Introduction

Attitudes and beliefs are a key predictor in the recovery from an episode of back pain. For example, negative beliefs such as not expecting recovery, back pain being unique and distinct from other pains, and viewing the back as particularly vulnerable and in need of protection are associated with poor prognosis (Chen et al., 2018; Melloh et al,. 2011). Furthermore, these views are common in the general population (Darlow et at., 2016).

An individual's beliefs about low back pain (LBP) are used to make sense of their experience—their representation. This representation then guides what they do about it—it drives behaviour (Bunzil et al., 2017). LBP representations are fluid and updated by experiences and information. Darlow et al., (2013) found that the strongest influence on individuals' back pain beliefs are from healthcare professionals (HCPs) they meet. How people make sense of back pain differs between individuals and even within individuals over time; hence, assessing back beliefs is vital in informing treatment programs. However, how back beliefs are constructed can be complex with some beliefs being negative, while others are not (Darlow et al., 2014(b)). Consequently, in-depth analysis on how we construct back beliefs is important to allow more targeted interventions in-line with national LBP treatment guidelines (National, 2016) .

Healthcare professionals have a key role in influencing the back pain beliefs of patients (Linton et al., 2002). It is important, therefore, to evaluate health professionals' beliefs, as it is known that their negative back pain beliefs may negatively influence the advice and management they give their patients (Coudeyre et al., 2006). Our previous work asked physiotherapists (PTs) and manual handling advisors (MHAs) their view on safe lifting posture and evaluated their back beliefs (Nolan et al,. 2018). This study found that that those

who perceive lifting with a straight back as being safest had more negative back beliefs, and that MHAs had significantly more negative back beliefs that PTs. Back beliefs in this study were evaluated using the Back Pain Attitudes Questionnaire (Back-PAQ) (Darlow et al., 2014).

The Back-PAQ was developed from in-depth interviews with people experiencing acute and chronic back pain, and includes 34 items that elicit back pain beliefs. Qualitative analysis of the original interviews, using the framework of Interpretive Description, identified six broad domains which reflect different types of back pain beliefs (Darlow et al., 2013): vulnerability of the back (*Vulnerability*); need to protect the back (*Protection*); correlation between pain and injury (*Pain-injury*); special nature of back pain (*Nature*); activity participation while experiencing back pain (*Activity*); and prognosis of back pain (*Prognosis*). Our previous study did not evaluate how these types of back pain beliefs relate to preferences in lifting postures and if they vary between the two types of HCPs. Knowing this information may help provide a deeper understanding of back pain beliefs in HCPs. This in turn may allow for targeted training of HCPs regarding evidence based back pain beliefs.

The aims of this study are therefore to perform a secondary analysis of data from our previous lifting postures study (Nolan et al., 2018) to evaluate:

- What domains best explain the differences in back beliefs between MHA and PT?
- Which domains best explain the differences between those who think straight back lifting is safer than using a round back?

Methods:

Participants

Participants, either MHAs or PTs, were recruited in three ways: (i) using an email sent to all members of the National Back Exchange – an association set up to promote evidence-based practice among MHAs; (ii) by advertisements placed on the Chartered Society of Physiotherapy web page; and (iii) via dissemination of Twitter links to the study. Those who did not work with individuals with back pain were asked not to participate.

Generating photographs

After consultation with professional colleagues, four sample lifting postures were chosen (Fig. 1). These reflected common lifting techniques. A 37-year-old male with no history of LBP and adequate flexibility to assume these postures was used as a model.

Lift a)

Lift b)

Lift c)

Lift d)

Four lifting postures: a and d straight back, and b and c round back.

Data collection

Demographic, health and employment data on participants was collected via an electronic survey, including: age (*Age*); sex (*Sex*); main country of work (*Country*); occupation, grouped into PT or MHA (*Occupation*); years of experience (*Experience*); whether or not specific qualifications in manual handling (MH) had been obtained (*Qualifications*); whether or not the participant taught MH techniques to others (*Teaching*); and whether or not the participant had low back pain (LBP) within the last 12 months (*LBP*).

Information on whether participants taught MH techniques to others was elicited only from those who reported that they had obtained specific qualifications in MH. This variable was reported descriptively only and was not considered in the main analysis due to large proportions of missing data. The *Country* variable was also only reported descriptively. All other variables which were collected from all participants were included for consideration in subsequent analyses.

