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The RETHINK Study: Could pain catastrophising explain why some women are more likely to attend hospital during the latent phase of labour

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ABSTRACT

Objective: To examine the prevalence of pain catastrophising and identify whether it impacts on the timing of hospital admission when in labour.
Methods: A longitudinal cohort study. Nulliparous women, experiencing an uncomplicated pregnancy in England, were recruited between 25 and 33 weeks gestation. Participants completed two online questionnaires, (1) on recruitment, including the Pain Catastrophizing Scale (PCS) and the Wijma Delivery Expectancy Questionnaire (WDEQ-A) (2) at three weeks postnatal.
Results: A total of 389 eligible participants entered the study. The percentage of women who were pain catastrophisers (PCS $\geq$ 20) was 28.1 %, while 7.6 % had a high pain catastrophising score (PCS $\geq$ 30). There was no association between pain catastrophising and the timing of hospital admission. The percentage of women reporting fear of childbirth (WDEQ-A score of $\geq$ 85) was 10.6 %. Fear of childbirth was highly associated with PCS scores ($p < .001$) at both the lower ($\geq$20) and higher ($\geq$30) thresholds.
Conclusion: Although not statistically significant, there was a tendency for women who pain catastrophise to present to hospital in the latent phase. The highly significant association between PCS and WDEQ-A scores has implications for the identification of these women and suggests that the PCS can be used as a screening tool to identify those women who have heightened fear around pain and who may also go on to develop clinically relevant fear of childbirth. Further studies are needed to confirm the acceptability of the PCS as a screening tool with women.

Introduction

Background

Evidence and current professional guidelines are clear: it is safe, judicious, and cost effective to advise women, who are experiencing pregnancy uncomplicated by risks factors, to remain at home until active labour begins [1]. What is not clear is how these women can be supported holistically so that they can make an informed decision about when to come into hospital, and that this decision is not driven by fear [2]. Decisions made during labour contribute to birth outcomes [3] and choosing the ideal time to move from home to hospital is important because hospitalisation during the latent phase of labour (early labour) often leads to a cascade of interventions [3,4,5] such as caesarean section [4] with implications for maternal [6] and infant [4] wellbeing. More work is needed to improve the health of women and their babies, and to answer the call from the World Health Organization to advance non-clinical interventions to help reduce the amount of non-urgent obstetric interventions during childbirth [7].

The latent phase of labour is a time *"not necessarily continuous, when there are painful contractions and there is some cervical change, including cervical effacement and dilatation"* up to the diagnosis of active labour [1]. Many women seek professional care during the latent phase due to pain and lack of confidence in their ability to cope [2,3,5]. Greater understanding is required of women's psychological experiences of labour pain and how this affects their labour choices [5], including their decisions on the timing of when to seek hospital admission.

Pain catastrophising is one psychological construct that may influence a woman's decision to seek early hospital admission. Pain catastrophising can be defined as "*an exaggerated negative mental set brought*

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to bear during actual or anticipated painful experience" [8]. Higher levels of cognitive distress and perceived pain have been associated with poorer labour efficiency and obstetric outcomes [9–11]. A recent study of women of reproductive age found high levels of pain catastrophising [12], however the prevalence among pregnant women is unknown. Studies have yet to consider whether pain catastrophising, identified in pregnancy, is a significant factor in hospital admission during the latent phase of labour.

Pain-related fear and fear of childbirth (FOC) are distinct yet interrelated concepts. Evidence suggests those women who fear pain also fear childbirth [13], with pain-related fear being a stimulus in the broader dimension of FOC and a factor that moderates women's childbirth decisions [14]. FOC has been shown to increase as pregnancy progresses [15] and it has also been linked with adverse childbirth outcomes such as prolonged labour, epidural use, obstetric complications, traumatic stress symptoms and the need for psychiatric care [9].

There is little research that has looked at how pain catastrophising and fear of childbirth impact the latent phase of labour. A high proportion of mothers who are admitted into hospital in the latent phase of labour have unnecessary intervention [3,4,5]. The primary aim of this study was to assess the prevalence of pain catastrophising in a population of nulliparous women who were experiencing an uncomplicated pregnancy, and to determine whether pain catastrophising had an impact on their timing of admission to hospital when they were in labour. The prevalence of FOC was also assessed, as was its relationship with pain catastrophising, and whether it had an impact on participants' timing of hospital admission when they were in labour.

Methods

Study Design

This was a longitudinal cohort study. Over an 18 month period data were collected via two online questionnaires, one antenatal and one postpartum, and by retrieving participants' routinely collected birth data from participating sites' digitally held records.

Setting

All National Health Service (NHS) Hospitals in England with an obstetric maternity unit, or alongside midwife-led units, or stand-alone midwife-led units were eligible to participate. A total of 24 primary care NHS Hospitals (sites) across England chose to be included. Participant recruitment took place concurrently at multiple independent sites.

The study opened to participant recruitment and data collection at the first participating site on 31st December 2020. This was following a delay caused by research measures imposed in the United Kingdom (UK) to help tackle the novel coronavirus pandemic. Data collection closed 30th June 2022.

