



## Research Article

# Exploring health and illness perceptions to identify the perceived cause of pregnancy-related pelvic girdle pain. A mixed-methods study among primiparous women in The Netherlands

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## ABSTRACT

**Background:** Pregnancy-related pelvic girdle pain (PPGP) is common and considered a multifactorial condition with biomechanical and psychosocial contributions. The patient's perceived cause is an important aspect of illness perceptions, and a strong predictor of self-management and healthcare utilization. It is unknown what causal beliefs primiparae hold regarding PPGP.

**Objective:** To explore and describe health and illness perceptions among primiparae towards PPGP and its cause.

**Design:** Exploratory, convergent parallel mixed-methods.

**Setting:** At the participants' homes.

**Participants:** Sixteen primiparae with and without PPGP.

**Findings:** Primiparae with and without PPGP held comparable causal beliefs about PPGP. PPGP was described as the result of hormonal softening and loosening of the pelvis, and failure of the muscular system to compensate for that. Women who experienced similar physical symptoms attributed them differently, leading to different coping strategies. Interestingly, maternal healthcare providers reinforced the unidimensional- and predominantly biomechanical view when women sought healthcare.

**Conclusion:** The causal mechanism of PPGP held by the women was not determined by their lived experience. It was primarily based on the concept of inevitable hormonal softening of the pelvis. This biomechanical belief is based on theories that are not in line with current knowledge of PPGP and contemporary pain science, yet they were reinforced by maternity healthcare providers.

**Implications for practice:** Healthcare seeking behavior is influenced by illness beliefs. Maternity healthcare providers may play a key role in providing reassurance and addressing the multifactorial nature of PPGP when providing care and support to pregnant women.

## Introduction

Pregnancy-related pelvic girdle pain (PPGP) affects 45.3 % of all pregnant women (Wu et al., 2004). It is observed and reported worldwide (Gutke et al., 2018). PPGP is experienced between the posterior

iliac crest and the gluteal fold, particularly in the vicinity of the sacroiliac joint. The pain may radiate in the posterior thigh and can occur in conjunction with or separately in the symphysis (Vleeming et al., 2008). Several qualitative studies focused on the experience of PPGP (Cepnija et al., 2022a; Elden et al., 2013; Fredriksen et al., 2008; Mackenzie et al.,

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2018; Persson et al., 2013; Wadehul et al., 2021). It is perceived as unpredictable (Fredriksen et al., 2008), and having an unexpected impact on activities of daily living (Cepnija et al., 2022a), relationships and social interactions (Elden et al., 2013; Mackenzie et al., 2018; Persson et al., 2013). While it is generally agreed that PPGP has negative emotional and psychological effects, and that it negatively affects daily life and women's identity (Mackenzie et al., 2018), important questions regarding the perceived cause of PPGP remain unanswered.

Despite considerable research efforts over the past 30 years, little progress has been made regarding understanding of the cause of PPGP. Many mechanisms have been proposed to explain PPGP, such as (1) form and force closure, which implies that both the geometric fit of the sacro-iliac joint surfaces as well as the muscles and ligaments around it keep the pelvis robust, (Kiapour et al., 2020; Pool-Goudzwaard et al., 1998), (2) load transfer, meaning the way forces and pressures are distributed through the pelvis during various movements (Snijders et al., 1993; Vleeming et al., 2008), (3) asymmetric sacroiliac joint laxity (Damen et al., 2001), (4) hormonal laxity (Aldabe et al., 2012), (5) weight gain (de Sousa et al., 2019) and (6) motor control deficits, which refers to the coordination and regulation of muscular activity for movement (Beales et al., 2010, 2009; de Groot et al., 2008; van Bente et al., 2022). Calls to abandon these unidimensional biomechanical explanations as the foundation for treatment approaches for PPGP are increasing (Meijer et al., 2020b, 2020a; O'Sullivan and Beales, 2007). Instead, there are appeals to embrace the multifactorial contributions to PPGP, such as contextual factors, neurobiological aspects and the health and illness perceptions that people have of PPGP (Beales et al., 2020).

The perceived cause of a condition is an aspect of health and illness perception, and a powerful predictor of self-management and healthcare utilization (McAndrew et al., 2018; Mose et al., 2022). It may therefore be of importance for all clinicians in maternal healthcare to be aware of the perceptions that women who are pregnant of their first child (primiparae) may have regarding PPGP. The common-sense model of self-regulation of health and illness (Leventhal et al., 2016; Mora and McAndrew, 2013) provides a framework to explore health and illness perceptions. The common-sense model considers people as actively engaged in problem-solving and purposefully managing health threats. Situational stimuli, such as symptoms, generate both cognitive and emotional illness representations, or illness perceptions. Illness perceptions comprise six dimensions: identity, timeline, consequences, causal beliefs, control beliefs and illness coherence (Mora and McAndrew, 2013). These dimensions arise from the individual's lived experience with the health threat and from information about it, gathered from healthcare providers, social environments, cultural frameworks and (social) media (McAndrew et al., 2018). Illness perceptions have both a concrete level (i.e., the actual experience of the health threat) and an abstract level (i.e., cognitive beliefs or perceptions to describe the health threat).

