Scandinavian Journal of Pain 17 (2017) 294–301

Contents lists available at ScienceDirect

Scandinavian Journal of Pain

journal homepage: www.ScandinavianJournalPain.com

Original experimental

What constitutes back pain flare? A cross sectional survey of individuals with low back pain

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HIGHLIGHTS

- LBP flares are a significant issue, yet poorly defined in literature to date.
- We found that a focus on pain may not differentiate minor pain events from flare.
- Individuals do not consider their LBP to be flared simply due to a pain increase.
- Understandings of LBP flare require consideration of various other factors.
- A definition encompassing various domains is likely to assist efforts to reduce LBP.

ARTICLE INFO

Article history:
Received 10 May 2017
Received in revised form 27 July 2017
Accepted 1 August 2017
Available online 31 August 2017

Keywords:
Pain flare
Low back pain
Patient perspectives
Qualitative research
Person-centred

ABSTRACT

Background and purpose: Low back pain (LBP) is a lifelong problem for many. In acute episodes, or as a persistent condition, LBP is fluctuating in nature, with pain and other features of the condition varying in intensity and duration over time. Symptom flares (also known as flare ups) contribute to this variation and can have a great impact on the lives of those who have LBP. An important goal of treatments for, and research on, LBP is arguably to decrease symptom flare in both frequency and severity. However, this goal is problematic with little research, and no consensus, on how to define LBP flare. In particular, patients' understandings of LBP flare have received limited attention in the literature. To appropriately address this issue, we sought to understand how flares are conceptualized by individuals with LBP.
Methods: We used an inductive, predominantly qualitative methodology, conducting an online survey with 130 individuals who self-reported experiencing LBP. The survey investigated participants' views on LBP flare including its meaning, features and symptoms, and whether 'flare' and 'pain increase' were synonymous. Qualitative analysis of responses involved thematic and content analysis with descriptive statistics used for the quantitative component.
Results: Our data analysis found that participants identified many aspects of a flare to be important. Qualitative analyses highlighted a number of themes including that LBP flare was conceptualized as: (1) an increase in pain and other uncomfortable sensations such as paraesthesia or muscle tension, (2) an increase in the area, quality and/or duration of symptoms, (3) a reduction in physical, cognitive and/or social functioning, and (4) negative psychological and/or emotional factors. Flare was also discussed as a change that was difficult to settle. When participants considered whether 'flare' and 'pain increase' were synonymous, responses were evenly divided between 'no' (47%) and 'yes' (46%) with remaining participants 'unsure'.
Conclusions: The key finding was that many people with LBP do not consider their condition to be flared simply on the basis of a pain increase. In general, other features were required to also change. Results highlighted that a narrow focus on pain is unlikely to differentiate minor pain events from a flare. These findings are important as they contrast with most commonly used definitions of a flare that focus predominantly on pain increase.

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http://dx.doi.org/10.1016/j.sjpain.2017.08.003

Implications: Our findings have implications for understanding the trajectory of LBP over time. Understandings derived from perspectives of individuals with LBP highlight that defining flare in LBP is complex. In order to provide person-centred care, individual context and experiences should be taken into account. Therefore, understandings of LBP flare require consideration of factors beyond simply an increase in pain. A comprehensive, person-centred understanding of flare that includes a number of features beyond simply an increase in pain intensity is likely to be useful to better identify flares in research settings, assisting endeavours to understand and reduce LBP. Similarly, in clinical settings a nuanced conceptualisation of flare is likely to help health professionals communicate understandings of flare when working with individuals to manage their LBP.

1. Introduction

Low back pain (LBP) is the most common musculoskeletal symptom, with an estimated lifetime global prevalence of 40% [1]. Flare of symptoms significantly impacts on the lives of those with LBP [e.g., 2–4]. Qualitative research has shown that difficulty coping with flares is a main concern of workers with LBP, as the unpredictability and immobilizing quality of symptom flare can disrupt the ability to work [5,6]. In a prospective cohort study, 96% of people with LBP reported at least one flare in the previous 12 months and 36% reported at least 10 flares [7]. The impact of flares was substantial – 36% of participants could not work, 21% were bed-ridden and 19% were dependent on others for basic self-care during flares. A goal of LBP treatments is often to decrease frequency and severity of flares [3].