Study Population

Eligibility Criteria

This study aimed to recruit healthy nulliparous women between 18 and $\leq$ 40 years of age, experiencing an uncomplicated pregnancy, and planning a hospital birth. Participants were required to understand and read English, be between 25 and 33 weeks and 6 days gestation and have internet access and an email address for study correspondence.

The age range was chosen to reflect the study focus on uncomplicated pregnancies. Women outside this age range are more likely to require medical assessment, intervention or, at the lower age range require additional support.

Women who chose to take up the invitation to be included accessed the study online either by themselves or with the assistance of the midwife researcher.

Exclusion Criteria

Women who were under ongoing care from an obstetrician, aged 41 or over, with current or pre-existing mental health condition requiring current medication or specialised care, or already participating in a study providing pain management or labour support interventions were excluded.

Sampling Method, Sample Size

The sampling technique was nonprobability, convenience sampling. The sample size was determined by considering previous studies that used the PCS as an assessment tool [12,16,17]. Studies have used various cut-off scores of between $\geq$ 20 [12,16] and $\geq$ 30 [12,17] for diagnosis of pain catastrophising. Considering a 47.5 % prevalence of pain catastrophising found in a non-pregnant population using the cut-off point of $\geq$ 20 [12], a cut-off point also used with a pregnant population [16], a power calculation determined the sample size of 384 participants which would give us 90 % power to determine association with hospital admission.

This study aimed to recruit 768 women to allow for potential loss to follow-up or changes in risk status from low to high during the antenatal period.

The Measures

Demographics

The demographic profile of participants helped provide context which aided understanding about the findings from this study. Demographic details, included:

- Relationship/Marital status
- Ethnicity
- Employment status
- Highest level of education achieved

Supplement contextual questions included:

- If they had ever been pregnant before but unfortunately suffered a miscarriage or termination of pregnancy before 24 weeks pregnant.
- Their current gestation
- A brief pain experience history, including antenatal pain level using an 11 point Numerical Rating Scale (NRS) for intensity ratings from 0 (no pain) to 10 (very severe pain). The NRS was chosen for its reliability and because it is easy to administer and score [18].

The Pain Catastrophising Scale (PCS)

The PCS is one of the most widely used psychometric measures of catastrophic thinking linked to pain [8,17,19]. The PCS is a self-report measure developed for both clinical and non-clinical use. It is composed of 13 items based on catastrophising definitions described in the literature, and previous experimental and clinical research on catastrophic thinking in connection to pain experience [17]. PCS scores have been found to correlate with other health measures, including pain intensity, pain-related disability, and psychosocial distress [20]. The 13 items are divided into three dimensions (subscales): helplessness, magnification and rumination. The correlational relationship between these dimensions has been replicated in several investigations demonstrating internal consistency and validity of the three subscales with total PCS Cronbach's coefficient alphas = 0.87, rumination = 0.87, magnification = 0.66, and helplessness = 0.78 [21] and it has a high test–retest correlation of r = 0.75 across 6 weeks [17].

For each of the 13 items participants are required to reflect on past painful experiences and score their thoughts or feelings on a 5-point

Likert scale between "not at all" (score 0), and "all the time" (score 4). The highest possible total score is 52. The higher the score the greater the catastrophic thinking. Although pain catastrophising scores have been shown to be normally distributed, the PCS developers have predominantly taken a score of 30 or more to determine pain catastrophising as clinically relevant [17] with other studies finding lower cut-off scores are clinically relevant [16].

The Wijma Delivery Expectancy Questionnaire WDEQ-A

The Wijma Delivery Expectancy Questionnaire Part A (WDEQ-A) [22] asks women about their cognitive and emotional beliefs about childbirth. It is a self-report measure with 33 items, each item rated on a 6-point Likert scale ranging from "not at all'' to "extremely''. The minimum total score is 0 and the maximum is 165. The higher the score the greater the fear with a cut-off point of 85 or above indicating clinically relevant FOC [10,23]. The internal consistency of the WDEQ-A has been found to be strong with a Cronbach's coefficient alpha of 0.87 [22] and 0.94 [10].

Although the WDEQ-A has been criticised for its multidimensionality [24] and its phraseology for use with UK women [25], the WDEQ-A was chosen in the absence of a more fitting measure of FOC. It is perceived by women as a thorough tool which captures most of women's fears [25] and has demonstrated good reliability and validity [26]. It is one of the most widely used tools worldwide in assessing FOC [26,27] and has also shown to correlate well with other FOC measures in identifying high childbirth fear in first time mothers, previous emergency caesarean and women with self-reported anxiety and/or depression [10].

Postnatal Questionnaire (PNQ)

Participants were asked to complete a second online survey at approximately 3 weeks postpartum, or 3 weeks after their expected due date if they had their baby early. The majority of woman completed the PNQ between 21 and 28 days.

Prior to its use the postnatal questionnaire was pretested with four pregnant women, two birthing partners, two non-pregnant multiparous women of childbearing age, four maternity support workers and nine clinical maternity experts.

For this study participants were asked to provide data on their latent phase (which is not routinely collected in the NHS), including cervical dilatation on admission.