To our knowledge, no previous study reported on the abstract level of illness perceptions, including causal beliefs, of PPGP. This study aimed to explore and describe the health and illness perceptions that primiparae hold towards PPGP. Our primary aim was to explore what primiparae perceive as the cause of PPGP and whether these causal beliefs differ between women with and without PPGP. Our secondary aim was to explore how health and illness perceptions of PPGP are generated.

## Methods

### Design

In this exploratory, convergent parallel mixed-methods study, sociodemographic data and pain, disability, and fear of childbirth, assessed with validated instruments (see 'questionnaires'), provided a context for the participants' views expressed in semi-structured interviews. Data were collected from sixteen primiparae at a single time point. The study

was conducted and reported according to the standards for reporting qualitative research (SRQR) (O'Brien et al., 2014). Ethical approval was received from the Scientific and Ethical Review Board of Vrije Universiteit Amsterdam (VCWE-2021-148).

### Research team and reflexivity

All interviews were conducted by EvB, a female physiotherapist and PhD candidate, specialized in musculoskeletal and perinatal physiotherapy, and the management of PPGP. She is trained in conducting and analysing semi-structured interviews. AdK has advanced expertise in qualitative health research. AP is internationally recognized for her clinical and research expertise in PPGP and has a background in physiotherapy and psychology. MC and HK are experienced researchers in musculoskeletal health and persistent pain and biopsychosocial contributors to illness and health.

### Selection and recruitment of participants

Participants were eligible if they were pregnant with their first child. Hence, they had no previous personal experience with PPGP. No exclusion criteria were specified, other than not having sufficient command of the Dutch language. Purposive and snowball sampling was used, aiming for variance in characteristics as age, gestational age, and presence and intensity of PPGP. Diversity, in terms of ethnicity and socioeconomic status was prioritized as much as possible during recruitment. The study was advertised in midwifery practices across The Netherlands, and via social media. Women who were interested could contact the researchers by email to receive further study information. Once they had decided to participate, participants provided their telephone number for eligibility screening and to make an appointment. Written informed consent was obtained from all participants prior to the commencement of the study.

### Qualitative data collection

All interviews were conducted at the participants' home, ensuring that they could talk freely and safely about their opinions and feelings about PPGP. The interviews were guided by an interview-guide including a topic list (Green and Thorogood, 2018), based on clinical and methodological expertise of the research team (EvB, AdK, AP) and literature on illness beliefs, using 'cause', 'identity' and 'coherence' from the common-sense model (Leventhal et al., 2016; Mora et al., 2008) as sensitising concepts. During the interviews, open questioning was used, with refining questioning when necessary. We reviewed the topic list after the first five interviews and made some minor changes. The definitive version is provided in Table 1. The interviews were audio-recorded and fieldnotes were written during and after the interviews. The audio recordings were transcribed verbatim and anonymized and fieldnotes were digitalized.

### Quantitative data collection

Following the interviews, participants answered four questions regarding their date of birth, gestational age, level of education and occupation, and completed three questionnaires (Dutch language versions) (see Table 2): (1) Participants rated their average and their worst pain intensity during the last week on a Numeric Pain Rating Scale (NPRS) (ranging from 0 (no pain) to 10 (worst imaginable pain)). The NPRS is a reliable and valid instrument to measure pain intensity (Ferreira-Valente et al., 2011) and is widely used in PPGP research; (2) Disability was assessed with the Quebec Back Pain Disability Scale (QBPDS) (Schoppink et al., 1996). As suggested in clinical guidelines (Bastiaenen et al., 2017; Vleeming et al., 2008), the QBPDS can be used in PPGP, replacing the words 'back pain' with 'pelvic pain'; and (3) Fear of childbirth was assessed by the Wijma Delivery Expectancy

**Table 1**

Topic list with examples of open and refined questioning.

	Topic list for primiparae with pelvic girdle pain	Topic list for primiparae without pelvic girdle pain
Grand Tour question	How do you feel?	*
Terminology and symptoms	What is pelvic girdle pain, according to you?	*
	How do you recognise pelvic girdle pain?	*
	Do you know other words or terms for this condition?	*
Causation	What do you think it is that causes pelvic girdle pain?	*
	Are there any risks for developing pelvic girdle pain?	*
	Can pelvic girdle pain be prevented?	*
Treatment	Have you seen a healthcare professional for your pelvic girdle pain?	Why don't you have pelvic girdle pain?
	Why did you choose this health care professional?	Would you consider to visit a healthcare professional in case you had any pelvic complaints?
	What have they told you?	Which healthcare professional would you choose?
	Did you get an explanation, advice?	
	What is the exact form of the therapy you receive?	
	Do you think it is effective? Why?	
Expectation	Did you think you would have to deal with pelvic girdle pain?	*
	Do you think that you have an influence on developing pelvic girdle pain?	*
	Do you think that you can influence your recovery?	
Information	What role does your midwife / GP / Physiotherapist play in dealing with your pelvic girdle pain?	
	What is the most important source of information on pregnancy and pelvic girdle pain for you?	*
	Do you attend any form of antenatal activities?	*
	Do you search the internet for information? What do you think of that?	*
Childbirth	What are your feelings about childbirth?	*
	Do you consider your pelvic girdle pain in that light?	
Social environment	Do you feel supported by your partner / family / friends?	*
	What do you do for a living?	*
	Do you practice any sports during your pregnancy?	*
	Have you been around other people with similar complaints as you have?	Have you been around anyone with pelvic girdle pain?
	Do you have any additions on what pelvic girdle pain means to you that we have not discussed yet?	*

\* Same question as for women with pregnancy-related pelvic girdle pain.