However, there are difficulties identifying LBP flare. The term "flare" (or "flare up") is commonly used in LBP literature but its meaning remains underexplored, despite work in other conditions that shows flare to be complex and multifactorial. In acute episodes, or as a persistent condition, LBP is fluctuating in nature, with pain and other features of the condition varying in intensity and duration over time [5,8]. Although it is accepted that LBP is a condition that varies over time, the nature of this variation differs between individuals. Various terminologies and conceptualisations are used to describe characteristics of the variation, but there is not yet consensus regarding how these are defined or whether this matches the experience of patients. For instance, there is ongoing debate among LBP researchers about how to differentiate between persistent fluctuating symptoms and episodic symptoms [9,10]. Differentiation between symptom fluctuation, flare and recurrence also remains unclear for other persistent musculoskeletal conditions [e.g., 11–13].

LBP flare has been described as "a period of time when pain is substantially more severe than usual for the patient", yet interpretation of key elements varies [10, p. 2042]. For example, in different definitions LBP flare duration ranges from less than one week to three months [e.g., 9,10]. Further, simple conceptualisation of flare as an increase in pain may not reflect the interpretation of patients. Young et al. [4] highlighted that people with LBP consider flare to be associated not simply with increased pain, but also with the use of strategies to overcome difficulties and modified participation. A narrow focus on pain may not differentiate minor pain events from a flare. A broader focus than pain has been discussed in investigations into other musculoskeletal conditions. That work differentiated flares from typical, or every day symptoms by identifying other flare elements besides pain, such as fatigue and changes in usual activities [14–16]. An imprecise differentiation of flare from recurrence and/or episode is likely to impact research and practice as it is not clear whether the terms are being used consistently [17]. Inadequate understanding of LBP flare may reduce effectiveness of clinicians intervening to help moderate flare.

Research considering LBP flare from the perspective of patients remains relatively scarce [18]. Extensive investigation of flares in other musculoskeletal conditions (e.g. rheumatoid arthritis) indicates that patients and clinicians consider flares somewhat differently [19,20]. To further understand LBP flare and to better differentiate states of fluctuation, it is important to consider what ways of conceptualizing flare are meaningful for people with LBP. This study aimed to determine: (i) how people with LBP conceptualize flare, and (ii) whether a low back flare is equivalent to an increase in pain.

2. Method

2.1. Study design

Individuals with LBP were recruited to complete an online survey in which they answered questions regarding their experiences and understanding of LBP. Four questions were specifically related to their interpretation of flare and are reported here. Other results of this survey will be analyzed and reported elsewhere.

2.1.1. Participant selection

Potential participants were recruited using a variety of methods including: contacting participants from previous studies on LBP, promotion through pain-related consumer organizations, and advertisements placed on social media and in local community and health centres. Snowballing (potential participants sharing study recruitment information with others) was encouraged. Potential participants received an email invitation explaining the study purpose was to explore LBP patterns. Inclusion criteria were: (1) age of 18 years and above, (2) ability to communicate in English, and (3) self identification as someone who has, or has had, LBP. There was no exclusion for duration of LBP, other co-existing pain(s) or co-morbidities. Consent was implied whereby, after reading an information page about the nature and commitment of the study, participants chose to progress into, and complete the study.

Although the recruitment strategy is best described as a sample of convenience, efforts were made to recruit a variety of participants by utilizing a diverse range of sources. Almost all participants lived in Australia, they varied considerably in age (mean = 43.2, range = 22–72 years) and over half were female (74.6%). Demographic details are presented in Tables 1 and 2. A total of 130 complete responses to the questionnaire were obtained and included in the analysis. It was mandatory to complete a response to each question before progressing through the survey. There were 492 incomplete entries into the questionnaire, which were discounted and are not included in this study; this was considered not an unexpected number for an online survey of this size. Participants remained anonymous throughout the study and were distinguished by numbers in data storage and reporting. Institutional ethics approval was gained prior to commencing the study.

Table 1
Demographic characteristics of study participants.

Characteristic	Mean ± SD or percentage of participants
Age (years)	43.2 ± 12.05
Gender	
Female	74.6%
Male	25.4%
Country	
Australia	98.5%
Other	1.5%
State	
Queensland	56.9%
New South Wales	16.9%
Victoria	15.4%
Other	10.8%

Table 2
Characterization of study participants' low back pain (LBP).

