The relationship between physical activity levels and psychosocial factors affecting pain perception in pregnant women with lumbopelvic pain

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have been reported to cause lumbopelvic pain (LPP) in pregnant women.

LPP is a common condition encountered during pregnancy: it is estimated to affect 50% of women during this time, with 25% continuing to experience pain after delivery [5]. Pregnancy-related LPP is defined as pain that occurs between the 12th rib and the gluteal sulcus and in the region surrounding the symphysis pubis, lasting for longer than one week [6-8]. Although the etiology of LPP remains unclear, various physical and psychosocial factors have been implicated in its emergence [7,9,10].

It has been hypothesized that LPP may arise during pregnancy following hormonal changes. Levels of relaxin, estrogen, and progesterone change from the beginning of pregnancy to birth, and it is thought that these may indirectly cause biomechanical changes, most notably by affecting ligament laxity. However, current evidence suggests that these hormones may influence LPP, but cannot be the sole cause [11]. It has also been proposed that pregnancy-induced neuromuscular adaptations may play a role in LPP. Findings such as decreased endurance in the pelvic floor muscles and increased muscle activation in the erector spinae support this hypothesis, but further studies are needed on this subject. Finally, it is possible that biomechanical factors such as changes in the kyphosis and lordosis structure seen with the increase in the weight of the baby and changes in the position of the pelvis may also influence LPP formation [12].

Pregnancy-related LPP not only reduces quality of life but also makes it difficult for pregnant women to perform their daily activities, resulting in decreased physical activity levels [8,13,14]. LPP generally worsens as pregnancy progresses. Additionally, increased pain intensity is associated with higher disability in women with LPP [13]. A Norwegian study revealed an association between LPP and sick leave in pregnant women [15]. During this period, pain can negatively affect all daily activities, especially carrying loads, walking, cleaning, working, entertaining and traveling comfortably in a car [9]. LPP has also been found to reduce the health-related quality of life due to its effects on walking, working, sleep, and mood [16]. Pain typically starts in the lumbopelvic area at the 18th gestational week, and generally peaks between weeks 24 and 36 [17]. Given the consequences of LPP, there is a need to understand the factors influencing pain perception to enable effective pain management in pregnant women.

When viewed from a biopsychosocial perspective, pain is recognized as a complex experience involving various cognitive, sensory, and emotional components. It is known to be affected by psychosocial factors such as distress, catastrophizing, and self-efficacy [18-20]. Recent studies have also shown that pregnant women with LPP demonstrate impaired body perception, which is associated with a more intense perception of pain [21]. In addition, factors affecting pain perception, such as self-efficacy in the management of chronic pain, can cause catastrophization and negatively affect pain management [22].

It is reported that physical activity during pregnancy has positive effects on both maternal and fetal health. Regular physical activity during pregnancy is linked to a number of benefits, including a reduced risk of gestational diabetes, hypertensive disorders, excessive weight gain and retention postpartum [23]. However, pregnancy is often associated with decreased physical activity due to factors such as inadequate education, socioeconomic level and false popular beliefs about exercising during pregnancy. Gashaw et al demonstrate that more than half of women with LPP are estimated to demonstrated moderate to severe activity limitation [24]. Sedentary pregnant women who do not have any complications should be encouraged to do physical activity for a healthy life [25,26]. Additionally, lack of exercise during mid-pregnancy has also been associated with an increased incidence of low back pain (LBP) or pelvic girdle pain (PGP) in late pregnancy [12].

While the current literature includes studies investigating pregnancy-related LPP from a biopsychosocial perspective [6,27,28] and others examining physical activity levels during pregnancy [12,29,30], there is a notable gap regarding studies evaluating the relationship between psychosocial factors affecting LPP and physical activity levels. Physical activity is known to have benefits for pregnant women before, during and after birth, and hence it would clearly be advantageous to increase physical activity in this group. However, as those with LPP are at risk of low physical activity, other factors should be taken into consideration when planning effective strategies for encouraging activity. Therefore, this study aims to investigate the relationship between psychosocial factors affecting pain perception and physical activity levels in pregnant women with LPP.

