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Faculteit Revalidatiewetenschappen

master in de revalidatiewetenschappen en de kinesitherapie

Masterthesis

The correlation of body perception with pain intensity, disability and psychological factors in the first and third trimester of pregnancy among multiparous women

Julie Boosten
Margo Lambrechts

Scriptie ingediend tot het behalen van de graad van master in de revalidatiewetenschappen en de kinesitherapie, afstudeerrichting revalidatiewetenschappen en kinesitherapie bij musculoskeletale aandoeningen

PROMOTOR :
Prof. dr. Lotte JANSSENS

COPROMOTOR :
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2021
2022

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ACKNOWLEDGEMENT

First and foremost, we would like to thank all the women who participated in our study. Next, we would like to express our sincerest thanks to our copromotor, dr. Nina Goossens, and our promotor, prof. dr. Lotte Janssens, for their guidance throughout this project. Furthermore, we would like to thank our faculty 'Revalidatiewetenschappen en Kinesitherapie' and the University of Hasselt. This research paper was financed by the AXA Research Fund (Postdoctoral Fellowship of dr. Goossens).

Tongeren, 14/05/2022 ML & JB

RESEARCH CONTEXT

This duo master thesis is part of the musculoskeletal rehabilitation research domain and took place at the REVAL Rehabilitation Research Center of the faculty “Revalidatiewetenschappen en Kinesitherapie” at the University of Hasselt, Diepenbeek. The focus of this research group is to conduct scientific research on detection, prevention and rehabilitation for optimalisation of healthy functioning throughout the entire lifecycle. In doing this, REVAL deems it important to investigate rehabilitation-related problems and to link the research with clinical applications (UHasselt, 2022). The particular focus of this study is on body perception in pregnant women with or without lumbopelvic pain (LPP). With this research, evidence can be provided on the importance of disturbed body perception for the treatment of LPP in pregnant women. Furthermore, when we gain knowledge about the correlation between body perception and psychological factors such as anxiety, depression and stress, we may also be able to tackle these cognitions and emotions, often associated with pregnancy.

This master thesis is part of an ongoing project of dr. Goossens, namely “The associated role of lumbar proprioceptive deficits and psychological factors in pregnancy-related pelvic girdle pain (PGP): a longitudinal follow-up study in multiparous women” (PROFit study). The aim of this larger study is to identify predictors for the development of pregnancy-related lumbopelvic pain (PLPP) during the pregnancy and the postpartum period. This means that the recruitment of participants already took place and questionnaires we used were previously decided on. Dr. Goossens provided us with the data acquired from the participants at both timepoints. The research questions were composed in dialogue with dr. Goossens. We took part in the testing of the participants but were blinded to the data afterwards. We carried out the data processing and academic writing after which dr. Goossens provided us with feedback.

Sick leave during pregnancy is a common occurrence. Truong et al. (2017) reported that up to 50.6% of pregnant women in European countries had been on sick leave during pregnancy, with sick leave being most common in the third trimester. The main reasons were complications, pain in the neck, back or pelvic girdle and nausea or vomiting (Truong et al., 2017). Similar findings were reported by Backhausen et al. (2018), who found that 56% of pregnant women in the first 32 weeks of gestation were on sick leave and more than one in four pregnant women reported long term sick leave (i.e., more than 20 days). The most frequently reported reason was pregnancy-related low back pain (LBP).

Stafne et al. (2019) found that pregnant women with LPP, allocated to an exercise group, showed a reduced risk for sick leave compared to pregnant women receiving standard antenatal care. The meta-analysis of Shiri et al. (2018) reported that exercise reduced the risk of LBP during pregnancy and reduced new sick leave due to LPP. Owe et al. (2016) reported that women regularly engaging in highly active sports before their pregnancy, may have a reduced risk of developing PGP during pregnancy.

In chronic LBP, disruptions in cortical body representation may lead to a distorted body perception. For this reason, it may be important to "train the brain" in people experiencing chronic LBP (Wand et al., 2011). Previous research has already shown that interventions such as graded motor imagery have positive effects in other conditions that are characterized by cortical dysfunctions (i.e., phantom limb pain and Complex Regional Pain Syndrome- CRPS) (Moseley, 2004; Moseley, 2006). Wand et al. (2011) hypothesized that changes in the brain also need to be considered as a possible contributor to psychological dysfunctions in people with chronic LBP. Applied to the pregnant population, we hypothesized that changes in the brain or a disturbed body perception may be correlated with psychological factors such as stress, anxiety or depression. This however has not been investigated thoroughly.

