

What do UK osteopaths view as the safest lifting posture, and how are these views influenced by their back pain beliefs?

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A B S T R A C T

Background: Lower back pain is a leading cause of disability and a common condition seen by osteopaths. Evidence and advice for the safest lifting posture vary, as do healthcare practitioners' attitudes and beliefs towards back pain.

Objectives: The aim of this study was to understand osteopaths' beliefs about safe lifting postures in relation to their attitudes towards back pain, and to compare these findings with published data from physiotherapists and manual handling advisors.

Design: Cross-sectional study.

Method: Between October and November 2018 a cross-sectional electronic survey was used to invite a sample of UK osteopaths to select images that best represent their perception of safe lifting posture (straight or rounded back), and to complete the Back Pain Attitudes Questionnaire (Back-PAQ). Data was analysed to assess lifting posture selection and relationship to back pain attitudes.

Results: 46 (85.2%) out of 54 osteopaths selected straight back posture as the safest, these participants had significantly more negative attitudes to back pain injury (i.e. higher Back-PAQ scores), than the 8 osteopaths who selected a rounded back posture ($p = 0.007$). Data from 266 physiotherapists and 132 manual handling advisors revealed an overall agreement about straight back lifting posture, and differences in Back-PAQ attitude between the professions.

Conclusion: Despite a lack of evidence and inconsistent recommendations, osteopaths in this study believed that straight back lifting posture is the safest and were associated with more negative back pain beliefs. Practitioners' attitudes and beliefs are known to influence their patients' attitudes and recovery behaviour. Further research is recommended to identify reasons for different beliefs, and their impact on advice-giving and patient outcomes.

Introduction

Lower back pain (LBP) has been identified globally as the leading cause of physical disability [1]. Not only is LBP debilitating [2], it constitutes a significant socioeconomic burden [3,4], and is the most common condition seen by osteopaths in the United Kingdom (UK) [5].

Some research has identified less 'optimal' or awkward lifting postures as a potential cause of LBP [6,7] and some evidence suggests occupational lifting is a contributing factor to the development of LBP [8–10]. Cross-sectional studies conducted globally including in New Zealand [11], Norway [12], and in Ireland [13] highlight that a common belief held by the general population is that there is a causative relationship between lifting posture and back pain. However, despite this

commonly held belief, there is weak evidence supporting such a causative relationship [14].

Research into the prevention of LBP when lifting focusses predominantly on the effect of adopting either a 'straight back' posture or 'rounded back' posture. Published recommendations about which is safest vary; the UK Health and Safety Executive [15] promotes a straight back squatting technique, whereas the UK National Charity BackCare (backcare.org.uk), who advise the UK National Institute for Health and Care Excellence (NICE), encourage "bending your knees and hips, maintain a straight back" [16]. In contrast, the UK National Health Service (NHS) advise a "slight bend of the back, knees and hips" [17]. In addition to such inconsistent recommendations, there appears to be a lack of high quality evidence supporting any single lifting technique

[18]. Plamondon et al. [19] used ground reaction force platforms and 3D photogrammetric systems to gather estimates of the forces at the spinal levels. In this study "expert" lifters, (as defined as having >5 years' experience in manual handling roles, and was regarded by colleagues as "expert"), demonstrated significantly less lumbar flexion when compared to more flexed novice lifters. Another study that utilised motion sensors to ascertain lumbar flexion angles [20] reported 'expert lifters' (defined as weightlifters who train 3 or more times a week), exhibit less lumbar flexion compared with novice lifters while undertaking a straight-leg lifting task. The authors concluded that maintaining a lumbar lordosis is important to avoid end-of-range strain and to therefore lowering the risks to safety of the lower back. Arjmand et al.

[21] generated a computer-based representation of local and global musculature to predict the forces acting at each spinal level. Their simulation indicated that moderate lumbar flexion generates significantly lower shear forces than kyphotic and straight back lifting posture and is therefore theoretically safer. In contrast, Gallagher et al. [22] used an EMG-assisted biomechanical model but reported no significant difference between the forces predicted for kyphotic and lordotic groups.