Materials and methods

Participants

This cross-sectional, descriptive study was conducted at Uskudar University Physiotherapy and Rehabilitation Research Center; an online environment option was also available for participants who chose not to visit a center due to the COVID-19 pandemic. Of the 65 pregnant women with LPP contacted within the research center, 60 participants were accepted to the study. Based on Cohen’s effect size coefficients, assuming an expected effect size (d = 0.5), the minimum sample size was determined as 60 when the power was calculated as 0.8.

The inclusion criteria comprised women aged 18-45 years, who had experienced LPP for longer than one week, rated pain between 1 and 10 on the Visual Ana-
logue Scale (VAS), could read and understand Turkish, were in the second or third trimester of pregnancy, and did not engage in regular exercise before pregnancy. The exclusion criteria included pregnancy complications (such as preeclampsia, pregnancy-related hypertension, and diabetes), gynecological or urological problems leading to pain during pregnancy, and a history of acute or chronic diseases, surgical interventions, or trauma to the musculoskeletal or nervous system. The flowchart of the recruitment process is shown in Figure 1.

Fig. 1. Study flowchart

Procedures
The surveys used in this study were delivered to the participants electronically. The participants who met the inclusion criteria and agreed to participate were informed about the study. Written informed consent to take part was obtained before the study from all participants. The responses to the surveys were sent via e-mail and collected using Google Forms. The participants were instructed to read and respond appropriately to the assessment forms. The test battery comprised the following: the Antenatal Psychosocial Health Assessment Scale (ALPHA), Tilburg Pregnancy Distress Scale (TPDS), Pain Catastrophizing Scale (PCS), Pain Self-Efficacy Questionnaire (PSEQ), and Pregnancy Physical Activity Questionnaire (PPAQ). Since the participants did not want to take part in face-to-face evaluation during the Covid 19 period, the interviews were continued online, as noted previously [31,32].

Ethics
The study adhered to the Principles of the Declaration of Helsinki [33], and was approved by the Uskudar University Non-Interventional Ethics Committee (No: 61351342).

Outcome Measures
The ALPHA tool was used to evaluate the psychosocial states of the pregnant women participating in the study. Developed by Yildiz in 2011 [34], ALPHA consists of 46 items rated on a 5-point Likert scale. The scale’s validity and reliability were confirmed in Yildiz’s original study with a Cronbach’s alpha of 0.93, indicating high internal consistency. The survey yields a total score ranging from 46 to 230; this is divided by the number of items to obtain an mean value, which is graded between 1 and 5. The interpretation for the pregnant women included in the assessment was as follows: 1 = very poor psychosocial health, 5 = very good psychosocial health [35].

Subsequently, the TPDS was used to determine the distress states of the participants. Developed by Pop et al. in 2011, TPDS assesses distress during pregnancy and includes 16 items. It is an important scale since it involves spouse participation in addition to negative emotions. A 4-point Likert scale is used to score each item [36]. The Turkish validity and reliability of the scale was confirmed by Çağık et al. in 2015, reporting a Cronbach’s alpha of 0.83 [37].

The level of pain catastrophizing was determined with the PCS. Developed by Sullivan et al. in 1995, the PCS assesses exaggerated and negative mental responses during pain experiences, i.e., their levels of catastrophizing. the tool comprises 13 items examining the feelings and opinions of individuals about their last pain experience, with each item evaluated on a scale from 0 to 4 (0: never, 4: always) [38]. A high score indicates a high level of pain catastrophizing [39]. The Turkish validity and reliability of the PCS was confirmed in 2017, with a Cronbach’s alpha of 0.95 [40].
The PSEQ, created by Nicholas in 1989, was used to assess an individual’s confidence in performing activities while experiencing pain [19]. It consists of 10 items, each assessed on a 7-point Likert scale. The highest possible score is 60, with higher values indicating more self-efficacy in accomplishing functionality despite pain. The Turkish validity and reliability study of the PSEQ was confirmed by Kaynarcı in 2016, with a Cronbach’s alpha of 0.95 [41].