Recruitment

A pragmatic approach was taken for participant recruitment allowing sites to use various methods such as posters, social media, or direct invitation by relevant staff, or a combination of methods.

Data Collection and Management

Online questionnaires were used for data collection and managed via a secure online survey provider (JISC Online Surveys). Routinely recorded birth outcome data was collected from sites.

Participants were asked to provide their email address to enable follow up with the postnatal online questionnaire. One reminder was emailed if no reply was received to the first request. Women's details were checked to confirm that there were no issues (such as the loss of a baby) in which it could be distressing if further study communication was sent to the participant.

The JISC Online Surveys tool is used for research and education by the majority of higher education institutions in the UK. It is certified to ISO 27001 (International Organization for Standardization (ISO) the world's best-known standard for information security management systems [28], and data is processed in compliance with the General Data Protection Regulation (2018) for organisations in the UK.

Participants' personal identifiable information were held separate to all other study data. Personal identifiable information and study data were held securely on the study sponsor's secure mainframe and accessed via a password-protected laptop. All site level data were managed by NHS approved, secure and fully auditable software systems. Women's data were protected, stored, and used in line with the Data Protection Act 2018 and General Data Protection Regulation 2018 and the latest study sponsor's policies.

Data Analysis

Data were analysed using the statistical software package SPSS (v.28). For participants who indicated that they had an elective caesarean section, an induction of labour, received ongoing antenatal care from a consultant obstetrician, or that they did not experience latent labour at home, their data were included in relevant sensitivity analysis only.

Prevalence data, socio-demographics, and latent labour experiences were analysed using descriptive statistics. Chi-square tests were used to test independence between relevant categorised variables. Pain catastrophising scores (PCS scores) were categorised $\geq$ 20 [16] and $\geq$ 30 [17], and FOC scores (WDEQ-A scores) were categorised $\geq$ 85 [23]. Multiple variables were examined in relation to the timing of hospital admission and PCS scores. The alpha level for the RETHINK study was set at $p \leq 0.05$.

Participants with missing answers to Likert scales within the PCS or the WDEQ-A were removed from relevant analysis. 7 participants failed to complete the PCS, 30 participants failed to complete the WDEQ-A, and 1 participant failed to complete both the PCS and the WDEQ-A.

This study used a cervical dilatation of $\geq$ 4 cm to diagnose the start of active labour. This reflects current guidance from the National Institute for Health and Care Excellence [1] and the most commonly followed guidance in the UK.

Ethical Considerations

Ethical approval to conduct this study was obtained on the 4th June 2020 from the National Health Service (NHS), Health Research Authority (HRA) and Health and Care Research Wales (HCRW).

Participants consented to their data being collected and stored. Before online consent participants were informed that if they chose to withdraw from the study then their data would only remain in if their withdrawal came after their data had been anonymised.

Results

Participants and Demographics

Fig. 1 provides a graphic of the journey of the participants through the RETHINK study. A total of 389 eligible participants entered the study. Participants were aged between 22 and 40 years (mean age 31.43 years [±3.98]). The majority of participants were educated to degree standard or above (78.5 %), were in full-time employment (81.0 %), were married or had a partner (95.6 %), categorised their ethnicity as White (75.8 %), and, as per the preferred eligibility criteria, were in their third trimester of pregnancy (59.1 %) (Table 1).

Data gathered from the antenatal questionnaire showed 77.8 % had not experienced a pregnancy loss before they reached 24 weeks gestation. One fifth of participants reported having a previous pain experience that lasted more than 3 months (20.1 %), with just over a third (144/389, 37.5 %) reporting being in pain at the time they answered the antenatal questionnaire. Of these participants, 23 % were experiencing high pain (levels 6–10), although the duration of the antenatal pain was unknown. Out of those participants who were in pain most reported musculoskeletal pain and generally cited their lower back, hip, or pelvic regions as the sources of their pain.

