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Opposing Vaccine Hesitancy During the Covid-19 Pandemic - A Critical Commentary and United Statement of an International Osteopathic Research Community

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## Editorial

### **Opposing Vaccine Hesitancy During the Covid-19 Pandemic - A Critical Commentary and United Statement of an International Osteopathic Research Community**

#### **Current situation**

The covid-19 pandemic has resulted in an unprecedented impact on the social, mental and physical health of the global population [1–3]. It is only now, more than a year since the beginning of the pandemic, that through remarkable medical and scientific innovation there are several safe and effective vaccines for covid-19, and more are being developed [4,5]. Vaccines have now been approved by regulators across the world and much hope rests on these to bring a return to a degree of pre-pandemic life, saving lives by preventing the illness in the most vulnerable and speeding up the course of the pandemic until large proportions of the population are immunised [5]. Research has confirmed that healthcare professionals (HCPs), such as osteopaths, will make an important contribution to patients' decision-making regarding the uptake of vaccination, and that osteopaths' own beliefs, confidence and behaviours with respect to vaccination will influence their recommendations to others [6].

Anecdotal evidence in the form of intraprofessional discourse and posts on social media suggest that a majority of osteopaths support the public health messages delivered and recommended [7], are keen to get vaccinated, and where local regulations permit, even assist to administer the vaccine [8] and there are examples of DOs in the USA organizing other healthcare professional organizations in the endeavour [9]. However, we are concerned with the negative sentiments, ill-formed views and in some cases frank scepticism regarding vaccines amongst what appears to be small sections of the osteopathic profession. There is concern globally at views that have been expressed on social media and within other intra-health professional groups and settings [10].

To our knowledge, there is no published research on osteopaths' beliefs and attitudes towards vaccines, and this should be a research priority given the profession's role in health promotion. Research is needed to better understand the breadth of views and beliefs of osteopaths' in regard to vaccination and to develop deeper insights into the beliefs which inform osteopaths' behaviour with respect to vaccination uptake and advice. However, as will be outlined below, research into vaccine hesitancy amongst the public and HCPs, plus osteopathy's professional emergence, theory and principles, may facilitate vaccine hesitant views amongst clinicians, and ultimately be detrimental to their patients' and the wider public health efforts during the ongoing covid-19 pandemic.

Since the start of the pandemic, concerns have been raised by some members of the osteopathic [11] and chiropractic [12,13] professions regarding pseudoscientific claims and misinformation promoted by clinicians and researchers alike, regarding the role that these professions' interventions may have on the prevention and morbidity of covid-19 infections. Our paper continues in a similar vein, but with a specific focus on the concept of vaccine hesitancy and scepticism directed towards vaccines amongst osteopaths and their patients. We aim to highlight the issue of vaccine hesitancy and illuminate why osteopaths or patients

may hold hesitant views towards vaccines to enhance collaborative practice, shared decision-making and stimulate a discourse. Strategies to support health should be informed by an appropriate level of evidence, to facilitate fair debate and transparent decision making. This allows the public to have confidence in the veracity of the information presented to them by professionals and make informed autonomous choices, based on accurate information.

### **Vaccine hesitancy**

In 1796, the smallpox vaccine was introduced and became the foundation of modern vaccinology [14]. Since that time, the different views that an individual holds about vaccines and vaccination have been said to lie on a continuum ranging from complete acceptance to complete refusal [15]. Negative views and ideologies around vaccines have been traced back to the 1840s [16] the social, cultural, psychological and contextual factors which lead to the different positions are varied and complex [15]. Underpinning many of these views are concerns around the risks, safety and harms of vaccines and in some cases, a breach of individual freedom of choice and autonomy [17] and mistrust of medicine [18]. The term 'vaccine hesitancy' has recently emerged as a less polarising alternative to describe an individual's position on vaccines, rather than as 'anti-vax' or 'vaccine skeptic' [15]. Vaccine hesitancy has been defined as the *"delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence"* [19], and has been considered by the World Health Organization (WHO) as one of the top ten threats to global health [20]. The issue of vaccine hesitancy is a worldwide phenomenon amongst the public [21], and increasingly observed in marginalised and minority ethnic groups [22].