The PPAQ was used to determine the physical activity levels of the pregnant women. Created by Chasan-Taber in 2004, the PPAQ evaluates the intensity, frequency, and duration of physical activity during pregnancy. The tool is comprised of 32 items that cover housework/caregiving activities, professional activities, sports/exercise activities, transportation activities, and inactivity. The average amount of energy spent on daily activity is calculated as “MET-hours/week” at the end of the evaluation. The Turkish validity and reliability was confirmed by Çırak et al. in 2015, with a Cronbach’s alpha of 0.82 [42,43].

**Statistical Analysis**

Data analysis was conducted using the SPSS 25.0 software (IBM, US). Descriptive statistics, including mean and standard deviation values, were employed to summarize data. Spearman’s correlation analysis was performed to investigate the relationship between the collected data. The significance level was considered as $p < 0.05$ for all analyses conducted in the study.

**Results**

Sixty pregnant women between the ages of 20 and 36 participated in the study. Among the pregnant women, 61.7% (n = 37) were employed, whereas 38.3% (n = 23) were homemakers. Regarding the trimester of pregnancy, 31.7% (n = 19) were in the second trimester, and 68.3% (n = 41) were in the third trimester. The descriptive characteristics of the participants are presented in Table 1.

<table>
<thead>
<tr>
<th>Age</th>
<th>X</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 60</td>
<td>28.67</td>
<td>3.32</td>
</tr>
<tr>
<td>Employment status</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Employed</td>
<td>37</td>
<td>61.70</td>
</tr>
<tr>
<td>Unemployed</td>
<td>23</td>
<td>38.30</td>
</tr>
<tr>
<td>Week of Gestation</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>3–6 months (2nd trimester)</td>
<td>19</td>
<td>31.70</td>
</tr>
<tr>
<td>6–9 months (3rd trimester)</td>
<td>41</td>
<td>68.30</td>
</tr>
<tr>
<td>Number of Pregnancies</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>1st pregnancy</td>
<td>35</td>
<td>58.30</td>
</tr>
<tr>
<td>2nd pregnancy</td>
<td>15</td>
<td>25.00</td>
</tr>
<tr>
<td>3rd pregnancy</td>
<td>5</td>
<td>8.30</td>
</tr>
<tr>
<td>4th pregnancy and above</td>
<td>5</td>
<td>8.30</td>
</tr>
</tbody>
</table>

n-number of pregnant women with lumbopelvic pain

Regarding physical activity, the lowest value was 47.25 MET-hours/week, and the highest was 595.3 MET-hours/week. The mean energy expenditure by the participants was 235.7 MET-hours/week. The highest level of physical activity was observed for “housework and caregiving activities” (145.0 MET-hours/week), and the lowest for “severe activity” (1.6 MET-hours/week) (Table 2).

Psychosocial health, pregnancy-related distress, catastrophizing, and pain self-efficacy levels were evaluated as psychosocial factors affecting pain perception (Table 3).

No statistically-significant relationship was found between physical activity level, and the studied psychosocial factors affecting pain perception, viz. physical activity and pregnancy-related psychosocial health, pregnancy-related distress, catastrophizing or pain self-efficacy value (Table 4).