Previous studies have shown that body perception may contribute to LPP in the pregnant and postpartum population (Beales et al., 2016; Goossens et al., 2021).

With previous findings in mind, we opted to carry out a study that investigates the correlation of body perception with variables such as pain intensity, disability and psychological factors in the first and third trimester of pregnancy in multiparous women.

PART 1 RESEARCH

CONTENT TABLE

1. ABSTRACT

Background: Pregnant women are frequently confronted with lumbopelvic pain (LPP) and the accompanying disability. There is no single cause of LPP, but it is most likely multifactorial. Body perception seems to play an important role in the experience of pain, but the correlation with disability and pain intensity is often investigated cross-sectionally. Furthermore, pregnant women with LPP seem to experience more negative thoughts, fear-avoidance beliefs and stress. However, findings about possible correlations between body perception and psychological variables are scarce.

Objectives: The first objective of this longitudinal study was to determine whether body perception and psychological factors changed throughout pregnancy. The second objective was to establish possible correlations of body perception with pain intensity, disability and psychological variables.

Participants: Fourteen pregnant women were included during the first trimester of their pregnancy through six different hospitals in Limburg (Belgium).

Measurements: Body perception and psychological questionnaires were administered by respectively three and 14 questionnaires at trimester one (T1) and trimester three (T3) in the REVAL Rehabilitation Research Center (Uhasselt, Diepenbeek). Statistics were performed in JMP Pro 16 using $\alpha = 0.05$ as significance level.

Results: The pregnant women showed significantly higher LPP disability and pain intensity from T1 towards T3, as well as more symptoms of depression, anxiety and stress ($p<0,05$). At T1, a correlation was determined between body perception and pain intensity ($p=0.0151$) and disability ($p=0.0291$), and at T3 between body perception and stress ($p=0.0247$) and anxiety ($p=0.0091$).

Conclusion: Pregnant women showed higher pain intensity and more disability associated with LPP, as well as more anxiety and depression at T3 compared to T1. Body perception correlated with pain intensity, disability (T1) and psychological factors such as stress and anxiety (T3) in pregnant women.

Keywords: Lumbopelvic pain (LPP), perceived disability, pain intensity, body perception, psychological factors, pregnant women

2. INTRODUCTION

Lumbopelvic pain (LPP) is a common condition during pregnancy as well as during the postpartum period. It is composed of either pelvic girdle pain (PGP) or low back pain (LBP) or a combination of both (Bakker et al., 2013). PGP is estimated to affect four to 76.4% of pregnant women (Vleeming et al., 2008). For LBP, studies reported incidences ranging from 25% to 90% (Katonis et al., 2011). This large variation in incidence may be due to different study designs, diagnostic procedures, unclear definitions and location of pain (Vleeming et al., 2008).

Similar factors have been suggested to contribute to the development of pregnancy-related LBP and PGP. As pregnancy progresses, the spine is maximally loaded and the center of gravity shifts more and more anteriorly, possibly contributing to both PGP and LBP (Conder et al., 2019; Perkins et al., 1998; Walters et al., 2018). Hormonal changes, such as in relaxin concentrations, may also contribute to the development of LPP. A rise in relaxin levels increases the laxity of ligaments and therefore decreases joint support and increases the range of motion in the pelvic girdle region (Perkins et al., 1998; Vleeming et al., 2008). However, evidence is ambiguous regarding this subject. Walters et al. (2018) found no clear association between relaxin levels and PGP or joint laxity in pregnancy. Most likely, pain experienced by women during pregnancy is not caused by one specific mechanism or structure. Instead, the cause is probably multifactorial (Perkins et al., 1998).