Questionnaire (WDEQ-A) (Wijma et al., 1998). The WDEQ-A was developed to measure fear of childbirth during pregnancy, as operationalized by the cognitive appraisal of the delivery. This questionnaire consists of thirty-three items with a six-point Likert scale, ranging from 'not at all' (zero) to 'extremely' (five). The total score ranges from 0 to 165, and a score higher than 85 indicates clinically relevant fear of childbirth. Measurement properties in a Dutch population are unavailable.

### Data analysis

Initially, qualitative and quantitative data were analyzed separately. Key themes and questions requiring further exploration were identified and followed up between both datasets. We aimed to integrate our quantitative data, using the 'follow the thread' approach, (O'Cathain et al., 2010) to provide a better understanding of our thematic analysis.

### Qualitative data analysis

A thematic analysis was conducted as described by Braun et al. (2016), Braun and Clarke (2006). First, the first three interviews were transcribed verbatim and repeatedly read closely. Memos were written on initial ideas about them by EvB, AdK and AP. Second, EvB and AK independently open-coded these first three transcripts. Initial codes and memos were thoroughly discussed in research meetings (EvB, AK and AP) to enhance credibility (Braun and Clarke, 2006; Braun et al., 2016). With the resulting initial code list, EvB coded the next three transcripts, reviewing and extending the code list, if necessary. Again, codes, findings and interpretations were discussed (EvB, AdK, AP). Third, the first themes were identified by clustering codes (axial coding), and a first thematic map of the codes and subcodes was generated (selective coding). Fourth, this thematic map was the basis for successive research meetings, in which coding, sub-coding and themes were discussed and

reviewed. Fifth, themes were defined, named, and checked for internal coherence, consistency and distinctiveness by EvB, AdK and AP. An iterative constant comparison was used, in which data collection and data analysis alternated. Differences and similarities between participants and deviant cases were discussed thoroughly to identify themes and a theoretical framework, enhancing dependability and confirmability (Smith and McGannon, 2018). The framework of themes and preliminary conclusions were thoroughly discussed by the research team (EvB, AdK and EB) and reflected upon by MC and HK. Then, the most vivid quotations were selected to illustrate our thematic analysis in the research report. During the writing phase, we moved from a descriptive to a more interpretative level of analysis (Braun et al., 2016).

All transcripts, fieldnotes, memos, and thematic maps were analyzed and discussed in Dutch using the software of Atlas.ti (version 20). After completion of the interpretative phase, themes and selected quotations were translated to English by EvB and a native English speaker (MO, see Acknowledgements).

### Quantitative data analysis

Sociodemographic and clinical data were summarized using descriptive statistics (see Table 3) and reported per participant (see Table 2). Differences between women with and without self-perceived PPGP were assessed using appropriate statistical tests (see Table 3).

### Integration of qualitative and quantitative analyses

In case of significant differences between groups on any of the quantitative variables, we explored possible meaningful connections with verbal expressions of participants, to provide context for our qualitative findings and, thus, a better understanding of our thematic analysis (O'Cathain et al., 2010).

**Table 2**  
Participant characteristics.

Participants*	Age (in years)	Occupation	Educational level**	Weeks of gestation	PPGP	Mean pain intensity over past week (NPRS score)	Maximum pain intensity over past week (NPRS score)	Disability (QBPDS score)	Fear of childbirth (WDEQ-A score)
Abbey	34	Project manager	7	38	Yes	8	10	60	70
Barbara	30	Physiotherapist, lecturer	7	38	No	1	1	53	47
Chrissy	27	Social Therapist	6	26	Yes	8	9	41	81
Diana	31	General Practitioner	7	30	No	3	7	37	59
Emma	29	Cleaner	3	11	No	5	7	27	34
Fiona	31	Shop assistant	2	25	No	1	2	3	30
Grace	37	Recruitment consultant	7	30	No	0	0	2	17
Helen	27	Maternity nurse	3	26	Yes	5	7	47	50
Iris	26	Healthcare assistant	3	29	No	2	4	23	78
June	34	Pelvic physiotherapist	7	35	No	0	1	5	30
Kate	26	Physiotherapist	6	34	No	0	1	5	67
Layla	34	Financial controller	7	36	Yes	6	8	56	63
Margot	27	Child care employee	3	34	Yes	6	7	30	78
Norah	30	Secretary	6	32	No	0	0	10	49
Olivia	28	Executive secretary	3	36	Yes	8	7	37	72
Phoebe	29	Project manager	7	38	Yes	1	3	47	51

Abbreviations: NPRS: Numeric Pain Rating Scale; PPGP: Pregnancy-related Pelvic Girdle Pain; QBPDS: Quebec Back Pain Disability Scale; WDEQ-A: Wijma Delivery Expectancy Questionnaire, version A.