Regarding the Antenatal Psychosocial Health Assessment, Spearman’s correlation analysis identified a statistically-significant negative relationship between the ALPHA score and moderate physical activity (Table 5; $p < 0.05$).
Tab. 2. Physical activity levels and activity levels in different types of activity during pregnancy

<table>
<thead>
<tr>
<th>PPAQ (MET-hours/week)</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total physical activity</td>
<td>60</td>
<td>235.70</td>
<td>123.90</td>
<td>47.25</td>
<td>595.30</td>
</tr>
<tr>
<td>Sedentary activity</td>
<td>60</td>
<td>49.50</td>
<td>37.90</td>
<td>0.28</td>
<td>202.30</td>
</tr>
<tr>
<td>Mild activity</td>
<td>60</td>
<td>107.60</td>
<td>51.50</td>
<td>17.50</td>
<td>301.50</td>
</tr>
<tr>
<td>Moderate activity</td>
<td>60</td>
<td>95.10</td>
<td>101.10</td>
<td>0.80</td>
<td>556.70</td>
</tr>
<tr>
<td>Severe activity</td>
<td>60</td>
<td>1.60</td>
<td>4.20</td>
<td>0.00</td>
<td>21.50</td>
</tr>
<tr>
<td>Housework/caregiving activities</td>
<td>60</td>
<td>145.00</td>
<td>101.80</td>
<td>13.13</td>
<td>398.00</td>
</tr>
<tr>
<td>Professional activities</td>
<td>60</td>
<td>21.50</td>
<td>68.00</td>
<td>0.00</td>
<td>483.00</td>
</tr>
<tr>
<td>Sports/exercise activities</td>
<td>60</td>
<td>5.90</td>
<td>10.90</td>
<td>0.00</td>
<td>56.20</td>
</tr>
</tbody>
</table>

Max- maximum, Min- minimum, n- number of pregnant women with lumbopelvic pain, PPAQ- Pregnancy Physical Activity Questionnaire, SD- standard deviation

Tab. 3. Pain score and psychosocial factors affecting pain perception

<table>
<thead>
<tr>
<th>Pain Score</th>
<th>Assessment Scale</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>VAS</td>
<td>60</td>
<td>5.80</td>
<td>1.82</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Psychosocial factors affecting pain perception</td>
<td>Assessment Scale</td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Pregnancy-related psychosocial health</td>
<td>ALPHA</td>
<td>60</td>
<td>3.78</td>
<td>0.50</td>
<td>2.50</td>
<td>4.80</td>
</tr>
<tr>
<td>Pregnancy-related distress</td>
<td>TPDS</td>
<td>60</td>
<td>26.90</td>
<td>7.61</td>
<td>3.00</td>
<td>40.00</td>
</tr>
<tr>
<td>Catastrophizing</td>
<td>PCS</td>
<td>60</td>
<td>14.60</td>
<td>10.70</td>
<td>0.00</td>
<td>40.00</td>
</tr>
<tr>
<td>Pain self-efficacy</td>
<td>PSEQ</td>
<td>60</td>
<td>40.60</td>
<td>12.50</td>
<td>11.00</td>
<td>60.00</td>
</tr>
</tbody>
</table>

ALPHA- Antenatal Psychosocial Health Assessment Scale, Max- maximum, Min- minimum, n- number of pregnant women with LPP, PCS- Pain Catastrophizing Scale, PSEQ- Pain Self-Efficacy Questionnaire, SD- standard deviation, TPDS- Tilburg Pregnancy Distress Scale, VAS- Visual Analogue Scale

Tab. 4. Relationship between psychosocial factors affecting pain perception and physical activity levels during pregnancy

<table>
<thead>
<tr>
<th></th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPHA-PPAQ (MET-hours/week)</td>
<td>-0.820</td>
<td>0.534</td>
</tr>
<tr>
<td>TPDS-PPAQ (MET-hours/week)</td>
<td>-0.130</td>
<td>0.323</td>
</tr>
<tr>
<td>PCS-PPAQ (MET-hours/week)</td>
<td>0.222</td>
<td>0.088</td>
</tr>
<tr>
<td>PSEQ-PPAQ (MET-hours/week)</td>
<td>-0.221</td>
<td>0.090</td>
</tr>
</tbody>
</table>