The expediency with which vaccines have been developed and approved can legitimately raise certain initial questions (and even 'hesitancy') amongst HCPs and patients. Further uncertainty may have developed when data on vaccine effectiveness from early trials [23] and dosing regimens [24] created some confusion within the scientific community and media. Nevertheless, osteopaths have a role in facilitating patients' access to reliable and credible information regarding vaccines [25] to support shared decision making and health promotion.

There are concerns that vaccine hesitancy will represent a major global challenge to the long-term control of covid-19 and overcoming the pandemic [26–29]. Recent research suggests negative attitudes towards covid-19 vaccines are a major public health concern [30]. Specifically, individuals that consult complementary and alternative medicine (CAM) practitioners (of which osteopathy can be considered to have arisen from, and which, in where some countries, continues to be considered CAM rather than a HCP [31]) tend to be more vaccine hesitant than non-CAM users [18]. This tendency may possibly be due to their broader health beliefs and the direct influence that CAM practitioners have on the vaccine attitudes of their patients is unclear [32]. Given this, osteopaths should be cautious and precise in how they communicate information regarding vaccination with their patients.

### Uncertainties, questions and concerns regarding vaccines

Determinants of vaccine hesitancy are not so straightforward but are thought to extend to cultural beliefs, health education, access to care, and language barriers [15] and for some people, a distrust of authority may also be a factor [33]. Given the complexity of the underlying phenomenon, there are no clear tailored interventions to reduce unfounded scepticism [34]. Overall, individuals who tend to feel over-cautious about vaccines are often those who are inclined to conspiratorial thinking, have individualistic and hierarchical worldviews, accord importance to their sense of freedom of behaviour, or dislike the sight of blood or needles [35]. Overconfidence is also believed to play a major role in the broader maintenance of one's beliefs [36] and making it difficult to distinguish facts from fallacies [37]. Osteopaths should be sensitive to any potential opportunities to positively inform patients' opinions of vaccines [38] and seek to understand, recognise and address any underlying fears they may have [17]. **Table 1** summarizes some of the identified fears that can help maintain hesitancy of vaccines and vaccination.

Type of fear	Advantage	Rationale	Underlying theory
Fear of being forced	Owning one's decision	Tempting to gain freedom of behaviour when a decision seems forced. Natural reaction against authority or unwanted consumerism.	Reactance theory [39]
Mistrust	Protection against manipulation	Fair-minded scepticism with affinity for conspiracy theories. Often linked to schizotypy, dangerous-world beliefs, and "bullshit receptivity" [40]	Overconfidence [36]
Fear of adverse events	Avoid risks	Safety concerns increased by the false impression that adverse events are much more present than invisible benefits. With conflicting messages, the preferred decision is often inaction.	Risk avoidance theory Status quo bias [39]
Fear of needles	Rationalising phobia	Risks of infection, pain [41]	Trypanophobia [42]

**Table 1.** Examples of underlying fears motivating vaccine hesitancy

With respect to vaccines, the main falsehoods and misinformation that circulate are on the claimed associations between MMR vaccination and autism spectrum disorders [39], hepatitis B vaccines and multiple sclerosis [43], aluminium intoxication [44], and more recently, microchip inoculation [45]. Even when independent scientific committees and multiple research teams investigate such allegations and provide strong evidence that they cannot be true [46], these beliefs seem to continue being propagated on social media. Online threads related to vaccines mainly concern safety and effectiveness, conspiracy theories, mistrust in science and authorities, freedom of choice, absence of intent for any vaccination, and religious beliefs [45].

There has been increasing interest in better understanding the origin and perpetuation of misinformation and conspiracy theorising in relation to many aspects of the covid-19 pandemic, including vaccines, use of face masks and the reality or existence of the pandemic itself [47]. Emotional components are more frequent in false anti-vaccine messages and help propagate them faster and to more people on social media than true ones [48,49]. Consumers of such information often feel torn between the quantity of perceived negative emotional anti-vaccine messages, and the sparsity of complex and factual pro-vaccine arguments. In such conflicting situations, some people can opt for the status quo, naturally choose inaction, and end up remaining unvaccinated [50,51].