A factor to take into account when discussing pregnancy-related lumbopelvic pain (PLPP) is body perception. It has already been investigated whether changes in body perception might contribute to the experience of pain in other musculoskeletal pain conditions (Lotze & Moseley, 2007; Wand et al., 2011). Since patients with chronic LBP show reduced proprioception and poor performance on back-related tasks, Wand et al. (2011) hypothesized that disruptions in cortical body representation may lead to a distorted body perception. This possible relationship has also been investigated in the pregnant population. Goossens et al. (2021) found that body perception in the lumbopelvic region was significantly more disturbed in women with LPP during late pregnancy compared to pregnant, pain-free women. They also discovered that a more disturbed body perception correlated significantly with a higher pain

intensity and more disability during late pregnancy (Goossens et al., 2021). This was the first longitudinal study to investigate differences in body perception regarding the lumbopelvic region in pregnant women who were experiencing low or high disability due to LPP. The study of Goossens et al. (2021) only reported on late pregnancy, however changes in body perception might already be apparent earlier on in pregnancy, but how body perception develops throughout pregnancy is currently unknown. By determining this, we could intervene earlier to prevent the development of the accompanying pain and disability.

Beales et al. (2016) found that a distorted body perception was present in postpartum women with moderate disability due to PLPP in comparison to postpartum women who were pain-free during pregnancy. They hypothesized that the correlation between body perception and disability could be due to a connection between changes in the body and kinesiophobia (i.e., fear-oriented thoughts about pain and movement). In support of this hypothesis, they found a weak correlation between scores on the Fremantle Back Awareness questionnaire (FreBAQ) for the evaluation of body perception and scores on the Tampa Scale for Kinesiophobia (TSK) for the evaluation of fear of movement (Beales et al., 2016). However, evidence on this topic is currently rather scarce.

It's not to be forgotten that pregnancy is a major event in a woman's life, which also comes with changes in the emotional and psychosocial planes. OLSSON et al. (2009) reported that women with LPP in early pregnancy have more extensive negative thoughts. The scores on the Pain Catastrophizing Scale (PCS) were higher for all three domains; rumination, magnification and helplessness. Next, these women reported more fear-avoidance beliefs about being physically active and about their work (OLSSON et al., 2009). Furthermore, Rashidi Fakari et al. (2018) found that pain-related fear-avoidance beliefs were higher in pregnant women with more severe PGP. Beyond this, until now there is little known about pain catastrophizing and fear-avoidance beliefs during all stages of pregnancy. Bakker et al. (2013) reported a significant association between perceived stress at 12, 24 and 36 weeks of gestation and LPP outcomes at 36 weeks. This is in support of Albert et al. (2006), who found that experiencing higher levels of stress was a risk factor for the development of PGP.

3. METHOD

3.1 Research questions and hypotheses

(1) We investigated whether body perception, pain intensity, disability and a number of psychological variables (i.e., anxiety, depression, kinesiophobia, pain catastrophizing, pain coping…) changed throughout the course of pregnancy. We hypothesized that there would be a significant change throughout pregnancy for body perception, pain intensity, disability, fear avoidance beliefs, pregnancy-related anxiety and distress.

(2a) We observed the correlation between back-specific body perception (measured by the FreBAQ) and pain intensity (measured by the Numeric Rating Scale, NRS) due to PLPP. Here, we hypothesized that a more disturbed body perception correlated with a higher pain intensity in the pregnant women.

(2b) We investigated the correlation between body perception and perceived disability (measured by the Quebec Pain Disability Questionnaire, QBPDS and Modified low back pain Disability Questionnaire, MDQ) due to PLPP. We hypothesized that a more disturbed body perception, correlated with higher perceived disability in pregnant women.

(2c) We evaluated whether there was a correlation between body perception and psychological variables. We specifically investigated the psychological questionnaires with a significant change in answers over time, since we don't expect a significant correlation when there is no significant change in answers throughout pregnancy. We hypothesized that a more disturbed body perception correlated with worse scores on the psychological questionnaires.

(3) We investigated whether the difference scores for body perception correlated with the difference scores for all the questionnaires with a significant change throughout pregnancy. We hypothesized that the difference scores for the questionnaires with a significant change throughout pregnancy correlated significantly with the difference scores for body perception, meaning that there was a significant correlation between the differences throughout pregnancy.

3.2 Study design

This study is a longitudinal follow-up study in pregnant women.

3.3 Medical ethics

This study was approved by the Medical Ethics Committee of UHasselt, Ziekenhuis Oost-Limburg (ZOL), Sint-Franciscus Ziekenhuis, Jessa Ziekenhuis Hasselt, AZ Vesalius Tongeren, Ziekenhuis Maas en Kempen and Mariaziekenhuis Noord-Limburg. The study number is B371201942396.