An early systematic literature review [23] conclude that the biomechanical evidence does not support a 'squat' technique as the safest, and found biomechanical shear forces and bending moments between stoop and squat technique both remained below injury threshold. Straker [24] conducted a broader systematic review of over 60 publications, which found that no single lifting technique can clearly be recommended. Most recently Kuijer et al. [18], led an extensive series of expert panel meetings alongside a robust systematic literature review, to examine how best to prevent work relates LBP; however, no consensus was reached regarding the safest lifting postures, and their final recommendations focused on reducing loads and working as a team to move loads. A recent systematic review [25] may tip the balance on consensus, as it found that lumbar spine flexion during lifting was neither a risk factor for LBP onset/persistence or a differentiator of people with and without LBP.

Given the conflicting nature of evidence and recommendations, it is unsurprising that healthcare practitioner (HCPs) knowledge and beliefs of safe lifting postures also vary [26]. Research identifying the different beliefs that HCPs hold in relation to lifting and LBP is important as evidence shows that these beliefs influence HCPs clinical behaviour and management of patients with LBP, and in turn patients' recovery [27, 28]. Recent research highlighted that 75% of physiotherapist, and 91% of manual handling advisors (MHAs) believe that a straight back lift is safer for the spine [26]. However, a straight back lifting belief was shown to be significantly correlated to an increase in negative back pain attitudes held by clinicians that may influence prognosis in people with back pain [29,30].

Osteopaths are encouraged to respond to recent 'calls to action' to utilise research evidence to inform their management of patients experiencing LBP [31], including provision of accurate health information and addressing misconceptions among people with back pain [4].

This present study aimed to build upon a previous published study [26]; and in doing so aimed to identify the lifting posture that UK osteopaths believe to be safest with regards to the prevention of back pain, and to establish whether there is a relationship between their safe lifting posture belief and their back pain attitudes. A final aim was to compare these results from UK osteopaths with results from Nolan et al. [26] who investigated PTs and MHAs, and identify whether the back pain attitudes and the safe lifting posture beliefs differ between these three professional groups.

Methods

This observational study is reported in accordance with the STROBE

reporting guidelines [32].

Design & setting

A cross-sectional electronic questionnaire design with two elements, 'Safe Lifting Posture belief' (straight versus rounded) and 'Back Pain Attitude Questionnaire' (Back-PAQ) was employed [33].

Participants

Recruitment

A convenience sample of UK, General Osteopathic Council (GOsC) registered osteopaths were selected from a list of those who have previously consented to be invited to participate in research. The raw data from other HCPs (MHAs and PTs) were kindly supplied by Nolan et al. [26].

The study was advertised via email containing a participant information sheet (PIS), which provided adequate information to permit a fully informed decision to participate and that submission of the completed survey would be assumed to indicate consent. All participants were recruited between October and November 2018.

Sample size

Sample size for this study was based on the planned test for associations between profession and preferred lifting posture which requires analysis using χ^2 test of independence. Assuming a medium effect size, w (ϕ) = 0.3, α = 0.05, power $(1-\beta)$ = 0.95 with degrees of freedom (df) = 2 (3 groups, 2 lifting postures, $df = (3-1)*(2-1) = 2$), the G*Power analysis software showed a total sample size of 172 is required [54,55].

Materials & apparatus

Participants completed three elements: a demographic survey, safe lifting belief survey and the Back-PAQ [33]. Participants were asked to provide their age, years in practice, and to disclose any qualifications in manual handling, or whether they had experience in teaching manual handling techniques, and if they themselves have suffered with lower back pain in the last 12 months. For lifting beliefs, participants were asked to select which posture they recommend as safest from the 4 images (Fig. 1), under the assumption that the subject finds the weight of the box to be heavy, but possible to lift.