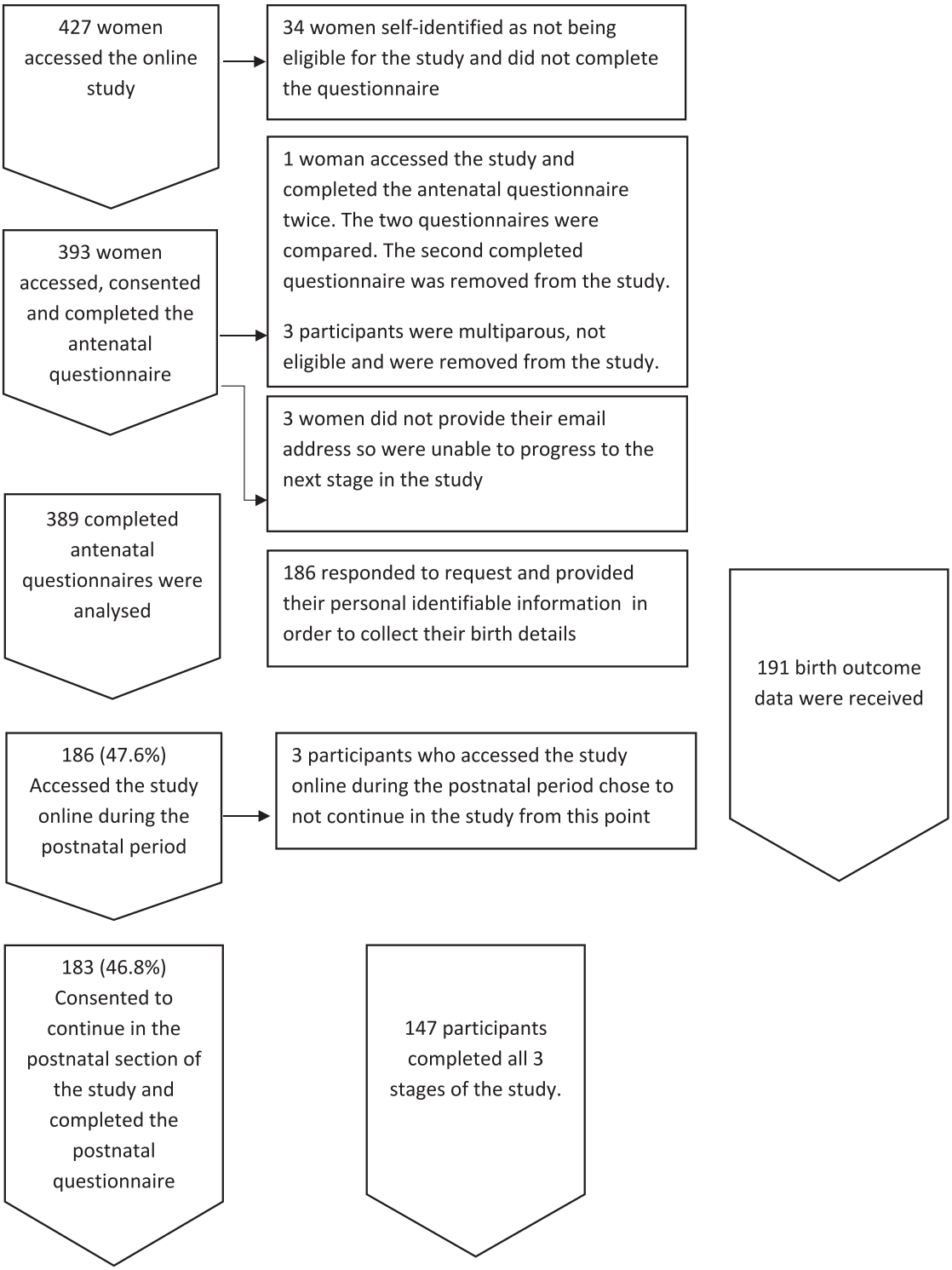

Fig. 1. Flowchart Displaying Participants' Journey Through the RETHINK Study.

Prevalence of Pain Catastrophising and FOC

The PCS was completed by 381 participants and the WDEQ-A by 358 participants (Table 2). The prevalence of pain catastrophising with a cut-off score of ≥ 20 was 28.1 % of participants. Prevalence of pain catastrophising with a cut-off score of ≥ 30 was 7.6 % of participants. The prevalence of FOC determined by WDEQ-A scores with a cut-off point of ≥ 85 was 10.6 % of participants. PCS scores at both the lower and higher cut-off points were highly associated (p <.001) with FOC (WDEQ-A score ≥ 85).

Participants' Latent Labour Experience

Data on latent phase of labour experience is drawn from the PNQ (Table 3). The majority (128/183) of participants responded between 21 and 28 days postnatal.

Table 1
Demographic characteristics of sample.

		Percentage	(*n*)
Gestation (Trimesters*)	**(n = 389)**		
1st Trimester		0.3 %	*(1)*
2nd Trimester		40.6 %	*(158)*
3rd Trimester		59.1 %	*(230)*
Employment	**(n = 389)**		
Full-time		81.0 %	*(315)*
Self-employed		4.4 %	*(17)*
Part-time		5.9 %	*(23)*
Maternity leave		2.6 %	*(10)*
Unemployed		3.6 %	*(14)*
Prefer not to say		1.5 %	*(6)*
Other** = Student MW, Shielding, Student, FT undergrad		1.0 %	*(4)*
Highest level of academic achievement	**(n = 377)**		
GCSE		7.7 %	*(29)*
A Level or equivalent		13.8 %	*(52)*
Degree or equivalent		46.9 %	*(177)*
Masters or equivalent		25.2 %	*(95)*
PhD		6.4 %	*(24)*
Relationship Status	**(n = 389)**		
Married		54.8 %	*(213)*
Single		2.6 %	*(10)*
Partner		39.8 %	*(155)*
Widow		0	*(0)*
Prefer not to say		1.8 %	*(7)*
Other = Civil partnership, Engaged, Married common-law, Co-habiting		1.0 %	*(4)*
Ethnic origin	**(n = 389)**		
White		75.8 %	*(295)*
Mixed		4.9 %	*(19)*
Asian or Asian British		10.5 %	*(41)*
Black or Black British		4.4 %	*(17)*
Arab or other ethnic group		0.5 %	*(2)*
Other = Kurdish, Chinese, Black African, Japanese, Moroccan, Indian, Latin American, South East Asian, Brazilian, British Chinese		3.9 %	*(15)*
Age (years)	**(n = 183)**		
22–25		9.3 %	*(17)*
26–30		28.4 %	*(52)*
31–35		45.4 %	*(83)*
36–40		16.9 %	*(31)*
Mean [SD]		31.43 [±3.98]	