Those most vulnerable to misconceptions about vaccinations are those who tend to rely on social media for information, have low levels of health literacy, and often question the legitimacy of science and medical authorities [40,52]. Osteopathic practitioners could play a central role in recognising patients fears, help solve potential misconceptions, and have patients make an informed decision about vaccination. Given the seemingly quick development of vaccines, plus the lack of specialist vaccine technical knowledge of osteopaths, it is understandable that practitioners have questions and concerns. Before endorsing their role as advocates, it is important for osteopaths to recognise and understand the grounding of their own position towards vaccination. Like any other healthcare professionals, osteopaths are also inclined to be vulnerable to confirmation bias (increased affinity for information that confirms prior beliefs), false-cause fallacy (seeing causes in correlations), cognitive dissonance (resolving conflicting thoughts by ignoring one aspect), heuristic bias (giving undue weight to certain arguments over others), and bias of omission (holding beliefs even in the absence of evidence) [37].

### **Osteopathy's history and theory - a context for vaccine hesitancy**

Osteopathy's history, inception and professionalisation may offer some possible reasons as to why some osteopaths may hold negative views towards vaccines. A T Still founded osteopathy in the late 1800s, in the midwestern USA. It is widely claimed osteopathy arose, in part, as a response to the crude practice of medicine at the time and in particular following the tragic death of three of Still's children from spinal Meningitis [53]. It is reported that Still felt 'philosophically divorced' from orthodox medicine, and developed osteopathy in response to the perceived failings of medicine at the time, viewing osteopathy as a profession philosophically underpinned by the body's natural healing capacity [54]. Needless to say, osteopathy and 19th century medicine 'got off on the wrong foot' and this early mistrust of medicine may have contributed to the development of negative views towards medical interventions and propagation of osteopathy-centric ideologies which continue to be held by some osteopaths over 100 years later [55,56], and possibly 'primed' some osteopaths (and possibly vicariously their patients) [18] to engender vaccine hesitant views, despite Still's beliefs arising from the context, limitations and knowledge of the time.

The epistemology of osteopathy (i.e. the types of knowledge which informs practice and the ways that this knowledge can be generated or 'known') [57] has been considered to lean towards positivism, [58]; inasmuch as practice appears to emphasise biomedical-dualist knowledge [59]. Such forms of knowledge include anatomy, physiology and biomechanics relating to the patient's body, which can be identified and causally affected by osteopaths through manual therapy techniques. This sets up a 'biomedical paradox', where other (i.e., 'non-osteopathic') interventions (such as vaccines) which are underpinned by similar biomedical assumptions are rejected on account for being the 'wrong type of biomedicalism' because they have been derived from and delivered by medicine. Looking further into osteopathic traditional principles and epistemology, there are obvious examples of edicts which would appear to be compatible with vaccine hesitant views (such as vaccines are 'unnatural' [37]), 'the human body provides *all* the chemicals necessary for the needs of tissues and organs' (stress added) [60], and evidence that Still positioned osteopathy as being opposed to vaccination [61]. That said, the extent to which these traditional concepts and principles feature in the clinical reasoning and practice of osteopaths in modern times varies [62].

### **Osteopaths' attitudes towards regulation, public health and evidence-based guidance**

Contemporary evidence suggests some osteopaths are resistant or reluctant to adopt evidence-based guidance for musculoskeletal complaints and this reticence may provide an insight into the possible reasons for vaccine hesitancy amongst osteopaths. For example, [56,63] have reported that some osteopaths feel that traditional osteopathic theory and principles takes precedence over evidence-based guidance for back pain. Osteopaths' professional views and identities [64] may also be a reason as to why some practitioners are hesitant in regard to vaccines. For example, some osteopaths have conceptions of practice which prioritise traditional osteopathic knowledge and skills [58,65] excluding other forms of knowledge from outside the discipline. Further, practitioners may feel vaccines are not aligned with the original values and principles as espoused by Still and other early practitioners of 19<sup>th</sup> century osteopathy. For some, these anachronistic values appear to be compatible with common fallacies which consider vaccines to be 'unnatural' (and therefore harmful) or a mistrust of the medical and pharmaceutical industries [37].