Characteristic	Percentage of participants (%)
LBP everyday	
Yes	82
No	18
Timeframe of variation	
Daily	55.4
Weekly	23.1
Monthly	7.7
Other	13.8
Periods of no LBP	
Yes	29.7
No	70.3

The number of participants was determined when the data collected was considered to show sufficient saturation [21]. That is, clear patterns were seen in the data and there was appropriate richness within each theme [22]. For example, when preliminary data analysis determined that responses to questions did not appear to be providing new information on the topics of interest, and there was sufficient repetition to be able to determine patterns.

2.1.2. Procedure

A survey methodology was used [23]. Survey methodologies are commonly employed in the social sciences to study phenomena not easily tested in traditional experimental methods [23]. As a qualitative method, surveys are an efficient way to engage large numbers of participants, particularly when conducted online. Although individual contextualisation is more difficult, surveys are suited to understanding people's thinking as a group [22]. These features suited the research aim to develop an overview of the flare understandings of people with LBP. The anonymous nature of the survey meant participants were likely to enter responses with little fear of judgement or counter-response so were likely to express their opinions relatively freely [24].

The survey was purpose-built for this study. There were three main sections of the survey: (1) an information sheet, (2) the questionnaire, and (3) demographic questions. The first section was a page providing information about the content of the survey, the (low) risks of involvement in the study, institutional ethical approval and it was explained that participants could exit the survey at any time without penalty. Choosing to enter the questionnaire from this information page implied consent to participate in the study.

The second section (the questionnaire) was designed to address the aims of the study as well as other questions about low back pain variability. Participants responded to responded to 55 short text-box or multiple-choice questions about the patterns and variations of their LBP. Four of these questions were analyzed for this study and were directed towards gaining insight into the understandings of flares held by people with LBP. Please note that while the term "flare" has been used throughout this paper, we used the synonym "flare up" in the survey wording. The rationale for this choice is that term "flare" appears more commonly in scientific literature and the term "flare up" in lay use. The questions were:

Q1) We are interested to know *your interpretation* of a "flare up" of your LBP: please write what the term "flare up" means to you. – This was an open question designed to prompt person-centred interpretations of the concept of LBP flare.
Q2) How much change in your LBP severity do you need to experience to consider it a "flare up"? – This question was created based on previous literature that had focussed on increase in severity as an important aspect of flare [e.g., 3,4]. The research team designed this question with the expectation that participants would describe their pain in terms of numbers on a pain scale in a short text box response.
Q3) What features or symptoms do you consider to be part of a "flare up"? – This question provided space for participants to enter seven different features or symptoms (space was provided to insert one to five words in each of the seven boxes) followed by an 'other' section where they could write what they liked.
Q4) When referring to LBP, do the terms "flare up" and "increase" mean the same thing to you? – As many previous studies had conflated the term 'flare' with 'increase', the research team were interested to further determine whether people with LBP perceived these as synonymous. Responses were restricted to "yes", "no" or "not sure".

The first three questions produced qualitative, and the final question quantitative, data. Q1, Q2 and Q3 required short text box answers, which were typically between one and four sentences long (Q1 and Q2), or one to five words long (Q3). The quantitative question (Q4) provided opportunity to select one of the three answers outlined above.

In the final section of the survey, participants responded to requests for demographic information including participant age, gender, place of residence and details about their low back pain. This information was collected so that it was possible to describe the sample.

Four participants with LBP (2F, 2M) were engaged to pilot test the questionnaire. These participants suggested minor design changes; small alterations were made to the layout of the survey questions as a result.

2.1.3. Theoretical underpinnings

The assumptions underlying this survey were relativist, that reality (or at least, a reality) is knowable through a person's experiences and perceptions [25,26]. This way of thinking is appropriate to our research aims as what is of interest is how people with LBP understand flare rather than attempting to reify measurable identifiers of flare. Using a relativist standpoint allows for inclusion of people with LBP's perspectives when seeking to understand, define and/or reduce LBP flare [27]. This reasoning is consistent with current understandings of pain where it is argued that pain is an individual and complex experience that is often (particularly when non-specific and persistent) irreducible to any of its components.

