly good quality. All are made on the latest approved Parisian models, thus imparting a graceful and attractive figure to the wearer. By a recently invented process of boning or cording, we are enabled to offer to the public an ABSOLUTELY UNBREAKABLE Corset, and will guarantee them as such with all ordinary wear.

Being "Electric," "Unbreakable," the true French shape, and of better material than those ordinarily sold at the price, these Corsets will command the preference of the purchaser. They are constructed on scientific principles, generating an exhilarating, health-giving current to the whole system. Their therapeutic value is unquestioned, and they quickly cure, in a marvelous manner, Nervous Debility, Spinal Complaints, Rheumatism, Paralysis, Numbness, Dyspepsia, Liver and Kidney troubles, Impaired Circulation, Constipation, and all other diseases peculiar to women, particularly those of sedentary habits. They also become, when constantly worn, equalizing agents in all cases of extreme fatness or leanness, by imparting to the system the required amount of "odic force" which Nature's law demands.

Scientists are daily making known to the world the indisputably beneficial effects of Electro-Magnetism, when properly and scientifically applied to the human body in this manner; and it is also affirmed by professional men that there is hardly a disease which Electricity and Magnetism will not benefit or cure, and all medical men daily practice the same. Ask your own physician!

PATENTED AND TRADEMARK ELECTRIC REGISTERED

N.B.—Each corset is stamped with the English coat-of-arms and the name PALL MALL ELECTRIC ASSOCIATION, LONDON.

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DR. W. A. HAMMOND, of New York, Late Surgeon-General of the U. S., an eminent authority publishes almost miraculous cures coming under his notice. Always doing good, never harm, there is no shock or sensation felt in wearing them.

The ordinary Electric Battery, when resorted to in similar cases to those above mentioned, is often too powerful and exciting, doing good during the operation, but leaving the patient more exhausted and weakened than before; whereas by daily (and nightly, too, if desired) wearing our Electric Corset as ordinary corsets are usually worn, a gentle and exhilarating influence is lastingly and agreeably perceptible, quickly accomplishing that good for which they are worn. They will never harm even in the most sensitive cases.

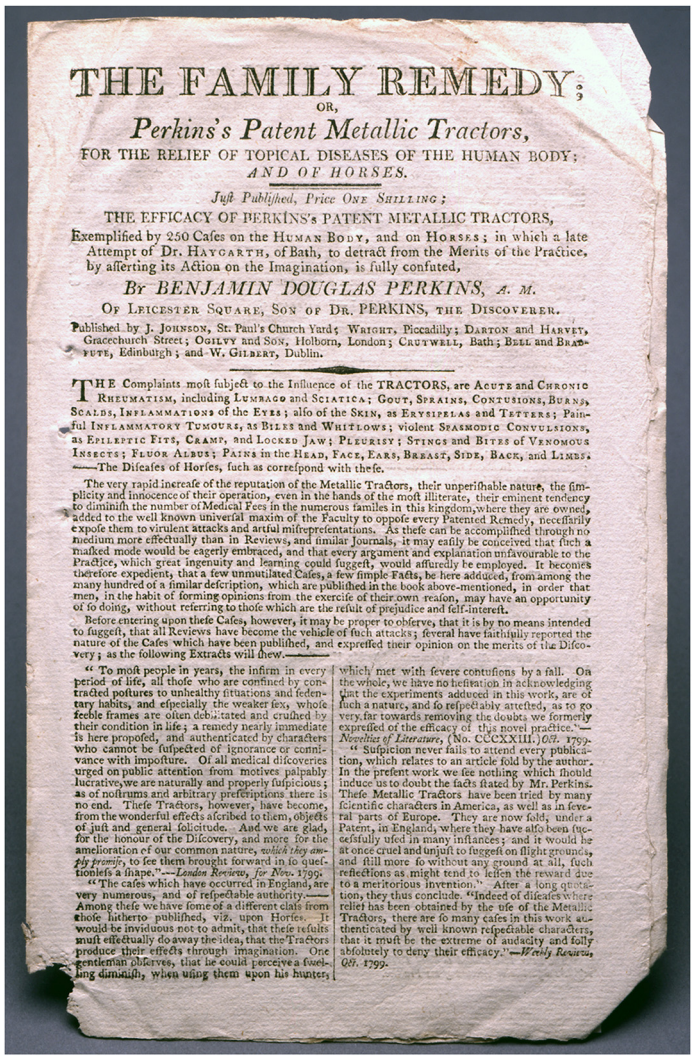
Ladies who have once tried them say they will wear no others. The prices are as follows: $1, $1.50, $2, $2.50 and $3. The two latter kinds are made in Pink, Blue, White and Dove; the others in White and Dove only. Each Corset is sent out in a handsome box, accompanied by a silver-plated compass, by which the electro-magnetic influence of the Corsets can be tested. We will send either kind to any address, postpaid, on receipt of the price; also add 10 cents for registration, to insure safe delivery. Remit in P. O. Money Order, Draft, Check, or in Currency, by Registered Letter.