A national mixed-methods study into osteopaths' attitudes towards regulation from the United Kingdom [66] show strong professional beliefs amongst some osteopaths such as 'osteopathic practice is distinctive' and is 'unique from other health care professions' and that some practitioners see themselves as 'osteopaths first, and then as a healthcare professional'. These data seem to be confirmed elsewhere, such as continental Europe [67–70] and Quebec [71]. Here studies indicated that most practitioners believed that osteopathy should be regulated as a distinct health care profession. These combined with concerns that some osteopaths have that 'pharmaceutical' models of research and evidence does not fit with osteopathic holism practice [72]. Together with the common working context of osteopathic clinical practice in many countries, where the vast majority of practitioners work outside of the public health system (such as the UK NHS) in which there are accepted and expected behaviours, attitudes and values with regards to promoting

public health information, may all be forces which motivate osteopaths to hesitate with regards to the promotion of vaccines.

### **Professional obligations and expectations**

Most (if not all) standards of osteopathic practice globally are clear on the expectation that osteopaths advocate for public health and health promotion activities, and partner with patients to help them make decisions about their health [73,74]. Since the start of the pandemic, osteopathic regulators worldwide (for example [75–77] have outlined additional requirements and guidance (e.g. infection control measures) when working closely with patients during covid-19 pandemic.

In conjunction with a broader societal moral obligation to contribute to herd immunity through vaccination [78], osteopaths have a more local public health and ethical responsibility to protect their own patients by volunteering to receive any approved covid-19 vaccine (where vaccination is not medically contraindicated) to diminish the risk of transmission of the virus within the context of clinical osteopathic care [79]. Further to this, research indicates that vaccinated healthcare professionals are more likely to recommend vaccination to others [6]. Osteopaths should ensure they are ‘informed advocates’ during the covid-19 vaccine roll out and beyond [17]. This entails providing their patients with balanced views based on credible sources of information [80,81] rather than unscientific speculation, and erroneous inference from traditional dogma.

### **Summary**

The trusted role and professional standing that osteopaths have with their patients and within their wider communities requires that the information and messages they communicate are informed by and congruent with current evidence, public health guidance and scientific consensus. This expectation is even more critical during the covid-19 pandemic, particularly in relation to sharing information and decisions with patients regarding vaccination. All osteopaths have a social, moral and professional duty to contribute to the prevention of the transmission of infectious diseases. Practitioners must be critically aware when traditional osteopathic theories, principles and ideology may appear to contradict public health advice. Osteopaths should correct erroneous reasoning, false claims or misleading messaging to ensure that their professional practice and advice follows the most robust and recent evidence, public health advice and regulatory requirements.

### **References**

1. Torales J, O’Higgins M, Castaldelli-Maia JM, Ventriglio A. The outbreak of COVID-19 coronavirus and its impact on global mental health. *Int J Soc Psychiatry*. 2020;66: 317–320.

