Changing the way we think about pain

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ORIGINAL

Introduction

Pain and fear are high on the list of reasons that women give for seeking hospital admission when they are in labour (Cheyne et al 2007, Barnett et al 2008, Carlsson et al 2009, Carlsson 2016). The timing of admission to hospital is important because women experiencing an uncomplicated pregnancy are at increased risk of obstetric intervention if they are admitted to hospital during early labour (Bailit et al 2005, Lundgren et al 2013, Neal et al 2014). This knowledge causes many women, who might have benefited from professional psychological support, to be sent home and left to manage this period of labour alone (Barnett et al 2008, Eri et al 2015). More work is needed to understand how women can be effectively supported in managing their pain at this time and safely await active labour before coming to hospital (Eri et al 2015, Kobayashi et al 2017).

This paper is presented as one of two papers aimed at prompting our thinking and understanding around pain perception in labour. It provides a summary of our current understanding about pain, and highlights pain catastrophising and how it might affect childbirth. We discuss the importance of effective psychological support for women, and how hypnosis may be one intervention to support women in early labour and encourage their timely admission to hospital.

The science behind pain

Definition of pain

A widely accepted definition of pain is that it is *'an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage'* (International Association for the Study of Pain (IASP) 2020). However, this definition may not adequately represent the uniqueness of labour pain.

For women at low obstetric risk, labour is a normal physiological event with labour pain being associated with normal tissue changes and not the threat of, or actual, tissue damage (Whitburn et al 2019). However, for other women, the fear and pain they experience during childbirth may be associated with the perceived potential for tissue damage. Nonetheless, in the absence of a specific definition for labour pain the IASP definition stands.

Nociception and pain differ

Nociception is a term used to describe how the human body encodes noxious (unpleasant) stimuli via its neural process in a normally functioning somatosensory nervous system (IASP 2011). Noxious stimuli are stimuli that damage, or threaten to damage, normal body tissues (IASP 2011) and can be in the form of mechanical stimulation (such as stretching, cutting, or pinching), intense heat exposure or exposure to noxious chemicals (Brodal 2010). However, it cannot be assumed that a person who is exposed to noxious stimuli will have a painful experience — nor that the absence of noxious stimuli means the absence of pain (Mischkowski 2018). The experience of pain is subjective and fundamentally differs from nociception (Bendelow 2006, Kong et al 2006, Garland 2012, Atlas et al 2014, Nickel et al 2017, Woo et al 2017, Mischkowski 2018).

Pain is an individual experience

Pain is an individual, subjective experience and a complex phenomenon which is not fully understood. It is an experience resulting in a range of responses, in each individual and between individuals, in response to an identical stimulus.

Contemporary theories generally consider pain to be multidimensional (Melzack 1990, Melzack 1999, Melzack 2001, Moayedi & Davis 2013) and influenced, to varying degrees, by an interplay between biological, psychological, and socio-cultural factors (Anderson & Losin 2017, IASP 2020) that are partially dissociable (Moayedi & Davis 2013, IASP 2020). It is thought that, in its translation of nociception, the brain incorporates the person's pain beliefs, which have been learnt and conditioned throughout their life and drive the person's pain-managing behaviours.

Innervation of pain

The pain of labour has two component sources: visceral (related to the organs in the midline of the body), and somatic (related to muscles, skin, joints, and bones).

Throughout labour, pressure triggered by uterine contractions causes stretching and distension of the lower segment and cervix. Stretching and distension are translated as visceral pain, and these are often reported as a deep dull ache or pressure and not easily localised. Visceral pain is associated with the first stage of labour (including early and active labour) and is mediated by the T10 to L1 spinal segments.

Somatic pain is felt in the late first stage and second stage of labour and is carried by the T12 to L1, and S2 to S4 spinal segments. Somatic pain arises as a result of fetal descent through the birth canal causing distension, stretching, ischemia, and possible tearing of the vagina, pelvic floor muscles and the perineum (Labor & Maguire 2008).

A selection of pain theories

Pain perception has interested philosophers, researchers and scientists for hundreds of years and can be traced back to around 375 BC and Plato. Plato suggested the Intensity Theory (Plato cited in Moayedi & Davis 2013). Over time, and with increasing knowledge, a number of more modern theories have been put forward to explain how and why we feel pain. Prominent modern theories are: Specificity Theory (Bell 1868, Von Frey 1894 cited in Trachsel et al 2022, Sherrington 1903, Sherrington 1906, Sherrington 1947); Pattern Theory (Nafe 1929); Gate Control Theory (Melzack & Wall 1965); Neuromatrix Theory (Melzack 1990) and the Biopsychosocial model (Engel 1977, Loeser 1982).

