International Journal of Osteopathic Medicine (2014) xxx, xxx–xxx

ELSEVIER

International Journal of Osteopathic Medicine

www.elsevier.com/ijos

SHORT REVIEW

Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings

Torsten Liem*

Osteopathie Schule Deutschland GmbH, Mexikoring 19, 22297 Hamburg, Germany

Received 28 November 2013; revised 18 April 2014; accepted 20 April 2014

KEYWORDS
Osteopathy;
Perception;
Diagnostic palpation;
Interpretation of palpatory findings;
Pareidolia;
Cognitive ease;
Perceptual bias;
Intuition;
Inattentional blindness

Abstract Palpation is the cornerstone of osteopathic diagnosis and treatment and the major building block of clinical decision making within osteopathy. It depends not only on the interpretation of palpatory sensations, but the perception process itself can be affected by many factors that mostly act on the subconscious of the palpating individual. Palpation is a complex process and influenced by previous experiences, the type of information to collect as well as the context in which it takes place. Hence, the various influences that shape the perception and interpretation of palpatory findings may create challenges when treating a patient.

Amongst other factors, such as the previously described multisensory integration of both vision and haptic information, diagnostic palpation can be experienced and interpreted based on additional influences, such as habitual and context-related influences, as well as cultural and social imprinting. This article reviews and explores these factors as potential pitfalls with regards to the osteopathic palpatory approach and in light of the available osteopathic research evidence. Other literature from the field of neuroscience and psychology, where relevant, has also been explored. Awareness of these challenges and pitfalls may result in more adequate palpation procedures and enhance competence in palpation practice.

Introduction

Diagnostic palpation skills are the major building blocks of osteopathic practice and clinical decision making, being essential to evaluate somatic

* Tel.: +49 (40) 64415690; fax: +49 (40) 644156910.
E-mail addresses: tliem@osteopathie-schule.de, tliem@torstenliem.de.

http://dx.doi.org/10.1016/j.ijosm.2014.04.005
1746-0689/

Please cite this article in press as: Liem T, Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings, International Journal of Osteopathic Medicine (2014), http://dx.doi.org/10.1016/j.ijosm.2014.04.005

dysfunctions, hence setting the groundwork for the treatment of the patient.[1–3] Therefore, diagnostic palpation is considered an important part of an osteopath's clinical competence profile but is also seen as one of the hardest clinical skills to develop, teach, and assess.[3] However, palpation as a process is complex and involves many types of knowledge, motor skills, perceptual skills, and a therapeutic attitude.[1] Palpation generally depends on an individual person's perception and is influenced by previous experiences and prior knowledge as well as the type of information to collect, and the context in which it takes place.[1,4] Only the context of the whole body structure gives meaning to local palpatory findings, because not only the interpretation of such findings, but palpatory perception itself is context-dependent.

The two components of palpation have previously been described as comprising of a motor component, in which the practitioner acts on the patient's tissue as well as the perceptual component, with which the practitioner assesses and feels the state of the patient's tissues.[1] The perceptual component is of subjective nature and characterised as a multidimensional experience, varying according to factors like visualisation process, emotional state, cognitive factors, and perceptual mechanisms and their dimensions.[1,5] However, objectively presenting tissue facts and their subjective interpretation are inseparably, but not inextricably linked. The reality of tissue and patient are always seen through the eyes of the perceiving osteopath. Thus, in the author's opinion, all perception is interpretation, although not open to arbitrary interpretation.

Osteopathic palpation is a complex process which, from the author's point of view, requires confidence in one's own abilities, but most often can be flawed by an arbitrary subjective approach, referring to inner perceptions, thoughts, sensations and associations an osteopathic practitioner may have during palpation, which generally is seen as a process of evaluating something external.