2. Shaukat N, Ali DM, Razzak J. Physical and mental health impacts of COVID-19 on healthcare workers: a scoping review. *Int J Emerg Med*. 2020;13: 40.
3. Abrams EM, Szeffler SJ. COVID-19 and the impact of social determinants of health. *Lancet Respir Med*. 2020;8: 659–661.
4. Dai L, Gao GF. Viral targets for vaccines against COVID-19. *Nat Rev Immunol*. 2021;21: 73–82.
5. Tumban E. Lead SARS-CoV-2 Candidate Vaccines: Expectations from Phase III Trials and Recommendations Post-Vaccine Approval. *Viruses*. 2020;13. doi:10.3390/v13010054
6. Paterson P, Meurice F, Stanberry LR, Glismann S, Rosenthal SL, Larson HJ. Vaccine hesitancy and healthcare providers. *Vaccine*. 2016;34: 6700–6706.
7. Swiss Osteopathy Science Foundation. Osteo-Covid-19 : analyse de l'impact du Covid-19 sur l'activité des ostéopathes FSO. 2020 [cited 12 Feb 2021]. Available: <https://www.osteopathyfoundation.ch/en/research-works/published-research/-osteo-covid-19-analyse-de-limpact-du-covid-19-sur-lactivite-des-osteopathes-fso>
8. Institute of Osteopathy. In: Osteopaths working as vaccinators [Internet]. 2021 [cited 12 Feb 2021]. Available: <https://www.iosteopathy.org/news/osteopaths-working-as-vaccinators/>
9. Cain R. LETTER TO THE EDITOR. *J Am Osteopath Assoc*. 2020;120: 943–944.
10. UNICEF. In: Tracking anti-vaccination sentiment in Eastern European social media networks [Internet]. Apr 2013 [cited 12 Feb 2021]. Available: <https://www.unicef.org/eca/reports/tracking-anti-vaccination-sentiment-eastern-european-social-media-networks>
11. Draper-Rodi J, Vaucher P, Thomson OP. The importance of rigour in the reporting of evidence for osteopathic care in Covid-19 papers. *Explore*. 2020. doi:10.1016/j.explore.2020.12.004
12. Côté P, Bussièrès A, Cassidy JD, Hartvigsen J, Kawchuk GN, Leboeuf-Yde C, et al. A united statement of the global chiropractic research community against the pseudoscientific claim that chiropractic care boosts immunity. *Chiropr Man Therap*. 2020;28: 21.
13. Axén I, Bergström C, Bronson M, Côté P, Nim CG, Goncalves G, et al. Misinformation, chiropractic, and the COVID-19 pandemic. *Chiropr Man Therap*. 2020;28: 65.
14. Esparza J, Nitsche A, Damaso CR. Beyond the myths: Novel findings for old paradigms in the history of the smallpox vaccine. *PLoS Pathog*. 2018;14: e1007082.
15. Larson HJ, Jarrett C, Eckersberger E, Smith DMD, Paterson P. Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: a systematic review of published literature, 2007-2012. *Vaccine*. 2014;32: 2150–2159.
16. Wolfe RM, Sharp LK. Anti-vaccinationists past and present. *BMJ*. 2002;325: 430–432.
17. Poland GA, Jacobson RM. Understanding those who do not understand: a brief review of the anti-vaccine movement. *Vaccine*. 2001;19: 2440–2445.
18. Hornsey MJ, Lobera J, Díaz-Catalán C. Vaccine hesitancy is strongly associated with distrust of conventional medicine, and only weakly associated with trust in alternative medicine. *Soc Sci Med*. 2020;255: 113019.