Participants were also invited to provide a motivation (in the form of free text response) for their choice of image. This 'qualitative' data was not formally analysed, but allowed some context to the discussion and statistical results to be provided.

Data analysis involved two of the images being grouped into a "straight" (a & d) or a "rounded" (b & c) back posture. Images were reproduced from the original study with the permission of the authors [26].

Back pain attitudes were measured using the Back-PAQ [33]. The Back-PAQ is a 34-item questionnaire using a 5-point Likert-like scale and resulted in a summed score between 34 and 170. Lower scores (closer to 1) indicate helpful beliefs for recovery from back pain, and higher scores (closer to 5) indicate unhelpful back pain beliefs; with 3 being unsure or neutral beliefs. The Back-PAQ has been shown to have high internal consistency, test-retest reliability and construct validity [34,35].

Procedure

Efforts were made to replicate the procedure of [26] as closely as possible to enable statistical comparison; including utilising the same photo images (Fig. 1) for participants to select their choice of safe lifting postures from; and the same questionnaire (Back-PAQ) [33] used to

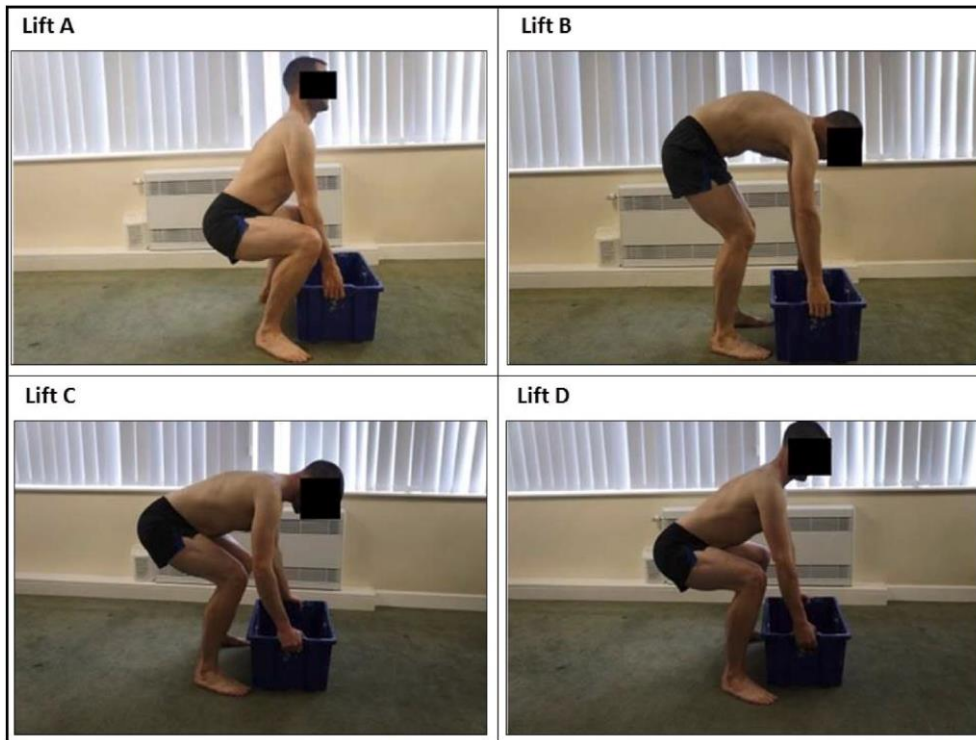


Fig. 1. Images used to display various safe lifting posture for selection (reproduced with permission from Nolan et al. [26]).

identify back pain attitudes. Participants were invited via an email which contained the PIS, and links to the 3 elements of the online survey which was to be completed anonymously via SurveyMonkey®.