* 1st trimester = 1 to 12 completed weeks gestation, 2nd = trimester 13 to 27 completed weeks gestation, 3rd trimester = 28 to 40 + weeks gestation
** 'Other' for Employment, Relationship status, and Ethnic origin is as participants specified and have not been re-categorised for purposes of demographic depiction.

Only 44.8 % of participants who completed the PNQ (81/183) provided data on their timing of hospital admission when in labour, because a high proportion of participants reported having an induction of labour (38.2 %) or an elective caesarean section (9.3 %).

Approximately one third (32.9 %) of women with spontaneous onset of labour were admitted to hospital during the latent phase. Just over a fifth (21.6 %) reported that they were admitted on their first presentation to hospital, while the majority were sent home and admitted on their second (57.9 %) or subsequent (20.5 %) visits. Overall, the median duration of latent labour experienced at home before the first, or only time seeking hospital admission was 8.5 h, with a range of 0 to 72 h.

Factors Associated with the Timing of Hospital Admission

There was no statistically significant association between PCS scores or WDEQ-A scores and the timing of hospital admission (Table 4). However, a tendency was observed for women with higher PCS scores (at both cut-off points) and WDEQ-A scores (≥85) to have latent phase hospital admission. There was a significant association between the timing of hospital admission and antenatal pain level, but participant numbers were very small.

Factors Associated with Pain Catastrophising and FOC

There was a significant association between antenatal pain level and both PCS cut-off points (Table 5). However, similar results were not seen with WDEQ-A scores.

Although antenatal pain lasting more than three months was not significantly associated with PCS scores (Table 5), there was a significant association with WDEQ-A scores. Participants who experienced pain that had lasted for more than three months were significantly more likely to have a high WDEQ-A score (20 % of those with pain compared to 8 % for those without, p =.004).

Age demonstrated a strong association (p =.007) with pain catastrophising at the lower pain catastrophising score (≥20), with participants aged ≥ 31 years being more likely to pain catastrophise than those aged ≤ 30 years (Table 5). This association was not reflected between age and the higher PCS scores (≥30). There were no associations found between age and WDEQ-A scores. Participants who classified their ethnicity as any other category other than white were more likely to pain catastrophise (score ≥ 20) than those who described themselves as white ($p < 0.038$). There was no association found between ethnicity and WDEQ-A scores.

Discussion

This is the first study to report the prevalence of pain catastrophising in a population of pregnant nulliparous women in the UK, and to explore its association with the timing of hospital admission when in labour.

Prevalence of Pain Catastrophising

This study found a lower prevalence of pain catastrophising compared to a non-pregnant UK population [12]. One potential explanation is that in Clark et al's [12] study participants may have been self-selecting with an interest in engaging with a study about pain. In contrast, the participants for the RETHINK study were pregnant nulliparous women. The aim was to investigate if the PCS might predict those women who would benefit from extra pain management support in latent labour with a view to enabling them to arrive in hospital in active labour to help reduce their chance of unnecessary obstetric interventions. A study by Flink et al [16] with a similar sample group to the RETHINK study, reported the prevalence of pain catastrophising at a PCS cut-off point ≥ 20 to be nearly double at 46.3 % [16]. The most notable differences are that Flink et al [16] did not exclude women on mental health grounds or with obstetric risk factors (other than those women who were planning to have a caesarean section) [16]. Pain catastrophising has been shown to be influenced by negative emotions and thoughts in response to pain and those with high pain catastrophising and mental health symptoms report the worst pain intensity [30].

Prevalence of FOC

This study found the prevalence of FOC to be 10.6 %, which is higher than the 3 % found in a recent UK study [29] but below the worldwide estimate of 14 % [27]. The variation in the estimation of FOC has been attributed to methodological flaws, and failure to account for, or control for confounding variables, including a broad conceptualisation of anxiety without specificity [31]. We attempted to reduce the confounding factors by recruiting low risk women and excluding those with mental health conditions, but we acknowledge that some undetected conditions

Table 2
Frequency Table showing cut-off scores of PCS and FOC.

Measure		Percentage (%)	n	Mean	Standard Deviation [±SD]	Overall Range
PCS				14.62	9.41	0–47
Cut-off score < 20	n = 381	71.9 %	*(274)*			
Cut-off score ≥ 20		28.1 %	*(107)*			
Total		100.0 %	*(381)*			
Cut-off score < 30	n = 381	92.4 %	*(352)*			
Cut-off score ≥ 30		7.6 %	*(29)*			
Total		100.0 %	*(381)*			
WDEQ-A				60.36	20.67	10–148
FOC < 85	n = 358	89.4 %	*(320)*			
FOC ≥ 85		10.6 %	*(38)*			
Total		100.0 %	*(358)*			

PCS = Pain Catastrophizing Scale [17] FOC = Fear of Childbirth WDEQ-A [22].

