Please be aware your membership certificate is enclosed in your envelope

Hands-on, hands-off

InTouch

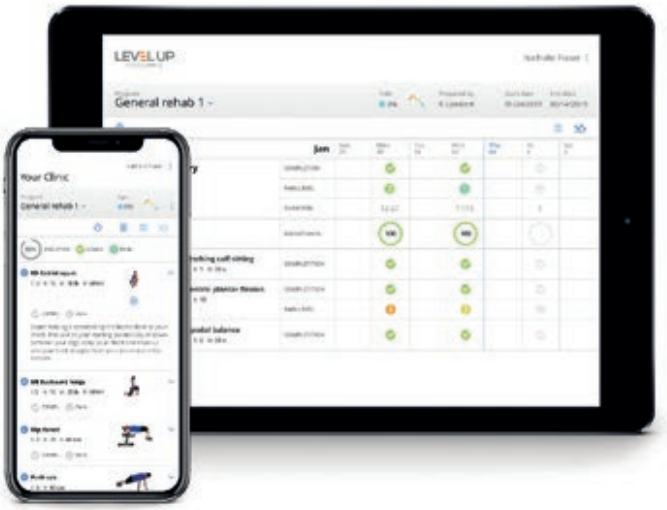
PHYSIO FIRST EST. 1952

NEW WEBSITE.
COMMUNICATION STARTS NOW !

BOOST YOUR PATIENTS' ENGAGEMENT

Your patients will love how our sleek and interactive home exercise program supports them throughout their journey. From motivating patients to fulfill their exercise goals to helping them overcome challenges, Physiotec boosts engagement and drives results.

- Share with your patients and track their progress
- Perfect printouts



PROGRAM BUILDING IS EASIER THAN EVER

With Physiotec, you can modify exercises quickly and easily. You want each exercise program to be clear and inspiring, but you have less than a minute to create it. We get it. Our system is designed based on feedback from therapists spanning more than two decades. It's intuitive, efficient and highly customizable.

- Simple and flexible program design
- Streamline your workflow
- Beautiful, on any device

0203 286 5865
www.physiotec.co.uk

PHYSIOTEC

Editorial

Quality first

Our core clinical competencies, such as anatomical knowledge, clinical reasoning, manual therapies, exercise prescription and biopsychosocial understanding have always defined us as physiotherapists and, alongside these skills, critical thinking is central to the development of our profession as a whole. A therapist's unbounded paradigm is necessary to enable us to incorporate new ideas and (re)define old values. It is easy to see how these domains dovetail and, when used in conjunction with one another, can make us expert clinicians able to deliver quality physiotherapy to be proud of.

As the incoming Editor of *In Touch* I am writing this, my first editorial, following our very successful 2019 Physio First conference where it became obvious to me that being either only a "hands on", or a "hands off" physiotherapist; a choice usually steered by some underlying preference of the therapist themselves, potentially limits us to treatment based on the results of random controlled trials (RCTs), rather than treating the "person in front of you", i.e. n=1, to the level they seek, and to the level they deserve. You don't need to take my word for it as the articles in this edition, kindly written for us by contributors to our conference and experts in their field, demonstrate this position far better than I can.

In addition to addressing our conference theme of "Hands On, Hands Off", our speakers also gave us some excellent new insights into their expertise. Antonio Stecco's presentation on the fascia was a particularly enjoyable way to enhance our knowledge of another important facet of our profession.

Physio First members are defined by quality. Our organisation has, for many years, driven the quality narrative, from the first standardised data collection scheme developed in 2004, to our Quality Assured Practitioner (QAP) and Clinic (QAC) kite marks that we are working towards today.

In Touch has a part to play in this quality ethos by providing evidence-based articles that are written by experts, and that aim to enhance our professional skills which, as far as I am concerned, should include our critical thinking.

Please enjoy this edition, hopefully the content will spark discussions with your colleagues and if you feel you would like to, please share that feedback with us. Let's continue to move our profession forward!

Until next time…

TOBIAS BREMER | MSc MCSP | EDITOR

Contents

Editorial Panel

TOBIAS BREMER EDITOR
editor@physiofirst.org.uk

HELENA BOUGHTON
EDITORIAL ADMINISTRATOR
helena.boughton@physiofirst.org.uk

COVER AND CONFERENCE ROUND UP IMAGES:
© Mike Urwin Photography
www.mikeurwinphotography.co.uk

Hands-on, hands-off: is that even a thing?

ROGER KERRY PhD
Associate Professor, Division of Physiotherapy Education, University of Nottingham

This article provides a critical appraisal of the debate about "hands-on or hands-off". It is important for individual clinicians and the broader profession, to understand the multiple dimensions through which this debate should take place. Arguments "against" and "for" the retention of "hands-on" physiotherapy are presented with reference to population data, social media dialogue, and sociocultural perspectives. Readers will understand the nuances and complexities of such a debate, as well as being informed about the latest scientific evidence and theories regarding the use of touch in physiotherapy.

LEARNING OUTCOMES
TO SUPPORT PHYSIO FIRST QAP

1 Understand a broader dialogue about evidence-based physiotherapy practice in relation to decisions about treatment.
2 Evaluate clinical reasoning within a multi-dimensional evidence-based framework.
3 Appreciate the strengths and limitations of a range of evidence sources.

Introduction

The "hands-on, hands-off" debate is well rehearsed and tired. It presents a dichotomy which is essentially false and distracts from more urgent questions about our profession. However, the continued emergence of data, social media commentary, and viewpoints from outside the profession make it worthwhile to re-examine some central issues about professional practice and identity. This article presents extracted arguments for and against hands-on interventions such as manual therapy. Conclusions are based on the limited utility of appealing to scientific population data in this instance, and a sociocultural perspective on the threats and opportunities of abandoning, or not, hands-on approaches.

The arguments for abandoning hands-on interventions

There is little explicit debate within the academic literature on why hands-on therapies should be abandoned. Some of what does exist comes in the guise of adjacent, but different, arguments such as the trends in bio versus psychosocial approaches to healthcare as investigated by Hancock *et al* (2011), which assume, perhaps, that a psychosocial approach is not accepting of hands-on interventions. Debates about proportionality of bio, psycho, and social components of healthcare are not the same as ones about hands-on versus hands-off. Judicious use of hands-on can form part of multifactorial pain and disability management (Lluch Girbes *et al* 2015; Louw *et al* 2017). There is some early interesting, but very limited, attention to the dichotomy which considers the impact of what a profession does on its public-facing identity (Bakker 1993); a point I will return to later.

Jull & Moore (2012) provoked some insightful discussion by highlighting polarisation of the profession with regards to the debate, enticing varied comments from the likes of Jones (2012), Zusman (2013), and Edwards & Jones (2013). The academic debate offers an informed stance by highlighting the equivocal nature of data, the challenges to traditionally accepted mechanisms, and re-focus on fundamental clinical reasoning processes. Conclusions towards the abandonment or otherwise of manual therapy are far from reached. The essence of the debate does not, therefore, seem to stem from peer-reviewed academic sources. Instead, it would seem that it can be traced to social media.

Lackovic *et al* (2017) suggest that social media should be considered as an important and serious professional tool to facilitate dialogue and education, and that to dismiss it would only serve to restrict professional growth and development. Undoubtedly, there is explicit and focused commentary on the debate, namely from Meakins (2017, 2018a, 2018b, 2019), and the core arguments against the use of manual therapy made here are useful to structure further attention. In short, it seems that the main social media driven arguments are:
1. manual therapy offers "low-value" treatment with a high placebo content
2. manual therapy is harmful and / or disempowers patients.

There are also subsidiary arguments, such as "we do not know the mechanisms of manual therapy", the "variability between practitioners", the "non-specific effects", and the "high placebo content", etc. Many of these points have already been

"THE ESSENCE OF THE HANDS-ON, HANDS-OFF DEBATE WOULD SEEM TO BE TRACED TO SOCIAL MEDIA"

graciously addressed, for example by Langridge (2018) within the social media domain. Langridge's succinct responses highlight that the arguments are not differentiating to any other physiotherapy intervention, about which evidence commonly shows small to moderate effect sizes; relies on placebo to maximise effectiveness; and fails to provide sufficient detail of mechanisms. The mechanisms debate has also been addressed in greater depth by others including Zusman (2010, 2011) and Lascurain-Aguirrebena *et al* (2016).

These alone are not convincing arguments to abandon a discrete therapeutic intervention, otherwise all interventions would need to be abandoned. They are, however, worthy of continued discussion, so I would like to add to existing commentary by briefly taking each of these points in turn.

1. *Manual therapy offers "low-value" treatment with a high placebo content.*
In essence, this argument is about comparative effectiveness of the intervention, something that is best sought by high-quality randomised controlled trials (RCTs). By definition of their underpinning methodological groundings, RCTs are conducted to test the effectiveness of interventions whose effects cannot be seen by "lesser" methods (Howick 2011), e.g. observation studies, case series, clinical observations, etc. If an effect was large, i.e. smoking causing cancer, parachutes saving lives, etc. (ibid), it would be visible outside of RCTs and therefore have no need to be subjected to RCT testing. So, calling for the abandonment of an intervention based on small effect sizes is not a robust call. What would be a stronger argument is that if manual therapy consistently showed a trend towards no, or negative, effects in conducted RCTs.

While I make no claims to provide a comprehensive or formal review, it is useful to look at the general trend of outcomes from contemporary systematic reviews and meta-analyses concerning manual therapy interventions. A quick search of reviews from the past five years shows that the pattern and general trend of outcomes in manual therapy trials is, again, far from consistent. For example, since 2014 there have been 13 systematic reviews published investigating the comparative effectiveness of hands-on interventions across a range of neuromusculoskeletal conditions. Of these, seven showed positive effects of manual therapy (Pollack *et al* 2018; Xu *et al* 2017; Hidalgo *et al* 2017; Gomes-Neto *et al* 2017; Gebremariam *et al* 2014; Page *et al* 2014; Lozano Lopez *et al* 2016), four reported inconclusive findings (Hall *et al* 2016; de Luca *et al* 2017; Hidalgo *et al* 2017; Wang *et al* 2015), and two showed negative effects, i.e. no better than compassion (Fredin & Loras 2017; Bizzarri *et al* 2018).

Of course, value also implies cost-effectiveness. A general lack of homogeneity in the available literature makes it difficult for truly valid comparisons to be made among the various cost-effectiveness studies (Harper *et al* 2017). However, the cost-effectiveness of manual therapy has been demonstrated. The addition of manual therapy to an exercise package, for example, has been shown to improve clinical outcomes, cost-effectiveness, and lower total societal costs when compared to supervised and / or home exercise alone (Bove *et al* 2018; Leininger *et al* 2016). A recent network analysis of trials reported that in those with low risk of bias, manual therapy was a comparatively cost-effective non-pharmacological intervention for people with knee osteoarthritis (Woods *et al* 2017). Additionally, the most recent comprehensive systematic review on the cost-effectiveness of manual therapy for a broad range of musculoskeletal conditions reported that manual therapy has some cost advantages when compared to a range of other interventions, including exercise and advice to remain active (Tsertsvadze *et al* 2014). For people with sub-acute and chronic neck pain, however, no clear total societal cost and effect differences between manual therapy and usual physical therapy were found, leading to the conclusion that "the decision about what intervention to administer, reimburse and / or implement can be based on the preferences of the patient and the decision-maker at hand" (van Dongen *et al* 2016). Of course, this is just a snapshot of recent cost-effectiveness data and if hands-on interventions were truly of low value, cost-wise, there would, by now, be visible emerging trends in the data in that direction. As it stands, there are no such trends.

2. *Manual therapy is harmful and / or disempowers patients.*
Again, much of this assertion rests on how we are defining words such as "harm". The Health Foundation, UK states:

"The simplest definition of harm in healthcare is a negative effect, whether or not it is evident to the patient" (The Health Foundation 2011)

There are formal ways of recording harm in healthcare (Rozental *et al*

"IF HANDS-ON INTERVENTIONS WERE OF LOW VALUE, COST-WISE, THERE WOULD BE VISIBLE EMERGING TRENDS IN THE DATA"

2016; Duggan *et al* 2014). However, these methods are not evident in physiotherapy, least of all manual therapy. Better reporting is called for, which is a sentiment supported both by Carlesso *et al* (2010) and Kranenburg *et al* (2017). It remains difficult, despite attempts having been made within the discipline of physiotherapy, to understand in essence whether manual therapy is harmful or not. With regard to the most obvious focus for consideration, i.e. the cervical spine, a brief summary of existing data, e.g. Carnes *et al* (2010) and Vogel *et al* (2013), suggests that mild-to-moderate benign adverse events are common, that serious events are rare and, compared to alternative pain management options, these are acceptable risks. A recent international survey looking at adverse events in physiotherapy students acting as models for manual therapy practice reported 40% of all responders experiencing mild effects, most resolving within 24 hours (Thoomes-de Graaf *et al* 2017). It is also proposed that, even though the risk of harm is very small, there are ways that manual therapists can further mitigate potential adverse events (Hutting *et al* 2018), with around half of all events being preventable (Puentedura *et al* 2012).

It is interesting that the narrative about harm is often conflated with disempowerment and is one that has been discussed repeatedly both in social media, e.g. Kerry (2018) and Taylor (2018), and in academia, e.g. Zadro *et al* (2018). The logic here is to suggest that disempowerment is harmful, and that passive interventions such as manual therapy can cause this to happen, therefore clearly suggesting a causal association between passive intervention and disempowerment. To defend this position, studies such as Darlow *et al* (2018) and Smith *et al* (2018) are often referred to as evidence of harm and / or disempowerment. These studies, among others, report on the patient's experience of feeling disempowered as a result of the actions of therapists, with passive interventions often cited as the culprit. This is a rich and important insight into people's health beliefs, but it is not evidence of causation. There are no data of the necessary type – i.e. drawn from RCTs – which support a causal effect between passive interventions and disempowerment.

The arguments against manual therapy are provocative and a well-timed stimulus for personal and professional reflection and reconsideration of our activities. Putting forward these arguments does, however, highlight that appealing purely to published population data on therapeutic effectiveness and harm cannot be the method by which we make a conclusive decision on whether or not to abandon hands-on interventions. A reasonable summary of the totality of evidence in these areas would generally support the continued, judicious use of hands-on interventions, at the very least, and would demonstrate that statements such as: "I don't think manual therapy should be part of our profession at all. Physiotherapy is striving to be a respected evidenced-based healthcare profession, to do this we need to recognise what is high-value cost-effective treatment and what isn't. Manual therapy isn't" (Meakins 2019) are empirically wrong.

The arguments for hands-on interventions

It is clear that the decision-making and information gathering processes needed to make a reasonable argument in a hands-on, hands-off debate are far more nuanced and complex than simply appealing to, and applying, population data. Both as a profession, and as individual clinicians, we should be mindful of not trying to over-defend our treatment approach based on reasons such as "I've always done it", "it's what I was taught", "I've seen it work", "it's what the patient wants" etc. We know these are not valid professional standpoints. In the absence of hard data to force a decision, we need to look elsewhere. There are two arguments that hold some substance for continuing the use of hands-on interventions, or at least deepening the discussion on it:

1. *Hands-on interventions can be re-conceptualised in the presence of contemporary pain science.*
As a reaction to both emerging pain science data and theory, as well as a contemporary re-focus on biopsychosocial healthcare, attempts have been made to re-conceptualise what we think of as hands-on interventions, or manual therapy specifically, e.g. Puentedura & Flynn (2016), Coronado & Bialosky (2017), Rabey *et al* (2017).

Puentedura & Flynn (2016) highlight that the most recent systematic review on pain neuroscience education (PNE) reports that the effectiveness of PNE for a range of outcomes is enhanced with the addition of "tissue focused" interventions such as manual therapy. Accordingly, they develop a thesis whereby, counterintuitively, hands-on therapies can have an integral role in PNE. This thesis considers manual therapy as having a "bottom-up" approach to modulate central processing and outputs; enhancing patients' expectations, and somatosensory cortex (body schema) re-mapping.

In an editorial, Coronado & Bialosky (2017) summarise a global attempt to re-conceptualise the position of manual therapy in the management of people with chronic pain. They first highlight the lack of importance of traditional features of manual therapy, such as "proper technique selection" and

> "IT IS DIFFICULT TO UNDERSTAND WHETHER MANUAL THERAPY IS HARMFUL OR NOT"

"precise implementation" to "correct peripheral impairment". These are old and irrelevant dimensions of the application of manual therapy. A new paradigm for manual therapy should embrace the known complexities and multidimensional aspects of pain. Such a "comprehensive" approach would see hands-on interventions as positively reinforcing key aspects of the patient's encounter and painful experience such as preferences, expectations, outcome assessments and, importantly, shared decision making, which should not be confused with acquiescence.

Finally, Rabey *et al* (2017) again highlight the limitations of the therapist relying on traditionally grounded palpation skills and interpretation of joint dysfunctions, clinical tests which have known poor validity and reliability, etc. While acknowledging the most likely short-lived, moderate effects of manual therapy, they still see an important role for its judicious inclusion in person-specific encounters, whereby it may enhance central, neurological components of a painful experience, and contribute towards functional, pain-free movement. Manual therapy, they claim, should be considered in a broader, multidimensional clinical reasoning framework.

In the same way that our understanding and reconceptualising of other dimensions of painful experiences has advanced, the notion of hands-on should, and can, be reconceptualised and re-tested in appropriately designed clinical trials. There seems to be some future for hands-on in a contemporary, multidimensional, biopsychosocial healthcare approach.

2. *Hands-on interventions are socio-culturally integral to our professional identity.*
Recently, my colleague Fiona Moffatt and I presented a commentary on the role of touch in physiotherapy through a contemporary sociocultural lens (Moffatt & Kerry 2018). The reason for this was by no means to support the unjustified continued use of tired hands-on approaches in physiotherapy. In fact, we clearly conclude that "The profession's rich history of 'holding on at all costs' to the idea of touch now seems to do us no favours" (ibid p189). Rather, our intent was to cast a social perspective on the historical picture of therapeutic touch, the role it has in our professional identity and possible social and professional consequences of its abandonment.

Although the detail of this work is framed in deep sociological notions (sociology of consumption, for those interested), the fundamental argument is quite straightforward; touch has had an urgent role in the identity of the profession from its very beginnings, it defines who we are. Touch is an essential sense, "the most perfect sense" (Aristotle) to the physical, sociocultural, and psychological wellbeing of the human. Within contemporary society (late modernity), citizens juxtapose touch as a consumer health technology, seeking it out in a crowded marketplace. However, there is a "crisis" at hand which may significantly challenge the physiotherapy profession's use of touch; evidence-based healthcare. This has the not yet realised potential, as summarised earlier, to displace the role of therapeutic touch in the alliance between practitioners and their consumers.

We envisage that, in the light of the hands-on, hands-off argument, there are three options available to the physiotherapy profession, as illustrated in figure 1.

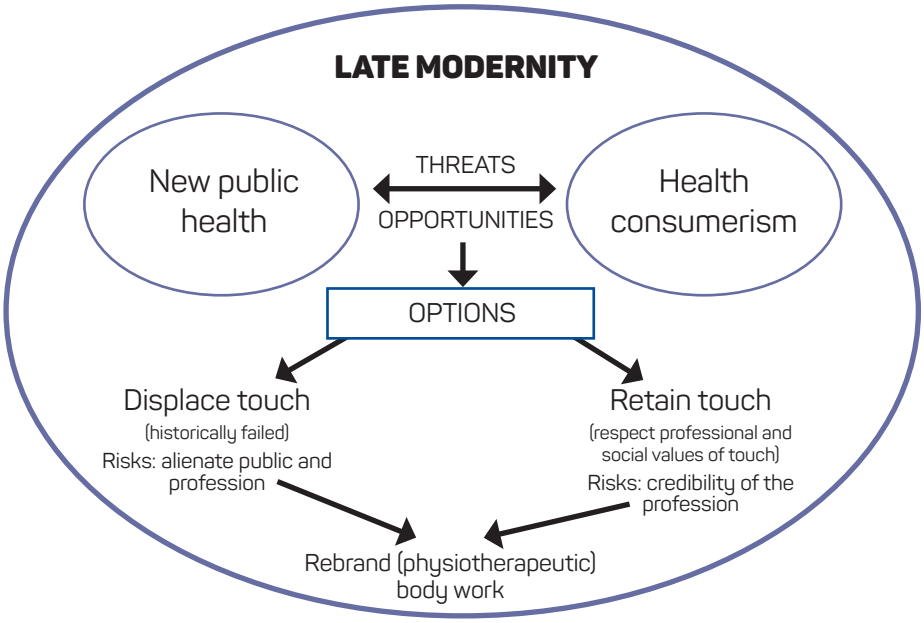


FIGURE 1: Options for the future framing of touch in physiotherapeutic work. Reproduced with permission (Moffatt & Kerry 2018)

First, we respect the professional and social values of touch and elect to retain it in all its therapeutic guises as a principal component of the physiotherapist's approach to treatment management. The implicit risk here, however, is that having aligned physiotherapy with a commitment to a particular type of evidence-based practice, we jeopardise our credibility within the wider scientific and healthcare community.