Statistical analysis

The safe lifting posture was compared to expected frequencies from other HCP's based on the frequencies reported by Nolan et al. [26]; employing a Pearson χ^2 test. The Back-PAQ [33] scores were compared using a chi-square test between respondents that selected Straight back Vs Rounded back as safest lifting posture.

Data obtained from osteopaths in this study was compared with that of physiotherapists and MHAs from Nolan et al. [26]; for safe lifting posture selection, using a chi-square test while back pain attitude

variances were analysed employing a Kruskal-Wallis test, with a Post hoc Mann-Whitney U tests identifying where significant differences existing between individual groups.

A Spearman's rank correlation between age and Back-PAQ [33] score was used to understand if a relationship existed.

Results

Participant demographics

Fig. 2 illustrates the source and numbers of participants included within this study. Table 1 presents a summary of participants' demographic data, from this study alone and combined with data from Nolan et al. [26]. Mean age was 41.6 years with an average 12.3 years in

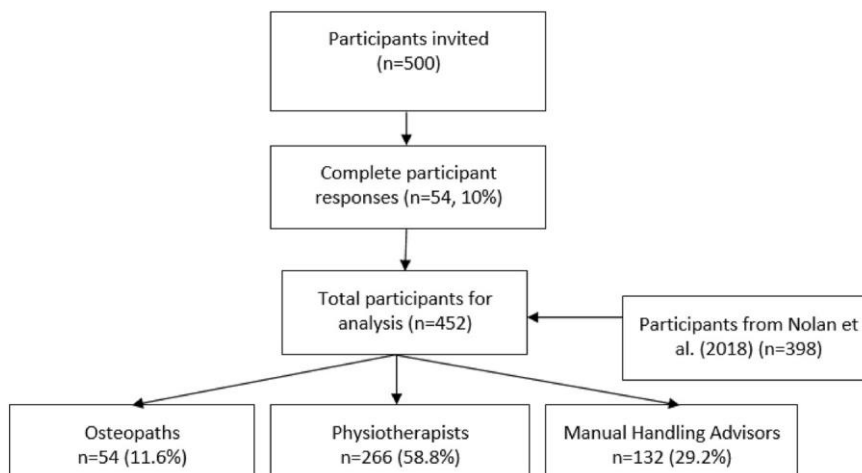


Fig. 2. Source and numbers of participants included within this study.

Table 1

Descriptive summary of participants (data in column 1 from this sample of osteopaths. Data in column 2 is from Nolan et al. [26]).

Categorical variable	Osteopaths	PTs and MHAs
	Mean (SD)	Mean (SD)
Age (years)	49.0 (10.1)	41.6 (11.3)
Years in practice (years)	18.9 (11.6)	12.3 (9.2)
Back-PAQ summed score (n = 412)	87.3 (17.09)	79.0 (23.3)
	Frequency (%)	Frequency (%)
Occupation		
Osteopath	54 (100%)	54 (11.6%)
Physiotherapist		266 (58.8%)
Manual Handling Advisor		132 (29.2%)
Lower back pain in last 12 months		
Yes	32 (72.7%)	97 (21.5%)
No	12 (27.3%)	355 (78.5%)
Qualifications in manual handling		
Yes	11 (20.4%)	232 (51.3%)
No	43 (79.6%)	220 (48.7%)
Taught Manual Handling Techniques		
Yes	9 (16.7%)	194 (42.9%)
No	45 (83.3%)	258 (57.1%)
Safe lifting posture selected (n = 452)		
Straight group combined a & d	46 (85.2%)	367 (81.2%)
Rounded group combined b & c	8 (14.8%)	85 (18.8%)

clinical practice.

Safe lifting beliefs survey

To identify the lifting posture that osteopaths believe to be safest, the choice of preferred back shape (straight, corresponding to stimuli images A & D, versus rounded, corresponding to images B & C) was analysed. From the fifty-four osteopath participants that provided responses to this question, 46 chose a straight back posture (85.2%) and 8 chose a rounded back posture (14.8%), suggesting that osteopaths preferred a straight back posture.