2.1.4. Data analysis

Data analyses were primarily qualitative, with a small quantitative component. Inductive methods were used for the qualitative analysis. Inductive analysis means that the research team did not impose a pre-existing theory on the analysis; rather it was the data that drove the development of new ways of understanding flare [22]. Although some interpretation is inevitable in any research

[22] this study aimed to descriptively represent participant's perspectives rather than interpret them. That is, the objective was to "give voice" [28] to the relatively overlooked perspectives of people with LBP about pain flare.

Three different methods of analysis were used. Thematic analyses as described by Braun and Clarke [22] were used for Q1 and Q2, content analysis was used for Q3 and descriptive statistics were used to quantitatively analyze the data from Q4. The choice of the different qualitative analytical methods was driven by the nature of the data, where longer responses were more appropriate to thematic analysis and short responses to content analysis. The primary analyses for all questions were conducted by two of the authors (JS and NC). JS is a female physiotherapist with 20 years of experience working with pain, a PhD in health psychology and is experienced with qualitative research. NC is also a physiotherapist who has 5 years of experience working with persistent pain; she received training in qualitative analysis.

The thematic analysis of Q1 and Q2 involved five iterative and partially overlapping steps. In step 1, JS and NC independently read the entire data set and made informal notes on the relevance of the data to the research questions. Step 2 involved these researchers re-reading the entire dataset, manually coding participant responses into data management software and the development of provisional themes. Provisional themes were then discussed to agreement with another researcher in the team (PH). The complete dataset was then coded into the data management software and themes were refined (Step 3). In step 4, four members of the research team (JS, NC, PH, MF) finalized themes through discussion to agreement. The final stage involved review by an expert external to the study. The content analysis of Q3 also comprised a similar five-step process and was reviewed by the others in the research team and the external expert. Results were expressed as the percentage of participants who provided at least one response (of the possible eight) that fitted within each identified flare feature category. The answers to Q4 were analyzed quantitatively using descriptive statistics. The number of responses in each of the categories ("yes", "no" or "unsure") was calculated and then expressed as a percentage of the total.

2.2. Trustworthiness and rigour

The consolidated criteria for reporting qualitative research (COREQ) 32 item checklist was used, where relevant, to guide rigour in this study [29]. All relevant categories of the checklist were satisfied in research design and reporting. Further, there were both internal and external checks of trustworthiness for this study [21]. Four authors reviewed the complete data set and any disagreements in coding or analysis were discussed to agreement. As described above, an experienced qualitative external researcher provided an expert and outside perspective from a different health discipline (psychology). This researcher reviewed the entire data set and confirmed the trustworthiness of coding, reporting of results and that analyses were grounded in the data.

3. Results

Answers to each question considered in this study are examined separately below. Numbers placed after quotations distinguish participants anonymously.

3.1. Q1: We are interested to know your interpretation of a "flare up" of your LBP

Four themes were identified in the inductive thematic analysis of the short text box responses to the question "We are interested to know your interpretation of a "flare up" of your LBP: please write what the term "flare up" means to you". The themes are summarized in Table 3 and discussed below. To provide an indication of quantity of participants responding: 'almost all' is >75%, 'most' is 50–75%, 'many' is 25–50%, 'some' is 10–25%, and 'a few' is <10% (Q1 and Q2).

3.1.1. Theme 1: Increase in unpleasant sensations

Almost all participants talked about a flare as involving some type of increase in unpleasant sensations. For example, one participant defined a flare to be a "*period of time where the pain's intensity and severity increases*" P7034. Many participants described this increase as temporary (hours to weeks), as one participant said: "*I consider a flare up to be a short-lived reaction lasting anywhere from a few hours to a day*" P8086. Most frequently, participants described the unpleasant sensation as being pain. Participants also often discussed other unpleasant sensations or symptoms such as paraesthesia, 'spasms', or reduced motor and bladder control. Some participants spoke more broadly without identifying a particular sensation using terms such as: "*discomfort*" P6736 or simply used descriptors such as "*excruciating*" P6911. Most frequently participants described an increase in *intensity* of these symptoms. However, they also discussed increased *frequency*, *duration* or *area*. Thus when flare is discussed, an 'increase' can mean many things beyond simply an increase in *pain intensity*.