Spearman’s correlation analysis (p < 0.05). ALPHA- Antenatal Psychosocial Health Assessment Scale, P- significance coefficient, PCS- Pain Catastrophizing Scale, PPAQ- Pregnancy Physical Activity Questionnaire, PSEQ- Pain Self-Efficacy Questionnaire, r- correlation coefficient, TPDS- Tilburg Pregnancy Distress Scale.
The aim of this study is to determine the relationship between psychosocial factors affecting pain perception and physical activity in pregnant women with LPP and to draw attention to the importance of maintaining physical activity in this group. Although the number of publications containing the effects of psychosocial factors on pregnant women with LPP is increasing, no studies have yet investigated the influence of these factors on physical activity level. Our present findings indicate that the level of physical activity does not appear to be influenced by the psychosocial factors affecting pain perception in pregnant women with LPP.

The physical activity levels reported in our study were consistent with findings from other studies [43,44]. For example, in the present study, “housework and caregiving activities” were identified as making the most significant contribution to the weekly total physical activity, followed by mild physical activity; these findings are similar to those noted among pregnant women from many other countries and cultures [45,46].

The WHO recommends that pregnant women engage in regular physical activity of moderate intensity for at least 150 minutes per week [47]. A 2020 guide by the WHO also regards housework as an important form of physical activity for pregnant women [48]. Notably, our data indicate that our participants engaged in remarkably higher levels of activity for “housework and caregiving activities” and considerably lower for “professional activities” compared to other studies [44,49].

A review found that exposure to occupational risks and inadequate pregnancy regulations may be a cause of sick leave during pregnancy [50]. In addition, pregnant women with higher distress levels tend to have longer leave periods of sick leave [51]. Gutke et al. report a significant relationship between pain intensity, disability and sick leave in pregnant women with lumbopelvic pain [52]. All of these factors may play roles in the low professional activity levels observed among the pregnant women in our study; furthermore, the decision to resign may have been further influences by the Covid-19 pandemic [53].

Exercising by women during pregnancy has both safe and protective effects [23]. Exercise programs are effective for relieving pain intensity and countering disability in pregnant women with LPP [8]. Our present findings reveal that pregnant women with LPP tended to engage less in exercise and sports activities than other types of physical activity. Altas et al. also report low levels of exercise and sports activities during pregnancy, and attribute this to various factors such as lack of time, fatigue, and the burden of caring for other children [29]. Improving the physical activity levels of pregnant women plays a key role in maintaining the health of both mother and baby [54] and should be encouraged.

During pregnancy, women undergo changes in both the musculoskeletal system and their psychosocial well-being. Psychosocial factors play a role in influencing pain severity in individuals experiencing musculoskeletal issues. Pregnancy-related LPP has been linked to adverse effects on the psychosocial states of pregnant women [55], and conversely, psychosocial risk factors have been found to affect the levels of physical activity in individuals [56,57]. A Canadian study investigated the impact of psychosocial states on physical activity levels and sedentary lifestyle of 70 pregnant women. While no significant and strong relationship was found between psychosocial conditions and physical activity levels in pregnant women with LPP, the authors note that these factors may pose a risk of low physical activity; furthermore, risk factors including pregnancy-related complications, especially in the last trimester, are more effective at decreasing physical activity [57].

A common condition among women during pregnancy is psychological distress. However while studies have demonstrated its impact on pregnancy-related LPP [55,58], there is limited research on the relationship between distress and physical activity. A study by Susukida et al. revealed a relationship between mild physical activity and distress [59]. In contrast, however, our present study found no relationship between distress levels and physical activity levels in pregnant women. Aksoy Derya et al. reveal that online training for pregnant women during the