\* Names of participants are fictitious and solely intended for ease of readability.  
\*\* Educational level was measured according to the International Standard Classification of Education (ISCED).

**Table 3**  
Comparison of quantitative characteristics of participants with and without PPGP.

	All participants (n = 16)	PPGP (n = 7)	No PPGP (n = 9)	p-value
Age (years)	29.8 [6.3]	28.8 [7.1]	30.7 [4.9]	0.54 <sup>a</sup>
Weeks of gestation	33 [9]	36 [12]	30 [8]	0.21 <sup>a</sup>
Level of education, high**	10 (0.63)	5 (0.71)	5 (0.56)	0.63 <sup>b</sup>
Mean pain intensity over past week (NPRS score)	3.4 [6]	6 [3]	1 [3]	0.002 <sup>a</sup>
Maximum pain intensity over past week (NPRS score)	4.6 (3.5)	7 [2]	1 [5]	0.005 <sup>a</sup>
Disability (QBPDS score)	30.2 (20.2)	45 (10)	18 (18)	0.003 <sup>a</sup>
Fear of childbirth (WDEQ-A score)	54.8 (19.6)	66 (12)	46 (20)	0.030 <sup>a</sup>

Values are median [IQR], n (percentage) or mean (SD). Abbreviations: NPRS: Numeric Pain Rating Scale; PPGP: Pregnancy-related Pelvic Girdle Pain; QBPDS: Quebec Back Pain Disability Scale; WDEQ-A: Wijma Delivery Expectancy Questionnaire, version A; a: Mann-Whitney U test; b: Fisher's exact test; c: independent Sample t-test, \*: significant difference between groups, \*\* Educational level was measured according to the International Standard Classification of Education (ISCED).

Findings

Study sample

The pursuit of best possible variation coverage yielded a sample of sixteen primiparae from various regions of The Netherlands, covering both urban and regional areas, with a median age of 29.8 (IQR 6.3) and a median gestational age of 33 weeks (IQR 9) (see Table 3). Seven women experienced PPGP, while nine did not (see Tables 2 and 3). Women with PPGP exhibited significantly higher scores in pain intensity, disability, and fear of childbirth. (see Table 3).

The duration of the interviews varied from 34 to 68 min (mean 50 min). For ease of readability, we provided fictitious first names for the participants with the quotes.

Context

There were strong similarities between primiparae with and without PPGP in our study sample in terms of bodily changes and the accessible information at their disposal. Women described their first pregnancy as an intense new experience, both mentally and physically. They became very aware of physical sensations in their changing bodies:

*‘So now I notice that I am really focussed on that [pelvic] area. What am I actually feeling. Being hyperalert, you know.’ (Barbara, 38 weeks pregnant).*

Women considered themselves susceptible for solicited and unsolicited information on pregnancy. They experienced that sources of information, such as pregnancy apps, internet, and antenatal gatherings at the midwifery practice, already assumed the occurrence of ailments:

*‘We have one of those pregnancy groups, they addressed every ailment you can get there, including pelvic pain. So, I did feel like, yes, of course there is a good chance that I can get that somewhere down the line too.’ (Phoebe, 38 weeks pregnant).*

Women were uncertain about recognising and interpreting certain sensations as indicators of the onset of PPGP.

*‘What is it that am I actually suffering from, is this pelvic pain like everyone says?’ (Margot, 34 weeks pregnant).*

Qualitative findings

The results of the thematic analysis are described in four themes: ‘Knowledge about PPGP’, ‘Perceived cause of PPGP’, ‘Interpreting and attributing symptoms’ and ‘Physiotherapy’, and thirteen subthemes (see Table 4).

**Table 4**  
Themes and subthemes.

Theme	Subthemes
Knowledge about PPGP	The pelvis is a puzzling body part Lack of clarity in terminology Expectations of developing PPGP Expectations of recovering from PPGP Healthcare pathways
Perceived cause of PPGP	Loosening, making space and keeping it together Being strong enough in the fullest sense
Interpreting and attributing symptoms	Physical discomforts
Physiotherapy	Disability PPGP should not be ignored Verification of the assumption of PPGP Reassurance Remaining concerns

Abbreviations: PPGP: Pregnancy-related Pelvic Girdle Pain.

**Theme 1.** Knowledge about PPGP

*The pelvis is a puzzling body part.* Women indicated that they did not know much about their pelvis. For some, it was hard to picture this part of their body:

*‘Well, you don’t know exactly what your pelvis is. Pelvis is not..., an arm is totally clear. This is your arm; you can point it out. Your back, you also know. So, I think that it is my hip, and then on the inside, where your uterus ends, where your child has to pass through, that that’s the pelvis.’ (Olivia, 36 weeks pregnant, PPGP).*

Women considered strength in this area very important. The fact that a baby had to pass through eventually, was evident, but hard to grasp.