Data relating to participants' opinions on safe lifting posture was also collected via the electronic survey. When selecting an optimum posture from four possible options (figure 1), participants were asked: "Assume the load in the box is a weight that the subject finds heavy, but possible to lift. Which lift do you consider to be the safest?" Two of the postures corresponded to different versions of straight back lifting and answers were combined to

form a “straight” group; the remaining two corresponded to different versions of rounded back lifting and were combined to form a “rounded” group. This variable was termed *Group*.

For the purposes of the analysis, the key predictor variables were considered to be *Occupation* (PT or MHA) and *Group (straight or rounded)*; with all other variables considered to be of equal priority to each other, and lower priority than the key predictors.

Measures

Back pain beliefs for each participant were collected via the Back-PAQ survey (Darlow et al., 2014]. This outcome measure has been shown to have adequate internal consistency, construct validity and test-retest reliability (Rushworth, 2015). It is designed to highlight beliefs that are thought to be unhelpful for recovery from an episode of back pain, and comprises 34 Likert-style items, each with 5 possible responses. Each item is assigned to one of 6 domains that were derived from in-depth interviews with people experiencing acute and chronic back pain and listed in the introduction. Scores from items in each theme are summed to give a series of theme scores. Higher scores indicating more unhelpful beliefs—for instance, that the back is easily injured and in need of protection.

For the purposes of this analysis, the *Vulnerability* and *Protection* domains of the Back-PAQ tool were considered to represent the primary outcomes because of their significance in influencing the advice provided to patients. Vulnerability comprises 9 items: hence a range of scores from 9 to 45 is possible. *Protection* comprises 5 items: hence a range of scores from 5 to 25 is possible.

The remaining domains were considered to represent the secondary outcomes. *Pain-injury*, *Nature*, *Activity* and *Prognosis* were based on, respectively, 8, 5, 3 and 4 items; corresponding to potential ranges of scores of, respectively: 8-40; 5-25; 3-15; and 4-20.

Data Analysis

The sample was summarised descriptively. A series of multivariate analyses of variance (MANOVAs) were conducted on the primary outcome measures. Initially, a series of uncontrolled analyses were derived, considering each of the lower priority (controlling) variables in turn. Any controlling variable that exhibited an association of substantive importance with the primary outcome measures assessed jointly was carried forward for re-assessment in a multiple model. Any controlling variables continuing to exhibit an association of substantive importance in the multiple model were carried forward for inclusion in a final model alongside the key predictors of *Occupation* and *Group*. A further MANOVA was conducted on the secondary outcome measures, including the two key predictors plus the same sub-set of controlling variables included in the final model of the primary outcome measures. Multivariate statistics, *F*-ratios with associated degrees of freedom, *p*-values and effect sizes were reported (using the partial-eta squared statistic) as appropriate. Summary statistics of data partitioned across levels of key predictors were also reported.

Automated modelling strategies were not utilised at any point of the modelling process.

Ethics

Approvals were attained from South West Yorkshire Partnership NHS Foundation Trust, UK, who sponsored the study. The electronic questionnaire included an information page informing participants of the purpose of the study and providing assurances of anonymity. Consent was assumed by completion of the questionnaire.

Results

Descriptive summary of sample

Data was obtained on 471 individuals; of which 400 completed the survey. 71 completed demographic information only. The sample is summarised descriptively in Table 1 below.

Table 1: Descriptive summary of sample

Categorical variable	**Frequency (valid %)**
Sex	
Male	216 (45.9%)
Female	255 (54.1%)
Main country of work	
United Kingdom and dependencies	306 (65.0%)
Ireland	23 (4.9%)
Australia and New Zealand	34 (7.2%)
Europe (non UK/Ireland)	60 (12.7%)
North America	25 (5.3%)
Others	23 (4.9%)
Occupation	
Manual Handling Advisor	160 (34.0%)
Physiotherapist	311 (66.0%)
Low back pain within previous 12 months	
Yes	80 (17.1%)
No	389 (82.9%)
Specific qualifications in manual handling	
Yes	254 (54.2%)
No	215 (45.8%)
Manual handling techniques taught to others	
Yes	213 (83.9%)
No	41 (16.1%)
Preferred back position when lifting	
a	210 (52.5%)
b	13 (3.3%)
c	64(16.0%)
d	113 (28.2%)
a&d combined - Straight	323 (80.7%)
b&c combined - Rounded	77 (19.3%)
Numerical variable	**Mean (SD; range)**
Age (years)	40.4 (11.3; 20-66)
Experience in role (years)	10.9 (8.17; 1-40)
BACK-PAQ score: *Vulnerability* domain (possible range 9-45)	22.4 (9.10; 9-45)
BACK-PAQ score: *Protection* domain (possible range 5-25)	15.4 (5.02; 5-25)
BACK-PAQ score: *Pain-injury* domain (possible range 8-40)	13.3 (4.82; 8-28)
BACK-PAQ score: *Nature* domain (possible range 5-25)	15.5 (4.45; 5-25)
BACK-PAQ score: *Activity* domain (possible range 3-15)	4.68 (1.66; 3-11)
BACK-PAQ score: *Prognosis* domain (possible range 4-20)	6.65 (2.87; 4-17)