Vision and haptics (tactile and proprioceptive information) have been shown to play a synergistic role in perceptual judgements requiring the use of palpation, as previous research in the field of cognitive neuroscience suggests.[4] Therefore, considering this reliance on palpation, osteopaths most likely use information conveyed by their senses to inform their diagnosis.[3] Diagnostic palpation has been suggested to involve the multisensory integration of both vision and haptic information, but in close relation to the assessment of the patients presenting symptoms and their medical history.[3]

An important framework for understanding the analytical and non-analytical processes likely to be associated with diagnostic palpation is the evidence from the dual process theories, which propose that decision making is underpinned by two distinct systems of judgement.[6,7] System one is described as an automatic, and intuitive mode of processing, hence performed rapidly, which shares commonalities with perception. Judgements in the context of clinical practice are typically made by pattern recognition.[6,8,9] In contrast, system two is an analytical, largely conscious and slow mode of processing which is used by practitioners, for example, when signs and symptoms are not easily recognised.[8,10]

The author of this review article proposes that palpatory perception and its interpretation may be subject to additional multiple conditioned experiences and influences, such as habitual and context-related influences, as well as cultural and social imprinting. The aim of this article is to review and discuss these additional influencing factors in light of available osteopathic and neuroscientific evidence, as well as identifying potential pitfalls that may be encountered while practising and interpreting palpation. Due to a lack of evidence on the topic within the osteopathic research literature, the author also has incorporated literature from the field of neuroscience and psychology where relevant, in order to familiarise the reader with the context and background of the described phenomena.

Habitual influences

Pareidolia

Humans have the natural tendency to attach meaning to accidental scenarios, i.e. perceiving familiar structures even where they are not existent. This is known as pareidolia, a type of perception in which a vague or obscure stimulus — i.e. subtle textures under the skin — is perceived as if it was actually clear and distinct, indicating the human ability to make meaning out of the random. Pareidolia is a subconscious illusion involving a vague and random stimulus being perceived as significant.[11] Osteopaths – e.g. while interpreting palpatory findings – may also be prone to it. They most likely will develop a preference for expected patterns and tend to reject those that contradict their assumptions. Palpating practitioners often think they may be feeling things under their hands that may not actually be there. This is because the human mind tends to see what it expects or wants to see.

Please cite this article in press as: Liem T, Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings, International Journal of Osteopathic Medicine (2014), http://dx.doi.org/10.1016/j.ijosm.2014.04.005

This argument can strongly be linked to the concept of confirmation bias, the tendency of people to favour information that confirms their beliefs or hypotheses.[12] Confirmation bias is only one of a number of cognitive biases, however, to date, there has been little research on the role of these biases in clinical decision-making.[8,13,14]

Within the context of osteopathic palpation, a good example is the palpation of the rhythm of the cerebrospinal fluid. No practitioner has been shown to detect that rhythm reliably; palpation reliability studies in the cranial area could not find satisfactory agreement between findings of different examiners.[15–17] This does not necessarily mean that the treatment that is administered is ineffective. However, it seems hardly to be possible to apply even a highly effective palpation-led treatment process if one cannot even be sure whether the structure or phenomenon that is supposed to be treated can be reliably detected.[18] It is important to acknowledge the reliability of palpation as a diagnostic tool, as osteopaths rely on it so heavily. Unfortunately, previous systematic reviews have suggested that palpatory diagnosis generally fails to demonstrate clinically acceptable levels of reliability,[19–21] with reliability defined as either inter-rater reliability; the amount of agreement between two or more raters, or intra-rater reliability; the amount of agreement made by a single rater after multiple repetitions.

Cognitive ease

In order to become convinced that one's own view is the true perspective, all it takes is cognitive ease — in other words, people tend to think of something as true if it is easily recognisable. Individuals are easily convinced that something is true as long as they are able to comprehend the situation easily and no contradictory or concurrent point of view is perceived. Cognitive ease is the mental state in which "things are going well — no threats, no major news, no need to redirect attention or mobilise effort".[22]

Often, teachers try to generate such conditions when introducing students to certain palpation methods. One example is the introduction to Fryette's laws. It is remarkable how, during a training session, osteopathy students apply these effortlessly to the lower thoracic or lumbar vertebral column during their treatment, with positive results — even where studies have shown that these underlying models are challenged by conflicting results.[23–25] It is all the more surprising that, according to the author's experience, students are usually led to believe during their osteopathic palpation training that their tutor is able to confirm or reject their palpation results on what is known as cranial rhythm or even more questionable anatomical detail at microscopic level. In this context, the tutor is attributed the role of intermediate tester for reliable and accurate feedback, assuming that the teacher is a valid reference standard and that the criterion of accuracy has been established for this "diagnostic test" when, in fact, it has not. In a lecture, a student might extract knowledge from information made available by the lecturer. The completeness of the given information is rarely questioned. This is why cognitive ease is no guarantee that the scenario believed to be true is in fact true. Additionally, one-sided information not only may have a strong impact on judgement, but also that someone exposed to one-sided information only will most likely be much more certain in their judgement than those exposed to two different or concurrent perspectives.[26,27]