Intensity Theory

Intensity Theory, first proposed by Plato (cited in Moayedi & Davis 2013), considered pain as an emotional experience, as opposed to pleasure, and experienced when the body is under threat from normal function or damage (Wolfsdorf 2015). This theory had backing into the twentieth century but lost support after Sherrington's (1947) proposal of a framework for Specificity Theory, and the discovery of the existence of the sensory receptors or 'nociceptors' (Moayedi & Davis 2013).

Specificity Theory

Specificity Theory (Bell & Shaw 1868, Von Frey 1894 cited in Trachsel et al 2022, Sherrington 1903, 1906, 1947) suggests pain is a specific modality with specific sensory receptors connected to associated pathways responsible for different sensations such as touch, cold, heat, and pain. However, this theory did not fully account for the complexities of pain perception and did not include neurons in the central nervous system that respond to both nociceptive and non-nociceptive stimuli.

Pattern Theory

Pattern Theory, presented by John Paul Nafe (1929), takes an opposite view, suggesting that there are no specific sensory receptors or associated pathways but that, instead, it is the pattern of neural firing in response to different sensations and intensity that are transduced to the brain where the pattern is then interpreted. However, this theory was disproved by the confirmation that there are unique nerve receptors for each type of sensation (Moayedi & Davis 2013, Trachsel et al 2022).

Gate Control Theory

In 1965, Melzack & Wall proposed the Gate Control Theory of pain that brought together ideas from both Specificity Theory and Pattern Theory and was one of the first modern theories to recognise the contribution of psychological aspects to the feeling of pain.

The original idea proposed a 'gate' control system, located in the substantia gelatinosa. The substantia gelatinosa is principally associated with transmitting and modulating touch, temperature and pain. Simplified, the Gate Control Theory suggests that, following a noxious stimulus, nociceptor impulses (signals) are transmitted along first-order neurons to the substantia gelatinosa where they synapse (communicate) with second-order neurons. These second-order neurons then decussate (cross over) to the opposite side of the spinal cord, before ascending up the spinal cord to the thalamus where they synapse with third-order neurons. The third-order neurons impulse to their final destination in the brain where conscious awareness and localisation of the pain occurs.

To trigger the body's own pain-reducing mechanisms, and inhibit the nociceptor impulses ascending to the brain, a non-noxious stimulus such as touch, warmth or cold can be simultaneously applied. The non-noxious stimulus causes mechanoreceptor impulses to be sent on their neuronal pathway to the brain.

En route to the brain, the mechanoreceptor impulses activate inhibitory neurons in the substantia gelatinosa, which block, or partially block (gate), the noxious nociceptor impulses passing through and ascending to the brain, therefore limiting the amount of pain perception.

Melzack & Wall (1965) additionally suggested that pain perception can be influenced by mechanisms descending from the brain. Once the output from the ascending impulses reaches a critical level the 'Action System' in the brain is activated. Critical levels and activation of the 'Action System' are based on past pain experiences, cognitive processes and current emotional state, making pain perception and behaviour an individualised experience.

Melzack & Wall (1965) suggest that some pain perception is so rapid and intense (for example,

a myocardial infarction (heart attack)) that the individual is unable to exert any strategies to manage or control their pain effectively by closing the pain gate.

The Gate Control Theory significantly advanced the understanding of pain, but it was criticised for its oversimplification and failings in its neural model, and the existence of the gating system, which was incorrect (Mendell 2014).

It is largely on the premise of Gate Control Theory that transcutaneous electrical nerve stimulation (TENS) machines and massage are thought to ease a woman's labour pain. When a TENS machine is set to a high pulse rate during a contraction it is thought to stimulate the faster communicating non-nociceptive nerves, thus closing the gate to the slower nociceptive nerve messages to the brain. Set at a lower pulse rate, between contractions, it stimulates the body's production of endorphins. Endorphins are the body's own natural pain-relief chemical. Relaxing massage is, similarly, thought to reduce labour pain perception because it boosts endorphin release and provides a sense of touch which closes the gate to nociceptive transmission.

TENS is not considered an effective pain-relief method in active/established labour (National Institute for Health and Care Excellence (NICE) 2017). The evidence relating to its effectiveness in early labour has not been conclusively established. This may be, in part, because of the low-quality research (Jones et al 2012). There is only limited evidence suggesting that massage reduces measured pain and expressed anxieties during labour (Smith et al 2018).