Assessment of primary outcomes

The screening tests revealed *Age, Sex* and *Qualifications* to exhibit associations with the primary outcome measures assessed jointly, in both uncontrolled and multiple models. These variables were included in the final model as controlling variables alongside the key predictors of *Occupation* and *Group*.

The MANOVA revealed both key predictors and all controlling variables to be significantly associated with the outcome measures assessed jointly (Table 2).

Table 2: Output from multivariate model of primary outcomes

Variable	**Wilk's Λ**	**F-ratio**	**Degrees of freedom**	***P*-value**	**Effect size (partial-η^2)**
Occupation	0.803	43.6	2,355	<0.001	0.197
Group	0.878	24.8	2,355	<0.001	0.122
Age	0.967	6.04	2,355	0.003	0.033
Gender	0.971	5.25	2,355	0.006	0.029
Qualifications	0.981	3.48	2,355	0.032	0.019

Hence the effect of both the key predictors was moderate, while the effect of each of the controlling variables was small. Follow-up univariate ANOVAs revealed significant differences between PTs and MHAs, and between "Straight" and "Rounded" categories of the *Occupation* variable on both *Vulnerability* and *Protection* scores (p<0.001 in all cases). Effects of the other controlling variables on both *Vulnerability* and *Protection* scores were also found to be significant in all cases.

Comparison of Back-PAQ domains between those who preferred rounded v straight lifting postures

Those in the "Rounded" group had significantly more positive beliefs than those in the "Straight" group. 71 individuals in the "Rounded" category of the *Group* variable had mean scores of 16.7 (SD 8.26) on the *Vulnerability* scale and mean scores of 11.6 (SD 5.00) on the

Protection scale. 297 individuals in the "Straight" category of the *Group* variable had mean scores of 23.7 (SD 8.76) on the *Vulnerability* scale and mean scores of 16.3 (SD 4.59) on the *Protection* scale.

Comparison of Back-PAQ domains between MHAs and PTs

PTs had significantly more positive beliefs than MHAs. 115 moving and handling assistants had mean scores of 30.7 (SD 6.14) on the *Vulnerability* scale and mean scores of 19.5 (SD 2.94) on the *Protection* scale. 253 physiotherapists had mean scores of 18.6 (SD 7.59) on the *Vulnerability* scale and mean scores of 13.6 (SD 4.66) on the *Protection* scale.

Assessment of secondary outcomes

The MANOVA revealed both key predictors to be significantly associated with the outcome measures assessed jointly. None of the controlling variables were revealed to exhibit any significant association with the outcome measures assessed jointly (Table 3).

Table 3: Output from multivariate model of secondary outcomes

Variable	**Wilk's Λ**	**F-ratio**	**Degrees of freedom**	***P*-value**	**Effect size (partial-η^2)**
Occupation	0.709	36.3	4,353	<0.001	0.291
Group	0.935	6.11	4,353	<0.001	0.065
Age	0.983	1.52	4,353	0.195	0.017
Gender	0.980	1.93	4,353	0.123	0.020
Qualifications	0.993	0.627	4,353	0.643	0.007

Hence the effect of the *Occupation* predictor was moderate-to large; whereas the effect of the *Group* predictor was small. The effects of all controlling variables were negligible. Follow-up univariate ANOVAs revealed significant differences between PTs and MHAs on all outcomes (p<0.001 in all cases); and between "Straight" and "Rounded" categories of the *Occupation* variable on *Pain-injury* (p=0.001); *Nature* (p<0.001) and *Prognosis* scores

(p=0.012 in all cases). There was no evidence for an effect of *Group* on *Activity* scores (p=0.200).