Context-related influences

Perceptual bias

Group-dynamic processes and social pressure may not only shape our truths and beliefs, but also our perception — in this case our palpatory perception. A dominant scenario and context may play an important role in the shaping of perception as demonstrated by a study which explored perceptions of the impact of negatively valued physical characteristics on social interaction.[28] Study participants were led to believe that they were perceived as physically deviant in the eyes of an interactant when in fact they were not. Participants who thought that they possessed negatively valued physical characteristics found strong reactivity to the deviance in the behaviour of their interactant, whereas those with a more neutrally valued characteristic did not. The authors concluded that perceptual bias could account for these results.[28] Likewise, experiments by Asch[29] and Berns et al.[30] demonstrate how other people's answers can produce changes in one's own perception.

Within the osteopathic teaching context, tutors are experienced clinicians with specialist interests in various areas of osteopathic care, who may influence the way in which students interpret their findings. Esteves and Spence point out that tutors typically examine the model themselves,

Please cite this article in press as: Liem T, Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings, International Journal of Osteopathic Medicine (2014), http://dx.doi.org/10.1016/j.ijosm.2014.04.005

and subsequently provide the students with an interpretation of their own findings.[3] This approach may enable the students to have a frame of reference for their own findings, but it also may nevertheless be responsible for a premature use of non-analytical processing in diagnostic palpation.[3] Consequently, students may start developing heuristics strategies (i.e., shortcuts) in their clinical examination before they have sufficient knowledge, skills, and experience to interpret their findings, which may contribute to the poor reliability of diagnostic palpation.[3] One way to overcome this challenge may be non-judgemental palpation classes and free discussion amongst students, as recently suggested in a study on current best practice of teaching palpation in osteopathic education, based on the consensus of expert osteopath palpation teachers.[2]

Moreover, social pressure, group thinking and group context may change not only our judgment on our perception, but perception itself. The way how other people around us perceive things will most likely shape our own perception.

Particularly important within the osteopathic teaching process, likeable traits in a teacher are intuitively extrapolated and transferred to the contents of what the teacher is teaching. Charismatic teachers may more likely to be able to hamper the analytical abilities of their students.[31] It is conceivable that similar processes may be at work when in certain osteopathic tutorials speculative approaches are accepted unquestioned by participants, although there may not be a single study to support these claims. However, increased instructor fluency may only be accompanied by an increase in perception of learning rather than an increase of the actual learning itself, compared to a disfluent instructor, indicating that students' perceptions of their own learning and an instructor's effectiveness appear to be based on lecture fluency and not on actual learning.[32]

Intuition

It seems to be not uncommon to find students who report that their tutors on occasion, are unable to explain their clinical findings and decision making process, and that some of their decisions are primarily based on clinical intuition.[3] The intuitive system can recognise relationships and put together information, but it is, for example, unable to handle purely statistical data. Our associative memory is constantly generating a model of our environment. It registers changes or deviations within seconds or milliseconds and provides interpretations and causal explanations. The intuitive system helps us to make sense of the world without always having to make the effort of thinking through every single situation we encounter. Its impressive ability to recognise patterns is automatic and usually subconscious.

According to the dual process theory, which provides a framework for human judgement and decision making, the intuitive system (System one) is highly contextualised.[7] Hence, the recognition of similarities between previously made diagnoses and novel clinical problems is likely to be associated with this automatic, intuitive and unconscious system. In the majority of cases, the quick recognition of particular patient features tends to activate a pattern, and judgements are therefore rapid, automatic and intuitive.[8] In clinical practice, ongoing exposure to clinically relevant diagnostic cues may enable practitioners to automatically recognise patterns of dysfunction.[8]