The second alternative is to accept the abandonment of all non-evidenced therapeutic touch as a treatment option. However, historical precedents suggest that advocating this abandonment of touch will be unsuccessful and has the potential to alienate a considerable proportion of physiotherapists, as well as the general public / health consumers (Owen 2014).

The third option offers a reconciliatory position. Re-branding physiotherapeutic touch and re-defining sociocultural conceptions could be valuable, and this

re-conceptualisation would encompass touch in a range of iterations, i.e. treatment to the body by the health consumer themselves by way of physical activity / self-management programmes, treatment facilitated remotely via tele-rehabilitation, and treatment that entails the clinician physically touching the patient (Moffat & Kerry 2018). This third option acknowledges that touch is an important part of the identity of the physiotherapy profession and consumer preference, and therefore prevents it from being displaced by evidence whilst still creating space for interventions that are therapeutically effective. This sociocultural position aligns well to existing thoughts on the re-conceptualisation of manual therapy, as set out earlier in this article. Many physiotherapists will already recognise this approach in their practice, but our challenge here is to complete the re-conceptualisation process en masse.

Conclusion

The physiotherapy profession has arguably more important things to debate than such a false dichotomy as "hands-on or hands-off". However, this debate does give the opportunity to explore some central issues about what we do, e.g. the state of the science, professional impact, sociocultural context, etc. Appealing to scientific and population data is not, at this present time, sufficient to decide whether or not the physiotherapy profession should abandon hands-on interventions. If anything, it continues to support their use in many clinical areas. Social media-fuelled arguments for the abandonment of manual therapy are, in the main, non-differentiating, non-evidence based, and vacuous. However, social media is serving to be a useful platform to continue with these debates. Socio-cultural perspectives on this issue raise important questions for the profession in terms of its identity and its place in a new public health, consumerist environment.

As an example of a hands-on approach, there seems to be potential to re-conceptualise the meaning of manual therapy and its role in a broader, evidence-based, multidimensional and biopsychosocial healthcare approach.

The concept of hands-on, hands-off as a dichotomous debate is not really a thing at all. Exploring our personal and professional nuances, complexities, threats, and opportunities, however, probably is.

CONTACT DETAILS
Tel: +44(0)115 8231790
Fax: +44(0)115 8231791
roger.kerry@nottingham.ac.uk

About the author

Roger Kerry is a chartered physiotherapist and Associate Professor at the University of Nottingham, UK. His clinical, research, and teaching interests include adverse events of physiotherapy; clinical reasoning; running rehabilitation; and the philosophy of evidence-based healthcare. He is UK lead for the Norwegian Research Council CauseHealth project, which investigates the nature of science within healthcare, and a founding member of the Critical Physiotherapy Network.

References

Bakker E. Hands Off or Hands On! *Physiotherapy*, 1993;79(9):654

Bizzarri P, Buzzatti L, Cattrysse E, Scafoglieri A. Thoracic manual therapy is not more effective than placebo thoracic manual therapy in patients with shoulder dysfunctions: a systematic review with meta-analysis. *Musculoskeletal Science and Practice* 2018;331-10

Bove AM, Smith KJ, Bise CG, Fritz JM, Childs JD, Brennan GP, Abbott JH, Fitzgerald GK. Exercise, manual therapy, and booster sessions in knee osteoarthritis: cost-effectiveness analysis from a multicenter randomized controlled trial. *Physical Therapy* 2018;98(1)16-27

Carlesso LC, Gross AR, Santaguida PL, Burnie S, Voth S, Sadi J. Adverse events associated with the use of cervical manipulation and mobilization for the treatment of neck pain in adults: a systematic review. *Manual Therapy* 2010;15(5):434-44

Carnes D, Mars TS, Mullinger B, Froud R, Underwood M. Adverse events and manual therapy: a systematic review. *Manual Therapy* 2010;15(4):355-63

Coronado RA, Bialosky JE. Manual physical therapy for chronic pain: the complex whole is greater than the sum of its parts. *Manual & Manipulative Therapy* 2017;25(3)115-117

Darlow B, Brown M, Thompson B, Hudson B, Grainger R, McKinlay E, Abbott JH. Living with osteoarthritis is a balancing act: an exploration of patients' beliefs about knee pain. *BioMed Central Rheumatology* 2018;215

de Luca KE, Fang SH, Ong J, Shin KS, Woods S, Tuchin PJ. The effectiveness and safety of manual therapy on pain and disability in older persons with chronic low back pain: a systematic review. *Manipulative Physiological Therapy* 2017;40(7):527-534

Duggan C, Parry G, McMurran M, Davidson K, Dennis J. The recording of adverse events from psychological treatments in clinical trials: evidence from a review of NIHR-funded trials. *Trials* 2014;15335

Edwards I, Jones M. Movement in our thinking and our practice. *Manual Therapy*, 2013;18(2):93-95

Fredin K, Loras H. Manual therapy, exercise therapy or combined treatment in the management of adult neck pain; a systematic review and meta-analysis. *Musculoskeletal Science and Practice* 2017;3162-71

Gebremariam L, Hay EM, van der Sande R, Rinkel WD, Koes BW, Huisstede BM. Subacromial impingement syndrome--effectiveness of physiotherapy and manual therapy. *British Journal Sports Medicine* 2014;48(16):1202-1208

Gomes-Neto M, Lopes JM, Conceicao CS, Araujo A, Brasileiro A, Sousa C, Carvalho VO, Arcanjo FL. Stabilization exercise compared to general exercises or manual therapy for the management of low back pain: A systematic review and meta-analysis. *Physical Therapy in Sport* 2017:23136-23142

Hall H, Cramer H, Sundberg T, Ward L, Adams J, Moore C, Sibbritt D, Lauche R. The effectiveness of complementary manual therapies for pregnancy-related back and pelvic pain: a systematic review with meta-analysis. *Medicine (Baltimore)*, 2016;95(38):e4723

Hancock MJ, Maher CG, Laslett M, Hay E, Koes B. Discussion paper: what happened to the 'bio' in the bio-psycho-social model of low back pain? *European Spine Journal* 2011;20(12):2105-2110

Harper B, Jagger K, Aron A, Steinbeck L, Stecco A. A commentary review of the cost effectiveness of manual therapies for neck and low back pain. *Bodywork & Movement Therapy* 2017;21(3):684-691

The Health Foundation. Levels of harm [Online]. 2011; Available: https://www.health.org.uk/publications/levels-of-harm [Accessed 20th March 2019]

Hidalgo B, Hall T, Bossert J, Dugeny A, Cagnie B, Pitance L. The efficacy of manual therapy and exercise for treating non-specific neck

pain: a systematic review. *Back Musculoskeletal Rehabilitation* 2017;30(6):1149-1169

Howick J. *The Philosophy of Evidence-Based Medicine*. Chichester, BMJ Books 2011

Hutting N, Kerry R, Coppieters MW, Scholten-Peeters GGM. Considerations to improve the safety of cervical spine manual therapy. *Musculoskeletal Science & Practice* 2018;3341-3345

Jones LE. Hands on, hands off? *Musculoskeletal Science & Practice* 2012;17(5):e14

Jull G, Moore A. Hands on, hands off? The swings in musculoskeletal physiotherapy practice. *Manual Therapy* 2012;17(3):199-200

Kerry R. There is a crack, there is a crack in everything, that's how the (truth) gets in*: a (non) scientific conversation. 2018; Available at: https://wordpress.com/view/rogerkerry.wordpress.com [Accessed 20th March 2019].

Kranenburg HA, Lakke SE, Schmitt MA, van der Schans CP. Adverse events following cervical manipulative therapy: consensus on classification among Dutch medical specialists, manual therapists, and patients. *Manual & Manipulative Therapy* 2017;25(5):279-287

Lackovic N, Kerry R, Lowe R, Lowe T. Being knowledge, power and profession subordinates: students' perceptions of Twitter for learning. The Internet and Higher Education 2017;3341-3348

Langridge N. Reflections of a dinosaur: Big R's, the patient narrative and a final thought on myths in the debate on manual therapy. 2018; Available from: https://mattlowpt.wordpress.com/2018/10/11/reflections-of-a-dinosaur-big-rs-the-patient-narrative-and-a-final-thought-on-myths-in-the-debate-on-manual-therapy/ [Accessed 20th March 2019]

Lascurain-Aguirrebena I, Newham D, Critchley DJ. Mechanism of action of spinal mobilizations a systematic review. *Spine* 2016;41(2):159-172

Leininger B, McDonough C, Evans R, Tosteson T, Tosteson AN, Bronfort G. Cost-effectiveness of spinal manipulative therapy, supervised exercise, and home exercise for older adults with chronic neck pain. *Spine* 2016;16(11):1292-1304

Lluch Girbes E, Meeus M, Baert I, Nijs J. Balancing "hands-on" with "hands-off" physical therapy interventions for the treatment of central sensitization pain in osteoarthritis. *Manual Therapy* 2015;20(2):349-52

Louw A, Nijs J, Puentedura EJ. A clinical perspective on a pain neuroscience education approach to manual therapy. *Manual & Manipulative Therapy* 2017;25(3):160-168

Lozano Lopez C, Mesa Jimenez J, de la Hoz Aizpurua JL, Pareja Grande J, Fernandez de Las Penas C. Efficacy of manual therapy in the treatment of tension-type headache. A systematic review from 2000-2013. *Neurologia* 2016;31(6):357-69

Meakins A. Manual therapy SUCKS… 2017; Available from: https://thesports.physio/2017/09/29/manual-therapy-sucks/ [Accessed 20th March 2019]

Meakins A. Re-evaluating manual therapy… 2018a; Available from: https://thesports.physio/2018/03/31/re-evaluating-manual-therapy/ [Accessed 20th March 2019].

Meakins A. More manual therapy bickering… 2018b; Available from: https://thesports.physio/2018/06/23/more-manual-therapy-bickering/ [Accessed 20th March 2019].

Meakins A. Abandoning manual therapy… 2019; Available from: https://thesports.physio/2019/03/07/abandoning-manual-therapy/ [Accessed 20th March 2019]

Moffatt F, Kerry R. The desire for "hands-on" therapy – a critical analysis of the phenomenon of touch In: Gibston B, Synne Groven K, Nicholls D, Setchell J. (eds.) Manipulating practices: a critical physiotherapy reader. Cappelen Damm Akademisk, Oslo, Norway 2018

Owen G. Becoming a practice profession a genealogy of physiotherapy's moving/touching practices. PhD paper, University of Cardiff 2014; http://orca.cf.ac.uk/68522/

Page MJ, Green S, Kramer S, Johnston RV, McBain B, Chau M, Buchbinder R. Manual therapy and exercise for adhesive capsulitis (frozen shoulder). *Cochrane Database Systematic Reviews* 2014;(8):Cd011275

Pollack Y, Shashua A, Kalichman L. Manual therapy for plantar heel pain. *Foot* (Edinb) 2018;3411-3416

Puentedura EJ, Flynn T. Combining manual therapy with pain neuroscience education in the treatment of chronic low back pain: a narrative review of the literature. *Physiotherapy Theory & Practice* 2016;32(5):408-414

Puentedura EJ, March J, Anders J, Perez A, Landers MR, Wallmann HW, Cleland JA. Safety of cervical spine manipulation: are adverse events preventable and are manipulations being performed appropriately? A review of 134 case reports. *Manual & Manipulative Therapy* 2012;20(2):66-74

Rabey M, Hall T, Hebron C, Palsson TS, Christensen SW, Moloney N. Re-conceptualising manual therapy skills in contemporary practice. *Musculoskeletal Science & Practice* 2017;2928-2932

Rozental A, Kottorp A, Boettcher J, Andersson G, Carlbring P. Negative effects of psychological treatments: an exploratory factor analysis of the negative effects questionnaire for monitoring and reporting adverse and unwanted events. *PLoS One* 2016;11(6):e0157503

Smith BE, Moffatt F, Hendrick P, Bateman M, Rathleff MS, Selfe J, Smith TO, Logan P. The experience of living with patellofemoral pain-loss, confusion and fear-avoidance: a UK qualitative study. *British Medical Journal Open* 2018;8(1): e018624

Taylor A. The case of the 'sprained ankle': a reflection on the narrative of 'harm'. 2018; Available from: http://alteredhaemodynamics.blogspot.com/2018/05/ [Accessed 20t March 2019 2019]

Thoomes-de Graaf M, Thoomes E, Carlesso L, Kerry R, Rushton A. Adverse effects as a consequence of being the subject of orthopaedic manual therapy training, a worldwide retrospective survey. *Musculoskeletal Science & Practice* 2017;2920-2927

Tsertsvadze A, Clar C, Court R, Clarke A, Mistry H, Sutcliffe P. Cost-effectiveness of manual therapy for the management of musculoskeletal conditions: a systematic review and narrative synthesis of evidence from randomized controlled trials. *Manipulative Physiological Therapy* 2014;37(6):343-362

van Dongen JM, Groeneweg R, Rubinstein SM, Bosmans JE, Oostendorp RA, Ostelo RW, van Tulder MW. Cost-effectiveness of manual therapy versus physiotherapy in patients with sub-acute and chronic neck pain: a randomised controlled trial. *European Spine Journal* 2016;25(7):2087-2096

Vogel S, Mars T, Keeping S, Barton T, Marlin N, Froud R, Eldridge S, Underwood M, Pincus T. Clinical Risk Osteopathy & Management (CROAM) Scientific Report 2013; https://www.ncor.org.uk/wp-content/uploads/2013/05/croam_full_report_0313.pdf

Wang Q, Wang TT, Qi XF, Yao M, Cui XJ, Wang YJ, Liang QQ. Manual therapy for hip osteoarthritis: a systematic review and meta-analysis. *Pain Physician* 2015;18(6):E1005-1020

Woods B, Manca A, Weatherly H, Saramago P, Sideris E, Giannopoulou C, Rice S, Corbett M, Vickers A, Bowes M, MacPherson H, Sculpher M. Cost-effectiveness of adjunct non-pharmacological interventions for osteoarthritis of the knee. *PLoS One* 2017;12(3):e0172749

Xu Q, Chen B, Wang Y, Wang X, Han D, Ding D, Zheng Y, Cao Y, Zhan H, Zhou Y. The effectiveness of manual therapy for relieving pain, stiffness, and dysfunction in knee osteoarthritis: a systematic review and meta-analysis. *Pain Physician* 2017;20(4):229-243

Zadro JR, O'Keeffe M, Maher CG. Evidence-based physiotherapy needs evidence-based marketing. *British Journal of Sports Medicine* 2018;bjsports-2018-099749

Zusman M. There's something about passive movement. *Medical Hypotheses* 2010;75(1):106-110

Zusman M. Mechanism of mobilization. *Physical Therapy Reviews* 2011;16(4):233-236

Zusman M. Hands on, hands off? The swings in musculoskeletal physiotherapy practice. *Manual Therapy* 2013;18(3):e13

New insights into pain related changes in muscle behaviour revealed by high-density surface electromyography

DEBORAH FALLA BPhty (Hons) PhD
Chair in Rehabilitation Science and Physiotherapy. Director of the Centre of Precision Rehabilitation for Spinal Pain (CPR Spine). School of Sport, Exercise and Rehabilitation Sciences, College of Life and Environmental Sciences, University of Birmingham, UK

ALESSIO GALLINA PT PhD
Lecturer, Centre of Precision Rehabilitation for Spinal Pain (CPR Spine). School of Sport, Exercise and Rehabilitation Sciences, College of Life and Environmental Sciences, University of Birmingham, UK

High-density surface electromyography (HDEMG) is an electrophysiological technique that can be used to describe the activation of regions within muscles. When pain-free individuals perform sustained or repetitive tasks, a progressive recruitment of different regions within a muscle has been observed; this is thought to help redistribute the load to different regions, thus limiting fatigue. If people with musculoskeletal pain perform the same task however, HDEMG usually reveals that a smaller region of the muscle is activated, and that the same muscle region tends to be active throughout the whole task. This potentially results in a focal overload of a muscle region and may contribute to pain persistence and / or recurrence over time. Interestingly, not all patients with musculoskeletal pain present with this regional alteration in muscle activation, reflecting the heterogeneity of patient presentations. This article will review these findings from HDEMG studies with a focus on changes in the behaviour of the lumbar erector spine and upper trapezius in people with low back pain and neck pain respectively. Collectively, this work highlights that clinical studies are needed to investigate whether knowing if a patient with pain has reduced ability to redistribute muscle activation can inform prognosis or guide physiotherapy interventions.

LEARNING OUTCOMES
TO SUPPORT PHYSIO FIRST QAP

1 Appreciate the advantage of high-density surface electromyography (EMG) investigations over classic EMG approaches.
2 Appreciate the normal variability and non-uniformity of spinal muscle activity and how this is modified in people with spinal pain.

What is high-density surface electromyography?

Given the association between the neural input a muscle receives and the electrical voltage it generates, muscle activation and neuromuscular control strategies are commonly assessed using electromyography (EMG). This technique for the acquisition and analysis of myoelectric signals has contributed significantly to enhancing our understanding of the function and dysfunction of the neuromuscular system and has become an essential tool in musculoskeletal physiotherapy research.

Traditional bipolar surface EMG recordings are obtained using a pair of large electrodes, spaced at 20-30mm on the skin above the muscle of interest. This bipolar recording technique has a fairly large detection volume, meaning that the electrodes will be able to pick up electrical activity of muscle fibres spread in a large volume, possibly even outside the muscle of interest. This can be an issue when investigating the control of muscles relevant for low back and neck pain, e.g. differentiating the activation of the lumbar extensors at different spinal levels, or compartments within the trapezius may be difficult because of the poor selectivity of these conventional EMG techniques. Alternatively, selective recordings can be obtained using intramuscular EMG, which consists of placing wire electrodes percutaneously in the muscle region of interest. This technique gives highly detailed information on the electrical activity of the fibres in close proximity to the wire electrodes. However, investigating neuromuscular activation strategies of a number of regions would require the insertion of a large quantity of indwelling electrodes which is not feasible in most cases, given the invasive nature of the technique.

When investigating the activation of superficial muscle regions in close anatomical proximity, HDEMG offers a

> "HIGH-DENSITY SURFACE ELECTROMYOGRAPHY IS AN IDEAL TECHNIQUE TO INVESTIGATE PAIN-RELATED REDISTRIBUTION OF ACTIVATION BETWEEN REGIONS OF SUPERFICIAL MUSCLE GROUPS"

number of advantages compared to both conventional bipolar and indwelling EMG recordings (Merletti *et al* 2010). This technique consists of a large number of small surface electrodes, organised in a bidimensional "grid". For instance, 64 electrodes could be organised in eight rows and eight columns; if the electrodes are spaced at 10 mm this HDEMG recording system could be used to characterise the activation of superficial muscles in a squared area of 8x8 cm^2 (figure 1). The small electrode size and the small distance between the electrodes ensure that the EMG signal recorded by each electrode is mainly representative of the activation of the muscle fibres around it. The electrodes distributed over two dimensions enables the recording of the electrical voltage at a number of multiple skin locations at the same time, in a completely non-invasive way. Unlike classic bipolar surface EMG applications, HDEMG provides a topographical representation of EMG amplitude, and can identify relative adaptations in the intensity of activity within regions of the muscle. As it provides more selective recordings than conventional surface EMG over a large anatomical area potentially spanning several spinal levels, HDEMG is an ideal technique to investigate the pain-related redistribution of activation between regions of superficial muscle groups such as the erector spinae.