Those in the "Rounded" group had significantly more positive beliefs than those in the "Straight" group on all secondary outcomes. 71 individuals in the "Rounded" category of the *Group* variable had mean scores of 11.0 (SD 4.09) on the *Pain-injury* scale; mean scores of 12.8 (SD 4.31) on the *Nature* scale; mean scores of 4.21 (SD 1.55) on the *Activity* scale and mean scores of 5.43 (SD 2.05) on the *Prognosis* scale. 297 individuals in the "Straight" category of the *Group* variable had mean scores of 13.9 (SD 4.83) on the *Pain-injury* scale; mean scores of 16.2 (SD 4.24) on the *Nature* scale; mean scores of 4.79 (SD 1.67) on the *Activity* scale and mean scores of 6.94 (SD 2.96) on the *Prognosis* scale.

Physiotherapists had significantly more positive beliefs than moving and handling assistants on all secondary outcomes. 115 moving and handling assistants had mean scores of 17.8 (SD 4.22) on the *Pain-injury* scale; mean scores of 18.5 (SD 4.06) on the *Nature* scale; mean scores of 5.63 (SD 1.75) on the *Activity* scale and mean scores of 9.10 (SD 2.78) on the *Prognosis* scale. 253 physiotherapists had mean scores of 11.2 (SD 3.49) on the *Pain-injury* scale; mean scores of 14.2 (SD 3.93) on the *Nature* scale; mean scores of 4.25 (SD 1.42) on the *Activity* scale and mean scores of 5.53 (SD 2.12) on the *Prognosis* scale.

Table 4: Back PAQ domain scores. Low scores indicate more positive beliefs.

	Vulnerability(SD) Range (9-45)	**Protect (SD) (5-25)**	**Pain-Injury (SD) (8-40)**	**Nature (SD) (5-25)**	**Activity (SD) (3-15)**	**Prognosis (SD) (4-20)**
Overall **Mean (SD; range)**	22.4 (9.10; 9-45)	15.4 (5.02; 5-25)	13.3 (4.82; 8-28)	15.5 (4.45; 5-25)	4.68 (1.66; 3-11)	6.65 (2.87; 4-17)
Rounded (n=71)	16.7 (8.26)	11.6 (5)	11.0 (4.09)	12.8 (4.31)	4.21 (1.55)	5.45 (2.05)
Straight (n=297)	23.7 (8.76) 70%	16.3 (4.59) 71%	13.9 (4.83)79%	16.2 (4.24) 79%	4.79 (1.67) 87%	6.94 (2.96) 79%
PT (n=115)	18.6 (7.59)	13.6 (4.66)	11.2 (3.49)	14.2 (3.93)	4.25 (1.42)	5.55 (2.12)
MHA	30.7 (6.14) 60%	19.5 (2.94)	17.8 (4.22)	18.5 (4.06)	5.63 (1.75)	9.10 (2.78)

(n=253)		70%	62%	76%	75%	61%

Discussion

This study showed that back pain beliefs differed between MHAs and PTs across all domains of back pain beliefs, and across five of six domains between those who endorse either straight back lifting or round back lifting as safest. They particularly believed that the back is vulnerable, needs to be protected and that back pain is different from other pains in the body. Our previous paper showed that those who view straight back lifting as safer do so believing that it is harder to injure the back when straight , and that they have a mechanical/anatomical view of the back (Nolan et al., 2018). This focus on structures that could be injured may explain the view that the back needs to be protected, and that back pain is more serious that other pains in the body. Interestingly, they also scored more negatively in three of the other four domains, with no difference in activity beliefs. This again shows that those who view straight back lifting as safer also tend to believe it is better to stay active with back pain, but with care. Interestingly, the belief that straight back lifting is safer was strong in MHAs and PTs despite there being no evidence that round back lifting is dangerous (Dreischart et al., 2016; Kingma et al., 2010; Wai et al., 2010) .

A range of international guidelines have given consistent messages to avoid bed rest and to stay active with LBP (Morris et al., 2004). The MHAs and PTs we surveyed largely shared this positive belief, suggesting this message in the back pain guidelines is largely endorsed by both groups. Morris et al., (2004) has also shown that the majority of the public also now share the belief that staying active with back pain is helpful. This may indicate that given time, and consistency of message, public and professional opinion regarding health conditions can be changed with appropriate information. However, the literature suggests that people with LBP remain cautious about how they use their back when being active—moving,

bending and exercising more carefully than people without LBP (Morris et al., 2004; Darlow et al., 2014). This study suggests that this belief is shared by MHAs. MHAs in this study endorsed beliefs that the spine is vulnerable and in need of protection, while having generally a positive view that staying active is important: so stay active but with care.