Neuromatrix Theory

Melzack (1990) went on to develop the Neuromatrix Theory of pain. Past theories based on nociception suggested the spinal cord and brain as secondary message receivers with the primary focus on actual tissue damage and the peripheral nervous system. Melzack (1989) noticed that people with amputated limbs still felt phantom limb pain, that is, they felt pain in body parts that no longer existed. This suggested that tissue damage and the peripheral nervous system were not solely responsible for pain. Furthermore, the extent of tissue damage does not always match the amount of pain reported. Equally, people who experience similar pain-inducing conditions do not have similar pain experiences — and some people go on to report long term/chronic pain with no apparent cause.

To explain these observations Melzack (1990) suggested the Neuromatrix Theory. This proposes that pain is a multidimensional experience shaped by multiple influences which create a neurosignature of pain experiences. The neurosignature is created by genetic and sensory influences and modulated by cognitive events and sensory inputs. The flow of neurosignatures is converted by the sentient neural hub into a continual awareness of the whole body and instigates behaviour to bring about the desired goal of pain reduction.

Biopsychosocial models

The above-described models all focused on biomedical approaches to describing pain perception, which was the favoured approach to disease at the time. The first biopsychosocial model for health care, challenging the biomedical model, was introduced by Engel in 1977. Although not specifically designed as a pain theory, the biopsychosocial model is applicable to pain as it provides a framework for research, teaching, and treatment which puts the individual at the centre and addresses their needs in a holistic manner. Loeser (1982) and Waddell (1987) were also key in taking forward the application of a biopsychosocial approach in the assessment and treatment of certain pain conditions.

Considering the complexities of pain, the biopsychosocial model has been criticised for its simplicist conceptualisation — which can support fragmented and reductionist application of its elements (biological, psychological and social factors) and allow bias when assessing and treating pain conditions (Nicholas 2022). It has, however, proved useful in rehabilitation and functional restoration for chronic pain (Guzman 2001).

Despite these limitations, biopsychosocial models are important in midwifery. For pregnant women, social and cultural influences provide expectation, context, and meaning for labour pain. These influences are assimilated alongside the woman's own beliefs about childbirth: her pain cognitions; her past pain experiences (Linton & Shaw 2011, Noel et al 2015); the personal meaning she ascribes to her labour pain (Whitburn et al 2019); her emotional state (Shackman et al 2011); self-efficacy (Bandura 1977, Tilden et al 2016) and other features, such as her tendency to catastrophise (Van Den Bussche et al 2007, Flink et al 2009, Veringa et al 2011, Sullivan 2012).

In the absence of a more complete contemporary model, it is important that midwives understand that features of the biopsychosocial model are still relevant — but that the web of complexity linking the features together and underpinning a painful experience should be at the forefront in assessment and care planning when supporting each woman through childbirth.

Terminology and reductionism

The understanding of nociception would appear to be extensive in the literature, but an understanding of the complex processes underlying the subjective experience of pain perception is not. Unfortunately, pain research literature can confound our

understanding of pain (Apkarian 2019). This is due to the frequent blending, or oversimplification, of terminologies from pain perception and the nociceptive system for example, 'pain fibres' (Labor & Maguire 2008) and 'pain pathways'.

Use of such blended terminology gives a false impression about the scientific understanding of the subjective experience and perception of pain (Apkarian 2019). This confusion can impact on how society understands pain (Apkarian 2019) and, arguably, how pain in childbirth is viewed. For example, if labour pain is thought to be the result of tissue changes, which are detected in pain fibres in pain pathways, then subsequently the presiding focus will be on targeting those pain fibres and pain pathways to reduce or eliminate pain.

In this situation the terminology suggests pain is a 'bottom-up' approach (that is, the noxious stimulus transmits 'pain' to the brain) and is reductive. It encourages focus on the biological process of nociception rather than on the woman's past pain experiences and how this affects her interpretation of her pain and her pain behaviours. Focus is diverted away from how the woman can be best supported psychologically, including support from her birth partner/s, her midwifery support, the support interventions offered, the organisation of, and responses from, the maternity system, maternity research, and wider society.

Societal and caregivers' responses to pain

Individuals' pain experience, and their responses to pain, are influenced by psychological factors and societal influences. How caregivers provide support for the person in pain is complex and is shaped by multifactorial variables, which are not yet fully understood (Campbell & Edwards 2012). Factors such as sex (Bartley & Fillingham 2013); ethnicity (Campbell & Edwards 2012, Herbert et al 2017); socio-economic status (Macfarlane et al 2009, Public Health England (PHE) 2017) and cultural group (Lasch 2000) have not only been demonstrated to influence a person's evaluation and interpretation of pain, and their emotional and behavioural responses to it, but can also influence assessment and treatment decisions (Wandner et al 2013, Miller et al 2022).