This preference for a straight back posture amongst osteopaths was comparable with the preferences that would have been expected based on the frequencies reported for other HCPs by Nolan et al. [26] (Table 1); Pearson chi-square test χ^2 (1, n = 452) < 1.

Back pain attitudes questionnaire (Back-PAQ)

To establish whether there was a relationship between the safe lifting belief and back pain attitudes of osteopaths, the responses of 44 osteopaths (those who completed both the image rating task and Back-PAQ [33]) were used to define two groups, those with a straight back preference (n = 37) and those with a rounded back preference (n = 7).

Osteopaths in the straight back group had significantly more negative beliefs about back pain injury and long-term prognosis (Back-PAQ median = 90) than those in the rounded back group (median = 58), $U = 46.0$, $p = 0.007$.

Table 2

Cross-tabulation of profession and lifting posture choice.

		Back Shape	
		Rounded	Straight
Osteopath (n = 54)	Observed	8.0	46.0
	Expected	10.2	43.8
Physiotherapist (n = 266)	Observed	65.0	201.0
	Expected	50.0	216.0
Manual Handling Advisor (n = 132)	Observed	12.0	120.0
	Expected	24.8	107.2
Column total (n = 452)	Observed	85.0	367.0
	Expected	85.0	367.0

Comparison of osteopaths with PTs and MHAs

To identify whether the back pain attitudes and safe lifting beliefs of osteopaths differed from those of PTs and MHAs, Back-PAQ scores in the group of osteopaths (data collected in this study) were further compared with those from group PTs and group MHAs from Nolan et al. [26].

Choice of lifting posture and profession were not independent, χ^2 (2, n = 452) = 14.2, $p = 0.001$. Inspection of the differences between observed and expected values (Table 2) suggests that this was due to the observed values for rounded back posture for the PTs being higher than the expected values and the reverse pattern for the MHAs.

Analysing the interaction between profession and back pain attitudes a Kruskal-Wallis test revealed a significant difference in Back-PAQ scores amongst the professions, H (2, n = 412) = 169.6, $p < 0.001$.

Further analysis (Post hoc Mann-Whitney U tests) showed significant differences in the median scores for all three professional groups (Table 2) suggesting that compared to osteopaths, PTs held significantly less negative beliefs towards back pain and recovery whereas MHAs held significantly more negative beliefs (Fig. 3).

Secondary analysis: age

There was a significant positive Spearman's rank correlation between age and Back-PAQ score, ρ (404) = 0.42, $p < 0.001$. Data represented in Fig. 4 below.

Secondary analysis: free text responses

The free text responses of participants' justification for their selection of safest lifting posture were not formally analysed. However reviewing the comments suggested that straight back justification focussed on perceived 'biomechanical efficiency', 'safety' and the distance of the load from the spine. In contrast, participants selecting rounded back perceived this lifting position to be more 'comfortable' or 'natural' position.

Discussion

This study aimed to identify the lifting postures that UK osteopaths believe to be safest, and to establish whether there is a relationship between their lifting beliefs and their back pain attitudes. The results from osteopaths in this sample were then compared to those reported in a prior similar study including PTs and MHAs [26].

The findings from this present study showed that most osteopaths (88.9%) believed a straight lifting posture is the safest for the back, despite the ambiguity that remains on the topic in the published scientific literature. For example, our findings of osteopaths' lifting beliefs are congruent with that of Caneiro et al. [36]; who reported in their cross-section study of implicit beliefs of pain-free individuals that straight lifting posture was believed to be the safest. These findings may

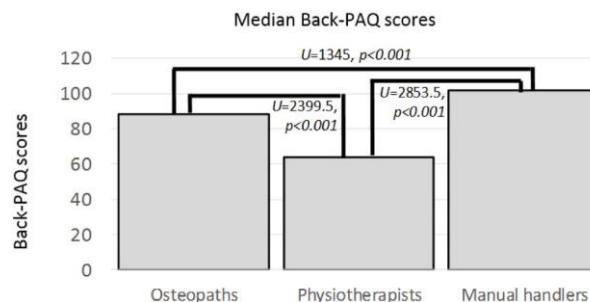


Fig. 3. Comparison of Back-PAQ scores between osteopaths (data from study participants), physiotherapists and manual handling advisers (data from Nolan et al. [26]).