<table>
<thead>
<tr>
<th></th>
<th>Sedentary</th>
<th>Light</th>
<th>Moderate</th>
<th>Vigorous</th>
<th>Household/ Caregiving</th>
<th>Occupational</th>
<th>Sports/ exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALPHA</strong></td>
<td>r</td>
<td>p</td>
<td>n</td>
<td>p</td>
<td>n</td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td></td>
<td>-0.204</td>
<td>0.119</td>
<td>60</td>
<td>0.062</td>
<td>0.642</td>
<td>0.042</td>
<td>0.076</td>
</tr>
<tr>
<td></td>
<td>-0.271*</td>
<td>0.042</td>
<td>60</td>
<td>-0.231</td>
<td>0.076</td>
<td>0.086</td>
<td>-0.193</td>
</tr>
<tr>
<td></td>
<td>-0.231</td>
<td>0.076</td>
<td>60</td>
<td>0.100</td>
<td>0.453</td>
<td>0.086</td>
<td>0.140</td>
</tr>
<tr>
<td></td>
<td>-0.224</td>
<td>0.086</td>
<td>60</td>
<td>-0.193</td>
<td>0.086</td>
<td>0.140</td>
<td></td>
</tr>
</tbody>
</table>

ALPHA- Antenatal Psychosocial Health Assessment Scale, n- number of pregnant women with LPP, p- significance coefficient, r- correlation coefficient.
Covid-19 period had a positive effect on the distress and anxiety levels of pregnant women [60]. We hypothesize that many pregnant women participating in our study might have high levels of distress, especially those experiencing first-time pregnancy. However, it is thought that easy access to information about the pregnancy process and regular follow-ups by a doctor may have contributed to lower levels of distress than expected.

In pregnant women with LPP, a high level of catastrophizing, particularly in the late stages of pregnancy, influences pain severity [6]. A study by Olsson et al. indicate that catastrophizing affected postpartum physical activity and LPP, but they provide no information about the pregnancy process [20]. In a study involving individuals with chronic low back pain, catastrophizing was found to affect pain and fear but had no relationship with physical activity [61]. Consistent with these findings, our study concluded that there was no relationship between catastrophizing and physical activity levels in pregnant women with LPP. Despite this, further studies investigating the mechanism of action of catastrophization in detail are needed to improve the level of evidence.

LPP creates difficulties for pregnant women, hindering the performance of almost all daily activities [9], and prompting a search for solutions to cope with the pain. One of the concepts discussed in pain management is pain self-efficacy. It has been reported that individuals with high levels of pain self-efficacy have been associated with a tendency to experience lower pain intensity and disability among patients with knee or hip osteoarthritis [62], and high levels with a positive impact on physical activity levels and pain intensity [57]. Low self-efficacy negatively affects chronic pain management and causes catastrophization. Although a relationship has been shown between postpartum lumbopelvic pain management and pain self-efficacy, no study has examined the effects of pain-self-efficacy during pregnancy [63]. Contrary to studies conducted on different groups [64,65], our present findings do not find any relationship between pain self-efficacy level and physical activity levels. This contradiction may be associated with differences in the motivations for physical activity during pregnancy and the postpartum period [66], perception of pregnancy-related pain as a temporary condition, and limited awareness among pregnant women [67].

A limitation of our study is that it did not evaluate the effects of the COVID-19 pandemic on psychosocial factors, and this may have influenced the conditions under which the research was conducted. However, our study nevertheless provides a complex analysis of multiple psychosocial factors that have rarely been investigated in the context of pregnancy. Many organizations, including the WHO, recommend maintaining physical activity levels during pregnancy, and a key aim of the present study is to offer a different perspective for planning future policies to achieve this goal.

Conclusions

In conclusion, no significant relationship was found between psychosocial factors known to have an impact on pain perception in pregnant women with LPP and their level of physical activity. This indicates that psychosocial factors alone do not present a strong obstacle to the physical activity levels of pregnant women with LPP, and other factors should also be questioned. Additionally, our study draws attention to psychosocial aspects which may be the basis of future studies, and emphasizes the need for further research on this subject.

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Conflicts of interest

The authors declare no conflict of interest.

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