*Lack of clarity in terminology.* The women were familiar with a variety of terms for PPGP, such as ‘pelvic instability’, ‘pelvic pain’, ‘pelvic complaints’, ‘pregnancy-related pelvic pain’, and ‘pelvic floor pain’. To women without PPGP, the difference between these terms was not important:

*‘Maybe I’m completely wrong, I just feel like it’s all the same thing.’ (Norah, 32 weeks pregnant, no PPGP).*

For women with PPGP however, these different terms created uncertainty about the severity of their symptoms:

*‘I don’t know the difference, because I asked: can you see what stage my pelvic pain is at, and then she [the physiotherapist] said, “You’re not to the point of pelvic instability yet.”, but what that entails exactly...’ (Margot, 34 weeks pregnant, PPGP).*

Moreover, women with PPGP experienced that the terms had different connotations and societal impact:

*‘There is a different feel to [the term] pelvic instability, it’s more accepted. People have heard of it; pelvic pain doesn’t really describe it for me. At work, if I say, ‘I have pelvic pain’, “Oh hm, that’s annoying.” If you say, ‘I have pelvic instability’, it’s like “O wow! That’s bad! Are you able to work?” (Olivia, 36 weeks pregnant, PPGP).*

*Expectations of developing PPGP.* PPGP was known as a common and serious condition during pregnancy. Women considered developing PPGP a real possibility:

*‘Yes, I did anticipate that. There is a fair chance it will happen.’ (Barbara, 38 weeks pregnant, no PPGP).*

*Expectations of recovering from PPGP.* In general, women assumed that recovery would follow childbirth; however, it would require some exercise:

*‘Of course, everything is not immediately tight and back in its place again, so your pelvis is still sort of unstable I think and it will take weeks or months for that to recover somewhat. And then, of course, there is also your pelvic floor muscle, which is all stretched and worn out and needs to be trained back into shape.’ (Diana, 30 weeks pregnant, no PPGP).*

They were also aware that sometimes symptoms may persist, although they did not fully understand why:

*‘You know that this is part of it. And I’m convinced that it can also get better again. But at the same time, I think that’s a tricky statement because you also know that many women are still really affected by it afterwards, years later...’ (Barbara, 38 weeks pregnant, no PPGP).*

With this insecurity in mind, women with PPGP expressed the hope of not belonging to the minority group of people who develop persistent pain:

*‘I have hopes of being in the biggest group! [laughs]’ (Abbey, 38 weeks pregnant, PPGP).*

*Healthcare pathways.* Women informed, or would inform, their midwife or general practitioner if they experienced symptoms of PPGP, but not with the need for treatment in mind:

*‘If I really did have pelvic pain I would say so, but I wouldn’t turn to them for a solution or treatment.’ (Fiona, 25 weeks pregnant, no PPGP).*

The physiotherapist was considered the expert on PPGP:

*‘I thought let’s just call a physio right away, they are the most knowledgeable on the subject.’ (Margot, 34 weeks pregnant, PPGP).*

Consequently, women believe that other healthcare providers should refer women with PPGP to the physiotherapist. They experienced that midwives thought the same:

*‘My midwife said, “I do think this may be linked to your pelvis, so I’d definitely call the physio.”’ (Margot, 34 weeks pregnant, PPGP).*

**Theme 2.** Perceived cause of PPGP

*Loosening, making space and keeping it together.* Irrespective of whether they experienced PPGP, women talked about hormonal loosening of the pelvis with a clear purpose:

*‘It all becomes more flexible between those bones, so that it’s easier for the baby to be born later on.’ (Helen, 26 weeks pregnant, PPGP).*

Women considered this loosening as a natural and necessary process. However, they considered the downside of this process that bones could move and get out of place. This was demonstrated further by women using hand gestures, forming a pelvic ring with both hands, depicting the potential separation of pelvic bones. Failing to control this extra joint mobility or being unable ‘to keep the pelvis together’ as some of them called it, was believed to cause pain.

*‘I think your tendons and joints that kind of hold it all in place, and also keep your uterus in its place of course, I think that all loses its elasticity and that it all becomes much too loose.’ (Emma, 11 weeks pregnant, no PPGP).*

Consequently, women believe that muscles should be able to hold the pelvis together while it is expanding to make room for the developing fetus and enlarging uterus, and eventually, to facilitate vaginal birth. Hence, they believed that keeping muscles strong is important.

*‘So, in my mind, pelvic complaints really are... the fact that your pelvis expands, that it just becomes very weak. And if you haven’t trained your muscles, or if there’s no tension on them, then of course everything pulls apart even faster than when you have trained muscles that sort of still hold things together.’ (Fiona, 25 weeks pregnant, no PPGP).*

*Being strong enough in the fullest sense.* To women without PPGP,

having strong muscles to compensate for the hormonal loosening was the main reason that they did not develop PPGP:

*'Before my pregnancy, I did exercise a lot, so I think that in terms of core stability, that helped a little for quite a while.'* (Kate, 34 weeks pregnant, no PPGP).

Along the same line of thinking, several women with PPGP blamed themselves for their pain:

*'The only exercise I got was cycling ten minutes to work and ten minutes back. And an occasional visit to the swimming pool, but that was it. So, if I had to blame something, that would be it.'* (Layla, 36 weeks pregnant, PPGP).