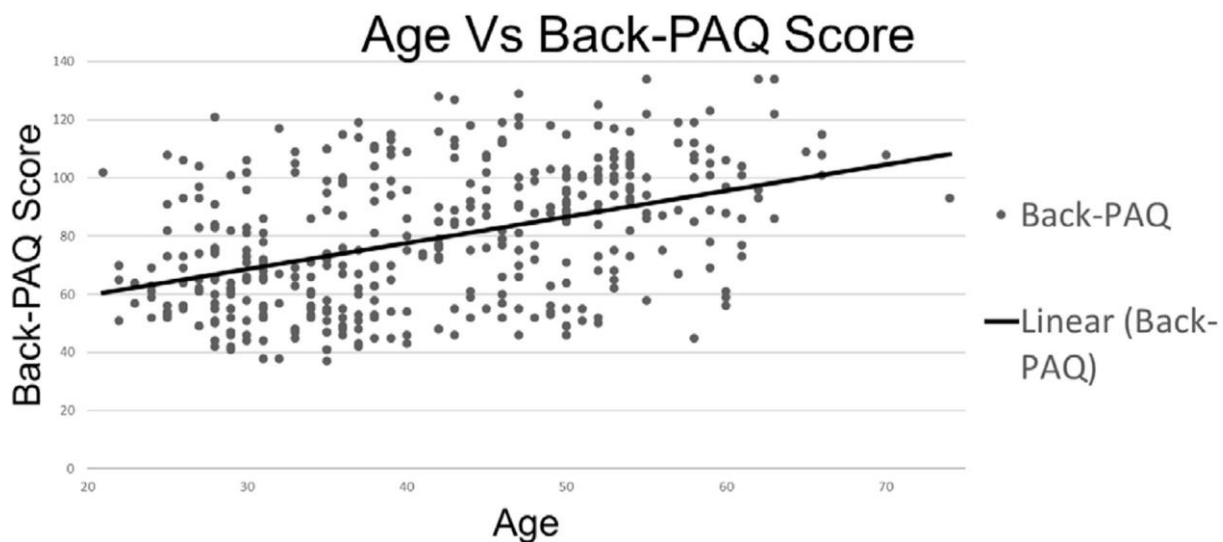


Fig. 4. Comparison of Back-PAQ scores and age.

be explained by the congruence between HCPs' and patients' back beliefs identified by Darlow et al. [29]. It may be that a common belief is that lifting and specifically lifting 'incorrectly' is harmful, and risks damaging the spine, resulting in back pain; a belief which is held across HCPs, the public and social media more widely [37]. It is thought that such misconceptions enhance a person's vigilance and fear and in turn encourage them to lift more cautiously and decrease range of movement throughout spinal segments, increasing muscle activation and spinal load [38].

Developing osteopaths' abilities in identifying and addressing their patients' maladaptive beliefs and behaviours in relation to lifting (such as spinal bracing/guarding or avoidance of spinal flexion to prevent hard/damage to the back) would allow effective cognitive interventions to be delivered and lead to enhanced therapeutic management. For example, osteopaths could employ cognitive re-framing strategies with LBP patients to re-construct helpful perceptions and understandings of their back pain and disability [39] which would assist recovery [40,41]. Focused continued professional development education (CPD) may be required [42] to support osteopaths in developing their knowledge of how to address such psycho-behavioural factors amongst their LBP patients. Such an endeavour could also involve developing clinicians' cognitive reassurance skills, to enhance their abilities in offering helpful explanations, education and active coping strategies which would enhance outcomes for their patients with LBP [43].