3.4 Participants

3.4.1 Recruitment

In this study, we followed pregnant women throughout the course of their pregnancy, evaluating them during the first and third trimester.

Multiparous women, with or without PLPP at time of inclusion, were enrolled in this study. These participants were recruited through the Gynecology departments of six hospitals in Limburg. Furthermore, participants were recruited via family and friends of the researchers, by distributing flyers and through social media. These women were enrolled at the start of their pregnancy, with the first study visit to the REVAL Rehabilitation Research Center (UHasselt, Diepenbeek) during the first trimester of pregnancy (gestational week 9-12).

3.4.2 Inclusion and exclusion criteria

3.4.2.1 Inclusion criteria

The following inclusion criteria were applied: (1) aged between 18 and 40 years old, (2) pregnant with (more than) their second child, (3) singleton pregnancy, (4) willing to sign informed consent.

3.4.2.2 Exclusion criteria

The following exclusion criteria were applied: (1) pregnant for more than 14 weeks (beyond the first trimester), (2) history of surgical procedures or severe trauma to spine, pelvis and/or lower extremity, (3) specific vestibular or balance disorders, (4) spinal deformities, (5) rheumatological disease, (6) neurological abnormalities, (7) uncorrected vision problems, (8) hyperemesis gravidarum, (9) acute ankle problems, (10) pre-existing disorders that could interfere with the course of pregnancy, (11) (a history of) psychiatric disorders (identified with the Structured Clinical Interview for DSM-5 Disorders-SCID-5), and (12) non-Dutch speaking.

3.5 Measurements

The questionnaires were administered at the REVAL Rehabilitation Research Center (UHasselt, Diepenbeek).

3.5.1 Patient characteristics

We collected both sociodemographic and anthropometric data from the subjects. During the first study visit, the following information was retrieved: (1) maternal age, (2) number of pregnancies, children delivered and miscarriages, (3) educational level, (4) history of LBP, (5) height (cm), (6) pre-pregnancy body weight (self-reported, kg) and (7) pre-pregnancy body mass index (BMI) (kg/m^2).

During each study visit, the following data was collected: (1) subjective sleep quality measured by the Pittsburgh Sleep Quality Index (PSQI), (2) an assessment of bowel-, bladder- and pelvic floor symptoms by the Pelvic Floor Distress Inventory (PFDI), (3) current body weight (kg), (4) current BMI (kg/m^2), (5) experiencing PLPP at this moment and (6) pain intensity measured by the NRS (average last week).

3.5.2 Primary outcome measures

3.5.2.1 Body perception, pain intensity and disability associated with PLPP

For the evaluation of PLPP, several questionnaires were used.
First, the patients were asked if they were experiencing PLPP at the moment of evaluation. Next, for the evaluation of current pain intensity and during the past week, we used the NRS. A score of zero indicated no pain, whereas ten represents the “worst pain imaginable”.

The first questionnaire administered was the Dutch version of the *MDQ* for the evaluation of the influence of LBP on daily activities such as walking, social life, employment and so on. Each of the ten items were scored on a scale ranging from zero to five, with a higher score representing a higher level of disability. The total score, ranging from zero to 50 is multiplied by two and expressed as a percentage (Denteneer et al., 2018). Denteneer et al. (2018) found that the Dutch version of the MDQ showed excellent test-retest reliability, and good construct validity in a population of chronic, non-specific LBP patients.

Next, the Dutch version of the *QBPDS* was administered. It consists of 20 items to assess activities of daily living. It is scored on a six-point numeric scale, ranging from zero (activity is not difficult) to five (unable to perform the activity), bringing the possible total score from zero to 100 (Smeets et al., 2011). The QBPDS showed both good test-retest reliability and construct validity in a chronic LBP population (Schoppink et al., 1996).

The third questionnaire administered was the Dutch version of the *FreBAQ.* The FreBAQ has nine items, evaluating neglect-like symptoms, reduced proprioceptive acuity and perceived trunk shape and size on a scale ranging from zero (never) to four (always). The total score ranges from zero to 36 (Wand et al., 2014). The Dutch version of the FreBAQ has a moderate to high internal consistency in a Dutch population with LBP. Test-retest reliability showed to be sufficient in the same population (Janssens et al., 2017).