In ordering, kindly mention this publication, and state exact size of Corset usually worn; or, where the size is not known, take a tight measurement of the waist over the linen. This can be done with a piece of common string, which send with your order. Make all remittances payable to

GEO. A. SCOTT, 842 Broadway, N. Y.

Dr. Scott's Electric Hair Brush—new prices, $1, $1.50, $2, $2.50 and $3—sent postpaid on receipt of price.

Figure 4 — Dr Scott's Electric Corset generated an "exhilarating, health-giving current," able to quickly cure nervous debility, spinal complaints, rheumatism, paralysis, liver and kidney troubles, and "all other diseases peculiar to women." Image courtesy of the New York Public Library.


THE FAMILY REMEDY;

OR,

Perkins's Patent Metallic Tractors,

FOR THE RELIEF OF TOPICAL DISEASES OF THE HUMAN BODY; *AND OF HORSES.*

Just Published, Price One Shilling;

THE EFFICACY OF PERKINS's PATENT METALLIC TRACTORS,

Exemplified by 250 Cases on the Human Body, and on Horses; in which a late Attempt of Dr. Haygarth, of Bath, to detract from the Merits of the Practice, by asserting its Action on the Imagination, is fully confuted,

By BENJAMIN DOUGLAS PERKINS, A. M.

Of Leicester Square, Son of Dr. PERKINS, the Discoverer.

Published by J. Johnson, St. Paul's Church Yard; Wright, Piccadilly; Darton and Harvey, Gracechurch Street; Ogilvy and Son, Holborn, London; Cruttwell, Bath; Bell and Bradfute, Edinburgh; and W. Gilbert, Dublin.

THE Complaints moſt ſubject to the Influence of the TRACTORS, are Acute and Chronic Rheumatism, including Lumbago and Sciatica; Gout, Sprains, Contuſions, Burns, Scalds, Inflammations of the Eyes; alſo of the Skin, as Erysipelas and Tetters; Painful Inflammatory Tumours, as Biles and Whitlows; violent Spasmodic Convulſions, as Epileptic Fits, Cramp, and Locked Jaw; Pleuriſy; Stings and Bites of Venomous Inſects; Fluor Albus; Pains in the Head, Face, Ears, Breast, Side, Back, and Limbs. ——The Diſeaſes of Horſes, ſuch as correſpond with theſe.

The very rapid increaſe of the reputation of the Metallic Tractors, their unperiſhable nature, the ſimplicity and innocence of their operation, even in the hands of the moſt illiterate, their eminent tendency to diminiſh the number of Medical Fees in the numerous families in this kingdom, where they are owned, added to the well known univerſal maxim of the Faculty to oppoſe every Patented Remedy, neceſſarily expoſe them to virulent attacks and artful miſrepreſentations. As theſe can be accomplished through no medium more effectually than in Reviews, and ſimilar Journals, it may eaſily be conceived that ſuch a maſked mode would be eagerly embraced, and that every argument and explanation unfavourable to the Practice, which great ingenuity and learning could ſuggeſt, would aſſuredly be employed. It becomes therefore expedient, that a few unmutilated Caſes, a few ſimple Facts, be here adduced, from among the many hundred of a ſimilar deſcription, which are published in the book above-mentioned, in order that men, in the habit of forming opinions from the exerciſe of their own reaſon, may have an opportunity of ſo doing, without referring to thoſe which are the reſult of prejudice and ſelf-intereſt.

Before entering upon theſe Caſes, however, it may be proper to obſerve, that it is by no means intended to ſuggeſt, that all Reviews have become the vehicle of ſuch attacks; ſeveral have faithfully reported the nature of the Caſes which have been publiſhed, and expreſſed their opinion on the merits of the Diſcovery; as the following Extracts will ſhew.——

"To moſt people in years, the infirm in every period of life, all thoſe who are confined by contracted poſtures to unhealthy ſituations and ſedentary habits, and eſpecially the weaker ſex, whoſe feeble frames are often debilitated and cruſhed by their condition in life; a remedy nearly immediate is here propoſed, and authenticated by characters who cannot be ſuſpected of ignorance or connivance with impoſture. Of all medical diſcoveries urged on public attention from motives palpably lucrative, we are naturally and properly ſuſpicious; as of noſtrums and arbitrary preſcriptions there is no end. Theſe Tractors, however, have become, from the wonderful effects aſcribed to them, objects of juſt and general ſolicitude. And we are glad, for the honour of the Diſcovery, and more for the amelioration of our common nature, *which they amply promiſe*, to ſee them brought forward in ſo queſtionleſs a ſhape."—*London Review, for Nov.* 1799.