Furthermore, randomised controlled trials have shown that such cognitive functional approaches which encourage patients with LBP to trust their backs whilst bending, can reduce their disability, pain-related fear and fear-avoidance behaviours [40,41]. In this present study, osteopaths who selected the straight back posture had significantly higher Back-PAQ scores ($p=0.007$), meaning they held more unhelpful beliefs towards back pain and overall more negative views towards LBP recovery, compared to those who chose the rounded back. This finding is important in light of evidence which confirms HCPs play a key role in the formation of patients' views and attitudes towards recovery from LBP [7,29,30], and suggests osteopathic educational institutions (OIEs) and continual professional development (CPD) groups should provide training which can address these beliefs and misconceptions amongst the osteopathy profession so that clinicians can positively contribute to their patients' views and beliefs regarding their back and how they use it [44,45].

This present study found osteopaths' preference for a straight back lifting posture is in line with other musculoskeletal healthcare professionals such as PTs and MHAs [26]. Furthermore this preference has a

significant relationship across all professions for an increase in Back-PAQ scores ($p = <0.05$) [26]. These findings are in accordance to reported patient views about awkward lifting being a common trigger for LBP [6].

In a more recent study Nolan et al. [38], performed secondary analysis from their previous lifting postures study [26] with the aim to gain a deeper understanding of the differences in back pain beliefs observed between PTs and MHAs. This secondary analysis encouragingly found that all study participants (regardless of the back pain beliefs held) believed activity was helpful for back pain recovery. However, PT and MHA participants who held beliefs that straight back lifting was safer held higher Back-PAQ [33] scores (unhelpful back pain beliefs) including that the back needed to be protected and that it was vulnerable during movement.

The results from this study and others [26,38] study recommends a change in practitioner language so that clinical communication incorporates a 'trust your back' message to patients while staying active in recovery rather than a 'protect your back' message [38]. Close attention to the language used by clinicians with patients experiencing back pain is supported by qualitative evidence highlighting the psycho-emotional impact of clinical communication [30,46]. This would be welcome as commonly held myths and misconceptions regarding back pain, may lead to patients having reduced confidence in their back and a fear that lifting may result in further damage and pain [11-13].

It has been proposed that mass media campaigns, especially via social media are thought to be an effective way to address such back pain misconceptions on a large scale [37]. However clarity and consensus in messaging is required, and this may be a challenge when the evidence is limited, contested and causation is not established, as is the case with lifting techniques and back pain [25,47]. Such a range of views across healthcare is consistent with the observed variance in Back-PAQ scores across the three professional groups ($p < 0.001$) in our study and that of Nolan et al. [26,47], with MHAs having significantly more negative beliefs than osteopaths and PTs showing significantly fewer negative beliefs.

As LBP is a leading cause of disability globally [1], this study reports significant variances in attitudes towards back pain between HCP groups, and is consistent with other research showing variation in back pain beliefs both intra-professionally, for example amongst osteopaths [44,48,49] and amongst physiotherapists [50]; and also inter-professionally [51]. The disputed nature of the safe lifting evidence within the musculoskeletal literature likely adds to this variance in back pain beliefs, with a number of studies concluding straight back as safest

[19,20] others rounded back [21] and others concluding no difference in the safety of either technique [18,22–24]. However, a recent systematic review [25] may help focus some consensus to inform clinicians and occupational health guidance. More robust evidence to more fully understand the relationship between lifting posture and LBP is needed, from which a consensus may be drawn and adopted into national and international guidelines [34].

In the UK, the National Institute of Clinical Excellence (NICE) produce guidelines for the management of LBP and sciatica [17], however no reference is made to the importance of the HCP's own attitude towards back pain, which given potential to influence patients should be reviewed to ensure a consistent standard is met across all HCPs.