In addition to regional activation, recording EMG signals using more than a single pair of electrodes is advantageous even if the electrodes are positioned on the same muscle fibre group. Recordings of HDEMG with multiple electrodes placed along the muscle fibre direction will reveal similar signals, but will progressively shift in time along the muscle fibre direction (Masuda & Sadoyama 1988). This is because action potentials are generated at the innervation zone and propagate along the muscle fibres towards the tendons, hence the same potential is recorded by different electrodes at different times. This electrode configuration can provide an investigation of muscle fibre conduction velocity; an important parameter which can be used to quantify muscle fatigability (Andreassen & Arendt-Nielsen 1987; Falla *et al* 2003; Falla & Farina 2005). Further uses of HDEMG include the possibility to extract single motor unit activity in some muscles, obtaining direct information on the neural command to the muscle (Farina & Holobar 2016; Martinez-Valdes *et al* 2016) and anatomical information such as muscle fibre orientation (Lapatki *et al* 2006). Studies applying these techniques in people with spinal pain are currently in progress.

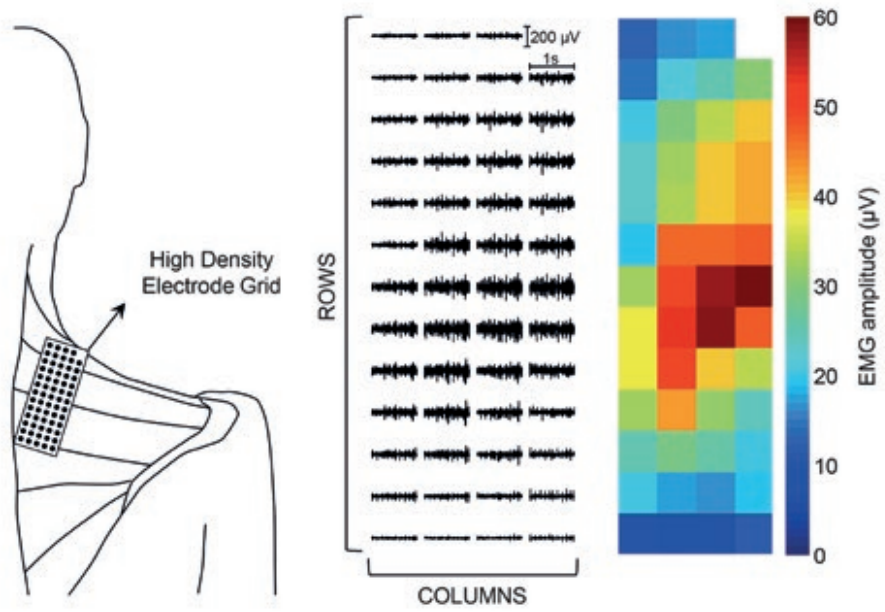


FIGURE 1: Example of regional activation within the trapezius muscle. Left: position of the high-density electromyography electrode grid. Middle: EMG signals collected by the different electrodes. Right: EMG amplitude distribution. The amplitude value (root mean square) of each channel is color-coded according to the bar on the right; the red/orange pixels in the middle rows of the grid indicate that the EMG amplitude is higher for the trapezius fibers under those electrodes compared to those in other muscle regions.

Non-uniform spatial distribution of muscle activity

One of the main indicators that can be estimated using HDEMG is the spatial distribution of EMG amplitude, which is a description of how the electrical voltage differs over the muscle and is often used to describe regional muscle activation. While this is possible in carefully designed studies, it should be kept in mind that non-uniform spatial distribution of EMG amplitude values can be explained by a variety of factors, some related to neuromuscular activation and some to muscle anatomy. For example, EMG signals collected by pairs of electrodes placed on the innervation zone can have amplitude even 75% lower than those collected on the same muscle fibre group, but 15mm away from the innervation zone (Gallina *et al* 2013a) and traditional bipolar signals were obtained from channels over and away from it; amplitude and mean frequency values were extracted and compared using an analysis of variance (ANOVA). Similarly, lower EMG amplitude values are observed if the electrodes are close to the muscle tendon, or if the pennation angle of the muscle fibres increases. The influence of anatomical factors is even

more important in the case of dynamic contractions, i.e. because of muscle contraction the innervation zone may shift under different electrodes when the joint angle changes (Gallina *et al* 2013a) and traditional bipolar signals were obtained from channels over and away from it; amplitude and mean frequency values were extracted and compared using an analysis of variance (ANOVA) or for large changes in the intensity of the contraction (Piitulainen *et al* 2009). This may result in large increases or decreases in EMG amplitude at different phases of the dynamic task or between force levels and may be erroneously interpreted as changes in neuromuscular activation. These anatomical factors should be taken into account when collecting and interpreting HDEMG data.

When different HDEMG electrodes are placed over muscle regions that can be recruited independently by the central nervous system, differences in HDEMG amplitude may describe preferential activation of motor units localised in different regions. Spatial heterogeneity in muscle activity has been observed from HDEMG recordings during sustained constant force contractions (Farina *et al* 2008; Holtermann & Roeleveld 2006; Sanderson *et al* 2019), contractions of increasing load (Gallina *et al* 2013b; Holtermann & Roeleveld 2006; Tucker *et al* 2009), and during dynamic contractions (Falla *et al* 2014, 2017). An intuitive example is when HDEMG is recorded from the dorsal forearm while a person performs isolated extension of individual fingers. During these tasks, large differences in the EMG amplitude spatial distribution can be observed depending on which finger is being extended. It can also be observed that the electrodes recording the highest EMG amplitude will be those placed above the different compartments of the extensor digitorum communis (Gallina & Botter 2013). This indicates that the spatial distribution of EMG amplitude can provide information on the location of active motor units, i.e., the location of the active muscle fibres in the area covered by the HDEMG system, and can be used to describe how regional activation changes in different conditions, such as pain.

> "KNOWING THE RELATION BETWEEN MUSCLE ANATOMY AND POSITION OF THE HDEMG GRID MAY BE USEFUL TO GUIDE THE INTERPRETATION OF EMG AMPLITUDE SPATIAL DISTRIBUTION"

In some cases, knowing the relation between muscle anatomy and position of the HDEMG grid may be useful to guide the interpretation of EMG amplitude spatial distribution. In the upper trapezius for instance, if the rows of electrodes are aligned with the muscle fibre direction (medio-laterally), differences in EMG amplitude distribution along this direction will mainly be associated to anatomical factors such as innervation zone and tendon. Instead, the activation of different regions within the trapezius, will mainly be observed along the columns of electrodes (cranio-caudally), as demonstrated by the association between EMG spatial amplitude distribution and the number of recruited motor units, identified using selective intramuscular electrodes placed in different muscle regions (Falla & Farina 2008). Large inter-individual variability in cranio-caudal EMG amplitude spatial distribution has been observed during a standardised scapular elevation task, describing different neuromuscular activation strategies between participants in regional activation patterns. Moreover, a caudal shift of EMG amplitude distribution was observed when higher forces were produced, while the distribution shifted caudally with repeated practice of the task (Gallina *et al* 2013b).
Preliminary results suggest that HDEMG amplitude distribution can be used to characterise the activation of different lumbar extensor muscles (Abboud *et al* 2019). Unlike the finger extension task, individual regions within the human lumbar multifidus and longissimus cannot be easily recruited in an independent manner. Thus, in this study both intramuscular recordings and HDEMG were collected during a trunk flexion task, and correlation analyses were used to identify which HDEMG signals contained information most similar to the selective, indwelling recordings (Abboud *et al* 2019). This analysis revealed that longissimus at L1, L4, and multifidus had different spatial representations on the HDEMG signals, although the location of superficial and deep multifidus could not be differentiated. These preliminary results offer information on which muscles contribute to different spatial distributions of EMG amplitude in the lumbar extensor muscles and are a first step for the differentiation between superficial multifidus and longissimus using HDEMG.

All of these studies validate and support the use of EMG amplitude spatial distribution, estimated with HDEMG, to investigate regional neuromuscular strategies in people with and without spinal pain.

Spatial re-distribution of muscle activity during sustained isometric and dynamic contractions

Uniquely, HDEMG studies have revealed that the distribution of activity within a muscle or muscle group changes during both isometric and dynamic contractions. This re-distribution of activity appears to have the physiological significance of minimising muscle fatigue and prolonging endurance, possibly by preventing overload on the muscle fibres active at the beginning of the task. This variation in activation within regions of the same muscle appears to be of particular relevance for muscles commonly exposed to repetitive or

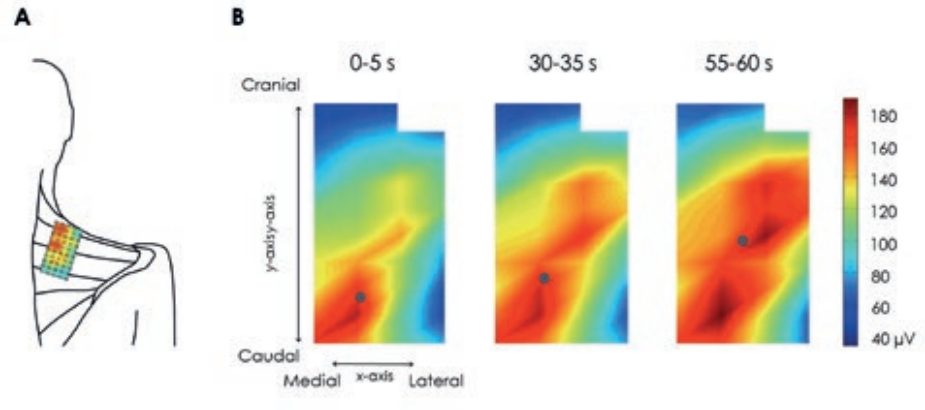


FIGURE 2: Representative topographical maps (interpolation by a factor 8) of the EMG amplitude recorded from the upper trapezius muscle of an asymptomatic person (A). Maps are shown for the first, middle and last 5 s of a 60 s sustained shoulder abduction contraction (B). Colours are scaled between the minimum and maximum amplitude values. Areas of dark blue correspond to low EMG amplitude and dark red to high EMG amplitude. Note the progressive shift of activity towards the cranial region of the muscle (Falla & Farina 2008)

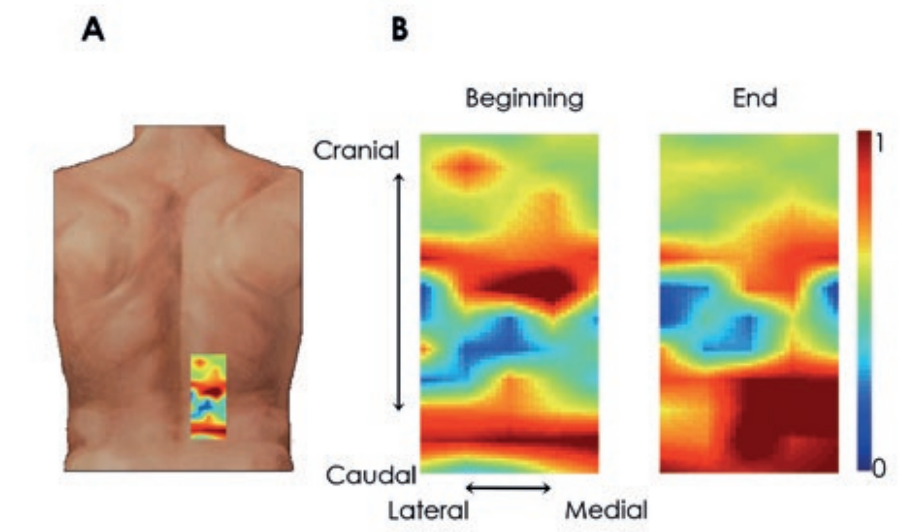


FIGURE 3: A) An adhesive grid of 64 electrodes placed above the right paraspinal muscles between the level of the L5 and L2 spinal processes as pain-free participants performed a 6-min sustained contraction in standing with 20° forward flexion holding a weighted bar (7.5-kg load). B) Topographical maps (interpolation by a factor 8) of the EMG amplitude obtained at the beginning and end of the 6 min sustained contraction. Note that the spatial distribution of activity changed over time during the sustained contraction with a shift toward the caudal direction of the lumbar region (Tucker *et al* 2009)

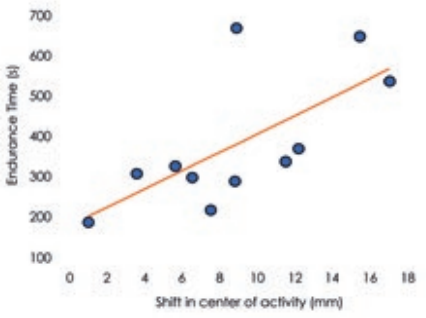


FIGURE 4: Significant correlation between the extent of the shift of the y-co-ordinate of the centre of upper trapezius muscle activity and the duration of a sustained shoulder abduction contraction in pain-free participants (Farina *et al* 2008)

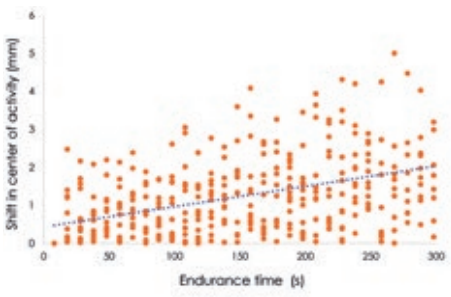


FIGURE 5: Linear regression analysis confirmed a significant association between the extent of the shift of the y-co-ordinate of the centre of lumbar paraspinal muscle activity and the duration of the trunk extension endurance contraction in pain-free participants (Sanderson *et al* 2019)

sustained activation, such as the upper trapezius (Farina *et al* 2008; Falla *et al* 2008) and the lumbar erector spinae (Abboud *et al* 2014; Tucker *et al* 2009; Sanderson *et al* 2019). Typically, research utilising HDEMG has evaluated changes in the distribution of muscle activity during either sustained or dynamic contractions by quantifying a shift in the centre of activity (centroid) of the HDEMG amplitude map, the point which defines the centre of muscle activation. To characterise the spatial distribution of muscle activity, the centroid of the EMG amplitude map is typically calculated with the x and y axis co-ordinates determined for the medial-lateral and cranial-caudal direction, respectively. Figure 2 illustrates a progressive shift of activity within the upper trapezius muscle during a task of sustained isometric shoulder abduction in an asymptomatic person (Falla & Farina 2008), while figure 3 shows a change in the distribution of activity over the lumbar erector spinae muscle during a fatiguing sustained lumbar flexion contraction (Tucker *et al* 2009). A further study showed a progressive redistribution of lumbar erector spinae activity during sustained trunk extension (Ito test) in healthy volunteers (Sanderson *et al* 2019). Importantly, an association between endurance time and the extent of redistribution of muscle activity in the trapezius (figure 4) was shown in asymptomatic participants (Farina *et al* 2008). Likewise, a study which investigated the spatial distribution of lumbar erector spinae activity and redistribution of activity during a trunk extension endurance task (figure 5), showed that those who displayed a larger redistribution of activity were able to sustain the contraction for longer (Sanderson *et al* 2019). This implies a direct association between the extent of adaptation of muscle activation under load and functional performance in pain-free individuals.

A redistribution of muscle activity is also normally observed in pain-free individuals during dynamic contractions. Figure 6 demonstrates a shift of activity

towards more cranial regions of the trapezius muscle when lifting a 1kg box between shelves positioned at hip and shoulder height (Falla *et al* 2017). A further example was described in a study which examined the spatial distribution of activity within the lumbar erector spinae during a repeated lifting task performed over three minutes (Falla *et al* 2014). Critical to this current review, recent work has shown that this normal physiological phenomenon of spatially re-distributing activity within a muscle or muscle region can be modified in people with neck or low back pain.

Changes in the distribution of muscle activity in people with neck or low back pain

While each of the previous examples describes changes in the distribution of muscle activity throughout either isometric or dynamic contractions, the studies also confirm that the observed phenomenon was not present or was reduced across a cohort of participants with chronic pain. If we revisit the example of a redistribution of upper trapezius muscle activity during sustained shoulder abduction in pain-free participants (figure 2), further work showed significantly less redistribution of trapezius muscle activity (figure 7) in people with chronic neck symptoms during the same task (Falla *et al* 2010).

Similarly, in the study that examined the distribution of the lumbar erector spinae activity during sustained trunk extension compared to the pain-free participants, people with low back pain (LBP) were shown to engage different regions of the lumbar erector spinae, reflecting less efficient activation of their muscles (Sanderson *et al* 2019). Specifically, those with LBP showed relatively more activity of cranial regions of the lumbar erector spinae when contrasted with the pain-free participants who displayed a more even activation of their erector spinae (figure 8) in the longitudinal direction (Sanderson *et al* 2019). Possibly, the less focal activation of the erector spinae observed in pain-free individuals indicates a more biomechanically favourable contraction through activating a greater number of fibres, distributing the load over a larger volume of the erector spinae. In addition, the LBP participants displayed a lower redistribution of lumbar erector spinae activity across the sustained task. This reduced ability to redistribute muscle activation was associated with significantly lower endurance in this group, i.e. controls: 283.0 ± 33.0s versus LBP: 186.2 ± 72.3s. A further example is illustrated in figure 9 which demonstrates reduced task-induced variations in the distribution of activity across back muscle regions in individuals with LBP during a repeated lifting task (Falla *et al* 2014). Specifically, in contrast to the pain-free participants which demonstrated a caudal shift of lumbar erector spinae over the duration of the three-minute lifting task, the LBP group displayed an unaltered distribution of muscle activity despite an overall increase in EMG amplitude over the task duration. Interestingly, this lack of variability in the distribution of muscle activity observed for the participants with LBP occurred concomitantly with an increase in LBP, reduced lumbar movement and was associated with increased pressure pain sensitivity of the lumbar region.