3.5.2.2 Psychological factors

3.5.2.2.1 Fear, pain catastrophizing and pain coping

For the evaluation of kinesiophobia, the Dutch version of the *TSK-17* was administered. This questionnaire assessed the self-reported pain-related fear of movement in patients with musculoskeletal disorders such as LBP. The TSK-17 contains 17 items scored from one (strongly disagree) to four (strongly agree). Total scores vary from 17 to 68 (Swinkels-Meewisse et al., 2003). The internal consistency and test-retest stability were rated as moderate to substantial in a population of patients with acute LBP (Swinkels-Meewisse et al., 2003).

The *Photograph Series of Daily Activities- Short Electronic Version (PHODA-SeV)* was conducted to evaluate which activities the participants thought were harmful for their lower back. This is an electronic form consisting of a set of 40 pictures that show specific activities of daily life. Patients rate every picture on a Visual Analogue Scale (VAS) ranging from zero (not harmful at all) to 100 (extremely harmful) (Oliveira & Pinto, 2021). The score for every picture was summed up and divided by the number of pictures to obtain the average score, ranging from zero to 100 (Leeuw et al., 2007; Oliveira & Pinto, 2021). Leeuw et al. (2007) found that the PHODA-SeV showed good reliability and validity in a population of chronic LBP patients.

Next, the Dutch version of the *Fear-Avoidance Beliefs Questionnaire (FABQ)* was used to evaluate pain-related avoidance behavior towards physical activity and occupation. It consists of 16 items scored from zero (completely disagree) to six (completely agree) (Waddell et al., 1993). Five items do not get scored, which is why the total score of the FABQ ranges from zero to 66 (Liu et al., 2021). Waddell et al. (1993) reported an internal consistency score of 0.88 for the physical activity part of the FABQ and 0.77 for the occupational section.

The Dutch version of the *PCS* was also administered. The PCS is a questionnaire developed by Sullivan et al. (1995) for the evaluation of three components of pain catastrophizing: rumination, helplessness and magnification. Each of the 13 items is rated on a five-point scale, from zero (not at all) to four (all the time). The total score ranges from zero to 52. A study

conducted by Osman et al. (1997) showed that the PCS and its subscales have acceptable reliability and validity.

Furthermore, the Dutch version of the *Pain Coping Inventory (PCI)* was used. It consists of 33 items, evaluating whether the patient has an active or passive coping style. For the evaluation of active coping, there are three subscales; pain transformation, distraction and reducing demands. The subscales retreating, worrying and resting give a representation of negative coping. Each item is scored on a scale ranging from one (rarely) to four (often). The subscale with the higher percentage in score, represents the patient's coping style (Kraaimaat et al., 1997). Kraaimaat and Evers (2003) found that the PCI is reliable for the evaluation of coping strategies and in patients with rheumatoid arthritis its predictive validity has been proven for long-term disability.

3.5.2.2.2 Maternal attachment, optimism and sense of coherence

The Dutch version of the *Maternal Antenatal Attachment Scale (MAAS)* was administered next. It consists of two subscales with a total of 19 items. The first subscale evaluates how close and tender versus how distant and irritated the mother feels towards the unborn child (i.e. quality of attachment). The second subscale evaluates how intensely preoccupied the mother is with the fetus (Condon, 1993). All items are scored on a scale ranging from one to five, with five correlating to high attachment or high preoccupation. The minimum total score is 19, the maximum score is 95. A higher score indicates a positive quality of affection and a high preoccupation with the child (van Bussel et al., 2010). The MAAS and its subscales were evaluated by van Bussel et al. (2010) and they found good reliability, internal consistency and validity for the MAAS.

Furthermore, we administered The Dutch version of *the Life Orientation Test Revised (LOT-R)*. The LOT-R was developed by (Scheier et al., 1994) for the assessment of dispositional optimism. The questionnaire consists of ten questions in total for the evaluation of optimism (three items), as well as pessimism (three items), four of the items are filler questions, meaning that these are not scored. Patients indicate how much they agree with an item on a five-point scale, ranging zero (strongly disagree) to four (strongly agree) (Scheier et al., 1994). The total score of the LOT-R is calculated by adding the score for optimism to the inverted sum

of the pessimism scale, with a total maximum score of 24 (Gustems-Carnicer et al., 2017; Scheier et al., 1994). The study by Gustems-Carnicer et al. (2017) found that the LOT-R has good psychometric properties and is a valid and reliable instrument in a population of Spanish students.