"The caſes which have occurred in England, are very numerous, and of reſpectable authority.—— Among theſe we have ſome of a different claſs from thoſe hitherto publiſhed, viz. upon Horſes. It would be invidious not to admit, that theſe reſults muſt effectually do away the idea, that the Tractors produce their effects through imagination. One gentleman obſerves, that he could perceive a feebling diminiſh, when uſing them upon his hunter, which met with ſevere contuſions by a fall. On the whole, we have no heſitation in acknowledging that the experiments adduced in this work, are of ſuch a nature, and ſo reſpectably atteſted, as to go very far towards removing the doubts we formerly expreſſed of the efficacy of this novel practice."—*Novelties of Literature*, (No. CCCXXIII.) *Oct.* 1799.

"Suſpicion never fails to attend every publication, which relates to an article ſold by the author. In the preſent work we ſee nothing which ſhould induce us to doubt the facts ſtated by Mr. Perkins. Theſe Metallic Tractors have been tried by many ſcientific characters in America, as well as in ſeveral parts of Europe. They are now ſold, under a Patent, in England, where they have alſo been ſucceſsfully uſed in many inſtances; and it would be at once cruel and unjuſt to ſuggeſt on illiberal grounds, and ſtill more ſo without any ground at all, ſuch reflections as might tend to leſſen the reward due to a meritorious invention." After a long quotation, they thus conclude. "Indeed of diſeaſes where relief has been obtained by the uſe of the Metallic Tractors, there are ſo many caſes in this work authenticated by well known reſpectable characters, that it muſt be the extreme of audacity and folly abſolutely to deny their efficacy."—*Weekly Review, Oct.* 1799.

Figure 5 — Elisha Perkins claimed that his 'metallic tractors' could cure inflammation, rheumatism, and pain in the head and face. Despite being exposed as a fraud by British Physician John Haygarth, public support for the metallic tractors remained steadfast, thanks in part to refutations like this from Benjamin Perkins, son of Elisha Perkins. The elder Perkins was eventually expelled from the Connecticut Medical Society for being "a user of nostrums." Image courtesy of the U.S. National Library of Medicine.

supported by valid sources (Tiller, 2022). Third, in line with critical thinking lore, we must educate others on *how* to think rather than *what* to think. This axiom obligates teaching basic critical appraisal but also exploring more nuanced strategies like "prebunking" and "inoculation theory"—the notion that individuals can be protected against persuasive attacks on their attitudes by exposing them, in advance, to weak forms of mis/disinformation (Compton et al., 2016). We have an array of pragmatic tools at our disposal.

Lastly, an important note about extending skepticism to our work and the methods we use to test our hypotheses and validate our interventions. As scientists and skeptics, we lean heavily on findings from scientific research. As David Hume asserted: "In our reasonings concerning matter of fact, there are all imaginable degrees of assurance . . . . A wise man, therefore, proportions his belief to the evidence." Unfortunately, our assertions, however well-intentioned, are only as accurate as our procedures of scientific inquiry. Kinesiology and its related disciplines, despite making

enormous strides in knowledge since their inception, are still relatively young. In our view, the field has become reluctant to acknowledge its methodological shortcomings. Data show that publication pressures, competition for grant income, and an overemphasis on quantitative performance metrics (e.g., h-index) have incentivized questionable research practices. As a consequence, the discipline suffers from inflated false positivity rates, diminished scientific quality and rigor, and a profound replication crisis (Tiller & Ekkekakis, 2023). Embracing the ethos of scientific skepticism may be the first step toward lasting reform: encouraging a culture shift in research to emphasize quality rather than quantity, and moving the field toward improved standards of practice across domains.

To conclude, science has rendered many fanciful gadgets and snake oils obsolete, confining them to the history books (see Figures 1–5), only for such products to be replaced by the nostrums of today. In fact, pseudoscience now thrives in commercial culture and wherever critical faculties are found wanting. Much of the proliferation of pseudoscience has been compounded by social media and the erosion of expertise (Nichols, 2018). Even the sacred domain of scientific research is not immune. Scientific skepticism, with its emphasis on process and objectivity, ethics and humility, is a viable solution, but only if we strive to further understand its principles and independently integrate its tenets into educational curricula, scientific research, and professional practice. As a collective, we can then share in the urgent tasks of challenging baseless claims in health and wellness and holding manufacturers to account for their sensational rhetoric. Do not leave this important work to others. Only by having the courage to confront health and wellness pseudoscience will we alter the paradigm and reverse the current emphasis on marketing over science.

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