In each of these studies, the patients with chronic neck or back pain performed repetitive or sustained tasks by maintaining the same type of activation of the muscle across the duration of the task. The long-term consequence of this strategy may be an overload of some muscle fibres and, as a further consequence, possibly a perpetuation or recurrence of LBP. Repetitive tasks are indeed considered an important risk factor for initiation, maintenance and recurrence of pain (Wai *et al* 2010). The altered neuromuscular control of neck and low back muscles observed in these studies for the participants with spinal pain likely contributes to this increased risk. It should be noted, however, that not all the participants with chronic pain behaved in the same way, reflecting the very common observation of heterogeneity of presentation in people with musculoskeletal pain. In the last example, 36% of LBP patients demonstrated what was considered to be a relevant caudal shift of the centroid of the EMG amplitude map during the lifting phase of the repetitive task, i.e. reflecting the muscle strategy observed in asymptomatic people (Falla *et al* 2014). Nevertheless, nociception alone was shown to be a sufficient trigger for such adaptations of muscle behaviour in the LBP and neck pain participants. For instance, when muscle pain is experimentally induced in healthy volunteers then the normal re-distribution of muscle activity seen for the erector spinae or trapezius during

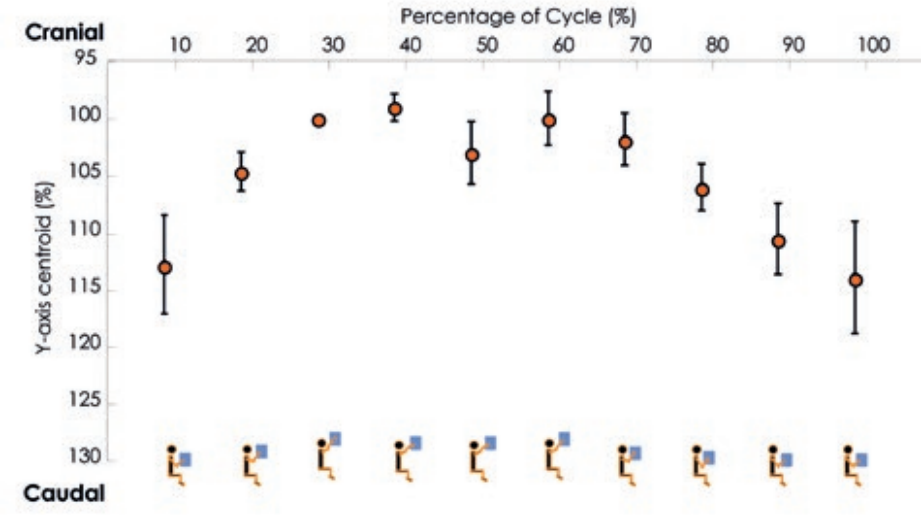


FIGURE 6: Mean (± standard error) of the y axis co-ordinate of the centroid of the upper trapezius EMG amplitude map estimated at 10% intervals of a task involving lifting and lowering of a 1kg box between shelves positioned at hip and shoulder height. Note the shift of the centre of activity depending on the extent of arm elevation (Falla *et al* 2017)

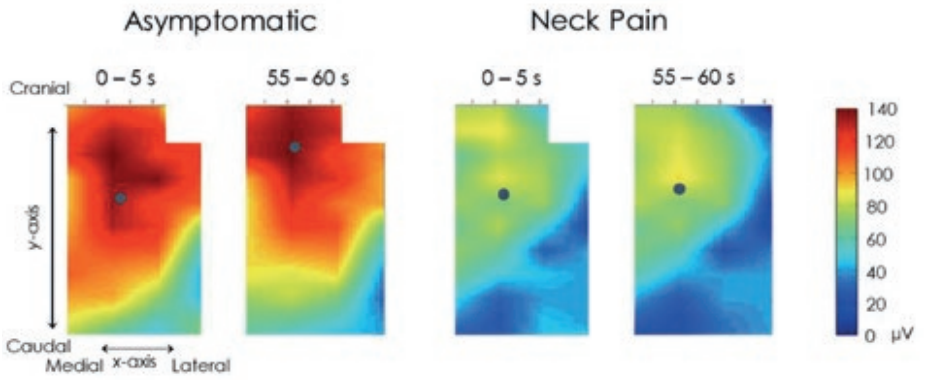


FIGURE 7: Representative topographical maps (interpolation by a factor 8) of the EMG amplitude recorded from the upper trapezius muscle of an asymptomatic person and person with neck pain. Maps are shown for the first and last 5 s of a 60 s sustained shoulder abduction contraction. Note the progressive shift of activity towards the cranial region of the muscle for the asymptomatic person but not the patient with neck pain (Falla *et al* 2010)

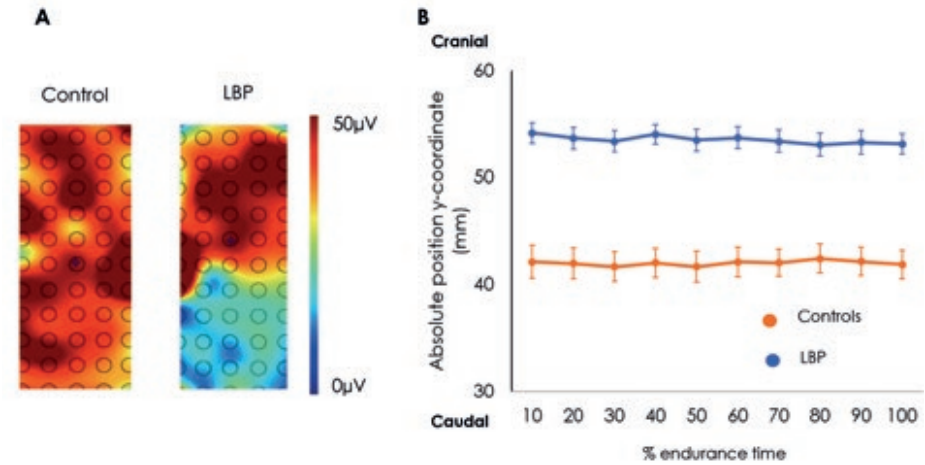


FIGURE 8: A) Representative topographical maps (interpolation by a factor 8) of the EMG amplitude recorded from the lumbar erector spinae of an asymptomatic person and person with low back pain (LBP) during isometric trunk extension. Note relatively greater activity of cranial regions of the lumbar erector spinae relative to more caudal regions in this person with LBP. This contrasted to the pain-free participants which displayed a more even activation of their erector spinae. (B) Displays the position of the center of lumbar paraspinal muscle activity along the longitudinal axis for people with chronic LBP and pain-free participants across the duration of a trunk extension endurance contraction. Note that the activity was concentrated more cranially across the entire task for the LBP participants (Sanderson *et al* 2019)

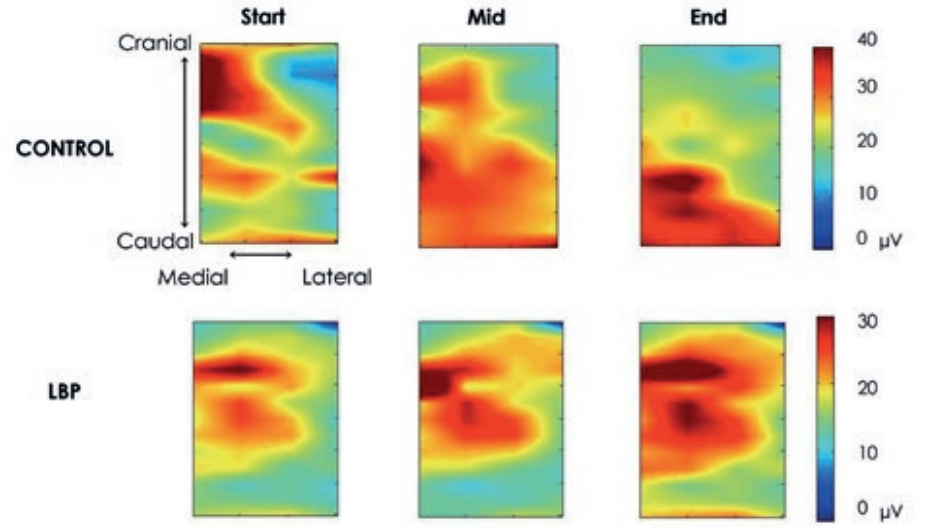


FIGURE 9: Representative topographical maps (interpolation by a factor 8) of the EMG amplitude recorded from the right lumbar erector spinae for a person with low back pain (LBP) and control subject for the start, mid and end of a repetitive lifting task. Note the shift of activity in the caudal direction for the control subject only (Falla *et al* 2014)

> "HIGH-DENSITY SURFACE ELECTROMYOGRAPHY PROVIDES UNIQUE INFORMATION ON THE NEUROMUSCULAR ADAPTIONS THAT CAN OCCUR IN PEOPLE WITH NECK OR BACK PAIN"

dynamic or sustained contractions becomes substantially reduced or even absent, similar to what is seen in people with chronic pain (Falla *et al* 2009, 2017).

Conclusion

By describing the regional activation within muscles, HDEMG provides unique information on the neuromuscular adaptations that can occur in people with neck or back pain. Studies have shown that most individuals with spinal pain are unable to vary the activity of their muscles during sustained or repetitive contractions. This suggests that specific regions within muscles or muscle groups may become overloaded potentially contributing to the persistence of their symptoms. Clinical studies are now needed to determine whether exercise interventions can modify the pattern of muscle activation similar to pain-free individuals, and whether this results in improved clinical outcomes. It may be that HDEMG will become a promising tool that musculoskeletal physiotherapists can use to identify and manage changes in neuromuscular control in patients with musculoskeletal pain.

References

Abboud J, Gallina A, Blouin J-S. Comparing individual lumbar muscles activation between indwelling and high-density surface electromyography. *10th Interdisciplinary World Congress on Low Back and Pelvic Girdle Pain* 2019;accepted

Abboud J, Nougarou F, Pagé I, Cantin V, Massicotte D, Descarreaux M. Trunk motor variability in patients with non-specific

chronic low back pain. *European Journal of Applied Physiology* 2014;114(12):2645-2654 https://doi.org/10.1007/s00421-014-2985-8

Andreassen S, Arendt-Nielsen L. Muscle fiber conduction velocity in motor units of the human anterior tibial muscle. *Physiology* 1987;561–571

Falla D, Andersen H, Danneskiold-Samsøe B, Arendt-Nielsen L, Farina D. Adaptations of upper trapezius muscle activity during sustained contractions in women with fibromyalgia. *Electromyography & Kinesiology* 2010;20(3):457-64

Falla D, Arendt-Nielsen L, Farina D. Gender-specific adaptations of upper trapezius muscle activity to acute nociceptive stimulation. *Pain* 2008;15;138(1):217-25

Falla, D, Arendt-Nielsen L, Farina D. The pain-induced change in relative activation of upper trapezius muscle regions is independent of the site of noxious stimulation. *Clinical Neurophysiology* 2009;120(1): 150-157 https://doi.org/10.1016/j.clinph.2008.10.148

Falla D, Farina D. Muscle fiber conduction velocity of the upper trapezius muscle during dynamic contraction of the upper limb in patients with chronic neck pain. *Pain* 2005;116:138-145 https://doi.org/10.1016/j.pain.2005.03.038

Falla D, Farina D. Non-uniform adaptation of motor unit discharge rates during sustained static contraction of the upper trapezius muscle. *Experimental Brain Research* 2008;191(3):363-370 https://doi.org/10.1007/s00221-008-1530-6

Falla D, Farina D, Graven-Nielsen T. Spatial dependency of trapezius muscle activity during repetitive shoulder flexion. *Journal of Electromyography and Kinesiology* 2017;17(3):299-306 https://doi.org/10.1016/j.jelekin.2006.03.005

Falla D, Gizzi L, Tschapek M, Erlenwein J, Petzke F. Reduced task-induced variations in the distribution of activity across back muscle regions in individuals with low back pain. *Pain* 2014;155(5):944-953 https://doi.org/10.1016/j.pain.2014.01.027

Falla D, Rainoldi A, Merletti R, Jull G. Myoelectric manifestations of sternocleidomastoid and anterior scalene muscle fatigue in chronic neck pain patients. *Clinical Neurophysiology* 2003;114(3):488-495 https://doi.org/10.1016/S1388-2457(02)00418-2

Farina D, Holobar A. Characterization of human motor units from surface EMG decomposition. *Proceedings of the IEEE* 2016;104(2):353-373 https://doi.org/10.1109/JPROC.2015.2498665

Farina D, Leclerc F, Arendt-Nielsen L, Buttelli O, Madeleine P. The change in spatial distribution of upper trapezius muscle activity is correlated to contraction duration. *Electromyography & Kinesiology* 2008;18(1):16-25. https://doi.org/10.1016/j.jelekin.2006.08.005

Gallina A, Botter A. Spatial localization of electromyographic amplitude distributions associated to the activation of dorsal forearm muscles. *Frontiers in Physiology* 2013;4(Dec):1-8 https://doi.org/10.3389/fphys.2013.00367

Gallina A, Merletti R, Gazzoni M. Innervation zone of the vastus medialis muscle: position and effect on surface EMG variables. *Physiological Measurement* 2013a;34(11):1411-1422 https://doi.org/10.1088/0967-3334/34/11/1411

Gallina A, Merletti R, Gazzoni M. Uneven spatial distribution of surface EMG: what does it mean? *European Journal of Applied Physiology*, 2013b;113(4), 887–894. https://doi.org/10.1007/s00421-012-2498-2

Holtermann A, Roeleveld K. EMG amplitude distribution changes over the upper trapezius muscle are similar in sustained and ramp contractions. *Acta Physiologica* 2006;159-168 https://doi.org/10.1111/j.1748-1716.2005.01520.x

Lapatki BG, Oostenveld R, Van Dijk JP, Jonas IE, Zwarts MJ, Stegeman DF. Topographical characteristics of motor units of the lower facial musculature revealed by means of high-density surface EMG. *Neurophysiology*, 2006;95(1):342-354 https://doi.org/10.1152/jn.00265.2005

Martinez-Valdes E, Laine CM, Falla D, Mayer F, Farina D. High-density surface electromyography provides reliable estimates of motor unit behavior. *Clinical Neurophysiology* 2016;127(6):2534-2541 https://doi.org/10.1016/j.clinph.2015.10.065

Masuda T, Sadoyama T. Topographical map of innervation zones within single motor units measured with a grid surface electrode. *IEEE Transactions on Biomedical Engineering* 1988;35(8), 623-628. https://doi.org/10.1109/10.4595

Merletti R, Aventaggiato M, Botter A, Holobar A, Marateb H, Vieira TMM. Advances in surface EMG: recent progress in detection and processing techniques. *Critical Reviews in Biomedical Engineering,* 2010;38(4):305-345

Piitulainen H, Rantalainen T, Linnamo V, Komi P, Avela J. Innervation zone shift at different levels of isometric contraction in the biceps brachii muscle. *Electromyography & Kinesiology* 2009;19(4):667-675 https://doi.org/10.1016/j.jelekin.2008.02.007

Sanderson A, Martinez-Valdes E, Heneghan NR, Murillo C, Rushton A, Falla D. Variation in the spatial distribution of erector spinae activity during a lumbar endurance task in people with low back pain. *Anatomy* 2019;532-542 https://doi.org/10.1111/joa.12935

Tucker K, Falla D, Graven-Nielsen T, Farina D. Electromyographic mapping of the erector spinae muscle with varying load and during sustained contraction. *Electromyography & Kinesiology* 2009;19(3):373-379 https://doi.org/10.1016/j.jelekin.2007.10.003

Wai EK, Roffey DM, Bishop P, Kwon BK, Dagenais S. (2010). Causal assessment of occupational lifting and low back pain: results of a systematic review. *Spine* 2010;10(6):554-566 https://doi.org/10.1016/j.spinee.2010.03.033

CONTACT DETAILS
d.falla@bham.ac.uk
Centre of Precision Rehabilitation for Spinal Pain (CPR Spine)
School of Sport, Exercise and Rehabilitation Sciences, College of Life and Environmental Sciences, University of Birmingham, UK

Voltarol
The joy of movement

gsk

Isn't it time you considered topical joint pain relief?

	Voltarol Gel	Oral NSAIDs
Clinically proven joint pain relief	✓	✓
Relieves pain AND inflammation	✓	✓
Applied directly to the source of pain to work directly on the joint tissue	✓	✗
Recommended by NICE as a first line treatment option for OA*[1]	✓	✗
Anti-inflammatory ingredient persists in the joint tissue rather than blood stream	✓	✗
Low risk of systemic side effects, including GI	✓	✗

THINK TOPICAL. THINK VOLTAROL GEL

Diclofenac diethylammonium

*Voltarol Osteoarthritis Joint Pain Relief Gel only. NICE Guidelines for Osteoarthritis Care and Management recommend topical NSAIDs and/or paracetamol as first line pharmacological treatment. For knee and hand Osteoarthritis.

References: 1. NICE. Osteoarthritis: Care and Management, 2014. Available at: https://www.nice.org.uk/guidance/cg177/chapter/1-Recommendations. Accessed: 23/4/19.

Product Information: Voltarol Osteoarthritis Joint Pain Relief 1.16% Gel, Voltarol 12 Hour Joint Pain Relief 2.32% Gel (diclofenac diethylammonium). Indications: Local symptomatic relief of pain and inflammation in trauma of the tendons, ligaments, muscles and joints e.g. due to sprains, strains and bruises, and localised forms of soft tissue rheumatism. **Osteoarthritis Gel:** Relief of pain of non-serious arthritic conditions. **Legal category:** P. **Licence holder:** GlaxoSmithKline Consumer Healthcare (UK) Trading Limited, 980 Great West Road, Brentford, Middlesex, TW8 9GS, U.K.

Information about these products, including adverse reactions, precautions, contraindications, and method of use can be found at: https://www.medicines.org.uk/emc/product/8774/smpc, https://www.medicines.org.uk/emc/product/8775/smpc

Fascial system: a sensory organ

ANTONIO STECCO MD PhD
Assistant Professor, New York University School of Medicine

Science has dismissed the value of a connective tissue structure that, internally and externally, encompasses our whole body. However, research has now established that normal muscle function depends on the health of the fascial system and the ability of receptors within it to feed back to the central nervous system. Alterations to the fascia, such as thickening, densification or restriction can cause interference in muscle function or co-ordination.

LEARNING OUTCOMES
TO SUPPORT PHYSIO FIRST QAP

1 Highlight the gross anatomy and histology of the superficial and deep fascia, including the significance of myofascial / myotendinous expansions.
2 Describe the pathophysiology of fascia, elaborating on the concept of the myofascial sliding system and its contribution to myofascial pain syndrome.
3 Explain the specific clinical assessment process via clinical rationale behind it as well as discuss the therapeutic advantage of the plasticity and malleability of fascia.

Introduction

The information that normal muscle function depends on the fascial system, and between 30 and 40% of the force generated by muscle is due to its surrounding fascia, can be compared in science to adding a new element to the periodic table.

Science has dismissed the value of a connective tissue structure that encompasses our whole body, both internally and externally. Carla Stecco (2015) elaborated on this dismissal by stating: *"In anatomy text books, only local areas of fasciae are described, and they are characterised by only one of their minor functions: as an opaque covering."* In the preface of her publication, she adds that most anatomists view connective tissue as something to be removed in order that joints, muscles, organs and tendons may be studied more carefully (Stecco 2015). In fact, it has now been established that a normal functioning fascial system is the basic requirement for joints, muscles, organs and tendons to work.

Research demonstrates that more than 30% of the force generated from the muscle is transmitted not along a tendon, but rather by the connective tissue within the muscle (Purslow 2010; Huijing & Jaspers 2005; Huijing & Baan 2001; Huijing 2009) and that fascia contains mechanoreceptors and proprioceptors (Boyd-Clarke *et al* 2002; Maier 1999; Stecco *et al* 2010; Strasmann *et al* 1990). In other words, every time we use a muscle, we stretch fascia that is connected to Ruffini and Pacini corpuscles. The normal stretching of fascia thus communicates the force of the muscle contraction, the status of the muscle tone, its movement, rate of change in muscle length, and the position of the associated body-part to the central nervous system (CNS). This raises some important questions; what if the fascia, where these receptors are located, is restricted due to increased viscosity or is chronically overstretched?

As receptors are activated by pressure or stretch and must be free to function, is it possible that if they are inhibited the feedback to the CNS could be altered?

An additional consideration with regard to these questions is that acupuncture points are located within the fascial system. Langevin *et al* (2002) describe acupuncture points and meridians as a network formed by connective tissue (fascia). Practitioners must understand what causes fascia to become pathological and why it disrupts function. Ultimately, the fascia is much more than an "opaque covering", it should probably be designated as another organ of the body and we need to know how to restore normality to the fascial system when it is not functioning properly.

Anatomy and physiology

Epimysial and aponeurotic are the specific types of deep fascia that cover

> "A NORMAL FUNCTIONING FASCIAL SYSTEM IS THE BASIC REQUIREMENT FOR JOINTS, MUSCLES, ORGANS AND TENDONS TO WORK"

> "WE NEED TO KNOW HOW TO RESTORE NORMALITY TO THE FASCIAL SYSTEM THAT IS NOT FUNCTIONING PROPERLY"

the muscles (Stecco 2015). In the extremities, a thin layer of epimysial fascia, called the epimysium, gives form to the muscle, enveloping the entire surface of each muscle belly and separating it from adjoining muscles. The epimysium is itself covered by aponeurotic fascia (AF), described by Stedman's medical dictionary as "well-defined fibrous sheaths that cover and keep in place a group of muscles, or serve for the insertion of broad muscles" (Stedman 1995). Examples of AF are the fascia lata that covers the whole thigh and buttock like a stocking and slides over the epimysium of the muscles beneath it, and the thoracolumbar fascia that cover the muscles along the vertebral column, and the fascia that covers all the extremity muscles. A principal function of the AF is to transmit the force (myofascial continuity) of the muscle groups it covers by way of myofascial expansions or insertions. Expansions enter into the periosteum, the paratenons, neurovascular sheaths and the fibrous capsules of joints (Stecco 2015). During forward movement of the upper extremity, for example, the clavicular fibres of the pectoralis major (epimysial fascia) upon contraction, stretches the anterior brachial AF, thereby contracting the biceps and stretching the antebrachial AF by way of the lacertus fibrosus to the flexor carpi radialis, and the thenar muscles. This sequence has been verified by dissection (Stecco *et al* 2009).

Similarly, the quadriceps muscle inserts into the tibia by way of its tendon and continues on to a myofascial expansion, that passes anterior to the patella and to the anterior knee retinaculum. The Achilles tendon connects from the calcaneus to fascial attachments to the plantar fascia over the back of the heel and to the heel fat pad (Stecco 2015). Every movement of the body will therefore stretch particular patterns of intra-fascial receptors, especially in the deep fascia. The firing of receptors embedded in the fascial network represents the perceptive continuity necessary for normal unimpeded movement, and the transmission of information proximally and distally to adjoining muscles and to our CNS.

Aponeurotic fascia helps to transmit the force of the muscles it covers and is innervated mostly in its superficial layer.