There was some divergence in the data regarding how long participants thought a flare lasts. Although many participants talked about a flare as lasting from hours to weeks, some participants said that if it was only hours they did not consider it a flare. For example, one participant said: "*For me to consider it a flare up it must also last for at least a couple of days*" P5423. Another spoke about a flare as a more long-term increase in pain, for example a "*consistent pain that may last for a month or more*" P3384.

3.1.2. Theme 2: Decreased function

Many participants spoke about decreased function as an important aspect of a flare. Participants discussed a change in various aspects of function including reduced ability to undertake usual daily and social activities as well as describing a general decrease of mobility. Some referred to difficulties undertaking basic activities of daily living. One participant said: "*I find it difficult to walk, sit or lay down for any extended periods.*" P7604, and another: "*some days are not too bad but after some normal house work or even just a drive in a car the pain is so bad I can't sleep*" P7270. A few discussed impact on social activities, for example: "*it impacts on quality time with family and friends.*" P5523. Many participants also discussed an effect of flare on mobility such as the "*ability to bend/twist*" P5243, and also that it can: "*prevent . . . bending or moving in certain ways*" P9553. Many participants discussed this reduction of function as a consequence of an increase in pain, however, some highlighted reduced function as part of a flare up irrespective of change in pain. This distinction was made particularly clear by one participant: "*Sometimes I use "flare up" with reference to an increase in the amount of disability that my back pain is causing independent of the pain level.*" P9863. This theme clearly highlights that a flare is not simply about pain; it also includes consideration of aspects of function for many individuals.

3.1.3. Theme 3: Difficult to alleviate

Many participants described a flare as when symptom increases were difficult to alleviate (or could not be alleviated). This was often discussed to be when additional interventions were needed. One participant said: "*flare is when the pain increases to the point where medication, mental or physical intervention is needed to sustain normal daily living.*" P6696. Another said that a flare "*would mean a remedial massage therapist, or chiropractor, etc. It would mean relying on increased pain meds.*" P8572. Others discussed that a flare

Table 3
We are interested to know *your interpretation* of a "flare up" of your LBP. Thematic analysis results overview.

Themes	Increased unpleasant sensations	Decreased function	Difficulty alleviating	Emotion and cognition
Sub-themes	Intensity Area Frequency Duration	ADLs Social Mobility	More interventions needed Cant find solutions	Difficulty thinking Reduced concentration Emotional changes

was a time when they could not find solutions for their pain. For example: "*not being able to get away from the severe pain*" P7107 or "*pain which I can no longer manage with my current medication or relaxing techniques*" P8612.

3.1.4. Theme 4: Emotion and cognition

Some participants spoke of flares as having emotional or psychological components. One said a flare means "*an increase in pain and associated emotions*" P7451 and another that "*I have found that my mood is negatively impacted as a result of the pain which affects those around me (especially family)*" P9553. Another said their psychological health changed with a flare: "*triggers my depression*" P5082. A few spoke about flares as being when thinking and cognition were affected. One participant said that it "*is intense to the point where I cannot even think, talk or concentrate on anything else, debilitating to the core*" P6976.

3.2. Q2: How much change in your LBP severity do you need to experience to consider it a "flare up"?

This question considered more directly how much change in severity was considered necessary for participants to consider their condition had flared. An overview of the four themes found in the analysis of the responses to this question is presented in Table 4.

3.2.1. Theme 1: Increased unpleasant sensations

Although some participants ($n = 15$, 12%) spoke of an increase in LBP using the Numerical Rating Scale (rating their pain on a scale of 0–10 with higher numbers representing more pain: NRS) most provided additional clarification beyond the amount of change on the NRS. One participant said:

"The pain affects my cognition, balance and mood. To be a flare up the pain would need to increase to an unbearable amount – 5 or more on the pain scale and knowing that normal medication will not make much of a difference that I must take stronger meds and lie down – depending on severity with ice or with heat" P6696

Another said the "*smallest important increase is probably from a 2 to a 4/10 but only if it is a sharp type pain. The dull ache does not bother me too much – the sharp pain is the worst because it is distressing and I can't ignore it*" P9863. Others did not use the VAS but referred to increase in pain in different ways. One participant said there was "*not much*" increase in severity because "*it is subtle*" P3282. Another said: "*For me ANY change in pain – being more pain – can mean a flair up*" P6766. There were only two participants who used the NRS alone, without mention of other factors.