Table 3
Tabulation of Participants' Latent Labour Experience.

Characteristics		(*n*)	% of total PNQ respondents
Total number of participants who responded to the PNQ		183	
How many times participants presented to hospital before being admitted	**0**	19	21. 6 %
	1	51	58.0 %
	2	15	17.0 %
	3	3	3.4 %
	Total (*n*)	88	100 %
Admitted to hospital in latent labour*		27	32.9 %
Admitted to hospital in active labour**		55	67.1 %
	Total	82	100 %
Minimum numbers of hours participants said they were in labour before presenting to hospital for admission	**Total (*n*)**	88	
	Median	8.50	
	IQR	4.00–14.75	
	Range	0–72	
Number of participants who said that they did have an IOL	**Yes**	70	38.3 %
	No or did not answer	113	61.7 %
	Total (*n*)	183	100 %
Out of the total participants who responded to the PNQ the number who reported that they had an elective caesarean section		17	9.3 %
Number of days postnatal that participants completed the PNQ	**Median**	25	
	IQR	22–29	
	10–20	3	1.6 %
	21–28	128	70.0 %
	29–35	25	13.7 %
	36–96	27	14.8 %
	Total (*n*)	183	100 %

*Cervical dilatation ≤ 3 cm **Cervical dilatation ≥ 4 cm.

might exist in the cohort. Nonetheless, this study adds to knowledge about FOC.

Factors Associated with the Timing of Hospital Admission

Approximately one third of the RETHINK study participants were admitted to hospital in the latent phase of labour. This is similar to the 32.4 % found in an Australian study by Miller et al [4]. In view of poorer birth outcomes associated with hospital admission during the latent phase of labour [3,4] it is important to consider the reasons why women present early.

Previous research has suggested that women seeking admission in the latent phase of labour do so because of pain [5,32]. This study found no statistically significant association between high PCS scores and latent phase hospital admission. However, the number of women admitted in spontaneous labour was much smaller than anticipated due to the high levels of induction, and the number of elective caesarean sections. Furthermore, participants who did experience the latent phase at home may have delayed their timing of hospital admission due to fears they may have had about attending hospital during a global pandemic, and the restrictions hospitals imposed on attending birth partners. Nonetheless, the tendency towards greater hospital admission during the latent phase of labour when women scored higher on the PCS, and higher on the WDEQ-A is noteworthy as this may indicate that these women may benefit from additional support in the future. Further studies with larger sample sizes are needed to confirm this.

The association between antenatal pain and hospital admission during the latent phase of labour is particularly noteworthy because those participants who rated their pain levels as high on the antenatal questionnaire were also those who were more likely to pain catastrophise. Taking a pain history on booking and/or later in pregnancy might be an important and simple way of identifying women who might benefit from targeted support prior to labour [33].

Factors Associated with Pain Catastrophising and FOC

The findings confirm previous research that indicates pain catastrophising is a predictor for pain intensity [19]. How women rate their pain level has been shown to be a strong predictor of childbirth pain [16]. It can be argued that women who rate their antenatal pain as high may also rate their labour pain as high. The potential then is that they

Table 4
Crosstabulation of timing of hospital admission against multiple variables.

	Timing of Hospital Admission Latent Vs Active Labour				df	Fisher's Exact 2-sided	Pearson Chi-Square Asympt. Signif.
	No		Yes				
	n	Row %	n	Row %			*p* value
PCS score ≥ 20							
No (n = 57)	17	29.8 %	40	70.2 %	1		0.347
Yes (n = 22)	9	40.9 %	13	59.1 %			
PCS score ≥ 30							
No (n = 74)	23	31.1 %	51	68.9 %	1		
Yes (n = 5)	3**	60.0 %	2**	40.0 %		0.324	
WDEQ-A score ≥ 85							
No (n = 73)	23	31.5 %	50	68.5 %	1		
Yes (n = 6)	4**	66.7 %	2**	33.3 %		0.173	
Previous pregnancy loss ≤ 24wks							
No (n = 59)	17	28.8 %	42	71.2 %	1		0.204
Yes (n = 23)	10	43.5 %	13	56.5 %			
Gestation							
≤27wks (n = 26)	7	26.9 %	19	73.1 %	1		0.431
≥28wks (n = 56)	20	35.7 %	36	64.3 %			
Age/years							
≤30 years (n = 19)	4	21.1 %	15	78.9 %	1		0.250
≥31 years (n = 36)	13	36.1 %	23	63.9 %			
Education							
GCSE/ A Level (n = 18)	6	33.3 %	12	66.7 %	2		0.317
Degree (n = 30)	7	23.3 %	23	76.7 %			
Post-Graduate (n = 34)	14	41.2 %	20	58.8 %			
Ethnicity							
White (n = 68)	22	32.4 %	46	67.6 %	1		
Not White (n = 14)	5**	35.7 %	9	64.3 %		1.000	
Antenatal Pain Level							
Level 0–5 (n = 28)	9	32.1 %	19	67.9 %	1		
Level 6–10 (n = 4)	4**	100 %	0**	0.0 %		0.020*	
Currently in pain							
No (n = 49)	13	26.5 %	36	73.5 %	1		0.067
Yes (n = 30)	14	46.7 %	16	53.3 %			
Ever had pain ≥ 3 months							
No (n = 65)	19	29.2 %	46	70.8 %	1		0.164
Yes (n = 17)	8	47.1 %	9	52.9 %			

