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Original article

What do physiotherapists consider to be the best sitting spinal posture?

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ABSTRACT

While sitting is a common aggravating factor in low back pain (LBP), the best sitting posture remains unclear. This study investigated the perceptions of 295 physiotherapists in four different European countries on sitting posture. Physiotherapists selected their perceived best sitting posture from a sample of nine options that ranged from slumped to upright sitting, as well as completing the back beliefs questionnaire (BBQ). 85% of physiotherapists selected one of two postures as best, with one posture being selected significantly more frequently than the remainder ($p < 0.05$). Interestingly, these two most frequently selected postures were very different from each other. Those who selected the more upright sitting posture had more negative LBP beliefs on the BBQ ($p < 0.05$). The choice of best sitting posture also varied between countries ($p < 0.05$). Overall, disagreement remains on what constitutes a neutral spine posture, and what is the best sitting posture. Qualitative comments indicated that sitting postures which matched the natural shape of the spine, and appeared comfortable and/or relaxed without excessive muscle tone were often deemed advantageous. Further research on the perceptions of people with LBP on sitting posture are indicated.

1. Introduction

Despite the large amount of research undertaken on low back pain (LBP), it remains a very common and costly musculoskeletal disorder (Woolf and Pfleger, 2003). It is now widely acknowledged that LBP is a complex disorder, with numerous contributing factors, including physical (Mitchell et al., 2010), biological (Moseley, 2007) and psychosocial factors (Jarvik et al., 2005; Campbell and Edwards, 2009), as well as genetic and environmental interactions (Reichborn-Kjennerud et al., 2002).

One of the most common strategies used by physiotherapists in the management of LBP is providing advice on spinal postures (Poitras et al., 2005). Prolonged sitting periods, for example periods exceeding 30 min, are a common aggravating factor for many subjects with LBP (Williams et al., 1991; O'Sullivan, 2005). There is evidence that the sitting spinal posture of some LBP subjects differs to that of matched controls (Dankaerts et al., 2009), and that addressing these postures may help reduce LBP (Dankaerts et al., 2006; Womersley and May, 2006). While there is no clear evidence that prolonged sitting in isolation is a significant risk factor for developing LBP (Lis et al., 2007; Roffey et al., 2010), combined exposure to prolonged sitting, awkward postures and vibration may increase the risk of developing LBP (Lis et al., 2007). Considering the large amount of time spent sitting in modern society, assuming seated spinal postures which are non-provocative may be helpful as part of LBP management.

What constitutes the best seated lumbar posture remains widely debated (Pynt et al., 2001; Claus et al., 2009a; Dankaerts et al., 2009; O'Sullivan et al., 2010). While sitting involves more lumbar flexion than standing (Scannell and McGill, 2003; Dunk et al., 2009; De Carvalho et al., 2010), it is not clear what constitutes an optimal amount of lumbar flexion in sitting (Claus et al., 2009a; O'Sullivan et al., 2010). Increased lumbar flexion in sitting, for example during slumped sitting postures, has traditionally been considered problematic, since sitting in lumbar flexion can increase LBP symptoms (Womersley and May, 2006). Reducing such flexed sitting postures can reduce LBP, such that many authors recommend lordotic seated postures (Williams et al., 1991; Lengsfeld et al., 2000; Womersley and May, 2006; Bettany-Saltikov et al., 2008; Pynt et al., 2008). In direct contrast however, increased lordosis has also been reported in LBP subjects (Christie et al., 1995; Vergara and Page, 2002; Dankaerts et al., 2006; Van Dillen et al., 2009), with relief of pain reported by some LBP subjects in more flexed postures (O'Sullivan, 2005). In addition, lordotic lumbar postures which are associated with higher levels of paraspinal muscle activation may increase fatigue and discomfort (Lander et al., 1987; O'Sullivan et al., 2006; Claus et al., 2009a).

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As a result, while it is clear that sitting postures do not all have the same effect on spinal load and trunk muscle activation (O'Sullivan et al., 2002; O'Sullivan et al., 2006; Claus et al., 2009a; Reeve and Dilley, 2009; O'Sullivan et al., 2010), there is little consensus on the best sitting posture. In recent years, there has been an increased emphasis on adopting "neutral" lumbar spine postures, to avoid potentially painful end-range positions (Scannell and McGill, 2003), and facilitate activation of key trunk muscles (O'Sullivan et al., 2006; Claus et al., 2009b; Reeve and Dilley, 2009).

Interestingly, no study has asked physiotherapists, or any other group of healthcare professionals, about what they perceive as the best sitting posture. There is strong evidence that the beliefs of healthcare professionals strongly influence their LBP management approach (Darlow et al., 2012). Consequently, the beliefs of physiotherapists about sitting postures, and the importance they attach to it, might also influence the advice they provide on spinal sitting posture. For example, we hypothesised that those physiotherapists who select more upright lumbar sitting postures may hold more negative beliefs about LBP, indicating a perceived vulnerability of the lumbar spine to mechanical loads among patients with LBP.