In a recently published article Sidler explores the phenomenon of intuition during osteopathic palpation.[33] Intuition is described as giving a qualitative insight into the patients' body that is more than receptors on fingers and hands can transfer.[33] It is argued that unconscious perceptual processes can influence the perception and behaviour of the palpating osteopath, hence a particular "feeling" can instantly occur to the treating practitioner. In particular situations, a seemingly brief and subtle touch can be the basis for a decision subsequently made.[33] One possible reason may be the action of so called mirror neurons. Mirror neurons are a class of neurons, originally discovered in the premotor cortex of monkeys, that discharge both when individuals perform a given motor act and when they observe others perform that same motor act. The human mirror neuron system is involved in understanding others' actions and their intentions behind them, and it underlies mechanisms of observational learning.[34–36] The "mirror mechanism" enables individuals to understand the meaning of actions done by others, their intentions, and their emotions.[37] During osteopathic palpation, the mirror neurons possibly may simulate the condition of the patient, i.e. dysfunctions in thorax or abdomen, hence generating an inner perspective that enables an intuitive understanding of the patient.[33] However, it is important to consider the limitations of intuitive stimuli, the osteopath may well

Please cite this article in press as: Liem T, Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings, International Journal of Osteopathic Medicine (2014), http://dx.doi.org/10.1016/j.ijosm.2014.04.005

be able to relate to the conditions and feelings of the patient, but intuition will not be able to exactly picture the anatomical structures of the patient, hence enabling to diagnose cancer or other disease processes.[33] Furthermore, an extensive prior knowledge and mental reference library of the osteopath is usually required, since without this knowledge no adequate meaning can be allocated to the perceived information.[33]

Inattentional blindness

The term "inattentional blindness" was initially introduced to describe the results of extensive studies of the visual perception of unexpected objects.[38] Inattentional blindness is the failure to notice an unexpected stimulus that is in one's field of vision when other attention-demanding tasks are being performed. It is categorised as an attentional error and is not associated with any vision deficits.[39]

During palpation, osteopaths typically may expect to recognise patterns that will, in turn, point them to certain patterns of dysfunction. This, however, may also be the cause of many erroneous responses — leading to wrong assumptions and causal interpretations. Simons and Chabris demonstrated how objects that move directly through our centre of attention may still go unrecognised, depending on whether we focus our attention on them, which may have an impact on our perception.[39]

Within the osteopathic context of palpation, it may be highly relevant where the attention of the palpating osteopath is directed to. During palpation, much information is generated which never reach the osteopath's conscious mind. Sidler comments on the practical approach of directing attention to different areas of the body during assessment, hence minimising the danger of inattentional blindness.[33]

Cultural and social influences

In order to perceive and interpret the world, cultural conditioning may also have an important influence, as demonstrated by the Pepsi Paradox, where blinded study participants preferred the taste of Pepsi® when confronted with unlabelled Coca Cola® or Pepsi®, but conversely almost all preferred Coca Cola® when the beverages were labelled.[40]

All cultures have systems of health beliefs to explain what causes illness, how it can be cured or treated, and who should be involved in the process. Within the osteopathic concept, the practitioner may be influenced by their cultural views, for example, on the subject of diagnosis, which may provide a cultural expression of what society is prepared to accept as normal and what it feels should be treated. A qualitative interview study with 44 manual practitioners who regularly treat back pain patients revealed that they perceived their role as giving ergonomic, postural and exercise based advice, but were more reluctant to address psychosocial problems related to back pain.[41] A common view was that patients' reluctance to take a break from work impacted badly on their condition, and many practitioners advocated a short time off work duties to focus on rehabilitation.[41]

With regards to perception and interpretation of palpation, the author speculates that it may be highly relevant which osteopathic concepts are taught to students, and this will vary not only between osteopathic educational institutions within one country, but also across different countries which may lead to different trends in diagnoses articulated. Particularly in the context of language and communication, i.e. through research articles or conference talks, and inter-rater reliability studies, these differences may propose a challenge to overcome.