The widespread view that physical activity and muscle strength reduce the risk of PPGP caused sadness and frustration in women who thought that they fitted that profile:

*'I always thought, oh, I won't get that. I always go and exercise after work, I'm quite an active person, and I always feel great physically, but that doesn't mean anything at all.'* (Margot, 34 weeks pregnant, PPGP).

When considering women who experience PPGP, women without PPGP interpreted 'being strong' in a broader sense than muscle strength alone:

*'Because they [women with PPGP] are less athletically inclined, haven't challenged their bodies very much, and are therefore less used to having some pain. You know, that occasional pain is normal, just in general.'* (Barbara, 38 weeks pregnant, no PPGP).

### Theme 3. Interpreting and attributing symptoms

**Physical discomforts.** Women with and without PPGP described similar symptoms in the region of their pelvis, buttocks, and lower back. However, they labeled them differently. For example, tailbone soreness was reported frequently. Some women attributed symptoms directly to PPGP:

*'It is like someone has kicked it really hard and continues to do so. [...] Yesterday I sat on a wooden chair for four hours, without a cushion, well, then that tailbone pain really flares up again.'* (Layla, 36 weeks pregnant, PPGP).

Other women saw similar symptoms as a result of pregnancy and a changing body.

*'I really have nothing to complain about, except for a few minor ailments. [...] Sometimes, if I sit down on a hard chair, then my tailbone is a bit painful, and I think; it feels as if you fell a few weeks ago or something, like bruised, you know. But that's only when I sit on a hard chair, and if I sit down a bit too quickly or awkwardly.'* (Kate, 34 weeks pregnant, no PPGP).

Women without PPGP thought of PPGP as a severe, disabling condition with wide-spread symptoms. Accordingly, a common thought was that the symptoms they were noticing were not serious enough to imply PPGP. In this light, they considered a little pain now and then a normal aspect of pregnancy.:

*'Well, you can't go through pregnancy without pain, tiredness and nausea, so pain is part of it too.'* (Diana, 30 weeks pregnant, no PPGP).

**Disability.** Similarly, women without PPGP often stated that the disabilities that they experienced were not severe enough to label them as PPGP. Women noticed that their energy levels were sometimes low and that they could not always move with ease. However, women with PPGP thought of this as a specific consequence of PPGP:

*'I have to pace myself. I just hope I can keep it that way and also, I do think it's doable if I just adapt.'* (Helen, 26 weeks pregnant, PPGP).

In contrast, women without PPGP considered this adjusting a normal

aspect of pregnancy:

*'What I felt, I think I that's normal; I did a little too much, obviously it's also heavy on the pelvis, it all makes a lot of sense to me.'* (June, 35 weeks pregnant, no PPGP).

And even though these women thought of PPGP as severe and disabling, if they would develop PPGP, they would still think of it as a normal condition during pregnancy:

*'There are some things that are annoying but not to the extent that it completely limits my functioning. You see, if it really did restrict my functioning totally, then I would definitely have a cry from time to time, but at the end of the day it's just part of it...'* (Fiona, 25 weeks pregnant, no PPGP).

### Theme 4. Physiotherapy

PPGP should not be ignored. Women who attributed their symptoms to PPGP expressed the need for physiotherapy:

*'I think, if you ignore it, that you will end up with a lot of permanent symptoms after giving birth. Maybe always suffering from back pain. I think that was why I said: Well, let me have this checked and treated.'* (Margot, 34 weeks pregnant, PPGP).

**Verification of the assumption of PPGP.** In our sample, every woman with self-reported PPGP consulted a physiotherapist about it. These women wanted to verify their understanding of PPGP with an expert, based on general information that they already had:

*'You always hear a lot of pregnant women talking about pelvic pain, and friends of mine had pelvic instability, which is even more serious, as I understood from them, so you immediately connect it to your pelvis. [...] So, I called, and said I suspect I have pelvic problems, but it's the first time for me, so I don't really know what I am supposed to feel, or what you mean by it.'* (Margot, 34 weeks pregnant, PPGP).

**Reassurance.** In general, women's experiences with physiotherapists were positive. They felt like they were being heard:

*'The physio did say to me, "you've been really hard on yourself, because this simply must hurt". And then I thought, I'm glad you're taking me seriously. Because I felt like such a whiner.'* (Helen, 26 weeks pregnant, PPGP).

When women were told that physiotherapy could reduce the pain during pregnancy, this was reassuring to them, and consistent with their expectations. Women feared to worsen the pain and expected to get advice on how to deal with it. Women highly valued easy applicable 'tips and tricks' they received. The physiotherapist also helped to set boundaries:

*'I did need that, for her to also tell me "You can't do everything the way you used to, you really need to slow down."'* (Phoebe, 38 weeks pregnant, PPGP).

Women who consulted a physiotherapist found validation of their initial belief that they were experiencing PPGP. This confirmation by an expert, in combination with a comprehensible explanation for their pain, was reassuring to them. They reported that, in their opinion, they understood the reason for their pain:

*'[...] my tailbone was out of place. That diagnosis was never made before.'* (Abbey, 38 weeks pregnant, PPGP).