df = Degrees of Freedom. Pearson Chi Square Asympt. Signif. = Pearson chi-square asymptotic significance.
* Significant finding (p=<0.05) **Cell has less than expected count for chi-square analysis.
PCS = Pain Catastrophizing Scale [17] WDEQ-A [22].

will be affected by the fear of being overwhelmed by pain [34] and choose to avoid labour pain by requesting epidural analgesia [35] or opting for an elective caesarean section [11] and face poorer recovery following birth [16].

Age and ethnicity were significantly associated with pain catastrophising at the lower cut-off point. The evidence regarding age and pain catastrophising in a pregnant population is unclear with Flink et al finding no relationship [16]. However, ethnicity has been shown to influence a person's evaluation and interpretation of pain and their emotional and behavioural responses to it [36]. Caution is needed in interpreting this result considering the sample size in this study. It is recommended that future studies considering pain catastrophising examine the implications of ethnicity.

Predictive Value of FOC Based on PCS Scores

There was a strong association between pain catastrophising and FOC and with the PCS scores significantly predicting WDEQ-A scores. This mirrors previous work by Rondung et al [13]. The predictive relationship of pain catastrophising for FOC is pertinent because FOC has been shown to increase after 20 weeks gestation [15] and suggests that the PCS may be used as a predictor earlier in pregnancy to identify women who may later develop FOC and need additional support [33].

Strengths and Limitations of The RETHINK Study

This is an original piece of work which brings together pain catastrophising and the latent phase of labour. It aims to fill the gap in knowledge about the prevalence of pain catastrophising in the target population and whether pain catastrophising is a risk factor for admission to hospital during the latent phase of labour.

The strengths of this study include the target sample size which was achieved and used to assess the prevalence of pain catastrophising at the higher cut-off point. This is a relatively high initial response rate compared to other studies considering a similar topic [11,16,34]. Another strength was that the study ran at multiple sites across England covering urban and rural areas and included obstetric-led maternity units and birth centres.

Table 5
Crosstabulation of PCS scores against multiple variables.

	PCS score ≥ 20				df	Pearson Chi-Square Asympt. Signif.	PCS score ≥ 30				df	Fisher's Exact 2-sided	Pearson Chi-Square Asympt. Signif.
	No		Yes				No		Yes				
	n	%	n	%		*p* Value	n	%	n	%			*p* Value
WDEQ-A score ≥ 85													
No (n = 314)	242	77.1 %	72	22.9 %	1	<0.001*	302	96.2 %	12	3.8 %	1		<0.001*
Yes (n = 37)	14	37.8 %	23	62.2 %			24	64.9 %	13	35.1 %			
Gestation													
≤27wks (n = 154)	111	72.1 %	43	27.9 %	1	0.954	139	90.3 %	15	9.7 %	1		0.197
≥28wks (n = 227)	163	71.8 %	64	28.2 %			213	93.8 %	14	6.2 %			
Previous pregnancy loss ≤ 24wks													
No (n = 296)	216	73.0 %	80	27.0 %	1	0.479	274	92.6 %	22	7.4 %	1		0.929
Yes (n = 84)	58	69.0 %	26	31.0 %			78	92.9 %	6	7.1 %			
Age/years													
≤30 years (n = 69)	58	84.1 %	11	15.9 %	1	0.007*	65	94.2 %	4**	5.8 %	1	1.000	
≥31 years (n = 111)	73	65.8 %	38	34.2 %			104	93.7 %	7	6.3 %			
Education													
GCSE/A-Level (n = 79)	61	77.2 %	18	22.8 %	2	0.139	74	93.7 %	5	6.3 %	2		0.826
Degree (n = 175)	128	73.1 %	47	26.9 %			160	91.4 %	15	8.6 %			
Post-Grad (n = 117)	76	65.0 %	41	35.0 %			108	92.3 %	9	7.7 %			
Ethnicity													
White (n = 291)	217	74.6 %	74	25.4 %	1	0.038*	272	93.5 %	19	6.5 %	1		0.152
Not White (n = 90)	57	63.3 %	33	36.7 %			80	88.9 %	10	11.1 %			
Antenatal Pain Levels													
Level 0–5 (n = 115)	87	75.7 %	28	24.3 %	1	0.006*	107	93.0 %	8	7.0 %	1		0.024*
Level 6–10 (n = 35)	18	51.4 %	17	48.6 %			28	80.0 %	7	20.0 %			
Currently in pain													
No (n = 233)	170	73.0 %	63	27.0 %	1	0.554	218	93.6 %	15	6.4 %	1		0.245
Yes (n = 144)	101	70.1 %	43	29.9 %			130	90.3 %	14	9.7 %			
Ever had pain ≥ 3 months													
No (n = 303)	220	72.6 %	83	27.4 %	1	0.554	283	93.4 %	20	6.6 %	1		0.143
Yes (n = 78)	54	69.2 %	24	30.8 %			69	88.5 %	9	11.5 %			

df = Degrees of Freedom. Pearson chi-square Asympt. Signif. = Pearson chi-square asymptotic significance.
* Significant finding (p=<0.05) **Cell has less than expected count for chi-square analysis.
PCS = Pain Catastrophizing Scale [17] WDEQ-A [22].