Conclusion

How to translate an inherently subjective phenomenon such as perception into a system that is reproducible and can be distinctly defined will remain a challenge that most likely can never be satisfactorily resolved for those exercising palpation, yet it must be addressed through the way osteopaths approach their patients. Thus, the various influences shaping the perception and interpretation of palpation may create pitfalls when treating a patient. By the same token, the subjective approach enables us to build a sympathetic relationship with our patients. By sympathising and resonating, osteopaths interact with the whole dynamic entity, including tissue, that is the patient. Knowing about the pitfalls and subconscious processes, becoming aware of them and dealing with them consciously may result in more adequate palpation procedures and enhance competence in palpation practice. Much needed additional research on the topic could lead to a greater understanding of these influencing factors, thus increasing the inter-reliability between professionals.

Please cite this article in press as: Liem T, Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings, International Journal of Osteopathic Medicine (2014), http://dx.doi.org/10.1016/j.ijosm.2014.04.005

Statement of competing interests

The author declares that he has no competing interests.

Author contribution statement

TL wrote the first and final draft of the manuscript.

Acknowledgements

The author would like to thank Anne Jakel for critically reviewing the revised version of the manuscript.

References

1. Aubin A, Gagnon K, Morin C. The seven-step palpation method: a proposal to improve palpation skills. *Int J Osteopath Med* 2013;**17**:66—72.
2. Browning S. An investigation into the current practices and educational theories that underpin the teaching of palpation in osteopathic education: a Delphi Study. *Int J Osteopath Med* 2014;**17**:5—11.
3. Esteves JE, Spence C. Developing competence in diagnostic palpation: perspectives from neuroscience and education. *Int J Osteopath Med* 2013;**17**:52—60.
4. Ernst MO, Bulthoff HH. Merging the senses into a robust percept. *Trends Cogn Sci* 2004;**8**:162—9.
5. Dror IE. Perception is far from perfection: the role of the brain and mind in constructing realities. *Behav Brain Sci* 2005;**28**:763.
6. Kahneman D. A perspective on judgment and choice: mapping bounded rationality. *Am Psychol* 2003;**58**:697—720.
7. Stanovich KE, West RF. Individual differences in reasoning: implications for the rationality debate? *Behav Brain Sci* 2000;**23**:645—65.
8. Croskerry P. A universal model of diagnostic reasoning. *Acad Med* 2009;**84**:1022—8.
9. Evans JS. Dual-processing accounts of reasoning, judgment, and social cognition. *Annu Rev Psychol* 2008;**59**:255—78.
10. Croskerry P. Clinical cognition and diagnostic error: applications of a dual process model of reasoning. *Adv Health Sci Educ Theory Pract* 2009;**14**:27—35.
11. Voss JL, Federmeier KD, Paller KA. The potato chip really does look like Elvis! Neural hallmarks of conceptual processing associated with finding novel shapes subjectively meaningful. *Cereb Cortex* 2012;**22**:2354—64.
12. Oswald ME, Grosjean S. Confirmation bias. In: Pohl RF, editor. *Cognitive illusions: a handbook on fallacies and biases in thinking*. Hove, UK: Psychology Press; 2004. pp. 79—96.
13. Bordage G. Why did I miss the diagnosis? Some cognitive explanations and educational implications. *Acad Med* 1999;**74**:S138—43.
14. Bornstein BH, Emler AC. Rationality in medical decision making: a review of the literature on doctors' decision-making biases. *J Eval Clin Pract* 2001;**7**:97—107.
15. Hartman SE, Norton JM. Interexaminer reliability and cranial osteopathy. *Sci Rev Altern Med* 2002;**6**:23—34.
16. Moran RW, Gibbons P. Intraexaminer and interexaminer reliability for palpation of the cranial rhythmic impulse at the head and sacrum. *J Manip Physiol Ther* 2001;**24**:183—90.
17. Sommerfeld P, Kaider A, Klein P. Inter- and intraexaminer reliability in palpation of the "primary respiratory mechanism" within the "cranial concept". *Man Ther* 2004;**9**:22—9.