Therefore, the aims of this study were to investigate the perceptions of physiotherapists on the best sitting posture, how these perceptions vary in four different European countries, what characteristics physiotherapists associate with good seated posture, and whether their beliefs about LBP are related to their perceptions on spinal sitting posture.

2. Methods

2.1. Participants

A total of 296 physiotherapists who attended continuing professional development workshops on LBP in four countries (Ireland; $n = 111$, England; $n = 88$, Germany; $n = 41$ and the Netherlands; $n = 56$) participated in this study prior to the workshops commencing. Ethical approval was obtained from a university Research Ethics Committee (Ref EHSREC 09-116).

2.2. Generating photographs of sample postures

A 29 year-old female with no history of LBP and adequate flexibility to assume a variety of spinal postures acted as a model for the generation of the seated posture photographs. The model wore shorts and her bra, and sat on a flat wooden stool without back support. Her knees and ankles were positioned at 90°, with her wrists positioned palms-downward on her thighs. Photo-reflective markers were placed overlying the spinous processes of C7, T12, L3 and S2 using hypoallergenic adhesive tape. These markers facilitate calculation of sagittal-plane angles for the thoracic (C7–T12–L3), lumbar (T12–L3–S2), and overall thoraco-lumbar (C7–T12–S2) regions using a LABVIEW programme. As such, these angles represent simple sagittal-plane spinal flexion, rather than forward tilt or lean of the trunk. The digital camera (Panasonic Lumix TZ3) was positioned on a tripod 80 cm from the floor and 250 cm from the model. The model was aligned such that she was facing perpendicular to the camera (Straker et al., 2009). After consultation with professional colleagues, a range of postures observed in clinical practice between slumped and upright sitting were chosen, including some postures with varying cervical, thoracic and lumbar spine angles, as well as varying degrees of trunk lean. The model was assisted into each of these postures using manual and verbal facilitation, and then maintained each posture for 10 s while the photograph was taken. Three images were taken in each posture, and the one which best reflected each target posture was used for the study. No single posture was considered to constitute the best posture. It was hypothesised that such a mix of postures may facilitate the participating physiotherapists having to prioritise their concepts of optimal sitting. For example, the most lordotic lumbar posture involved significant thoracic flexion along with considerable relaxation of the neck and shoulders. The actual spinal angles associated with each posture are displayed in Table 1.

2.3. Data collection

After explaining the study to participants, and obtaining written informed consent, the nine photographs were displayed in colour via digital projection, prior to the commencement of each workshop. The postures were randomly numbered from one to nine, starting in the top left hand corner (Fig. 1). The model's face was obscured in each photograph. Participants were also given a black/white paper copy of the photographs. They were asked to view all nine postures, and then select the best posture, justifying their selection with some comments on the relative advantages and disadvantages of the selected postures. The specific instruction to participants was to "select the best posture for the spine as a whole, especially the lumbar spine". Participants were asked about their level of experience, qualifications, area of expertise and work location. In addition, all participants, with the exception of those in the Netherlands, completed the Back Beliefs Questionnaire (Buchbinder and Jolley, 2005). Finally, participants were asked to rate how important they thought spinal posture was in the management of non-specific chronic low back pain (N-SCLBP), on a scale of 0–10, where 0 = very unimportant and 10 = very important. Participants were given approximately 10 min to complete this task.

2.4. Data analysis

Data was entered into, and analysed using, SPSS 19.0. The frequency with which each posture was selected was first examined, and chi-square analysis was then used to examine if there were significant differences in the frequency with which specific postures were selected, and if this varied significantly between countries. The qualitative comments justifying selecting each posture as the best sitting posture were categorised into common themes, divided into both positive and negative aspects of each posture. To examine differences in the characteristics of physiotherapists selecting the most common postures, Mann–Whitney *U*-tests were used. The level for statistical significance was set at $p < 0.05$, and was adjusted appropriately using a Bonferroni correction for multiple comparisons.

Table 1
Spinal angles for each of the selected photographs.

Posture	Thoraco-lumbar, (C7–T12–S2)	Thoracic, (C7–T12–L3)	Lumbar, (T12–L3–S2)
1	32.7	28.9	7.6
2	−16.5	−7.0	−16.3
3	24.8	21.4	6.9
4	10.4	9.5	1.7
5	2.1	4.0	−3.4
6	30.6	26.9	7.5
7	14.0	21.9	−16.6
8	18.3	15.5	5.4
9	18.8	23.7	−10.6

C7 – Spinous process of 7th cervical vertebra; T12 – Spinous process of 12th thoracic vertebra; L3 – Spinous process of 3rd lumbar vertebra; S2 – Positioned in midline between both posterior superior iliac spines. Positive values indicate flexion; Negative angles indicate extension; All values in degrees.