It is unclear how the advice to stay active but with care is received by those with LBP. Reviews of the literature demonstrate that those with LBP move differently when they bend and lift: they move slower, bend their back less and brace their muscles—they protect themselves (Ferguson et al., 2004; Rudy et al., 2003; Slaboda et al., 2008; Laird et al., 2014). These protective motor responses are associated with higher levels of fear of movement (Geisser et al., 2004) and lower levels of self-efficacy (Lewis et al., 2012). These movement patterns are proposed to be pain provocative, and associated with negative beliefs and emotional responses to pain, reinforcing pain and disability (Bunzli et al., 2017; O'Sullivan et al., 2018). It is possible that advice to stay active, but carefully, may reinforce danger beliefs, fear and protective movement behaviours.

Negative illness perceptions predict the transition of acute to chronic LBP (Chen et al., 2018) and these include viewing the back as a vulnerable structure in need of protection. Our study suggests that this is a view shared by MHAs. If these views are being transmitted to their course participants, this would be a cause for concern, with clear implications for the training and practice of MHAs.

Clinical guidelines in the management of LBP advise on patient education and self-management (National, 2016). To effectively implement these guidelines it is important to evaluate individuals' back beliefs in depth, to understand how people make sense of pain. As patients are influenced by healthcare professionals they consult, it is important to identify the

back beliefs of healthcare providers in order to target educational campaigns and training. Arguably, education programs, to both healthcare professionals and the public, should shift the focus towards incorporating 'how' people stay active rather than staying active alone, as this advice seems to be widely understood. This may need a change in tone on how manual handling training is delivered. Currently, manual handling guidelines advise that training often includes: spinal mechanics and function, importance of back care and posture, risk factors for back pain and the importance of an ergonomic approach (NBE 2010). Common interpretation of these means training includes pathoanatomical analysis of structures that can be injured, with implicit or explicit messages warning people of the dangers of bending, lifting and twisting. It is possible, and needs further research, that focus on such material may drive participants to adopt negative back beliefs.

The evidence is now compelling that attitudes and beliefs play a key part in the recovery from back pain (Chen et al., 2018; Bunzil et al., 2016), and that people who relate their back pain to a structural or pathoanatomical cause have higher levels of disability (Briggs et al., 2010). These findings suggest that – at a minimum – the advice provided in manual handling guidelines and training needs to evolve to reflect contemporary evidence that there is no single 'safe' lifting posture. Lessons from other areas suggest that being unaccustomed to a given activity or load may be more closely linked to injury than the magnitude of that load, or the way that load is undertaken (Gabbett and Jenkins 2011; Gabbett and Whiteley 2017). Applying these principles to the manual handling training would support training for the loads likely to be experienced at work (e.g. lifting), and by practicing them regularly to maintain conditioning would be better than advocating avoidance of, or caution about, such loads. While such an approach would require further investigation to establish efficacy, it would also be consistent with the proposal that training in a rehabilitation context can be quite task-specific (Crombez et al., 2002); such that if we want people to be able to lift safely

and effectively, they might need to practice it more often, not less. This would require a fundamental change in the philosophy of how manual handling training is viewed and practiced—moving towards a 'trust your back' message rather than a 'protect your back' message. Such a shift in emphasis could face considerable opposition from various stakeholders (e.g. employees, MHAs, employers, HCPs) unless societal beliefs as a whole are adjusted in parallel. In this regard, large scale public health campaigns on LBP beliefs based on previous successful models (Buchbinder and Jolley 2005) are worth investigating.

Limitations to this study include the electronic nature and being advertised on social media, which could have biased the sample to those active on the internet. As such, these views may not be fully representative of the professions. Also, the survey is a snapshot in time, and beliefs may be fluid. Finally, we did not ask if participants' view of the safest lift would have changed if the lift was painful to perform, which may have influenced their choice.

Conclusion

MHAs had more negative beliefs than PTs across all back beliefs domains, and those who preferred straight back to rounded lifting had more negative beliefs across five of the six domains. The type of belief that was least different was 'activity', broadly suggesting the message regarding being active is endorsed by most HCPs. However, training for MHA may be necessary to improve their back beliefs and prevent them from reinforcing unhelpful beliefs and behaviours. Education campaigns now need to emphasise a 'trust your back' message rather than a 'protect your back' message while staying active.

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