In this present study, analysis across all participants resulted in a significant correlation between increasing age and an increase in negative attitudes towards back pain ($p < 0.001$). Further investigation into this relationship would be helpful to identify if this is due to factors such as variances in HCP education or experiences in practice. Caneiro et al. [52] reports physiotherapy training includes pattern recognition of posture and movement and its relationship with clinical symptoms (e.g. lifting posture and LBP presentations). While this skill may be useful in time pressure treatment environments, Gupta et al [56] reported that HCPs struggle to 'unlearn' their current practice, even when presented with new scientific evidence. Furthermore, it has been reported that continued professional development (CPD) may make HCPs more aware of a specific topic, however seldom leads to meaningful change in practice [53]. Using a cross-sectional survey Bar-Zaccay and Bailey [48] reported that UK osteopaths held strong traditional biomechanical views on the management of LBP and are potentially neglecting an increasingly promoted biopsychosocial (BPS) approach. Similarly, a cross-sectional questionnaire of UK osteopaths [49] reported that despite a common perception that osteopaths take a more BPS approach compare to other professions, this was not statistically different to physiotherapists, chiropractors, medical doctors, occupational therapists, nurses or pharmacists.

Limitations

Although this study aimed to repeat the methods reported by Nolan et al. [26]; this was not always possible and a number of limitations of this study are important to note. The small sample size may not be representative of the profession when compared to the much larger cohort recruited by Nolan et al. [26]. This present study compared data from UK osteopaths to an international sample of MHAs and PTs; future expansion of this study should include osteopaths from beyond the UK, to enhance the validity of comparison to the data obtained from Nolan et al. [26].

No formal or systematic qualitative analysis was performed on the free text justifications and motivations for safe lifting posture selection, but the comments from participants were largely in line with those reported by Nolan et al. [26]. However, future studies should include more rigorous methods of qualitative analysis. It is likely that HCP's beliefs are based on a diverse and complex set of motivational factors including cultural, educational, professional, and personal. In view of this complexity, and that much of the existing research into HCP's lifting beliefs have adopted quantitative cross-section study designs, qualitative studies would allow a deeper and contextual understanding of the origin and nature of these beliefs to be developed.

This research is a snapshot in time. As noted within limitations in other research conducted in this area [30,48,49] beliefs may be fluid depending on educational experience and years in practice therefore a longitudinal study to understand how practitioner attitudes are influenced over time may be worthy of consideration.

Given the variance of back pain beliefs across HCPs [44,48–51], expanding future studies to include other 'first contact' musculoskeletal clinicians, such as chiropractors and general practitioners would allow a broader knowledge of the how professional groups are advising patients

regarding safe lifting which would allow more targeted educational and training support and facilitate uniformity of the advice and information delivered to patient with LBP across MSK services.

Conclusion

Osteopaths in this study believe a straight back to be safer than a rounded back while lifting to avoid lower back injury and pain, and this belief was significantly associated with more negative back pain attitudes. Across HCPs there is consistency in the belief that a straight back posture is safer than rounded back when lifting despite a lack of supporting evidence. Osteopaths should be aware of their own negative belief towards back pain and how these beliefs may underpin their lifting advice to patients and general 'back messages'. Communicating negative beliefs which convey messages of spinal fragility, vulnerability and risk may influence patients' own beliefs and attitudes and be unhelpful in their recovery from back pain. Qualitative longitudinal research is required to more fully understand the source and development of such unhelpful beliefs and the effectiveness of educational interventions to change osteopaths' back pain beliefs.

Ethics approval and consent to participate

This study was approved by the University College of Osteopathy Research and Ethics Committee. Participants provided consent by completing the survey, as this was clearly outlined in the participant information sheet.

Declaration of competing interest

OT is an Associate Editor for IJOM but was not involved in any of the peer-review or editorial decisions regarding this paper. Consent was obtained from David Nolan for the use of his images (Fig. 1) within this publication.

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