Participants also spoke about a change in the area of pain, change in the quality of pain, more constant pain and also an increase or onset of other symptoms such as paraesthesia or muscle tension. One participant highlighted that a flare was when there was a change in the quality of the unpleasant sensations: "*Not much change before I consider it a flare up . . . When it starts stinging or when it gets itchy, its always there.*" P4423. Another described the other symptoms they considered part of a flare: "*A flare starts close to the L1 region . . .. is a focused (not pin point or knife sharp) warm feeling. Severity can increase from level 1–7+/10 over a few minutes or more slowly from 1 to 6 over an hour. The indicator for a flare is this pain plus increasing muscle tension in my back, leading to spasm.*" P8086.

3.2.2. Theme 2: Increase in interventions

Similar to some responses to Q1 (discussed above), participants said they considered it to be a sufficient increase in severity to denote a flare when they required medications (or more/stronger medications) or other types of interventions. Others discussed that it was when usual interventions do not settle the flare. One participant simply stated that "*I consider my back pain a flare up when nothing eases the pain, example medication*" P6737. Similarly, another described flare as "*when medication, heat and light stretching no longer provide relief*" P8612.

3.2.3. Theme 3: Impaired function

Many participants discussed an important indicator of a change in severity was when they noted that their physical or cognitive function decreased, or when usual function caused more pain. Almost all of these people spoke about physical function. One participant said: "*If I can't walk more then 5 min, without feeling the need to stop, if that happens, its a flare up.*" P7063, another said that a flare was when there was an "*increase in pain level stopping me doing my everyday activities*". Three participants spoke about reduced cognitive function, such as: "*I consider a flare up when my back pain reduces my ability to concentrate on work or study. . .*" *P9627*.

3.2.4. Theme 4: Duration

Many participants emphasized the duration of a change of intensity as an important feature to consider when distinguishing a flare. One participant simply responded by saying "*Increase in intensity for a few days*" P7034. Another added the domain of duration onto an increase on a VAS scale "*Change to a 4 or 5 for longer than one hour*" P6736.

3.3. Q3: What are the features or symptoms of a flare up?

Participants entered information for at least one of the eight available text boxes. The results of the content analysis of these data are summarized in Table 5. Most people mentioned pain as a feature of a flare in at least one of their responses (103, 79%) and other sensations were also frequently listed (76, 58%). Other sensations included paraesthesia (e.g., "*burning*", "*numbness*", "*shocks*", "*heat*") and a considerable variety of other symptoms – many mentioned stiffness and spasms but also other things such as "*exhaustion*", "*headache*", "*nausea*" and "*swelling*". Half of the participants mentioned a restriction of activities (65, 50%). Emotions and thinking were noted to be a feature or symptom of flare by over a third of participants (48, 37%), such as: "*disappointment*", "*depression*", "*helplessness*", "*distress*", "*anger*". Occasionally (<10%) a word indicating an increase was entered by itself, without indication which symptom/feature this related to. This implies that participants place importance on intensification of symptoms but that the increase is not necessarily related to pain or any other feature (e.g., "*intensity*", "*worse*", "*spread*", "*blow up*", "*worse than before*"). Participants also occasionally mentioned other aspects of flare such as a greater difficulty in managing symptoms, various causes and the sudden or temporary nature of the flare.

Table 4
How much change in your LBP severity do you need to experience to consider it a "flare up"? Thematic analysis results overview.

Themes	Increased unpleasant sensations	Increase in interventions needed	Impaired function	Duration
Sub-themes	Numbers on pain scale Change in quality of pain Area of pain changed Symptoms other than pain Become more constant	More interventions Interventions cease to be effective	Physical Cognitive	

Table 5
What are the features or symptoms of a flare? Content analysis results overview.

Features	Pain	Other sensations	Emotions, thinking	Restricted function
Participants listing each feature at least once, *n* (%)	103 (79%)	76 (58%)	48 (37%)	65 (50%)

3.4. Q4: Is flare up the same as an increase?

The responses to the question "When referring to LBP, do the terms "flare up" and "increase" mean the same thing to you?" were almost even between people agreeing or disagreeing with the statement; 47% (61 participants) responded 'no', 46% (60 participants) responded 'yes', and 7% (9 participants) responded 'unsure'.