The Dutch version of *the Sense of Coherence scale (SOC-13)* was also conducted. Sense of coherence represents one's sources and dispositional orientation which enables one to handle tension and deal with stressful situations in a healthy manner (Eriksson & Lindström, 2005). It consists of thirteen items scored on a seven-point scale ranging from one (never) to seven (always). The total score ranges from 13 to 91. The SOC-13 shows high internal consistency in an Australian Pregnant population (Ferguson et al., 2015).

3.5.2.2.3 General anxiety, stress and depression

Next, we conducted several general questionnaires for the evaluation of anxiety, stress and depression. The Dutch version of the *Depression Anxiety Stress Scale (DASS-21)* is a self-reported measure of depression, anxiety and stress to evaluate negative affect in adults. There are seven questions concerning each domain (i.e., depression, anxiety and stress). On four-point scale patients indicate how often they experienced the statement in the past week, ranging from zero (not at all) to three (all the time) (Lovibond & Lovibond, 1995). Total scores range from zero to 63 (Henry & Crawford, 2005). The study by Henry and Crawford (2005) found that the DASS-21 is a valid tool with good reliability for its total and subscale scores.

The GAD-7 is a self-administered questionnaire used as a tool to measure the severity of generalized anxiety disorders. It consists of seven items scored on a four-point scale. People get asked how often they experience the presented problems, with scores ranging from zero (not at all) to four (nearly every day). Next, they assign zero to the least severe situation, one and two to moderate experiences and three to the most severe one (Sousa et al., 2015). A higher total score indicates more severe anxiety, with a score of eight or higher indicates that someone experiences significant anxiety symptoms (Sousa et al., 2015).

Next, the *Leuven Affect and Pleasure Scale (LAPS)* was conducted. This questionnaire consists of 16 items for the evaluation of depression. It assesses negative affect, positive affect and hedonic tone. Furthermore, there are four questions included as independent variables

(cognitive and overall functioning, meaningfulness of life and general happiness). Patients indicate how often they experienced the question in the past week, ranging from zero (not at all) to ten (very much), with a maximum total score of 160 (Demyttenaere et al., 2019). Demyttenaere et al. (2021) reported that the positive and negative affect scale are mostly independent measures.

3.5.2.2.4 Pregnancy-specific anxiety, stress and depression

Besides these general questionnaires for anxiety, stress and depression, we also conducted questionnaires specifically related to pregnancy and/or delivery.

To evaluate pregnancy-related depressive symptoms in the last seven days, the Dutch version of the *Edinburgh Depression Scale (EDS)* was administered. It consists of ten items, scored on a scale ranging from zero to three. Total scores range from zero to 30, with a higher score indicating more depressive symptoms (Bergink et al., 2011). The study by Bergink et al. (2011) evaluated the EDS in each trimester of pregnancy. For the test-retest reliability, they found that the correlations between the EDS scores were significant between 12 and 24 weeks of gestation, between 12 and 36 weeks and between 24 and 36 weeks.

The PRAQ-R2 is a modified version of the 10 item PRAQ-R to assess pregnancy-specific anxiety. Each item is scored from one (definitely not true) to five (definitely true). It can be divided into three categories: fear of giving birth (score 3-20), worries about giving birth to a handicapped child (score 4-20) and concern about one's own appearance (score 3-20). The total score ranges from ten to 50 (Huizink et al., 2016). The study by (Huizink et al., 2016) found good reliability for the PRAQ-R2 in both nulliparous and parous women.

The Dutch version of the *Tilburg Pregnancy Distress Scale (TPDS)* was administered. This scale was invented by Pop et al. (2011), to evaluate pregnancy-specific distress, from the mothers' perspective. The scale consists of 16 items with two main components, namely negative affect and perceived partner involvement. Each item is scored on a four-point scale, ranging from zero (very often) to three (rarely/never) (Boekhorst et al., 2020). The total score ranges from zero to 48. The TPDS shows appropriate test-retest reliability and an adequate internal consistency in a cohort of 1739 pregnant women (Boekhorst et al., 2020).

3.6 Data analysis

Data analysis was performed in JMP Pro 16 (JMP, 1989-2021). Missing data was reported and taken into account during the analysis. The significance level was set at $\alpha = 0.05$ throughout the complete research. Since the non-parametric Wilcoxon Signed Rank test was used for all parameters, we reported all data as 'median [Q1 - Q3]', with [Q1 - Q3] referring to the interquartile range, to create uniformity in the notation method.