19. MacDonald NE, SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: Definition, scope and determinants. *Vaccine*. 2015;33: 4161–4164.
20. Godlee F. What should we do about vaccine hesitancy? *BMJ*. 2019;365. doi:10.1136/bmj.l4044
21. Larson HJ, de Figueiredo A, Xiahong Z, Schulz WS, Verger P, Johnston IG, et al. The State of Vaccine Confidence 2016: Global Insights Through a 67-Country Survey. *EBioMedicine*. 2016;12: 295–301.
22. Robertson E, Reeve KS, Niedzwiedz CL, Moore J, Blake M, Green M, et al. Predictors of COVID-19 vaccine hesitancy in the UK Household Longitudinal Study. *bioRxiv. medRxiv*; 2021. doi:10.1101/2020.12.27.20248899
23. Mahase E. Covid-19: UK government asks regulator to assess Oxford vaccine as questions are raised over interim data. *BMJ*. 2020;371: m4670.
24. Mahase E. Covid-19: Medical community split over vaccine interval policy as WHO recommends six weeks. *BMJ*. 2021;372: n226.
25. WHO. In: COVID-19 vaccines [Internet]. 2021 [cited 12 Feb 2021]. Available: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines>
26. COCONEL Group. A future vaccination campaign against COVID-19 at risk of vaccine hesitancy and politicisation. *Lancet Infect Dis*. 2020;20: 769–770.
27. Palamenghi L, Barello S, Boccia S, Graffigna G. Mistrust in biomedical research and vaccine hesitancy: the forefront challenge in the battle against COVID-19 in Italy. *Eur J Epidemiol*. 2020;35: 785–788.
28. Dror AA, Eisenbach N, Taiber S, Morozov NG, Mizrahi M, Zigran A, et al. Vaccine hesitancy: the next challenge in the fight against COVID-19. *Eur J Epidemiol*. 2020;35: 775–779.
29. Lee CHJ, Sibley CG. Attitudes toward vaccinations are becoming more polarized in New Zealand: Findings from a longitudinal survey. *EClinicalMedicine*. 2020;23: 100387.
30. Paul E, Steptoe A, Fancourt D. Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. *The Lancet Regional Health - Europe*. 2021;1: 100012.
31. Organization WH, Others. Benchmarks for training in osteopathy. *Benchmarks for training in osteopathy. pesquisa.bvsalud.org*; 2010. pp. 23–23.
32. Bryden GM, Browne M, Rockloff M, Unsworth C. Anti-vaccination and pro-CAM attitudes both reflect magical beliefs about health. *Vaccine*. 2018;36: 1227–1234.
33. Nichols T. *The Death of Expertise: The Campaign against Established Knowledge and Why it Matters*. Oxford University Press; 2017.
34. Ullsch B, Damm O, Beutels P, Bilcke J, Brügggenjürgen B, Gerber-Grote A, et al. Methods for Health Economic Evaluation of Vaccines and Immunization Decision Frameworks: A Consensus Framework from a European Vaccine Economics Community. *Pharmacoeconomics*. 2016;34: 227–244.
35. Hornsey MJ, Harris EA, Fielding KS. The psychological roots of anti-vaccination attitudes: A 24-

- nation investigation. *Health Psychol.* 2018;37: 307–315.
36. Motta M, Callaghan T, Sylvester S. Knowing less but presuming more: Dunning-Kruger effects and the endorsement of anti-vaccine policy attitudes. *Soc Sci Med.* 2018;211: 274–281.
  37. Stolle LB, Nalamasu R, Pergolizzi JV Jr, Varrassi G, Magnusson P, LeQuang J, et al. Fact vs Fallacy: The Anti-Vaccine Discussion Reloaded. *Adv Ther.* 2020;37: 4481–4490.
  38. Davis R, Campbell R, Hildon Z, Hobbs L, Michie S. Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health Psychol Rev.* 2015;9: 323–344.
  39. DeStefano F, Shimabukuro TT. The MMR Vaccine and Autism. *Annu Rev Virol.* 2019;6: 585–600.
  40. Hart J, Graether M. Something's Going on Here. *Journal of Individual Differences.* 2018;39: 229–237.
  41. Hervé C, Laupèze B, Del Giudice G, Didierlaurent AM, Tavares Da Silva F. The how's and what's of vaccine reactogenicity. *NPJ Vaccines.* 2019;4: 39.
  42. McLendon J, Rogers MAM. The fear of needles: A systematic review and meta-analysis. *J Adv Nurs.* 2019;75: 30–42.
  43. Mouchet J, Salvo F, Raschi E, Poluzzi E, Antonazzo IC, De Ponti F, et al. Hepatitis B vaccination and the putative risk of central demyelinating diseases - A systematic review and meta-analysis. *Vaccine.* 2018;36: 1548–1555.
  44. Goullé J-P, Grangeot-Keros L. Aluminum and vaccines: Current state of knowledge. *Med Mal Infect.* 2020;50: 16–21.
  45. Nuzhath T, Tasnim S, Sanjwal RK, Trisha NF, Rahman M, Mahmud SMF, et al. COVID-19 vaccination hesitancy, misinformation and conspiracy theories on social media: A content analysis of Twitter data. *SocArXiv.* 2020. doi:10.31235/osf.io/vc9jb
  46. François G, Duclos P, Margolis H, Lavanchy D, Siegrist C-A, Meheus A, et al. Vaccine safety controversies and the future of vaccination programs. *Pediatr Infect Dis J.* 2005;24: 953–961.
  47. Agle J, Xiao Y. Misinformation about COVID-19: evidence for differential latent profiles and a strong association with trust in science. *BMC Public Health.* 2021;21: 89.
  48. Okuhara T, Ishikawa H, Okada H, Ueno H, Kiuchi T. Dual-process theories to counter the anti-vaccination movement. *Prev Med Rep.* 2020;20: 101205.
  49. Vosoughi S, Roy D, Aral S. The spread of true and false news online. *Science.* 2018;359: 1146–1151.
  50. Damman OC, Hendriks M, Rademakers J, Delnoij DMJ, Groenewegen PP. How do healthcare consumers process and evaluate comparative healthcare information? A qualitative study using cognitive interviews. *BMC Public Health.* 2009;9: 423.
  51. Samuelson W, Zeckhauser R. Status quo bias in decision making. *J Risk Uncertain.* 1988;1: 7–59.
  52. Dubé E, Laberge C, Guay M, Bramadat P, Roy R, Bettinger J. Vaccine hesitancy: an overview. *Hum Vaccin Immunother.* 2013;9: 1763–1773.