4. Discussion

This study provides novel insight into LBP flare from the perspective of individuals who have experienced the condition. The key finding is that many people with LBP do not consider their condition to be flared simply on the basis of an increase pain. In general, other features were required to also change. This has important implications for understanding the trajectory of LBP over time, particularly with respect to interpretation of fluctuations in pain intensity.

Analysis of the survey responses identified a number of important aspects of LBP flare from the perspective of individuals who have experienced the condition. When asked to indicate what flare meant to them (Q1), responses highlight that although an *increase in pain intensity* is frequently an important component of flare, individuals with LBP describe a more complex picture. Findings indicate that an 'increase' can also be about *other unpleasant sensations* (e.g., paraesthesia, motor control, bladder control) and is not simply about intensity but can also be about *frequency*, *duration* or *area* of various unpleasant sensations. Analysis of this question also highlights that, to those with LBP, flare is also not only about pain but also several aspects of function, when unpleasant sensations are difficult to alleviate, and/or when there are changes in emotions and cognition.

Responses to the question regarding the amount of change participants required to consider they were experiencing a flare (Q2) produced unexpected results. This question was designed with the expectation that participants would define a flare in terms of a change in value on a pain scale. However, few described their flare using "numbers" and most people provided more detailed information. The diverse answers to this question reflect issues many people with persistent pain have reported with the use of numeric pain scales[30].

Despite differences in approach to requesting information, many responses were similar for the first two questions. Like Q1, the central theme of Q2 responses was that participants discussed a flare as more than simply an increase in pain. Although some participants provided a numerical response (in terms of a change on the NRS) to help describe the flare, this was rarely provided in isolation and most often not used at all. This suggests that a pain scale might be helpful *at times* to help denote a flare, but a more complex description is likely to be more appropriate. In contrast to the response to Q1, more people spoke about cognitive and concentration changes. This indicates that differences between questioning approaches incite people to think quite differently about flare and provides a strong basis for developing person-centred understandings of flare.

We asked participants specifically about features they considered to be a component of a flare as a separate question (Q3) as we had thought it would be necessary to prompt them for this information. As highlighted above, this was not the case. Responses to this question overlapped with the findings highlighted above; LBP flare is more than simply an increase in pain, and although pain is a frequently mentioned feature or symptom of flare so are other sensations, decreases in function, psychological and cognitive features. Considering responses to Q1-3 together indicates that aspects of flare other than pain intensity are likely to be fundamental to the experience of flare, and not merely associated phenomena. This needs to be taken into account when defining and measuring flare in LBP in future studies.

When participants were asked to consider whether "flare" and "pain increase" were synonymous (Q4), responses were evenly divided between "no" and "yes". This even division of results supports our qualitative findings from Q1 to 3, that indicate people with LBP do not necessarily consider a flare to be the same as, or only, an increase in pain, rather an increase in pain is most likely a common component of a flare.

It is well established that LBP follows a trajectory characterized by fluctuations in pain intensity with patterns that differ between individuals [5,31,32]. It is possible that not all fluctuations in pain are important for people with LBP. Our *a priori* view was that a flare in pain would constitute a meaningful increase in symptoms, and this is consistent with earlier qualitative work with people with LBP [4]. Thus, the key motivation for the present work was to determine how individuals with LBP conceptualize flare. The combined results of our analyses indicate that individuals with LBP's understandings of flare include multiple elements. As has been reported by others [e.g., 2–4], part of this conceptualisation is an *increase in pain.* However, as outlined above, other elements including other unpleasant sensations or symptoms were also considered features of flare. A similar combination has also been discussed with respect to flare in osteoarthritis [15] and rheumatoid arthritis [33] Our findings also concur with studies of other conditions that suggest flare is often identified as being an increase that is difficult to alleviate [14,16,20] or requiring a change in treatment [13,19,34,35].

A notable finding was that people with LBP conceptualize flare to include loss of function (physical or cognitive) and/or emotional changes. These aspects of flare align with findings of other qualitative studies that reported participants associated "flared-up" with modified participation and the use of strategies to overcome

difficulties [2,7]. Outcomes of a cohort study provide further support. Patients who identified that they had a flare-up (self-report) were more disabled, reported higher levels of depression, somatization and passive coping, lower levels of perceived control and worse overall health than people without flare-ups [3]. The authors discussed that flare may be pain experiences that reinforce functional or maladaptive behaviour in a way that non-variable pain cannot.