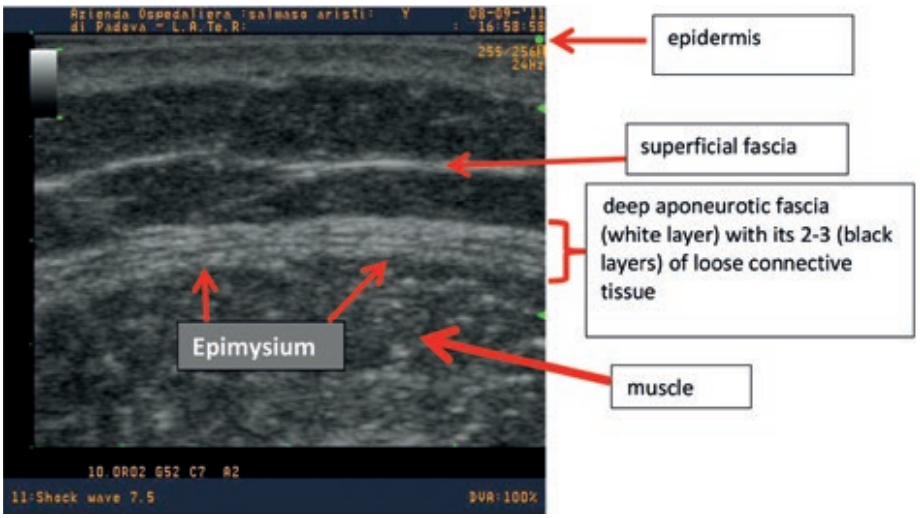


FIGURE 1: Ultrasound of normal Fascia lata. Note the minimal thickness of the loose connective tissue layers. (Reproduced with permission of Antonio Stecco, MD)

In the extremities, AF is made up of two to three layers of parallel collagen fibre bundles, densely packed and separated from the epimysium by a thin layer of its own loose connective tissue which allows normal glide between the two fascial layers. Each layer slides independently over its adjoining one (figure 1). The loose connective tissue with normal viscoelasticity allows normal tissue gliding, but this gliding function can become abnormal when viscosity of the loose connective tissue increases.

Closely connected to the epimysium is an intramuscular fascial layer called the perimysium which surrounds the muscle bundles (fascicles). Both the epimysium and perimysium are an organised framework that transmits the force produced in the locomotor system (Passerieux *et al* 2007), and both are thickened in tendinosis and with immobilisation (Järvinen *et al* 2002). From a sensory point of view, the chief proprioceptor for muscles are the muscle spindles that are localised in the perimysium, with capsules that connect to the epimysium and fascial septae (Maier 1999). The spindle cells that are the chief sensory component of muscles reside in the fascia. Finally, the endomysium covers every muscle fibre and separates them from each other to allow individual fibre gliding.

Pathology

Spindle cells represent a common final pathway since their reflex activation is caused by the proprioceptive input from fascia, ligaments, skin etc. that goes to the dorsal horn where the collaterals synapse on the gamma motor neurons. Spindle cells are active even during sleep and they must be stretched during muscle contraction for passive stretch to be activated. Therefore, the fact that the spindle cells are in the fascia implies that if altered, i.e. thickened, densified or restricted, the spindle cells may not function normally, depriving the CNS of the necessary feedback regarding joint movement, muscle co-ordination and position.

In response to a question about fascial

adhesions having an adverse effect on spindle cells, Siegfried Mense MD, one of the world's leading experts on muscle pain and neurophysiology answered: *"Structural disorders of the fascia can surely distort the information sent by the spindles to the CNS and thus can interfere with a proper co-ordinated movement"* and *"the primary spindle afferents (Ia fibres) are so sensitive that even slight distortions of the perimysium will change their discharge frequency"* (Mense 2011).

When a patient complains that the last thing they did, e.g. *"getting out of bed wrong"* was the cause of their pain, they were already in an unco-ordinated situation.

What is the actual mechanism of fascial disruption creating abnormal sensory afferentation? One of the chief causes of fascial restriction is related to a substance called hyaluronan or hyaluronic acid (HA), which is a high molecular weight glycosaminoglycan polymer of the extracellular matrix. Among its many functions, HA is a lubricant that allows normal gliding between joints and between connective tissue. Gliding within the fascial system is crucial for normal fascial function, and normal gliding between the layers of fascia surrounding the muscle, and within the muscle, depends on the normal hydration provided principally by HA. The use of HA injection in the treatment of osteoarthritic knees and "frozen shoulders" is already proving successful (Ishijima *et al* 2014; Ghosh & Guidolin 2002). Hyaluronic acid is located in the loose connective tissue between the deep AF and muscle where the AF slides on the epimysium, and in the loose connective tissue between the two or three layers of the AF, and the intramuscular fascia. Loose connective tissue appears as an irregular gelatinous mesh containing mainly HA, some fibroblasts, collagen and elastic fibres. Stecco *et al* (2011) state that: *"If the HA assumes a more packed conformation, or more generally, if the loose connective tissue inside the fascia alters its density, the behavior of the entire deep fascia and the underlying muscle would be compromised. This, we predict, may be the basis of the common phenomenon known as myofascial pain."*

There is evidence that if the loose connective tissue within the fascia has increased viscosity, the receptors will not be activated properly (Swerup & Rydqvist 1996; Wilkinson & Fukami 1983). Additionally, densified HA also alters the distribution of the lines of force within the fascia. In this environment, pain and stiffness may be created with stretching even within the physiological ranges (Stecco *et al* 2013). When the HA chains become concentrated, their visco-elastic properties are altered and this contributes to myofascial pain and the myofascial pain syndrome (Stecco *et al* 2011).

There are corroborating studies that demonstrate the relationship between HA and myofascial pain. When the tissue is stressed, e.g. through injury, HA becomes depolymerized and lower molecular mass polymers of hyaluronan fragments appear. These smaller fragments signal to the host that normal homeostasis has been profoundly disturbed (Noble 2002) and contribute to scar formation. Overuse and trauma causes HA to become fragmented and proinflammatory, as Matteini *et al* (2009) suggest: *"By increasing the concentration of HA, HA chains begin to entangle conferring to the solution distinctive hydrodynamic properties: the viscoelasticity is dramatically increased."* Other studies show thoracolumbar fascia shear strain was around 20% lower in human subjects with chronic low back pain. This reduction of shear plane motion may be due to abnormal trunk movement patterns and / or intrinsic connective tissue pathology (Langevin *et al* 2011). Fascial thickening has been held responsible for chronic pain both in the neck (Stecco *et al* 2014), where the thickness was found in the loose connective tissue rather than the collagen fibres, and in the lower back (Langevin *et al* 2009) where studies showed that the chronic low back pain group had approximately 25% greater peri-muscular thickness and echogenicity compared with the non-low back pain group.

The chronic neck pain study (Stecco *et al* 2013) demonstrated that the variation of thickness of the fascia correlated with the increase in quantity of the loose connective tissue, but not with dense connective tissue (figure 2). The value of 0.15cm thickness of the sternocleidomastoid muscle (SCM) fascia was considered as a cut-off value which allows the clinician to make a diagnosis of myofascial disease in a subject with chronic neck pain.

Restoring deep fascial glide requires a method of reaching the deep fascia, especially since this is the principle location of the spindle cells and HA. Deising *et al* (2012) sensitised the tissue, from the skin to the deep fascia in the erector spinae muscles equally, and discovered that long-term sensitisation to mechanical pressure and chemical stimulation remained in the deep fascia rather than in the superficial areas. Another study looked at the methods of manual effects on restoring HA fluidity (Roman *et al* 2013). They compared perpendicular vibration and tangential oscillation to constant sliding motions and showed that the perpendicular and tangential vibrations caused greater HA lubrication than the sliding method. This demonstrates why it is important that treatment of an area is for long enough, i.e. an area

> "IF THE LOOSE CONNECTIVE TISSUE WITHIN THE FASCIA HAS INCREASED VISCOSITY, THE RECEPTORS WILL NOT BE ACTIVATED PROPERLY"

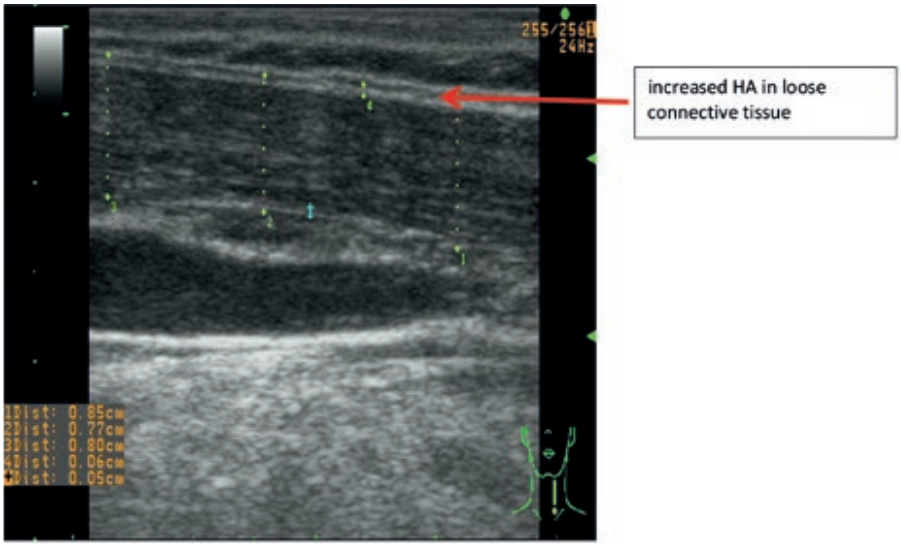


FIGURE 2: Increase in loose connective tissue space in patient with neck pain. (Reproduced with permission of Antonio Stecco, MD)

of less than 2cm^2 requires between two to four minutes (Ercole *et al* 2010) of palpation until a gliding sensation is revealed, rather than densification (highly stiff area). Treatment should render pro-inflammatory HA fragments to a size where they become anti-inflammatory (Stern *et al* 2006). This resultant reduction in inflammation can take around 48 hours and may explain the possible soreness referred two days post treatment. Vertical type pressure with back and forward gliding using elbows and knuckles are necessary to affect the change in HA fluidity, and it is recommended that there should be a break of at least four days or more between treatments on the same area.

Summary

Much of the information in this article is derived from my research with Luigi Stecco PT and Carla Stecco MD, as a result of which we have created a modality called Fascial Manipulation® (FM) which is now being taught on almost every continent. The following are some basic principles of FM which might be of use to the physiotherapist reviewing their own methods of fascial treatment:

- The fascia is a sensory organ.
- Normal muscular function requires the surrounding fascia to be hydrated to allow normal tissue gliding.
- Improper tissue gliding is directly related to mechanoreceptive and proprioceptive insufficiency and lack of muscle co-ordination.
- Dysfunction follows kinetic chains, especially those that relate to both the anatomical myofascial and acupuncture meridian fascial planes.
- A thorough case history that considers areas of previous trauma or surgery may reveal fascial densities responsible for present complaints.
- Functional testing and palpation of fascial planes are a primary diagnostic method.
- Treatment of affected points should be continued until normal density is palpated and negative functional testing improves.

Much of our research can be found in the U.S. National Library of Medicine, National Institute of Health (**www.pubmed.com**). *Search Stecco C or Stecco A for around 120 entries or go to* **www.fasciaresearch.com, www.fascialmanipulation.com** *and* **www.fascialmanipulation-stecco.com** *for more information on the work of Luigi Stecco PT and the fascial system.*

About the author

Dr Antonio Stecco is a graduate in medicine and surgery and is currently a Research Assistant Professor at RUSK Institute of Rehabilitation Medicine in New York, USA. He specialised in Physics Medicine and Rehabilitation at the University of Padua, Italy, and his areas of prevalent scientific and clinical interest are anatomy of the fascia corporis via dissections and histological studies, including immunohistochemical and molecular biology; study and clinical application of hyaluronic acid; and myofascial syndrome. Following the techniques developed by his father, Luigi Stecco, PT, Antonio co-authored *Fascial Manipulation for Musculoskeletal Pain* with his sister Carla Stecco and he has authored more than 50 articles that have been published in international journals.

References

Boyd-Clark LC, Briggs CA, Galea MP. Muscle spindle distribution, morphology and density in longus colli and multiidus muscles of the cervical spine. *Spine* 2002;27:694-70

Deising S, Weinkauf B, Blunk J, Obreja O, Schmelz M, Rukwied R. NGF-evoked sensitization of muscle fascia nociceptors in humans. *Pain* 2012;153(8):1673-1679

Ercole B, Stecco A, Day JA, Stecco C. How much time is required to modify a fascial fibrosis? *Bodyworks & Movement Therapy* 2010;14:318-25

Ghosh P, Guidolin D. Potential mechanism of action of intra-articular hyaluronan therapy in osteoarthritis: are the effects molecular weight dependent? *Seminars in Arthritis & Rheumatism* 2002;32(1):10-37

Huijing PA, Jaspers RT. Adaptation of muscle size and myofascial force transmission: a review and some new experimental results. *Scandinavian Journal of Medicine & Science in Sports* 2005;15:349-380

Huijing PA, Baan GC. Myofascial force transmission causes interaction between adjacent muscles and connective tissue: effects of blunt dissection and compartmental fasciotomy on length force characteristics of rat extensor digitorum longus muscle. *Archives of Physiology & Biochemistry* 2001;109:97-109

Huijing PA. Epimuscular myofascial force transmission: a historical review and implications for new research. *Biomechanics* 2009;42:9-21

Ishijima M, Nakamura T, Shimizu K, Hayashi K, Kikuch H, Soen S, Omori G, Yamasha T, Uchio Y, Chiba J, Ideno Y, Kubota M, Kurosawa H, Kaneko K. Intra-articular hyaluronic acid injection versus oral non-steroidal

anti-inflammatory drug for the treatment of knee osteoarthritis: a multi-center, randomized, open-label, non-inferiority trial. *Arthritis Research & Therapy* 2014;16(1):R18

Järvinen TA, Józsa L, Kannus P, Järvinen L. Organization and distribution of intramuscular connective tissue in normal and immobilized skeletal muscles. An immunohistochemical, polarization and scanning electron microscopic study. *Muscle Research & Cell Motility* 2002;23(3):245-54

Langevin HM, Churchill DL, Wu J, Badger GJ, Yandow JA, Fox JR, Krag MH. Evidence of connective tissue involvement in acupuncture. *Federation of American Societies for Experimental Biology* 2002;16(8):872-874

Langevin HM, Fox JR, Koptiuch C, Badger G, Greenan-Naumann AC, Bouffard NA, Konofagou EE, Lee W-N, Triano JJ, Henry SM. Reduced thoracolumbar fascia shear strain in human chronic low back pain. *BioMed Central Musculoskeletal Disorders* 2011;19;12:203

Langevin HM, Stevens-Tuttle D, Fox JR, Badger GJ, Bouffard NA, Krag WH, Wu J, Henry SM. Ultrasound evidence of altered lumbar connective tissue structure in human subjects with chronic low back pain. *BioMed Central Musculoskeletal Disorder* 2009;(3)10:151

Maier A. Proportions of slow myosin heavy chain-positive fibers in muscle spindles and adjoining extrafusal fascicles and the positioning of spindles relative to these fascicles. *Morphology* 1999;242:157-65

Matteini P, Dei L, Carreti E, Volpi N, Goti A, Pini R. Structural behavior of highly concentrated hyaluronan. *Biomacromolecules* 2009;8;10(6):1516-1522

CONTACT DETAILS
antonio.stecco@gmail.com

Mense S (MD). *Personal communication* 2011

Noble PW. Hyaluronan and its catabolic products in tissue injury and repair. *Matrix Biology* 2002;21(1):25-9

Passerieux E, Rossignol R, Letellier T, Delage JP. Physical continuity of the perimysium from myofibers to tendons: involvement in lateral force transmission in skeletal muscle. *Structural Biology* 2007;159(1):19-28

Purslow PP. Muscle fascia and force transmission. *Bodywork & Movement Therapies* 2010;14: 411-417

Roman M, Chaudhry H, Buklet B, Stecco A, Findly TW. Mathematical analysis of the flow of hyaluronic acid around fascia during manual therapy motions. *American Osteopathy Association 2013*;(8):600-610

Stecco A, Gesi M, Stecco C. Fascial components of the myofascial pain syndrome. *Current Pain & Headache Reports* 2013;(17)352:1-10

Stecco A, Macchi V, Stecco C, Porgionato A, Day AJ, Delmas V, De Caro R. Anatomical study of myofascial continuity in the anterior region of the upper limb. Anatomical study of myofascial continuity in the anterior region of the upper limb. *Bodyworks & Movement Therapy* 2009;13(1):53-62

Stecco A, Meneghini M, Stern R, Stecco C, Imamura M. Ultrasonography in myofascial neck pain: randomized clinical trial for diagnosis and follow-up. *Surgical & Radiologic Anatomy* 2014;36(3):243-253

Stecco C. *Functional Atlas of the Human Fascial System*. Elsevier 2015; ISBN: 978-0702044304

Stecco C, Macchi V, Porzionato A, Stecco A, Delmas V, De Caro R. The ankle retinacula, morphological evidence of the proprioceptive role of the fascial system. *Cells Tissues Organs* 2010;192:200-10

Stecco C, Stern R, Porzionato A, Macchi V, Masiero S, Stecco A, De Caro R. Hyaluronan within fascia in the etiology of myofascial pain. *Surgical & Radiologic Anatomy* 2011;33:891-896

Stedman's Medical Dictionary 26th edn. Lippincott Williams & Wilkins 1995; ISBN: 978 0781733908

Stern R, E Asarib AA, Sugaharac KN. Hyaluronan fragments: an information-rich system. *European Journal of Cell Biology* 2006;85:699-715.

Strasmann T, van der Wal JC, Halata Z, Drukker J. Functional topography and ultrastructure of periarticular mechanoreceptors in the lateral elbow region of the rat. *Cells Tissues Organs* 1990;138(1):1-14 [PubMed: 2368595]

Swerup C, Rydqvist B. A mathematical model of the crustacean stretch receptor neuron. Biomechanics of the receptor muscle, mechanosensitive ion channels and macrotransducer properties. *Neurophysiology* 1996;76:2211-2220

Wilkinson RS, Fukami Y. Responses of isolated Golgi tendon organs of cat to sinusoidal stretch. *Neurophysiology* 1983;49:976-988

Establishing approaches to behaviours and movement in low back pain: thinking beyond what we observe

NEIL LANGRIDGE DClinP MSc MMACP MCSP

Consultant Physiotherapist in musculoskeletal practice and a senior lecturer at the University of Winchester.

When presented with a patient reporting persistent low back pain (LBP), the musculoskeletal physiotherapist will have a range of thoughts, considerations, processes and ideas with which they feel that they may be able to approach the problem. Over many years, these have ranged from advice, electrotherapy, manual techniques, hydrotherapy, exercise classes, specific exercises, and movement modifications; the list goes on. This article highlights some of the clinical methods of addressing alterations in movement behaviour that may help to integrate, in a clinical setting, some more novel approaches to supporting individuals reporting persistent long-term LBP. The emotional, cognitive, and lived individual experiences of a persistent problem are acknowledged and considered when as part of a pragmatic approach to movement behaviour.

LEARNING OUTCOMES
TO SUPPORT PHYSIO FIRST QAP

1 Appreciate how clinical reasoning and the person-centred approach to the management of LBP are central to patient goals.
2 Encourage improved patient self-management, self-determination and self-efficacy.
3 Understand the appropriate triage of patients and the subjective delivery of planned treatment in order to improve functional, physical and subjective outcomes.

Introduction

It is well recognised that individuals reporting LBP will commonly present with fear, concern and altered maladaptive beliefs which lead to changes in behaviour, function and ultimately their natural ability to achieve success in day-to-day tasks (O'Sullivan *et al* 2016). The role of the physiotherapist is to try to build an understanding of these contextual beliefs, review the ability of physical function, link the two elements together and then produce a structured plan (figure 1) that integrates an educational model, physical treatment plan, advantageous motivations and beliefs through treatment, and ultimately a discharge strategy that enhances self-management, efficacy and determination (Ferrari *et al* 2016; Keogh *et al* 2015).

There is no one way to move, no perfect way to sit or stand and so, to a certain degree, observing how a patient with LBP moves presents a challenge to the clinician. In essence, the patient is presenting with a movement or posture that they regard as unsuccessful. The reason it is unsuccessful is that the particular movement or posture is associated with a pain experience or loss of function, which may lead the patient to adapt their behaviour and lifestyle around it, they may avoid the movement or posture completely or attempt it in a way that has associated social repercussions such as always having to carry a cushion or wear support.