53. Lewis JR. *AT Still: From the Dry Bone to the Living Man*. Dry Bone Press; 2012.
54. Stark JE. An historical perspective on principles of osteopathy. *Int J Osteopath Med*. 2013;16: 3–10.
55. Grundy M, Vogel S. Attitudes towards prescribing rights: a qualitative focus group study with UK osteopaths. *Int J Osteopath Med*. 2005;8: 12–21.
56. Figg-Latham J, Rajendran D. Quiet dissent: The attitudes, beliefs and behaviours of UK osteopaths who reject low back pain guidance - A qualitative study. *Musculoskelet Sci Pract*. 2017;27: 97–105.
57. Fish D, Coles C, editors. *Developing professional judgement in health care : learning through the critical appreciation of practice*. Oxford; Boston, Butterworth-Heinemann.; 1998.
58. Thomson OP, Petty NJ, Moore AP. A qualitative grounded theory study of the conceptions of clinical practice in osteopathy - a continuum from technical rationality to professional artistry. *Man Ther*. 2014;19: 37–43.
59. Tyreman S. Re-evaluating “osteopathic principles.” *Int J Osteopath Med*. 2013;16: 38–45.
60. Seffinger M, H. King, Ward R, J J, Rogers F, Patterson AM. Osteopathic philosophy. In: Ward R, editor. *Foundations for osteopathic medicine*. Philadelphia, Lippincott Williams & Wilkins; 2003. pp. 3–18.
61. Still AT. *Osteopathy, Research and Practice*. CreateSpace Independent Publishing Platform; 1910.
62. Kasiri-Martino H, Bright P. Osteopathic educators’ attitudes towards osteopathic principles and their application in clinical practice: A qualitative inquiry. *Man Ther*. 2016;21: 233–240.
63. Inman J, Thomson OP. Complementing or conflicting? A qualitative study of osteopaths’ perceptions of NICE low back pain and sciatica guidelines in the UK. *Int J Osteopath Med*. 2019;31: 7–14.
64. Alvarez G, Van Biesen T, Roura S. Professional identity in the evolution of osteopathic models: Response to Esteves et al. *Int J Osteopath Med*. 2020;36: 58–59.
65. Thomson OP, Petty NJ, Moore AP. Osteopaths’ professional views, identities and conceptions – A qualitative grounded theory study. *Int J Osteopath Med*. 2014;17: 146–159.
66. McGivern et al. In: *Research to promote effective regulation* [Internet]. 2015 [cited 12 Feb 2021]. Available: <https://www.osteopathy.org.uk/news-and-resources/research-surveys/gosc-research/research-to-promote-effective-regulation/>
67. Cerritelli F, Consorti G, van Dun PLS, Esteves JE, Sciomachen P, Valente M, et al. The Italian Osteopathic Practitioners Estimates and RATES (OPERA) study: How osteopaths work. *PLoS One*. 2020;15: e0235539.
68. Alvarez G, Roura S, Cerritelli F, Esteves JE, Verbeeck J, van Dun PLS. The Spanish Osteopathic Practitioners Estimates and RATES (OPERA) study: A cross-sectional survey. *PLoS One*. 2020;15: e0234713.
69. Cerritelli F, van Dun PLS, Esteves JE, Consorti G, Sciomachen P, Lacorte E, et al. The Italian