18. Resch KL, Liem T. Kraniosakral — Mythen und Fakten. *Dtsch Z für Osteopat* 2004;**4**:6—9.
19. Haneline MT, Young M. A review of intraexaminer and interexaminer reliability of static spinal palpation: a literature synthesis. *J Manip Physiol Ther* 2009;**32**:379—86.
20. Seffinger MA, Najm WI, Mishra SI, Adams A, Dickerson V, Murphy M, et al. Reliability of spinal palpation for diagnosis of back and neck pain: a systematic review of the literature. *Spine (Phila Pa 1976)* 2004;**29**:E413—25.
21. Stochkendahl MJ, Christensen HW, Hartvigsen J, Vach V, Haas M, Hestbaek L, et al. Manual examination of the spine: a systematic critical literature review of reproducibility. *J Manip Physiol Ther* 2006;**29**:475—85.
22. Kahneman D. *Thinking fast and slow*. New York: Farrar, Strauss and Giroux; 2011. p. 59.
23. Cook C. Coupling behavior of the lumbar spine: a review of the literature. *J Man Manip Ther* 2003;**11**:137—45.
24. Legaspi O, Edmond SL. Does the evidence support the existence of lumbar spine coupled motion? A critical review of the literature. *J Orthop Sports Phys Ther* 2007;**37**:169—78.
25. Sizer Jr PS, Brismee JM, Cook C. Coupling behavior of the thoracic spine: a systematic review of the literature. *J Manip Physiol Ther* 2007;**30**:390—9.
26. Baron J. Myside bias in thinking about abortion. *Think Reason* 1995;**1**:221—35.
27. Brenner LA, Koehler DJ, Tversky A. On the evaluation of one-sided evidence. *J Behav Decis Mak* 1996;**9**:59—70.
28. Kleck RE, Strenta A. Perceptions of the impact of negatively valued physical characteristics on social integration. *J Personal Soc Psychol* 1980;**39**:861—73.
29. Asch SE. Opinions and social pressure. *Sci Am* 1955;**193**:31—5.
30. Berns GS, Chappelow J, Zink CF, Pagnoni G, Martin-Skurski M, Richard J, et al. Neurobiological correlates of social conformity and independence during mental rotation. *Biol Psychiatry* 2005;**58**:245—53.
31. Schjoedt U, Stodkilde-Jorgensen H, Geertz AW, Lund TE, Roepstorff A. The power of charisma—perceived charisma inhibits the frontal executive network of believers in intercessory prayer. *Soc Cogn Affect Neurosci* 2011;**6**:119—27.
32. Carpenter SK, Wilford MM, Kornell N, Mullaney KM. Appearances can be deceiving: instructor fluency increases perceptions of learning without increasing actual learning. *Psychon Bull Rev* 2013;**20**:1350—6.
33. Sidler S. How do the fingers see? Unconscious perception as a basis of intuition. *Osteopat Med* 2013;**14**:14—9.
34. Cattaneo L, Rizzolatti G. The mirror neuron system. *Arch Neurol* 2009;**66**:557—60.
35. Rizzolatti G, Craighero L. The mirror-neuron system. *Annu Rev Neurosci* 2004;**27**:169—92.
36. Rizzolatti G. The mirror neuron system and its function in humans. *Anat Embryol Berl* 2005;**210**:419—21.
37. Rizzolatti G, Craighero L. Mirror neuron: a neurological approach to empathy. In: Changeux JP, Damasio AR,

Please cite this article in press as: Liem T, Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings, International Journal of Osteopathic Medicine (2014), http://dx.doi.org/10.1016/j.ijosm.2014.04.005

Singer W, editors. *Neurobiology of human values*. Berlin-Heidelberg: Springer-Verlag; 2005. pp. 107—23.
38. Mack A. Inattentional blindness: looking without seeing. *Curr Dir Psychol Sci* 2003;**12**:180—4.
39. Simons DJ, Chabris CF. Gorillas in our midst: sustained inattentional blindness for dynamic events. *Perception* 1999;**28**:1059—74.
40. McClure SM, Li J, Tomlin D, Cypert k, Montague L, Montague P. Neural correlates of behavioral preference for culturally familiar drinks. *Neuron* 2004;**44**:379—87.
41. Pincus T, Woodcock A, Vogel S. Returning back pain patients to work: how private musculoskeletal practitioners outside the national health service perceive their role (an interview study). *J Occup Rehabil* 2010;**20**:322—30.

Please cite this article in press as: Liem T, Pitfalls and challenges involved in the process of perception and interpretation of palpatory findings, International Journal of Osteopathic Medicine (2014), http://dx.doi.org/10.1016/j.ijosm.2014.04.005