Knowledge about pain, why and how we react and respond to pain, and awareness of inequalities in pain-related treatment, means that midwives need to be vigilant and reflective in their practice in order to provide skilful and equitable care.

Midwifery education and learning from experience

Midwives are experienced at preparing and supporting women through pregnancy, childbirth and postpartum, with women greatly valuing this care (Mattison et al 2018, Perriman et al 2018). But the majority of midwives may never have received formal training in how they can provide evidence-based, psychological support intervention for managing labour pain. To provide an anecdotal example, when discussing the concept of pain catastrophising with midwives the primary author noted that the vast majority did not recognise this term although, following an explanation, they recognised associated behaviours.

Current midwifery training for non-pharmacological methods of pain management includes touch, relaxation, mobility, and hydrotherapy, with no reference to any psychological support interventions (Nursing and Midwifery Council (NMC) 2019a). The recommended methods for psychologically supporting women through childbirth may be insufficient (Whitburn et al 2017). More research is needed to understand how women process and experience childbirth pain. This is imperative so that midwives are able to effectively assess, plan and provide individualised psychological support rather than relying on knowledge gained from learning from experience. While learning from experience is required (NMC 2019b), it does not provide student midwives and midwives with adequate, evidenced-based knowledge and skills on the assessment, planning and provision of effective psychological pain management strategies to support women through such a transformational life event as childbirth.

The importance of focusing on early labour

Despite the advice to stay at home until active labour commences many women seek out professional support in hospital during early labour (Bohra et al 2003, Lundgren et al 2013). This is commonly because of the labour pain they experience and fear (Cheyne et al 2007, Carlsson et al 2009, Lundgren et al 2013, Eri et al 2015, Carlsson 2016). However, women experiencing an uncomplicated pregnancy are at increased risk of obstetric intervention (Bailit et al 2005, Lundgren et al 2013, Neal et al 2014) and have a higher chance of caesarean section (Davey et al 2013, Yang et al 2013) if they are admitted to hospital during early labour. So, it is understandable that women at low obstetric risk are advised to stay at home until active labour begins.

Many who are turned away to await the start of active labour are given minimal guidance and support (Eri et al 2015). Knowing that obstetric intervention is reduced if hospital admission is delayed makes early labour a clinically relevant and sensitive stage (Wuitchik et al 1989), and staying at home an organisational target, with midwives wielding a powerful influence over whether to send women home until active labour commences (Eri et al 2010). Women are left feeling as if they must prove their credibility before they can be admitted to hospital

and feel embarrassed and vulnerable if judged to have sought hospital admission 'too early' (Eri et al 2010).

So far, interventions to help optimise the timing of women's admission to hospital have proven unsuccessful (Kobayashi et al 2017). Women are generally offered a variety of support and assessment methods during early labour, but this is not always linked to an understanding of the holistic nature of pain-related fear, and how this might affect labour choices (Eri et al 2015, Kobayashi et al 2017). Pain-related fear is important: a study by Geissbuehler & Eberhard (2002) found that 40 per cent of pregnant women expressed a fear of pain, and fear has been associated with an increase in the risk of emergency caesarean section (Ryding et al 1998).

More work is needed to, first, understand which characteristics of women's fear and anxiety contribute to their need for professional support and pain relief during early labour (Clark et al 2022) and, second, how women can be best supported to manage their pain and fear during this time.

Pain catastrophising

Pain catastrophising can be defined as *'an exaggerated negative mental set brought to bear during an actual or anticipated painful experience'* (Sullivan et al 2001:4). In the context of childbirth, knowledge about pain catastrophising and how women can be supported with this psychological distortion is important.

In a recent study by Clark et al (2022) the prevalence of pain catastrophising in women of reproductive age was high (ranging from 21.3 per cent to 47.5 per cent of participants, depending on the pain catastrophising cut-off score used). The few studies directly investigating pain catastrophising in relation to childbirth suggest that pain catastrophising is not only of importance for the anticipation of childbirth pain, but also associated with: fear of being overwhelmed by pain (Van den Bussche et al 2007); preferred mode of birth (Dehghani et al 2014); the experience of pain intensity during delivery, and poorer physical recovery following childbirth (Flink et al 2009).

In the childbirth setting a woman's interpretation of the significance of her labour pain, coupled with her views about the normality or pathology of childbirth and the responsibility she bears for determining 'the right time' to seek professional labour care, will affect her labour pain behaviours and the time she presents to hospital for admission (Lally et al 2008, Carlsson et al 2009, Carlsson and Edwards 2012, Lally et al 2014, Carlsson 2016).