So, what are some of the common deficits that might be worthy of consideration in terms of rehabilitation, and what might be the simple

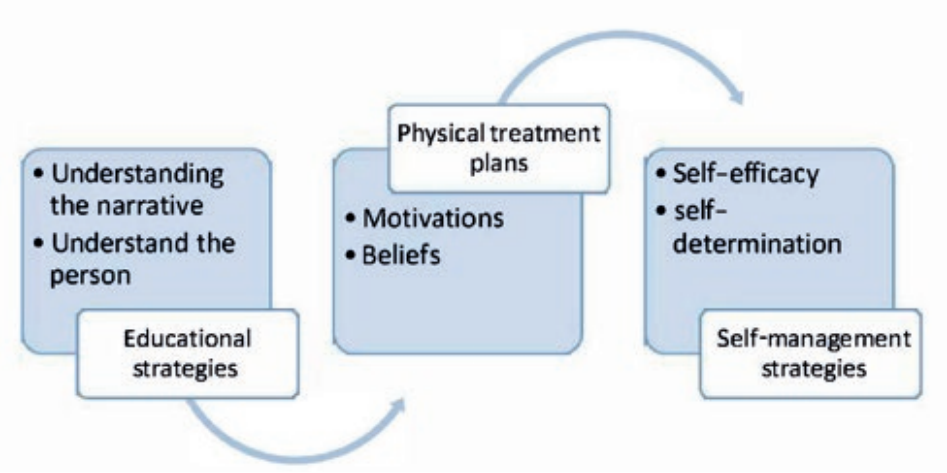


FIGURE 1: Simplified model linking narrative, education and physical approaches

"WITHOUT THE CONTEXT OF THE PATIENT'S EXPERIENCES, ASSESSING MOVEMENT IS JUST AN OBSERVATION"

approaches to help? There are numerous "dysfunctions" cited in the literature, but here I will concentrate on some common long-term strategies seen in practice. In numerous experimental studies, individuals with LBP have been shown to differ in how they achieve a skill, task or function. The ability to re-learn a function is commonly referred to as skill acquisition which links the perceptual and motor learning elements into a performed activity (Ostry & Gribble 2016). When a task is performed appropriately, it reflects the interaction between the neuromuscular and sensory systems providing adequate movement planning, execution, and adaptation based on afferent and environmental feedback (figure 2). When the task is performed inappropriately, there may be a mismatch of the interactions of the neuromuscular and sensory systems which are likely to be negatively affected by a pain experience, and the subsequent cognitive, emotional and behavioural responses underpinned by fear, and altered beliefs (Cook & Artino 2016; Zlomuzica *et al* 2016).

These fears and beliefs will be individualised to the patient's own experiences, knowledge and the social, situational contexts and environments that they inhabit. It is therefore key for the physiotherapist to ascertain the relevance and priority of these in the initial phase of contextualising the movement or task assessed. Without this context the movement is just an observation. It is the understanding of the context, of that movement from the patient's own experiences, the associated pain responses which then manifest themselves into changes in behaviour that will lead the clinician towards a bespoke management plan based on a deeper appreciation of the factors contributing to the movement and the responses. In past experimental

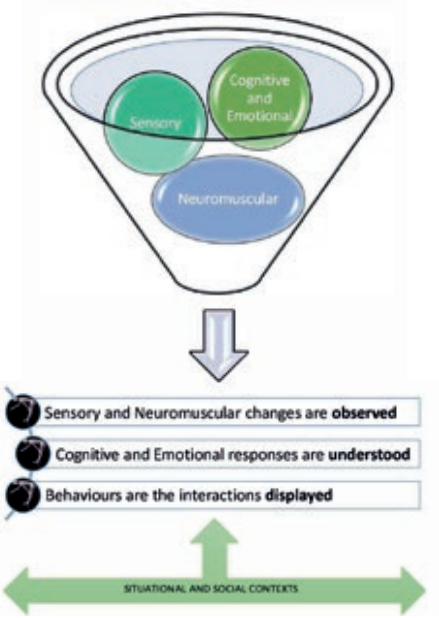


FIGURE 2: Simplified model describing interactions, observation and behaviours

studies, authors have linked these responses to the neuroplasticity model of change (Kuner & Flor 2017), alterations in brain function (Schabrun *et al* 2017), spinal reflex changes or simply muscular contractile differences (Hides *et al* 2016). As physiotherapists, it is beyond our observational abilities to discriminate in what way these behaviour changes are physiologically driven. We can potentially link the individualised responses to pain and disability via the observed changes in behaviour or, as some call this, patterns, control, timings or synergies. However, developing relevance in these observations is a reasoning challenge.

Loss of variability, rigidity and perturbation

A number of studies have demonstrated that, under different conditions when matched against healthy controls, individuals with LBP tend to demonstrate rigid responses to changes in position or increased requirements for speed when there is potential threat associated with the prediction of movement. Mokhtarinia *et al* (2016) asked participants to perform repeated cycles of trunk flexion and extension, in different challenging positions, in time with a metronome. With high-velocity movements, the variability of movement patterns for the control group were significantly different from the LBP group who primarily dealt with the increased speed requirements by decreasing variability, and so became more rigid. The reason for this remains unclear. Lamoth *et al* 2006 examined individuals with LBP capacity to alter their pattern of gait in response to sudden changes in velocity. Once again, the LBP group when compared to healthy matched controls demonstrated movements of the thorax and lumbar spine as a rigid unit, compared to the more natural synergy in the control group. When placed under increased perturbation, the rigidity of movement in participants with LBP also increased, which may be a protective measure developed through fear.

Fear of movement / re-injury, pain related fear, consequent long-standing inactivity and fear avoidance are important components of the bio-behavioural model and are believed to be potent risk factors and predictors of chronicity of back pain (Vlaeyen & Linton 2012; Swinkels-Meewisse *et al* 2006; Leeuw *et al* 2007). Fear of movement has been inversely associated with increased abdominal contraction, demonstrated in a study that identified kinesiophobia scores and rectus abdominus contractions in a chronic low back pain (CLBP) population during unexpected perturbation on stable and unstable surfaces (Ramprasad *et al* 2011). A common strategy in this population is to remain rigid, which may be fear induced and protective. The cause of the patient's fear requires exploration in parallel with the observed rigid strategy. An observed strategy employed by patients with CLBP when under perturbation challenge is to make greater use of the ankle to manage the change in their centre of gravity, rather than being able to selectively move areas within the trunk to compensate for tone change in

load (Brumagne *et al* 2008). This study highlights the rigidity strategy of CLBP patients, but the compensation in the ankles, which again may be a clinical observation, supports the proposed change in strategy and is a way of aiding the patient through a rehabilitation programme.

Prediction and expectation

Lussanet *et al* (2013) assessed the ability of participants with CLBP to be able to predict the weight of objects being lifted in trunk rotation and discovered that the ability of CLBP patients to predict which object was heavier or lighter was not as accurate as that of the control group. It is difficult to be exact on how we interpret this clinically. However, it is worth considering the ability of the individual to predict an activity and link any associated risk. An action or task that has an associative emotional experience connected with the prediction of the movement could create alarm and concern and, with it, the associated protected factors such as pain, muscle guarding and sympathetic nervous responses such as sweating, heart rate and breathing rate changes. Some of these may be observable. The relative concern needs exploration, and the reasoning behind the patient's beliefs need to be understood before modification and changes can be made. Kusters *et al* (2011) in a small pilot study looked at assessing, in a CLBP group, movement and reaction times in the upper limb in differing provocative positions. When compared against controls, movement and reaction times were slower in participants highly susceptible to a pain response. The background to these individuals such as their exercise levels, beliefs and past treatments were not explored in this study but what can be elucidated is that it is highly probable that individuals with CLBP react and move differently in provoking positions, and so from a rehabilitation perspective exposing these patients to the provocative positions and challenging them in variable ways would be a reasonable approach if conducted within manageable parameters. Brumagne *et al* (2000) and Newcomer *et al* (2000) both concluded that CLBP groups found differences in repositioning their lower trunk accurately after repeated movements when compared to pain-free individuals; therefore their discrete control strategy, low-level proprioceptive awareness, and the integration with the sensory motor complex were potentially inhibited.

Interestingly, the research from Brumagne *et al* (2000) highlighted that, when muscles are stimulated via vibration across the muscle groups to induce a sense of lengthening via muscle spindle stimulation, the CLBP patients improved their ability to be accurate while the control group worsened. This indicates that inappropriate stimulation can, for a short period of time, lead to a disruption in the integration with the sensory motor complex, and therefore performance. The ability of an individual to have localised awareness of their lumbar spine was investigated in a study that assessed this via EMG in the paraspinal muscles and mapped evoked responses in the brain via transcranial magnetic stimulation (Tsao *et al* 2011). The authors observed that in individuals without LBP, the dorsal multifidus was mapped separately from the erector spinae musculature, while in LBP subjects the mapped areas of cortical representation overlapped. Clinically, this would suggest a challenge for patients who are asked to selectively move areas of the spine while reporting LBP (figure 3) as their inherent ability to kinaesthetically be aware of their spine would be inhibited. The rehabilitation goal therefore would be in understanding this challenge in order to build on variable movement. However, that too would be challenging as it would likely lead to overt muscular responses which would further supplement a tonic, rigid model of protection.

Some of the key observable features in CLBP that may be seen or assumed in practice are described in figure 4. These will be context specific and individualised on the basis of the personalised narrative.

Patients with CLBP commonly present with one or more of these observable

FIGURE 3: Patient attempting to move selectively against a background of erector spine tonicity

features in variable amounts and linkages. There are no hard and fast rules. The next question is how does the therapist with the patient attempt to alter these changes to something advantageous when the patient's movements are currently associated with a pain response? Further moving in the same manner will only reinforce the response and therefore the behaviour, small changes in precision are lost as discrete control is an unwilling partner with long-term pain and muscular tonal changes, so the past models of tiny contractions and small changes are in conflict with the somatosensory changes we propose have occurred over time with behavioural change.

The behavioural changes and responses to tasks experienced by patients with LBP may be thought of as an associative / linked memory (Zusman 2013), connecting the skill or function to a pain experience. Associative memory may be described as integrating and storing external associated experiences (Poppa & Bechara 2018) while

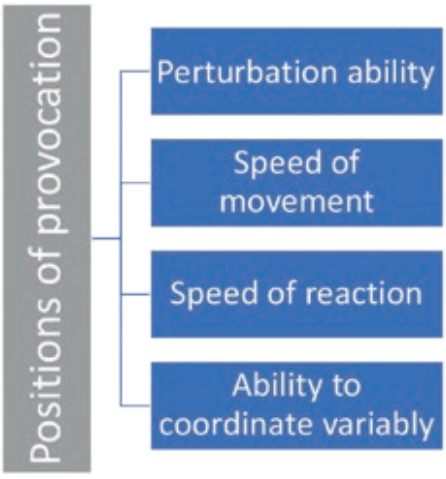


FIGURE 4: Key observable features of CLBP

declarative (stored memories linked to awareness) and non-declarative (performance without conscious memory requirements) processes are also utilised terms in the literature (Squire & Dede 2015). The consequences and processes of associative thinking and logical reasoning based on these stored experiences can be memorised, which is essential for decision making, intention and planning. Associative memory therefore supports the cognition of events and emotional reactions in life, through the plasticity of synaptic connectivity. The activation of these associative memories initiates information recall in the mind which subsequently endorses memory presentations through behaviours and emotional reactions (Wang & Cui 2018). Therefore, as therapists, we would be wise to consider that, when addressing movement and function, we are inherently dealing with learned behaviours based on associative memories that are emotionally charged and experientially underpinned. In summary, movement changes, lack of variability, overt muscular responses, inability to pertubate and loss of function may be the result of an inappropriate associative memory linking the task

> "WHEN ADDRESSING MOVEMENT FUNCTION WE WOULD BE WISE TO CONSIDER THAT WE ARE DEALING WITH LEARNED BEHAVIOURS"

of moving the spine to pain and past experiences, as well as being influenced by present negative cognitive thoughts (figure 5). So, what the therapist observes is the result of learned behaviours, not necessarily the cause of the problem.

To address the cause, the therapist, with the patient, will need to provide a new context, alter the association, which will supplement a change in belief and ultimately a prolonged change in output and the acquired skill of "normal" pain free movement.

Targeted therapeutic interventions

What might we, as clinicians, wish to consider when we prescribe an exercise or aim to encourage a change in movement? This process must be a collaboration with the patient and clinician; therefore it is essential to build a therapeutic relationship. It is beyond the scope of this article to explore these methods in detail. However, building in the education of the condition, the understanding of the patient with regard to the emotional, physical and social reactions of what you may ask them to do, has to be in place before requesting the patient to begin to modify or alter their lifestyle or how they perform a task. It is worth considering that we, as clinicians, will be aiding the individual to re-acquire some skill, so in coaching them to move differently and asking the patient to do this repetitively, we need to build in a reward, something that is endogenous in itself (Navratilova *et al* 2015) as the feeling of improvement or change will "encourage" the patient to work towards the new skill of movement adaptation or task function. A "reward" may be symptom reduction during a movement, seeing a change in range of motion, being able to sit or stand for longer, walking with less fatigue or even more socially enhancing activities such as re-engaging with family or friends.

Exercises may involve a completely different experience in task success, and it may be a breakdown of that task, such as the ability to bend successfully. In this example, the patient may display a hypertonic spine and a loss of motion. Asking the individual to flex can create a cascade of events neurobiologically and emotionally linking the movement to a pain experience. Even when suggesting the individual modifies their forward flexion in a very selectively and in a similar way to the original method, the Pavlovian reaction / environmental cue (Claes *et al* 2016) is likely to remain the same. However, giving the patient a different context and method for bending, such as considering the individual's ability to pertubate effectively and whether their trunk

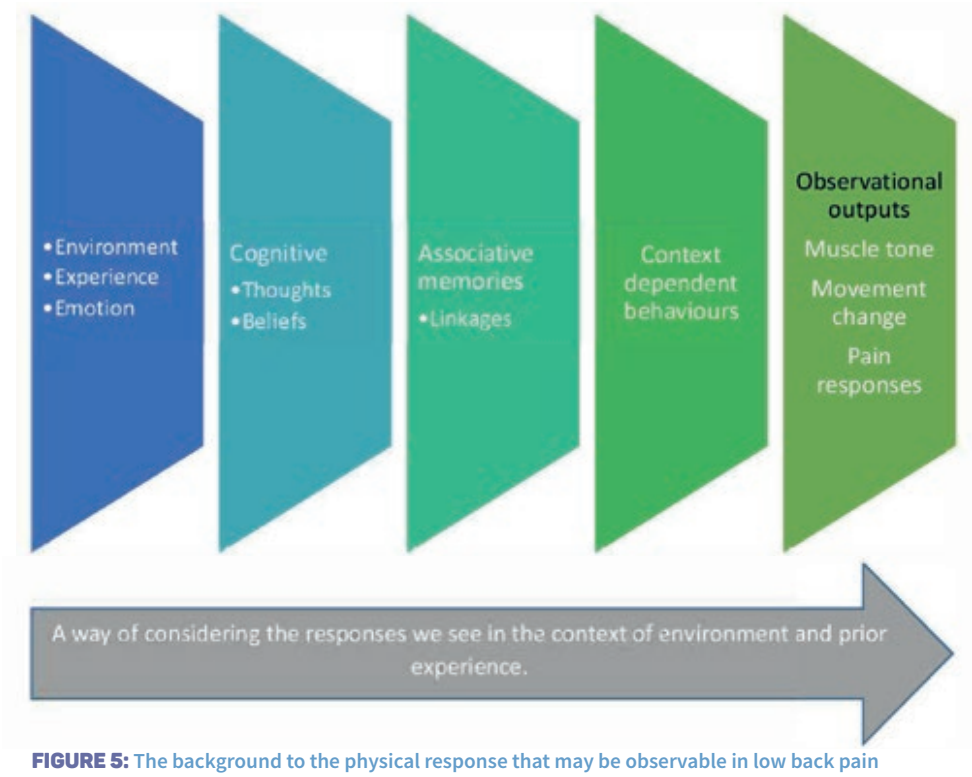


FIGURE 5: The background to the physical response that may be observable in low back pain

moves independently of their head, suggesting alterations in the initiation of the movement, changing their centre of gravity in the starting position, and using language that does not mimic that linked to spinal motion, such as "please bend forward" and instead ask if they are able to move their hips back and put weight on their heels (figure 6), might achieve the desired outcome in obtaining forward flexion and potentially lessen the patient's associated memory and therefore response and make the movement rewarding. Once this process has begun, the acquisition of the skill could be enhanced away from the clinic by visual feedback, a graded sense of achievement by picking objects up in different ways more successfully, or by possibly a distraction technique such as asking the individual to concentrate on words such as "softening, relaxing, lengthening" as well as relaxed breathing. All of these modifications would be designed to begin the process of motor imagery change and therefore resultant physical performance alteration with enhanced feedback.

The addition of a hands-on approach in these instances could be considered dependent on the successful acquirement of skill as this would preclude the need to utilise any further external input. However, where we need to change the patient's perspective of moving differently, there may be an opportunity to do this with a hands-on approach that supplements the patient's movement in a positive way. Numerous studies highlight that pain reduction is, for whatever reason, modified under hands-on treatment protocols, the other two further benefits are likely to be a proprioceptive awareness to enhance the learning of an advantageous movement pattern and the psychological / emotional "support" that a helpful hand may offer to "guide" the individual through a task. The "interruption" in behaviour, supported by the clinical interaction, i.e. hands-on support, is only as valuable as the subsequent reinforcement of learning that the clinician can introduce as part of that change process. If the modification of movement supported by the clinician is not then enhanced by the patient's own control and capacity, then the new movement strategy cannot be relied upon once the patient has left the clinic. This is commonly defined as compliance or adherence, but perhaps it is really just loss of opportunity and we, as clinicians, are at fault if this occurs. Our focus is to build a non-declarative memory response to a task that is not linked to a pain experience, but if we don't understand the patient's fears, their expectations, their drive or motivation, and do not establish the delivery of reward in our clinical interaction, we cannot describe the result as "poor patient compliance", rather it is poor clinical relationship building.

FIGURE 6: Patient leaning back on heels to achieve bending forward

> "IF WE DO NOT UNDERSTAND THE PATIENT'S FEARS, EXPECTATIONS, MOTIVATION AND ESTABLISH THE DELIVERY OF REWARD, WE CANNOT DESCRIBE THE RESULT AS POOR PATIENT COMPLIANCE"

Conclusion

Analysis of movement in long-term LBP is an observation of behaviour, while the assessment of muscle "function" is an observation of response due to the drive to behavioural change. The associative memories that patients have are environmentally and experientially driven and so, to establish change, the clinician is advised to consider re-building through a skill acquisition model with the knowledge of how this can be positively or negatively affected. Building strategies that gain the patient rewards are a must in the deconstruction of an unsuccessful strategy and the reconstruction of a new one. There are observable behaviours that are noted in the literature; however, the rehabilitation key is to understand these not from a movement loss, stiffness, or biomechanical perspective but from a behavioural model that encompasses the person at the heart of the rehabilitation plan.

CONTACT DETAILS
Neil.langridge@nhs.net
@neiljlangridge

About the author

Neil is a consultant physiotherapist in musculoskeletal practice. He also has an AHP director role and is a senior lecturer at the University of Winchester. He holds an MSc in Musculoskeletal Physiotherapy and a clinical doctorate. As a practising injection therapist, he works across primary care (FCP) and secondary care triage. Neil has been commissioned by HEE to develop e-learning modules for primary care and has been teaching MSK physiotherapy in many different areas for many years across the UK and overseas.