- Osteopathic Practitioners Estimates and RATES (OPERA) study: A cross sectional survey. *PLoS One*. 2019;14: e0211353.
70. van Dun PLS, Nicolaie MA, Van Messem A. State of affairs of osteopathy in the Benelux: Benelux Osteosurvey 2013. *Int J Osteopath Med*. 2016;20: 3–17.
  71. Morin C, Aubin A. Primary reasons for osteopathic consultation: a prospective survey in Quebec. *PLoS One*. 2014;9: e106259.
  72. McGivern et al. In: Research to promote effective regulation [Internet]. 2015 [cited 12 Feb 2021]. Available: <https://www.osteopathy.org.uk/news-and-resources/research-surveys/gosc-research/research-to-promote-effective-regulation/>
  73. GOsC. In: Updated osteopathic practice standards [Internet]. 2018 [cited 14 Feb 2021]. Available: <https://www.osteopathy.org.uk/news-and-resources/document-library/osteopathic-practice-standards/updated-osteopathic-practice-standards/>
  74. Osteopathy Board of Australia. In: Capabilities for osteopathic practice [Internet]. 2019 [cited 13 Feb 2021]. Available: <https://www.osteopathyboard.gov.au/Codes-Guidelines/Capabilities-for-osteopathic-practice.aspx>
  75. General Osteopathic Council. General Osteopathic Council. In: Interim guidance on infection control in osteopathy during COVID-19 pandemic [Internet]. 5 Jan 2021 [cited 12 Feb 2021]. Available: <https://www.osteopathy.org.uk/news-and-resources/document-library/about-the-gosc/interim-guidance-on-infection-control/>
  76. Unité pour l'Ostéopathie. In: Continuité des soins ostéopathiques en cabinets libéraux en stade 3 épidémique du COVID-19 [Internet]. 4 May 2020 [cited 12 Feb 2021]. Available: <https://ogi.osteopathe-syndicat.fr/upload/files/Recommandations-UPO-Covid-19-V-4mai2020.pdf>
  77. Registro de Osteópatas de España. In: Biosecurity and COVID-19 [Internet]. 3 Apr 2020 [cited 12 Feb 2021]. Available: [https://www.osteopatas.org/ficheros/BIOSEGURIDAD\\_Y\\_COVID-19\\_ROE\\_12-4.pdf](https://www.osteopatas.org/ficheros/BIOSEGURIDAD_Y_COVID-19_ROE_12-4.pdf)
  78. Giubilini A, Douglas T, Savulescu J. The moral obligation to be vaccinated: utilitarianism, contractualism, and collective easy rescue. *Med Health Care Philos*. 2018;21: 547–560.
  79. Theodoridou M. Professional and ethical responsibilities of health-care workers in regard to vaccinations. *Vaccine*. 2014;32: 4866–4868.
  80. CDC. Ensuring the safety of COVID-19 vaccines in the United States. 5 Feb 2021 [cited 13 Feb 2021]. Available: <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/safety.html>
  81. Public Health England. COVID-19 vaccination: easy-read resources. GOV.UK; 8 Jan 2021 [cited 13 Feb 2021]. Available: <https://www.gov.uk/government/publications/covid-19-vaccination-easy-read-resources>

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