*'At my, ehm, SI joint, normally all those little bumps fit together nicely, and the softening means that there is space and the bumps move across each other, and that pinches my leg nerve. And that's why I'm in so much pain.'* (Helen, 26 weeks pregnant, PPGP).

**Remaining concerns.** However, consulting a physiotherapist was not always clarifying. For some women, it was still difficult to make sense of

PPGP, raising concerns for a next pregnancy:

*'It's just a complicated thing. And you don't know what the consequences are had you done nothing about it, because you don't experience them until after that time [...] And when should you raise the alarm? About that I really do still have questions; how do you recognise it sooner the next time?'* (Margot, 34 weeks pregnant, PPGP).

### Quantitative findings

The scores for pain intensity (NPRS), disability (QBPDs), and fear of childbirth (WDEQ-A) were higher in women with self-perceived PPGP (see Table 3). No significant differences regarding age, gestational age, and educational level were found (see Table 3).

### Integration of qualitative and quantitative findings

To provide a better understanding of our thematic analysis, we explored possible meaningful connections between significant differences between groups and the themes of our thematic analysis.

The scores on the NPRS and QBPDs were higher in women with self-perceived PPGP. These differences were also present in theme 3; 'Interpreting and attributing symptoms'. These quantitative findings reflect the experience of physical discomfort and disability to some extent during pregnancy as stated by women without PPGP, and the intense experience of it when labeled as PPGP, as shown in the qualitative data. Moreover, women who did not attribute physical discomforts to PPGP not only stated that they considered their symptoms not serious enough to label them as PPGP, but also scored lower on pain and disability assessments.

The score on the WDEQ-A was higher in women with PPGP (see Table 3). No qualitative findings on fear for childbirth related to PPGP were present. However, women with PPGP did make more remarks on pain and disability-related fear, often related to the remainder of their pregnancy and healthcare needs:

*'I thought: If it is already starting now, then what is going to happen later? I thought, oh no, I hope I don't end up at home very early on, or that I am unable to do anything.'* (Chrissy, 26 weeks pregnant, PPGP).

No significant differences were found in age, gestational age and level of education between women with and without PPGP. This illustrates that the findings in themes 1 and 2 ('Knowledge about PPGP' and 'Perceived cause of PPGP') are not associated with age, gestational age or level of education.

## Discussion

This study aimed to explore what primiparae perceive as the cause of PPGP, whether causal beliefs differ between women with and without PPGP, and how these health and illness perceptions are generated. Our study revealed a strong societal belief among primiparous women regarding the cause and the management of PPGP, regardless of whether they experienced PPGP. Moreover, our study revealed a common pathway in the Dutch healthcare system where the physiotherapist serves as the primary point of contact for pregnant women experiencing pelvic discomfort.

Women with and without PPGP held similar beliefs regarding the cause of the condition, illustrating that the casual beliefs are not solely formed by the lived experience of PPGP. PPGP was considered normal during pregnancy and believed to be evoked by the inability of muscles to compensate for hormonal laxity of the pelvis. Hormonal laxity was also considered normal, inevitable and necessary to make room for the baby and prepare for childbirth. Consequently, women did not expect symptoms to disappear during pregnancy but thought positively about recovery after childbirth. This consensus challenged our initial thought of differences between women with and without PPGP, emphasising a strong societal belief regarding the etiology of PPGP. This could be

related to the vast amount of available information on pregnancy and PPGP.

The difference between women with and without PPGP was present in the attribution of physical sensations. Women experienced physical discomforts and disability to some extent, but this was interpreted in different ways: as a result of pregnancy and a changing body, or as a specific symptom of PPGP. Women who attributed symptoms to their pregnancy and their changing body, considered themselves strong enough to cope with the symptoms. They were effective in self-management of their physical and psychological well-being. Women who interpreted their symptoms as PPGP, had significantly higher pain intensity, disability and fear of childbirth, which might illustrate their perception of a serious condition, that should not be ignored.

The role of physiotherapists emerged prominently. Women who attributed their symptoms to PPGP consistently sought the expertise of a physiotherapist, because they were afraid of worsening symptoms and expressed the desire for diagnostic confirmation from a clinical expert (Bunzli et al., 2015). As mentioned previously, women valued the advice of midwives to consult a physiotherapist, and physiotherapists for their handy 'tips and tricks', active listening, practical skills and expertise (Cepnija et al., 2022b; Monaghan and Haywood, 2017; O'Keeffe et al., 2016). Physiotherapy consultations appeared to validate and confirm the pre-existing unidimensional biomedical view on PPGP that primiparae had. Together with extensive explanation of the condition, this provided reassurance. It is essential to note here that our insights into these interactions were derived from the accounts and viewpoints provided by the participants, not the clinicians. The precise content of these interactions, and the intentions of the physiotherapists, remains unknown. This necessitates further research into the impact of communication between physiotherapists and primiparae.