References

Brumagne S, Cordo P, Lysens R, Verschueren S, Swinnen S. The role of paraspinal muscle spindles in lumbosacral position sense in individuals with and without low back pain. *Spine* 2000;25(8):989-994

Brumagne S, Janssens L, Knapen S, Claeys K, Suuden-Johansen E. Persons with recurrent low back pain exhibit a rigid postural control strategy. *European Spine* 2008;17(9):1177-1184

Claes N, Vlaeyen J, Crombez G. Pain in context: cues predicting a reward decrease fear of movement related pain and avoidance behaviour. *Behavioural Research & Therapy* 2016;84:35-44

Cook D, Artino A. Motivation to learn: an overview of contemporary theories. *Medical Education* 2016;50:997-1014

Ferrari S, Chiarotto A, Pellizzer M, Vani C, Monticone M. Pain self-efficacy and fear of movement are similarly associated with pain intensity and disability in Italian patients with chronic low back pain. *Pain Practice* 2016;16(8):1040-1047

Hides J, Lambrecht G, Stanton W, Damman V. 2016. Changes in multifidus and abdominal muscle size in response to microgravity: possible implications for low back pain research. *European Spine* 2016;25(Suppl1):175-182

Keogh A, Tully M, Matthews J, Hurley D. A review of behaviour change theories and techniques used in group based self-management programmes for chronic low back pain and arthritis. *Manual Therapy* 2015;20(6):727-735

Kuner R, Flor H. Structural plasticity and recovery in chronic pain. *National Review of Neurological Science* 2017;18(2):18-30

Kusters D, Vollenbroek-Hutten M, Hermens H. Motor performance in chronic low back pain: is there an influence of pain-related cognitions? A pilot study. *BioMed Central Musculoskeletal Disorders* 2011;12:211

Lamoth C, Meijet O, Daffertshofer A, Wuisman P, Beek P. Effects of chronic low back pain on trunk coordination and back muscle activity during walking: changes in motor control. *European Spine* 2006;15(1):23-40

Leeuw M, Goossens M, Linton S, Crombez G, Boersma K, Vlaeyen J. The Fear-Avoidance model of musculoskeletal pain: Current state of scientific evidence. *Behavioural Medicine* 2007;30(1):77-94

Lussanet, M, Behrend F, Puta C, Sculte L, Lappe M, Weiss T, Wagner H. Impaired visual perception of hurtful actions in patients with chronic low back pain. *Human Movement Science* 2013;32(5):938-953

Mokhtarinia H, Sanjari M, Chehrehazri M, Parnianpour M. Trunk coordination in health and chronic nonspecific low back pain subjects during repetitive flexion-extension tasks: effects of movement asymmetry, velocity and load. *Human Movement Science* 2016;45:182-192

Navratilova E, Atcherley C, Porreca F. Brain circuits encoding reward from pain relief. *Trends in Neuroscience* 2015;38(11):741-750

Newcomer K, Laskowski E, Bing Y, Johnson J. Differences in repositioning error among patients with low back pain compared with control subjects. *Spine* 2000;25(19):2488-2493

O'Sullivan P, Caneiro JP, O'Keeffe M, O'Sullivan K. Unravelling the complexity of low back pain. *Orthopaedic & Sports Physical Therapy* 2016;46(11)932-937

Ostry D, Gribble P. Sensory plasticity in human motor learning. *Trends in Neuroscience* 2016;39(2):114-123

Poppa T, Bechara A. The somatic marker hypothesis: revisiting the role of the "body loop" in decision-making. *Current Opinion in Behavioural Science* 2018;19:61-66

Ramprasad D, Shenoy S, Sadhu J, Sankara N. The influence of kinesiophobia responses with pre-programmed reactions during perturbation in patients with chronic low back pain. *Bodywork & Movement Therapies* 2011;15(4):485-495

Schabrun S, Elgueta-Cancino E, Hodges P. Smudging of the motor cortex is related to the severity of low back pain. *Spine* 2017;42(15):1172-1178

Squire L, Dede A. Conscious and unconscious memory systems. Cold Spring Harbor, *Perspectives in Biology* 2015;7:a021667

Swinkels-Meewisse I, Roelofs J, Oostendorp R, Verbeek A, Vlaeyen W. Acute low back pain: pain related fear and pain catastrophizing influence physical performance and perceived disability. *Pain* 2006;120(1-2):36-43

Tsao H, Daneels L, Hodges P. Smudging the motor brain in young adults with recurrent low back pain. *Spine* 2011;36(21):1721-1727

Vlaeyen J, Linton S. Fear avoidance model of chronic musculoskeletal pain: 12 years on. *Pain* 2012;153(6):1144-1147

Wang J, Cui S. Associative memory cells and their working principle in the brain. Research. 2018;13665:1

Zlomuzica A, Preusser F, Scneider S, Maragraf J. Increased perceived self-efficacy facilitates the extinction of fear in healthy participants. *Frontiers in Behavioural Science* 2016;9:270

Zusman M. Belief reinforcement: one reason why costs for low back pain have not decreased. *Multidisc Health* 2013;6:197-204

Is quality a choice?

NATALIE BESWETHERICK
Head of Practice and Development, CSP

GREG SWARBRICK
Head of Healthcare Outcomes, Bupa

PAM SIMPSON
Communications Officer, Physio First

The final session at our 2019 conference was an historic one, with the CSP, Bupa and Physio First all sharing a platform and a message. The message is clear: that decisions around commissioning healthcare in the future will be determined by the provider being able to demonstrate the quality of their services. This is the first and necessary step towards a greater recognition or a shared reward.

Introduction

Our Physio First Executive were delighted when both Natalie Beswetherick, Head of Practice and Development at the CSP, and Greg Swarbrick, Head of Healthcare Outcomes at Bupa, accepted our invitation to join Pam Simpson in delivering a presentation on quality at our annual conference, and to share, with our delegates, their own experiences in this topic.

Here, we have summarised the presentations from all three speakers in order to remind those who were present and inform those of our members who weren't able to be there just how significant this event was in terms of how Physio First is informing the quality agenda.

Natalie Beswetherick

Thank you for inviting me to your conference. It's great to be here and great to experience such a vibrant network…
You are really driving forward and it's incredible to see the changes in the things you are working on and, in particular, your data collection and quality assurance schemes.

I'm going to be talking about outcome measures.

I'm going to go through what our position is and why they are really critical to practice. You will know that outcomes have become the currency of modern healthcare. Patient related and patient reported outcomes (PROMs) and experience (PREMs) measures are key to demonstrating the success of physiotherapy and your interventions.

Using standardised, validated outcome measures in clinical practice is an explicit requirement of the CSP's quality assurance standards for members. You all know that improving the quality of healthcare is top of the agenda across the UK and it is resulting in a massively increased focus on measuring quality of practice and service delivery.

I'm going to quickly talk about why we use PROMs and PREMs and actually think about "where next". The PROMs were introduced into the NHS in 2009 and they marked a significant change in emphasis in terms of care and the outcome for people. There was a real desire to measure the impact of healthcare interventions from a patient's perspective rather than historically from the therapist's perspective, so it was a really big sea-change. Commissioners and service planners have increasingly included PROMs and PREMs in their specifications, in contracts and have become a routine element in clinical governance and service redesign.

The other reason why collecting outcomes is critical for all practitioners, is because it is demanded through the Health & Care Professions Council. Standard 12. This standard of proficiency for physiotherapists states that all registrant physiotherapists must be able to assure the quality of their practice and that includes the collection of data to demonstrate the outcomes that you have actually delivered in terms of all of your interventions. It is really important stuff.

So, both PROMs and PREMs play a vital role in enabling physiotherapy services to demonstrate their effectiveness, their cost-effectiveness and their impact on healthcare.

There are a range of PROMs that you will be familiar with, some generic and focussing on quality of life and some more MSK focused.

There are a range of PREMs as well. There are two types of patient

questionnaire: functional and relational. The functional questionnaire normally asks about issues like "Could you park your car?" "Were there nice magazines in the waiting room?" and "How long did you wait?", and the relational questionnaire asks the patient about the experience of the treatment relationship that they had. For example, did they feel "they were listened to?", "that the therapist understood them?", and did they "take part in decision-making?".

So, there are two different types, but the most important one is the relational questionnaire.

The one key message I would ask you to go away with is that if you are using something, do make sure it is standardised and make sure it is ratified and is robust. It is no good collecting your own data on your own system. That is not going to help because then you can't be compared with anybody else.

> "MAKE SURE THAT THE DATA YOU ARE COLLECTING IS STANDARDISED, VALIDATED AND ROBUST"

Greg Swarbrick

I work with all of our different businesses, both provider and insurance businesses that includes our care homes and dental practices, health clinics, hospitals and the insurance business, to understand what are the most appropriate measures of quality, and how we collect and record the data and use it to improve patient care.

A frustration that I'm sure is shared by many is that, currently, you have one very simple measure of quality, which is the number of treatment sessions. This really isn't very satisfactory and we wanted to move on beyond that because it's what our patients wanted most of all. We understand the number of sessions causes frustrations for practitioners as well, and as an insurer we wanted to make sure we were getting value for money, that we were getting the right outcomes.

So, we have different measures of quality in a variety of the outcome measures. You can't say what is quality just looking at one particular measure, its not enough.

You want health impact, you want patient satisfaction, you want efficiency as collective measures of outcome.

These collective measures are important (figure 1) because they are good for patients. They help them understand what they're hoping to get in terms of getting better. What that looks like in terms of improvement for pain, function, quality of life.

They are good for clinicians to understand how well they are doing and areas to improve on, and, from a commissioner's point of view, they are really good for making sure they're getting the right quality they are hoping to deliver to their customers.

I was asked to identify what would be good quality measures for private MSK healthcare.

So, we had this [cross sector] working group, we listened to each other's points of view and what we ended up with was a set of recommended measures, and also a sequence to get us from complete fragmentation in private healthcare in terms of the measurement of quality to standardisation. The important starting point is that everyone is collecting measures of quality. That's the bottom line and this is certainly influencing Bupa from the commissioning perspective. We want to be able to work with organisations that are demonstrating an interest and a commitment to the recording of quality.

We're really impressed with Physio First's QAP and QAC schemes in that they fit the model very well.

In terms of direction of travel within Bupa, we are increasingly incorporating this into our commissioning. The important point from a commissioner's point of view is that we don't want to be commissioning blindly, we do want to trust more, and

Why are quality and outcomes important?

Good for patients	Good for clinicians		Good for commissioners and regulators	
Help patients choose the treatment that's right for them and manage expectations	Motivate staff with evidence of the tangible difference they make	Support clinicians' appraisals with evidence as required by the GMC	Demonstrate delivery of Bupa's purpose of longer, healthier, happier lives	Demonstrate quality to regulators such as the CQC
Define what great care tangibly looks like from the patient's point of view and use this to set goals	Enable clinicians to have a better and more comparable view of their patients' health	Improve clinical practice by identifying problems or gaps	Market our services based on evidence of how we get patients better, or meet their needs and aspirations	Demonstrate safety and the effectiveness of our processes
Track patient progress versus expectations	Identify risks in treatments or for individual patients	Demonstrate our added value versus our peers and reassure our patients about effectiveness	Hold providers to account and reward them in terms of their quality, not just for costs or activity	Counterbalance financial performance with clinical indicators of success, using this to differentiate Bupa

FIGURE 1: The importance of measuring outcomes

where we've been moving to in the last six months or so is setting up working with clinical groups who show that they have all the right measures in place in their area; that they've got the right processes. We're devolving more and more responsibility to them and that seems to be working well. You know your patients best, but we can't just trust or pay a cheque blindly, we need to trust and verify at the same time. It's an interesting balance but we do need data, otherwise we would be completely in the dark.

So, we do need to look at the data, to use that data as a starting point to ask questions, not to rush to judgement, and, with that, there is a better understanding of what's right and what's appropriate.

I'm really keen that the whole point of outcomes is to support all providers to deliver the best quality care possible, to help our customers get the best care possible for them. We need to do it carefully, we need to move step by step, we need to learn as we go through this process, but it's the right thing, it's what our customers are asking for from us.

Pam Simpson

So, it seems that data collection using validated tools is not really a choice if physiotherapy practices want to demonstrate their quality service and be rewarded accordingly in the future. Physio First members can make several small changes to satisfy the requirements both of our marketplace and of our profession. In, and of itself, it is sufficient to join our Data for Impact project and collect anonymised patient data through the University of Brighton. This is a validated tool, with elements of both a PREM and recognised diagnostic coding embedded within it. However, data collection is not necessarily "quality" unless it is analysed by a third party. As soon as a member has entered the required number of data-sets, they are measured against our five quality markers, three of which are required to meet or exceed the average, formed from the baseline data, in order to be deemed to provide quality private MSK physiotherapy. This can be either as an individual Quality Assured Practitioner (QAP), or as a Quality Assured Clinic (QAC), the latter being recognised by Bupa and trusted enough not to have to undergo Bupa audits which are planned for this contract period.

Our full standardised data collection tool is 23 questions but the five criteria that count as quality indicators when taken in an equation together are:

- goal achievement
- outcome of referral
- number of treatments
- FPS (functional, physical and subjective) score changes between initial and discharge appointments
- time between referral and commencement of treatment.

This allows specialist or unusual clinics and practitioners to be included. Examples of diverse practices include those with complex caseloads or long waiting times due to popularity. In addition, every participant commits to using a separate PROM and we recommend the University of Brighton BmProm as this is purely electronic and can be easily matched by the University of Brighton against the rest of your inputted data. This is more validation which is great!

Data collection becomes part of everyday practice and not a chore. Our experience indicates that following simple explanations most patients love being involved in this, and our practices benefit from the benchmarking as well as the measuring.

Visit our website **www.physiofirst.org.uk** and see our new e-booklet (**https://www.physiofirst.org.uk/asset/7C476EFA-A219-4EC7-958572925AF19095/**) explaining QAP and QAC very simply and use this with your patients to explain to them why you are asking them to help you collect their data. Here you will find the evidence to support some of the sentences highlighted in this article too.

It may feel to some members that Physio First created the quality measures for the insurance companies. This is absolutely not the case. Do you ever select anything on quality? Registered plumbers? Recommended decorators? Star rated restaurants? Our main patients who are the self-referred, self-paying uninsured members of the public will increasingly look for recognised kitemarks. Our QAP and QAC kitemarks are gaining traction very quickly and being recognised. Endorsement by our professional body and the largest private medical insurer in the UK can only help with that. What are you waiting for?

77%

of patients **exceed**, **fully** or **significantly achieve** their treatment **goals**

We all want increased recognition for our quality services but, unless we are comfortable being measured in order to truly demonstrate our effectiveness, how can we individually, or collectively, negotiate greater reward?

"9 OUT OF 10 PATIENTS WHO SEE A PRIVATE PRACTITIONER ARE SEEN WITHIN ONE WEEK"

Obituary | Sue England, President, Physio First

Remembering Jean Kelly 1944-2019

It is with great sadness that we report the news of the death in April this year of past Chairman, past President and Honorary Life Member of Physio First, Jean Kelly. Here, our current President Sue England shares her memories of a friend and colleague.

I first became aware of Jean when, as the Education Officer, she had set up the then OCPPP's first business and marketing course. She was very warm and welcoming both to new members like myself and to very experienced practitioners. The course led to her interest in assessing and delivering quality physiotherapy outcomes, a topic that was sweeping the business world at that time. Jean set up a small working party to develop the Practice Accreditation programme which correlated with the European ISO9000 programme for business and, over the next few years, she and her team worked hard to promote "the quality spiral" and the accreditation process. All gave their time freely delivering one- and two-day courses, enthusing the membership and taking the accreditation process forward. For this groundbreaking work, Jean was awarded the CSP Fellowship.

Later, as a trustee of the Private Physiotherapy Educational Foundation (PPEF), Jean became involved with the University of Brighton and revisited her interest in the efficacy and value of private physiotherapy. These were the earliest days of data collection! It is this legacy, taken forward by successive Chairs, that has put Physio First in charge of its own destiny.

Jean was Chair of OCPPP for six years and, as her Vice-Chair, I witnessed her courage at close quarters. She demonstrated her personal strength, continuing as well as she could while undergoing the rollercoaster path that is radiotherapy and chemotherapy. Fortunately, she made an excellent recovery.

Professionally, I had the privilege to support her when a small insurance company started to try to dictate how private physiotherapy should be delivered through determining the number of sessions and clinical content that would be covered under their terms (sound familiar?). We called the one and only Extraordinary General Meeting on that issue. It was held at Edgbaston Cricket Club and more than 500 members attended! This was more grist to Jean's mill regarding the pursuit of "data collection" to demonstrate our professional worth and support our autonomy, and she did so more vigorously than ever. One of her other innovations was to appoint the first General Secretary of OCPPP.

Jean was a people person, an innovator, a forward thinker and leader, taking her ideas forward where she demonstrated her professional courage. She was passionate about the profession, she did everything with integrity, compassion, and with fun. Our committee meetings were hard work but there was always fun to be had. She was an inspiration and great mentor to me, and she always led by example.

Jean, you touched many lives and you will be greatly missed.

... and from Paul Donnelly, Strategic and Business Lead

I first met Jean in around 1998 when she was Chairman of the then OCPPP. However, by the time I joined Physio First in the role of General Secretary in 2001, she had already stepped down from that post but was still an active and enthusiastic member of our organisation.

Jean remained front and centre within Physio First as part of our Education sub committee and as a passionate advocate for the physiotherapy profession in her role as PPEF Chairman and then as IPPTA Chairman.

In 2002, to celebrate our organisation's 50th anniversary, Jean wrote a comprehensive history of the origins of OCPPP, which was revisited for our 60th anniversary and published in the summer 2012 edition of *In Touch*, and now forms part of our Physio First business plan. The more I think about it, the more I think it might be easier to list all the things Jean did not do! I am sure that, like me, all who knew her will be in a state of shock at hearing the very sad news of her passing.

Physio First conference: a first-hand experience

Jo Greene, Physio First member

As a new start-up physiotherapy practitioner working from home and on "shaky legs", my first Physio First conference came at a time when I was just starting to find my feet. I saw it as the opportunity to network with other private practitioners and I hoped to find the "magic place" where I could get consumables and equipment for my new practice at a reasonable price, and advice for a new starter.

As I had attended Level 1 Stecco training last year, which was a game-changer for me, I was keen to hear what Antonio Stecco had to say in his lecture. In addition, I had heard Professor Tim Watson speak 10 years ago when I was at university, so I was looking forward to an update, especially as I hoped to attend one of his courses in the near future

to brush up my knowledge. I was not familiar with any of the other speakers.

The East Midland Conference Centre is perfect as a venue, notwithstanding my unplanned drive around the university accommodation area, and sign-in was effortless with my "goodie bag" and name tag waiting for me. The layout of the programme was clear and the only concern I had was whether I would find time to peruse all the exhibition stands.

My fears of attending the event on my own were very quickly alleviated as, in true physio style, I struck up a conversation with a colleague over pastries and coffee. It was her second conference and, once we were in the auditorium for the first lecture, our group started to grow. It wasn't long before we were discussing our practices and talk turned to the problem we have with insurance companies, especially Bupa and Nuffield.

The speakers were well worth the cost and time involved in spending two days in Nottingham. Deborah Falla fascinated the audience with her research into how dysfunctional muscles behave in terms of spatial distribution of muscle activity and there was a palpable buzz of excitement when she revealed research into surface EMG patches that would have a potential use in our own clinics. Joanne Elphinston, of whom I had sadly not heard before, delivered a friendly, conversational talk on manual therapy being the "gateway" into patient's treatment. Her assertion that manual therapy is not the treatment is a phrase that I connected with and her compassion-based practice was inspirational. I look forward to attending one of her courses soon.

The Physio First conference then introduced me to someone I can only describe as "Physio's own Mad Professor", Mick Thacker. He delivered complex information in an engaging, humorous way, regularly making his audience laugh. He certainly inspired, through his lecture, an enthusiasm to dive back into the subject of pain. His point about how the visual is far more powerful than hearing, challenged me to reflect on my recent eager attempts to get my patients "on board" with their treatment and whether I do, in fact, use too many words. This gave me a great deal of food for thought (more on food later), and I came away from Professor Thacker's lecture with my own personal challenge.

I'm pleased to say that Antonio Stecco did not disappoint. The depth of his knowledge and understanding of the fascial system is breathtaking. We were lucky enough to have the opportunity to attend two presentations by him, as he spoke Friday and Saturday. On Saturday morning the auditorium was buzzing with tales of his Italian dancing style during the Friday evening supper event which I had opted not to attend. The fact that he was besieged by questions via the sli.do app during the questions to the panel session clearly demonstrated the hunger we physios have for finding ways in which we can better help our patients. Learning of Tim Watson's decision

> "ANY FEARS OF ATTENDING ON MY OWN WERE QUICKLY ALLEVIATED AS I STRUCK UP A CONVERSATION WITH A COLLEAGUE OVER COFFEE AND PASTRIES ."

to step down from offering courses in electrophysical modalities came as a disappointment. I feel we have been lucky to have his tireless work in this area and I feel sad that I have not spent enough time utilising the resources he has given so freely to the physiotherapy community. I was glad to see, however, that he hadn't changed a jot; he remains as excited by his subject matter as I remember when I first saw him speak to a bunch of wide-eyed physiotherapy students, when he first inspired me to look beneath the popular culture of the humble ultrasound and take it out for a spin.