Taken together, the findings of the present study highlight that it is unlikely to be helpful to define a flare of LBP as simply an increase in pain and that a definition is likely to be improved by the inclusion of consideration of other elements. A narrow focus on pain is may not differentiate minor pain events from a flare, which may have a greater impact for individuals who experience fluctuating LBP. A broader focus than pain has also been discussed in other musculoskeletal conditions (e.g. RA, knee OA, fibromyalgia) which differentiated flares from typical or every day symptoms by identifying other flare elements besides pain, as fatigue, flu-like symptoms, changes in activity, and mood changes [e.g., 14–16].

Several factors require consideration when interpreting the results of this study. Participants were predominantly living in Australia, and our sample might have particular religious, educational and cultural backgrounds, which may have influenced study outcomes. There may be some cultural nuances that will not apply in other locations. As there are many similarities between medical systems and pain beliefs globally (particularly in the West), the findings are likely to be relevant outside of the local context. The investigatory team was comprised primarily of researchers with a physiotherapy background (and one social worker). Physiotherapists would be expected to have particular views on health and healthcare grounded in biomedical assumptions and may traditionally give less attention to psychological and socio-cultural aspects of health [36]. This viewpoint may have affected the focus and findings of this study. Efforts were made to reduce this effect by assembling a team that includes a social worker (MN), a researcher who focuses on the socio-cultural elements of health (JS), and sourcing external review. There was a high proportion of participants with daily and severe symptoms. This may need to be taken into account when considering how this study's findings relate to individuals with less severe or frequent LBP symptoms.

The study was conducted entirely online and in survey format, this will have produced certain types of findings. For example, participants may feel comfortable expressing their views freely as they can do so relatively unencumbered by the visible presence of a 'listener'. Although the survey approach used in this study has the advantage of obtaining data that can provide an overview of a topic, it is unsuited to detailed social enquiry [22]. Consequently, it is important to remember that the results can only speak about people with LBP at a particular time and sociocultural setting nor consider how or why these ways of thinking about LBP flare were produced. A high percentage of people commenced, but did not complete, the survey and thus were not included in the sample. We believe this may be due to survey being time consuming to complete in its entirety (approximately 30 min). Individuals who completed the survey may have therefore been those with higher personal investment in LBP and this may be a reason for the high proportion of people with daily/severe symptoms in our sample.

Further research can build on the findings of this study. Similar research design could be conducted in different cultural contexts to investigate how pain flare is conceptualized across cultures. The findings could also be used to develop a definition of pain flare encompassing features of flare found in this study. Future research could add to work already begun in other conditions such as rheumatoid arthritis [11] to include considerations of which (and how many) additional features beyond pain should be described in definitions of flare, and factored into the development of tools to measure flare. It would also be valuable to employ more naturalistic methods in further research, creating or utilizing contexts similar to those in which the research findings might be applied (such as clinical settings).

5. Conclusion

Understandings derived from perspectives of individuals with LBP highlight that defining flare in LBP is complex. In order to provide person-centred care, individual context and experiences should be taken into account. Therefore, understandings of LBP flare necessarily need to be broader than simply an increase in pain. Individuals with LBP discuss pain flare as a worsening of their condition that lasts from hours to weeks that does not improve easily and may impact usual activity and emotions. This more complex understanding of LBP flare is likely to be valuable in research settings where it is important to determine when a person is experiencing LBP flare. Similarly, in clinical settings this person-centred understanding of flare is likely to help health professionals communicate understandings of flare.

Ethical issues

Institutional approval was sought and gained for this project. Informed consent was required and participants gave informed consent. Data was handled within institutional guidelines to ensure anonymity of participants in data storage and reporting. As the research was not a clinical trial it was not registered.

Conflicts of interest

The authors state that there are no conflicts of interest to declare.

Acknowledgements

We thank the participants who contributed their time and experience to this study. The study was funded by the National Health and Medical Research Council of Australia (Programme Grant: 1091302; Centre of Research Excellence grant: 1079078; Senior Principal Research Fellowship (PH): 1102905). MLF holds a Sydney Medical Foundation Fellowship, Sydney Medical School.

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