Our findings illustrate that the perception of the cause is a key aspect of illness perception of PPGP, strongly interdependent with the other cognitive aspects; identity, timeline, control, and coherence, as described in the common-sense model (Leventhal et al., 2016; Mora and McAndrew, 2013). Consistent with previous research, primiparae experienced new physical sensations (Fredriksen et al., 2008; Modh et al., 2011), leading to cognitive and emotional health and illness perceptions (Cepnija et al., 2022a; Clarkson and Adams, 2018; Persson et al., 2013). 'Identity' and 'coherence' appeared to be the most important dimensions of illness beliefs in the cyclic appraisal of the health threat of these sensations and consequently, for coping strategies (Mora and McAndrew, 2013).

Although the mechanism of hormonal softening may be a comprehensible explanation for PPGP to women, it is not in line with contemporary views on pain as a multifaceted condition. Moreover, the general concept that PPGP is a normal aspect of pregnancy and a result of muscles which cannot compensate for hormonal laxity, reflects narratives that were recently presented as unhelpful (Beales et al., 2020; Pulsifer et al., 2022). Other unhelpful beliefs, e.g., moving less and keeping the legs together to avoid pain or the idea that a vaginal birth and breastfeeding will worsen or prolong the symptoms (Pulsifer et al., 2022), were not present in our study.

Our study highlights the importance of paying attention to the patients' perceptions of PPGP within clinical practice. How patients perceive PPGP, along with how their perceptions are validated, may have a profound impact on their healthcare-seeking behaviour. Maternal healthcare professionals should reflect on the perception of PPGP in their patient care. As mentioned previously, physiotherapists play a significant role in the validation and explanation of PPGP, but midwives also play an important role. In the Dutch healthcare system, midwives are typically the healthcare professional who recommend women to seek physiotherapy care. While primiparae in our study appreciated this recommendation, it may have inadvertently contributed to the formation of unhelpful health and illness beliefs, since it could potentially imply the presence of a serious condition. However, this interpretation is heavily contingent upon the communication

approach of the midwife. Further research is needed to enhance our understanding of communication along this maternal healthcare pathway, to strengthen these findings and eventually, improve maternal healthcare.

### Strengths and limitations

This is the first mixed-methods study that investigated the perceived cause of PPGP. Purposive sampling, constant comparison, extensive triangulation and recursive completion of the phases of thematic analysis ensured that our findings were trustworthy and grounded in the participants' experiences (Braun et al., 2016). These experiences could be presented in the context of measurement of pain intensity, disability and fear of childbirth of the participants through integration of quantitative findings (O'Cathain et al., 2010).

Transferability was enhanced by the selection of participants from different regions of The Netherlands, and the average age of the participants corresponding to the average age of women becoming first-time mothers in The Netherlands (CBS Statistics Netherlands Centraal Bureau voor Statistiek, 2023). We interviewed a diverse group of primiparae with respect to the presence and intensity of PPGP. Women reported similar pain scores and disability as presented in the literature (Gutke et al., 2018; Vleeming et al., 2008). Furthermore, our themes are internally consistent and coherent in a process (Braun et al., 2016).

There are some limitations to consider that may have influenced our results. It would have been desirable to include more women in their first trimester, more non-native Dutch speaking women, and more women with a low educational level and lower socioeconomic status. Despite our efforts, we were unable to do so, which may affect transferability of our findings.

Recruitment bias could have occurred, since women who were interested in the study could voluntarily contact the researchers. This could be the reason why six participating women were employed in healthcare (see Table 2). Nevertheless, their perceptions regarding the cause of PPGP did not differ from those of the women in our sample who did not have a background in healthcare. It is noteworthy that participants with a background in healthcare self-reported PPGP less frequently than participants without a background in healthcare. Attributing symptoms to PPGP could be related to the level of health literacy.

Highlighting a potential limitation, our findings pertain specifically to the Dutch healthcare system and Dutch society. Consequently, when engaging in international healthcare discourse, it is important to recognise that differences may exist between countries. Diverse cultural, socioeconomic, and healthcare system factors across countries could affect the transferability of our conclusions. Subsequent studies could focus on cross-cultural comparisons of health- and illness beliefs on PPGP in varying countries and healthcare systems.

### Conclusion

Primiparae in The Netherlands perceive PPGP to be caused by inevitable hormonal softening and loosening of the pelvis and failure of the muscular system to compensate for this. Sources of information that constitute the basis for this are the internet, (social) media and antenatal gatherings, available to all primiparae in The Netherlands. Women who consulted physiotherapists about their symptoms, got this perception reinforced and further explained. Prevailing beliefs on PPGP are based on assumptions and theories that might be comprehensible, yet not in line with current knowledge of PPGP and contemporary pain science.

### Ethical approval

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### CRedit authorship contribution statement

**Esther van Benten:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft. **Anja de Kruijff:** Methodology, Formal analysis, Validation, Writing – review & editing. **Henri Kiers:** Funding acquisition, Methodology, Writing – review & editing. **Michel W. Coppieters:** Methodology, Writing – review & editing. **Annelies L. Pool-Goudzwaard:** Conceptualization, Formal analysis, Funding acquisition, Methodology, Supervision, Writing – review & editing.

### Declaration of Competing Interest

None declared.

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