I did manage to get my time in the exhibition hall. I was excited to see Celia Champion from Painless Practice there as I had attended her invaluable course on Proactive Planning for Business Success in February. I was also surprised that she remembered me but perhaps shouldn't have been as she has an astounding capacity to be interested in your practice's welfare, and I think I already had found my "magic support" in her course. This encounter drove home to me that even when you are a lone private practitioner, the physiotherapy community can be a supportive unit. As for the question of where a new practice can find affordable equipment with a friendly down to earth face, I found myself at Trimbio! John identified my ancient ultrasound and the company is a fantastic resource for second-hand equipment that they can service. There were countless more companies in the trade exhibition with a range of products and services to fill the gap for the needs of private practice; from practice software to shiny new state-of-the-art electrotherapy technology such as those offered by Celtic SMR, consumables, and exciting new research and development of interactive rehabilitation tools from the likes of Knee Tracker and Activbody.

So, what do I think was good, and what could be improved on? The organisation, the speakers, the venue, the food (yum), the exhibitors and the free parking all get on to my good list, but I think a simple diagram of the campus would have made things less stressful for first-time visitors to the venue. Mick Thacker had talked about visually setting expectations and ours had been set during Friday's tea break with a spread of pastries, but on Saturday there were none. I'm not sure that this is what he had in mind when he gave his presentation, but it drove the message home and there were quite a few jokes being made about it after the break.

On a more serious note, the final session with a presentation from Greg Swarbrick from Bupa could have allayed the fears we have with regard to insurance companies, but the debate was hardly opened and it seemed to be a missed valuable opportunity to engage with a collective of private physios under one roof.

With regard to the theme of conference, I and many of my fellow delegates had arrived with concerns about how the hands-off approach is being adopted by NHS services, and the weekend confirmed that hands-on, the bread and butter of our private field, is something that we are still overwhelmingly in agreement with.

Conference report from PPEF Louis Gifford Award winners

CLAIRE OLDROYD AND CLARE PETTIGREW, PHYSIO FIRST MEMBERS

Firstly, we would like to thank the Private Physiotherapy Educational foundation (PPEF) for so generously sponsoring the Louis Gifford Award that enabled us to attend, fully funded, the 2019 Physio First conference entitled "Hands-on, hands-off – what is the evidence?"

Lectures were given by international speakers; from Ireland, Mary O'Keeffe, and from America, Antonio Stecco winner of the best dancer award at the Friday night party! The UK speakers were Deborah Falla, Joanne Elphinston, Mick Thacker, Roger Kerry and Tim Watson, all of whom have presented at past Physio First conferences, but it was a delight to have the opportunity to listen to them again.

The hands-on, hands-off theme emphasised the value of touch which, in turn, may allow an opening for other forms of physiotherapy treatment. As we know from the analysed and verified data from the Physio First Data for Impact (DfI) scheme, most members of Physio First use at least three different modalities when treating our patients.

Questions to presenters via sli.do at the end of each half-day session were lively and challenging.

Mick Thacker was a particular highlight on Saturday morning, when he took us through some of his ongoing research into "predictive processing". As a contemporary, and close friend of Louis Gifford, Mick is expanding on Louis' "Mature Organism Model" with his work on predictive coding.

As an introduction to this work, Mick presented some of the neurophysiology behind the expectation and reality "mismatch" and how that can generate pain. He reinforced the notion that "you are not your brain" and discussed how we, as therapists, can use touch and movement to influence our patients' experience of pain.

He reminded us that pain is complex and that our job is to "find a way in". This echoed the sentiments that had been expressed on Friday by Joanne Elphinston during her discussion of the "4 C's" of physiotherapy practice: clinical reasoning, common sense, confidence and caring.

> "LOUIS GIFFORD WOULD BE PLEASED THAT WE ARE INFORMED PRACTITIONERS WHO LISTEN TO THE POSSIBILITY OF NEW EXPLANATIONS"

Joanne advocated the use of "hands-on" as a way of creating space to calm and reassure the patient, to help facilitate them to a point where they can progress their treatment.

Deborah Falla introduced us to the benefits of using high-density surface EMG in the evaluation of spinal muscle control. She has used it to demonstrate how healthy individuals can re-distribute muscle activation across the muscle fibres over the duration of a task, and how the same parts of muscles become more active over time in low back pain patients; the question, however, was which comes first, the pain or the adaptation?

Tim Watson was as highly entertaining as ever. He reminded us that the right electro-physical modality (EPM), used at the right time, at the correct dose can have great results, and there is stacks of evidence to prove it, much of which can be found in Tim's fantastic resource **www.electrotherapy.org**.

He urged us not to throw the baby out with the bath water in the current

"hands-off" climate where we tend to consider EPMs as "passive", and pointed out that physiotherapists don't have a monopoly on the use of EPMs. If we're not careful, our patients will head elsewhere to access the evidence-based treatment that they know works. Chances are that, following his presentation, there were a few of us dusting off our ultrasound machines and cranking them up to their thermal settings for the odd OA knee in our clinics on the Monday after conference.

For those of us who use acupuncture in our practices, Antonio Stecco's idea that fascia can be the bridge between the two cultures of east and western medicine was particularly exciting. His detailed information on the physiopathology of the deep fascia was backed up by superb dissection slides. His description of the fascial layers and explanations around sliding and viscosity made sense of much of what we see every day in our clinics. The popularity of questions for Antonio from the sli.do app was testament to how he had got us all thinking about how we can use his work in our own practice.

We were reminded throughout the conference of the importance of reading behind the headline; to consider the motivations of authors and speakers as we evaluate their positions. We were encouraged to recognise where the gaps are in the evidence, and to read and investigate further in order to have the confidence to clinically reason.

Louis Gifford would have been pleased that we no longer seem to be the "guru-led" profession of the past, but that we are informed practitioners who listen to the possibilities of new explanations and have the knowledge to explore different avenues.

For the final lecture of the conference, we were joined by Natalie Beswetherwick from the Chartered Society of Physiotherapy, and Greg Swarbrick from Bupa who both endorsed the Physio First Quality Assured Practitioner (QAP) and Clinic (QAC) schemes. Another stimulating question and answer session followed this and it was perhaps a little awkward that, after a weekend of lectures championing individualised patient care and the importance of spending time listening to, and treating, each person's unique needs, that Bupa still see "time to discharge" as a valuable measure of efficiency.

As always, in addition to the full programme of presentations and lectures, the conference included an excellent trade exhibition, with many incentives for visiting the individual stands, such as prize draws where you could win a variety of great items, including a Chromebook!

The University of Brighton team were present throughout to answer any queries on DfI. This was especially useful as the Bupa renewal application had just recently landed in many of our inboxes, and collecting data is listed as one of their commissioning requirements.

The final report from outgoing Chairman, Pam Simpson, at the Physio First AGM reminded us of all our organisation's amazing achievements over past years. Pam then passed the chain of office to our new Chairman, Karen Lay. Friday night was party night, with dancing that made up for the lack of exercise during the day!

Many thanks to the Physio First office team and education sub committee who ensured the whole delegate experience was slick and smooth.

Certainly, one of the most valuable parts of the two days at conference is the opportunity for networking with the lecturers, colleagues and friends – old and new – over a glass or two of wine. For those members who have not attended conference before, or haven't recently, please do put the dates of 24-25 April 2020 in your diaries. The theme next year is Brave New World and it promises to be a stimulating and fun two days.

Thank you again to the PPEF for giving us this opportunity for fully funded attendance. Information about how you can apply for the 2020 Louis Gifford Award can be found at **www.ppef.org.uk**.

We hope to see you in Nottingham next year.

…and remember, n=1.

PPEF Louis Gifford Award

THIS AWARD is in memory of Louis Gifford, a private physiotherapist who made an outstanding contribution both to Physio First, and to the physiotherapy profession in general. Recipients receive a free place, accommodation and return travel for the Physio First Conference.

Applications are invited from both Physio First members and non-members, to be received by the deadline of midnight on 1 September 2019. Full details can be found on our PPEF website **www.ppef.org.uk**.

Conference report from an exhibitor's perspective

SHAMEEM SAMPATH, KNEE TRACKER LIMITED

For us, the Physio First 2019 conference was an outstanding event. As a start-up company, Knee Tracker Limited needs to be selective with regard to where and with whom we choose to spend our budget for attending exhibitions; we need bang for our buck, and the fact that the trade event was on Friday and Saturday definitely suited us better than last year's timetable when we needed to be in attendance from Friday to Sunday.

As with our experience in 2018, this Physio First event exceeded our expectations. The team, the venue, the floor plan, catering, lecture schedule, and attention to detail were all spot on, absolutely everything was right.

As exhibitors, it is essential that we have the opportunity not only to meet prospective customers, but also to network in order to have the potential for partnering with other businesses and, in this regard, we were certainly not disappointed. As a result of meeting with over 200 physio delegates and obtaining their feedback, we have been able to increase the projection for our business for the coming year.

Ultimately, most notable for our team, in a weekend full of notable experiences, was the feeling of personalised care that we received from the Physio First team. It is for this reason that the Physio First conference stands out from the rest.

We look forward to joining you again in 2020.

Winner of our Physio First Survey prize draw

Congratulations to Steve Kent, the winner of a place on our 2019 Physio First conference. Steve was one of the many members and non-members who completed our feedback survey and was entered into our prize draw.

Steve, pictured, opted to attend Neil Langridge's course on Low Back Pain Management which he subsequently described as interesting, informative and thought-stimulating and one that he would very much recommend to others.

As a non-member, he found it interesting to see our Physio First conference in action and commented on how well organised he found it.

We were thrilled to have Steve join us.

CONFERENCE COMPETITION WINNERS

Congratulations to those delegates who entered the competitions run by our trade exhibitors and won their wide variety of generously offered prizes.

1 **Activebody**
Niall McKeever and Phoebe Machin
Activ5 Yoga device worth £120

2 **Calderdale Framework**
Sarah Crichton and Emma Graham
Yorkshire goody bags

3 **Knee Tracker**
Tanya Croall and Susan Spence
Bottles of pink champagne

4 **Medserve**
Jennifer Austin SpineGym core exerciser worth £269

5 **Naqi Skincare**
Liz Taylor, Liz Bowman and Pamela Bruce Gift boxes worth £40

6 **Osmond Group**
Stuart McKee
RH Logic chair worth over £1,000

Painless Practice
Michelle Henry
Practice review worth £350

7 **Phoenix Healthcare**
Anna Caskey and Charlotte Morris
Hamper prizes containing physiotherapy items, chocolates and wine

PhysioTools
Angela Waite
12 month subscription to PhysioTools online premium package worth £129

8 **Physique**
Peter Jellett
A goody bag worth over £60

9 **Sissel UK Ltd**
Phoebe Machin
Bottle of Champagne

10 **TM3 (Blue Zinc)**
Claire Oldroyd Chromebook

11 **Trimbio**
Tracey Miles
Products to the value of £50

Tower Health (Medi Direct)
Paul Dando
Fisiocrem shirt and £250 worth Fisiocrem products

CONFERENCE THANK-YOU

To all those contributing to the success of our 2019 conference either as an exhibitor or sponsor.

ActiveBody
www.activ5.com
0131 552 2090

Calderdale Framework
www.calderdaleframework.com
07825 271166

Celtic SMR Healthcare
www.celticsmr.co.uk
01646 603150

Federation of Small Businesses
www.fsb.org.uk • 0808 2020 888

First Contact Health
www.firstcontacthealth.com
01480 722999

Frequency Specific Microcurrent
www.fsmuk.co.uk • 0877 695 7500

Gait and Motion
www.gaitandmotion.co.uk
01223 603984

Handspring Publishing
www.handspringpublishing.com
01875 341859

Indiba
www.indibaactiv.com
00 34 93 265 55 22

Jane App
www.janeapp.com

Knee Tracker
www.kneetracker.com
07771 996334

Medserve Therapy Innovations
www.medserveinnovations.co.uk
01327 310310

Meglio
www.mymeglio.com • 01491 520718

Mike Urwin Photography
www.mikeurwinphotography.co.uk
07875 672807

Naqi
www.naqi.com

Osmond Ergonomics
www.ergonomics.co.uk • 0345 345 0898

Painless Practice
www.painlesspractice.com
01491 659073

PAL Advisors
www.palphysioadvisors.com
07427 660338

Phoenix Healthcare Ltd
www.phoenix-healthcare.co.uk
0115 965 6634

Physio Co-op
paul.donnelly@physiofirst.org.uk

PhysioTools UK
www.physiotools.com •
01749 890870

Physique
www.physique.co.uk • 023 9247 1346

PPEF
chairman@ppef.org.uk

PPS
www.rushcliff.com • 01283 550777

Ravensford
www.ravensford.co.uk • 0208 242 6098

Sissel UK Ltd
www.sisseluk.com • 01422 885433

TM3 Practice Management Software
www.tm3.com • 02890 998697

Tower Health Ltd
www.tower-health.co.uk
07850 374618 / 0115 977 8371

Track Active
www.trackactive.co • 07939 529018

Trimbio
www.trimbio.co.uk • 01403 597597

Vald Performance
www.valdperformance.com
07737 461053

Tips from our team

2019/20 membership certificates

Thank you to those members who have renewed their membership with us, and to all new joiners, your membership certificate to **31 March 2020** is enclosed with this edition of *In Touch*.

Do we have your up-to-date details?

It has come to our attention, mainly owing to the verification process required by the University of Brighton for those members joining our Data for Impact programme, that the data we hold on our members is not always up to date. If you have recently changed your address, contact details or email address, please ensure that you let our Physio First office know. This also helps us to ensure that members receive essential, organisational and marketplace information from us.

If you need to inform us of any changes, or aren't sure if we have your correct details, please contact our membership team on **minerva@physiofirst.org.uk** or call **01604 684960**.

Explaining data collection and quality

From our Physio First Research and Development team

How do I become a Quality Assured Practitioner?

This is available to Full and Affiliate members of Physio First only. Part-time subscriber members cannot be awarded Quality Assured Practitioner (QAP) status in their own right.

1. Enrol for Data for Impact (DfI) and start collecting data.
This can be done by going to the Physio First website **www.physiofirst.org.uk**, where you can find contact details for the University of Brighton (UoB). The team at the UoB will verify that you are a member of Physio First and send you log in details so that you can start inputting data to the UoB hosted data collection website.

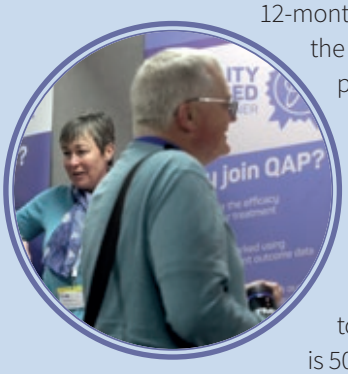
If you are aiming for QAP, you must also be using a Patient Recorded Outcome Measure (PROM) as part of your data collection. We do not currently specify which you should use but do recommend the BmPROM as this is a validated PROM that is freely available to use.

2. Measuring your data
Once you have submitted a minimum of 50 discharged datasets over a 12-month period, your data is measured against agreed and realistic outcome levels for the following five criteria

- goal achievement
- outcome of referral
- number of treatments
- FPS (functional, physical and subjective) score changes between initial and discharge appointments
- time between referral and commencement of treatment

and from the national data. This analysis takes place in January, May and September.

Quality Assured Practitioner status will be awarded to members who are collecting PROM data and have submitted sufficient datasets that meet or exceed at least three of the five criteria as measured and validated by the UoB. Members will be advised of their results by the UoB in either the Janaury, May or September analysis period.



Becoming a Quality Assured Clinic (QAC)

In order to qualify to become a QAC, the Practice Principal in your clinic must be a Full member of Physio First and all other musculoskeletal (MSK) physiotherapists in your clinic need to be either Full or Affiliate members of, or part-time subscribers to, Physio First. All must be enrolled for DfI, inputting data and using a PROM.

1. Collecting data
Full and Affiliate members should enrol for DfI as previously explained. Part-time subscribers in your clinic are required to be enrolled with DfI and inputting data within a month of subscribing to Physio First.

The Practice Principal should contact the UoB requesting a QAC practice principal declaration form on which the Practice Principal will list all the MSK practitioners in their clinic and the hours they work. Following receipt of this form the UoB will verify the Physio First status of each MSK practitioner in your clinic and contact them individually to obtain their consent for their DfI datasets to be amalgamated with the clinic's for QAC assessment.

2. Measuring your clinic's data
Your clinic is assessed as a whole unit in proportion to the hours worked for each practitioner, i.e. a full-time physiotherapist must complete at least 50 discharged datasets over a 12-month period, in line with the QAP requirement, but a part-time physiotherapist will only be required to complete a pro rata figure of the 50 discharged datasets. The minimum number of datasets for a clinic to be measured for QAC is 50.

Achieving QAP / QAC status

Assessment for QAP and QAC takes place three times a year; January, May and September. Those with successful results will be notified directly by email from the UoB team, and you will be sent an individual report of your data. Because these results are anonymised, it will be up to you to make contact with Physio First to register your QAP or QAC status.

For physiotherapists unsuccessful in achieving Quality Assured status, the UoB will contact you to guide you through the results and give advice on how you might achieve your QAP or QAC at the next assessment.

More information on our QAP and QAC schemes can be found on our website **www.physiofirst.org.uk**, where you can also access our e-booklet on how QAP and QAC can help you.

Small ads

SERVICE & REPAIR: MATHUR ELECTRO-MEDICAL LTD

Sales and servicing of all physiotherapy equipment.
New and second hand guaranteed available.
For prompt, reliable service:

telephone: 01273 842425
mobile: 07850 858584

email: **mathurelectromedical@hotmail.com**

RWR SERVICES

Service and repairs of all Physiotherapy
Electrotherapy and Rehabilitation Equipment

- Sales of new and refurbished equipment
- Second hand equipment bought and sold
- Full support of the **SHREWSBURY** product range

For further details visit: **www.rwrservices.co.uk**
Tel: 0345 257 8925 / 01743 860432
Email: **richard@rwrservices.co.uk**

COPY DATE FOR *IN TOUCH* 168
AUTUMN EDITION 2019 – 20 JULY 2019

Published by Physio First.
Physio First, Minerva House, Tithe Barn Way, Swan Valley, Northampton NN4 9BA.
Tel 01604 684960 **Fax** 01604 58923
email minerva@physiofirst.org.uk
www.physiofirst.org.uk

All enquiries for *In Touch* to:
Tobias Bremer, Editor.
email: editor@physiofirst.org.uk
or post to: Physio First, Minerva House, Tithe Barn Way, Northampton NN4 9BA.
The editorial board reserves the right to edit all material submitted.

Design and production by Pages Creative (Cheltenham) Ltd.
www.pagescreative.co.uk

Printed by Severn, Gloucester on FSC® Essential Silk to ISO9001 quality and ISO14001 environmental standards.
Using 100% renewable energy from Ecotricity.
www.severnprint.co.uk

MIX
Paper from responsible sources
FSC® C022174

TM3

STREAMLINE YOUR OPERATIONS

INVEST IN THE FUTURE OF YOUR CLINIC

Industry leading private practice software

Flexible Solution

TM3 promotes flexibility, allowing you to run your clinic across multiple devices with seamless integrations.

Clinical Notes

Our industry leading Clinical Notes tools make note taking far more efficient, flexible and engaging for patients than ever before.

Practice Management

From patient invoicing to managing private health group accounts, unlock the potential in your practice with TM3.

Why TM3?

Trusted by over 10,000 practitioners to streamline operations, enhance compliance and improve patient engagement. TM3 is a modern and intuitive clinic management system that helps manage your day, so you spend less time on administration and more time treating patients.

- Patient, finance, diary & appointment management
- Industry leading clinical records
- Online patient appointment booking
- Secure data hosting in ISO27001 data centres
- Comprehensive business & clinical reporting
- Automated communications with patients
- Expert, 5 star rated help at hand
- Greatly enhance GDPR compliance

Physio First Discount

We are delighted to be working in partnership with Physio First to offer an exclusive discount on TM3 products. Contact us today to find out more.

Blue Zinc IT Dill House, Castlereagh Business Park, Belfast, BT5 6BQ

☎ 028 9099 8696 ✉ enquiries@tm3pm.com 🖵 www.tm3pm.com

bluezinc