Excluding women from this study if they had a current or pre-existing mental health condition requiring medication or specialised care is a strength of this study. This is because it isolates pain catastrophising and fear of childbirth from such conditions which has been a criticism of some studies in the past [31].

The study is limited by its use of convenience sampling with the potential for sampling bias and a sample that is not representative of the target population. The diverse nature of the participating sites may limit the impact of sampling bias. The necessities of time, costs and accessibility to the required sample group meant nonprobability convenience sampling was the most suitable method to meet the study aims and objectives.

Considering the target population in this study, an unexpected limitation was the high number of women undergoing induction of labour, coupled with those having an elective caesarean section which reduced the power to explore and conclude on associations between variables and the timing of hospital admission. The rate of induction is rising in England and yet there is much debate, and uncertainty surrounding the evidence for the optimum time, and in other particular instances the clinical need [37]. The percentage of the RETHINK study participants who said that they had an induction of labour (38.25 %) is slightly higher than national UK figure at 33.3 % for all singleton pregnancies at term [38].

This study was further limited by the unknown influence that the global pandemic, including fear about contracting the COVID-19 virus, and hospital measures aimed at minimising the transmission of the virus had on the participants' decisions about when to seek hospital admission when they were in labour. Furthermore, the pandemic had a major impact on study recruitment delaying the study start date as NHS staff were prioritised elsewhere.

Data about the latent phase and the timing of hospital admission are not routinely collected and were therefore collected from participants. The timing of hospital admission was based on cervical dilatation, which is usual practice in the UK [1] and excluded other factors that women would incorporate into their decision of when to move from home to hospital. This additional data may have advanced the findings about the influence of pain catastrophising on the timing of hospital admission decisions. Data collection could also have been hindered by relying on women's recollection of events [39]. Although women's memories about their childbirth experiences have been questioned in the literature [40] the evidence is not conclusive and recall of events has been shown to be excellent at four months postpartum [41]. Furthermore, to the authors' knowledge there is no evidence about the reliability of women's recall of events specifically around the latent phase of labour.

Conclusion

This is the first study to report the prevalence of pain catastrophising in a UK population of women at low obstetric risk and to consider how pain catastrophising impacts the timing of hospital admission in labour. Although this study was unable to identify a significant association between pain catastrophising and the timing of hospital admission, the findings suggest a tendency for women who pain catastrophise to present to hospital for admission during the latent phase of labour. The highly significant association between pain catastrophising and FOC has implications for the identification of these women. FOC has previously been shown to increase as pregnancy advances. This suggests that the PCS can be used as a screening tool to identify those women who have heightened fear around pain and who may also go on to develop clinically relevant FOC. Further studies are needed to confirm the acceptability of the PCS as a screening tool with women and identify the optimum gestation period to enhance its utility.

Author contributions

VH, CC and BP conceived the study and obtained funding to support the work. VB planned the study design, designed the data collection form and analysed the data with support from VH, CC and BP. All authors interpreted the data. All authors contributed to the discussion and interpretation of the findings. All authors contributed to the planning, conduct and reporting of this research article. VB is the guarantor. All authors contributed to the writing of the paper and approved the final version. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Transparency declaration

I, Vanessa Bartholomew, as the lead author of this work, affirm that this manuscript is an honest, accurate and transparent account of the study; no important aspects of the study have been omitted and that any discrepancies from the study as originally planned have been explained.

Role of the funding source

The RETHINK study was supported through a Wessex Clinical Academic Training Programme. The funding source has had no influence on the study findings.

Dissemination declaration

Findings will be made available to study participants and organisations promoting women's reproductive health and wellbeing.

Data sharing statement

A de-identified data set can be made available for research purposes following completion of the study and on application to the corresponding author.

Ethics statement

The study has been approved by a National Health Service (NHS) research ethics committee and the NHS Health Research Authority in England. The ethics committee was the Black Country Research Ethics Committee. The Health Research Authority (HRA) and Health and Care Research (HCRW) Approval was given on the 4th June 2020 and the IRAS project ID number is 270583.

In all instances participants' data are protected, securely stored and used in line with the Data Protection Act 2018 and General Data Protection Regulation 2018 and professional regulating bodies. Research data collected, managed, and stored at participating Trust level are retained in line with each Trust's data management policy.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The RETHINK study was a doctotal study supported through the Wessex Clinical Academic Training Programme.

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