Psychological support, hypnosis and self-hypnosis

There is limited literature on psychological interventions to support women who are at low obstetric risk during early labour. There is, however, evidence that increased self-efficacy is associated with a variety of improved perinatal outcomes (Tilden et al 2016), with pain-relief requirements being reduced for those women with greater autonomy and less anxiety (Tiran 2018).

Hong et al (2021) found that antenatal education can reduce maternal stress and increase self-efficacy, lower caesarean birth rate and reduce epidural analgesia use. A variety of antenatal education programmes including birth preparation courses, social support programmes, music therapy sessions, progressive relaxation programmes, self-hypnosis training, parenting skills, and cognitive coping were reviewed. There was evidence of lower birth interventions and improved mental health outcomes for women following better antenatal psychological preparation. Demirci et al (2021) also found that antenatal education is effective in promoting women's self-belief, and the desired outcome of coping behaviour, which is effective in achieving a positive birth experience.

Childbirth self-efficacy can be modified through various efficacy-enhancing interventions (Tilden et al 2016) including self-hypnosis (Cyna et al 2006, Cyna et al 2013). In her review of the evidence Marsh (2021) concluded that hypnosis could reduce pharmacological methods of pain relief. Hypnosis, including self-hypnosis, has demonstrated its value in supporting people with pain in other fields (Kendrick et al 2016, Eason & Parris 2019). There is evidence that hypnosis reduces the overall use of pain medication in labour — but not that it reduces epidural use (Madden et al 2016). Hypnosis has shown potential benefit in reducing experiences of anxiety and fear associated with childbirth (Downe et al 2015) and a positive impact on women's reflection on their childbirth experience (Werner et al 2013, Marsh 2021).

Self-hypnosis might prove to be particularly useful in early labour. Harmon et al (1990) showed that adding self-hypnosis training to childbirth education classes produced shorter Stage-I labour (from cervical dilatation of 5cm to fully dilated) but did not affect Stage-II labour (from when the cervix was fully dilated), possibly because hypnotic analgesia, while effective, might be limited in its effect. Nevertheless, its potential, in terms of being a self-guided activity that requires no external intervention and the generally less intense pain experience in early labour, might make self-hypnosis a particularly useful tool in pain control during this phase.

These are important factors which enhance the midwifery care model and promote women's satisfaction with their childbirth experience (Overgaard et al 2012, Mattison et al 2018) and their autonomy (Renfrew et al 2014). These psychological and emotional experiences of pregnancy, as well as the health of themselves and their growing baby, are valued by women (WHO 2016, Downe et al 2018) and are essential non-clinical aspects of care that should complement any necessary clinical interventions to optimise the quality of care provided (WHO 2016, WHO 2018a, WHO 2018b).

The lack of conclusive evidence on the benefits of self-hypnosis could be due to the methodology of the research. Eason & Parris (2019) pointed out that, in the studies reporting no effect of self-hypnosis in childbirth, self-hypnosis was defined as listening to audio recordings, but did not involve specific self-regulated self-hypnosis skills, a previous hetero-hypnosis session or tailoring training to the needs of the individual. In contrast, in Harmon et al (1990) self-hypnosis was practised in a self-directed way with an emphasis on skill mastery and resulted in a reduced period of early labour, reduced medication and higher Apgar scores.

This raises another issue, that of suggestibility. Any form of hypnosis requires the subject to be able to adopt a hypnotic mindset and be suggestible. Hypnosis is not a skill that everyone will be proficient at, particularly in the face of such a potential physical and psychological challenge as childbirth, but it is a skill which can be improved by effective training.

Hypnosis is also an inexpensive, relatively simple intervention that has no known adverse side effects when used during pregnancy, labour or postpartum (Marsh 2021).

Childbirth studies have not yet considered using hypnosis for early labour to empower women and improve their self-efficacy and pain-coping strategies. A hypnosis intervention could prove valuable if combined with a tool to identify those women most concerned about pain. Any intervention should provide relevant knowledge and hypnotic skills and specifically target those women who are suggestible, who tend to pain catastrophise, and who are at low obstetric risk and therefore advised to experience early labour at home.

Conclusion

It is evident that supporting women through childbirth and optimising the time that women are admitted to hospital when in labour are complex and interwoven issues. Through better understanding of a woman's past pain experiences, her beliefs about childbirth, her attitudes towards childbirth pain and her individual care needs, individualised care can be created providing women with support through the psychological and physiological continuum of pregnancy and the postnatal period. Targeted and skilful implementation of self-hypnosis is one psychological adjunct that could benefit many women and improve birth outcomes.

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