3.6.1 Participant characteristics

Participant characteristics were evaluated and normality was checked for every parameter by using the Shapiro-Wilk test.

Matched pairs analysis was performed on the participant characteristics data to determine differences throughout pregnancy. Since the sample size was smaller than 20, normally distributed data (Shapiro-Wilk value: $p>0.05$) was analyzed by a non-parametric Wilcoxon Signed Rank Test (A) and a parametric Paired T-test (B) to assess the significance of a possible difference between the values at trimester one (T1) and trimester three (T3). For non-normally distributed data (Shapiro-Wilk value: $p<0.05$), only the non-parametric Wilcoxon Signed Rank Test was used. The difference in the proportion of pregnant women experiencing PLPP (categorical data) at T1 and T3 was assessed by using the McNemar's Test (C).

The matched-pairs analysis was not performed on the parameters height, pre-pregnancy weight and pre-pregnancy BMI, since these parameters did not change over time. The same goes for the parameter age, since the change for all participants throughout the study is similar.

3.6.2 Changes in questionnaire scores throughout pregnancy

Every questionnaire was evaluated by the Shapiro-Wilk Test to determine normality, for T1 and T3 separately. Matched pairs analysis was applied on the questionnaire's data, according to the method described above, to establish possible group differences.

3.6.3 Correlations

The normality of both parameters in the correlation was checked by the Shapiro-Wilk test at T1 and T3 separately and for the difference scores between T1 and T3.

We only investigated a possible correlation between body perception and the psychological questionnaires that changed significantly from T1 to T3.

Depending on the normality of the parameters, either the non-parametric Spearman's correlation (for non-normally distributed data: $p<0.05$) or the parametric Pairwise Pearson correlation (for normally distributed data: $p>0.05$) was used to examine possible correlations.

4. RESULTS

A total of 14 pregnant women were included in this research study. Important to notice is the missing data from some participants. No information was assembled for one participant with regard to T1 and for another participant with regard to T3, which left us with 12 datasets for comparison of participant characteristics and questionnaire scores. At T1, we lacked information about the LAPS questionnaire for one participant and about the PHODA-SeV for six participants. For one of these six participants, we also lacked information about the PHODA-SeV at T3.

4.1 Participant Characteristics

All parameters were normally distributed at T1 and T3, except for 'weight gain relative to pre-pregnancy' at T3, NRS (average last week) at T1 and T3, and the PFDI at T1.

Table 1 presents the patient characteristics at T1 and T3. A refers to the p-value of the Wilcoxon Signed Rank Test, B refers to the p-value of the Paired T-test and C refers to the p-value of the McNemar's Test. Weight gain relative to pre-pregnancy (A: $p<0.0005$), current body weight (A: $p<0.0005$, B: $p<0.0001$), current BMI (A: $p<0.0005$, B: $p<0.0001$), experiencing PLPP at this moment (C: $p=0.0253$), NRS (average last week) (A: $p=0.0313$) and the PFDI (A: $p=0.0010$) showed significantly higher scores at T3 compared to T1.

Table 1

Participant Characteristics

	T1 (n=12)	T3 (n=12)	T1 vs T3 (n=12)
Age (yrs)	30.28 [29.03 - 33.57]	30.63 [29.43 - 33.93]	NA
Height (m)	1.68 [1.63 - 1.73]	1.68 [1.63 - 1.73]	NA
Pre-pregnancy body weight (kg)	71.00 [62.25 - 73.75]	71.00 [62.25 - 73.75]	NA
Weight gain relative to pre-pregnancy (kg)	2.00 [1.00 - 2.88]	10.00 [9.13 - 13.55]	**A: p<0.0005***
Pre-pregnancy BMI (kg/m²)	23.81 [21.00 -27.36]	23.81 [21.00 -27.36]	NA
Current body weight (kg)	71.25 [64.25 - 76.63]	81.25 [74.50 - 84.75]	**A: p<0.0005*** **B: p<0.0001***
Current BMI (kg/m²)	24.53 [21.83 - 27.72]	28.09 [24.54 - 30.62]	**A: p<0.0005*** **B: p<0.0001***
Experiencing PLPP at this moment (yes)	2	7	**C: p=0.0253***
NRS (average last week) (0-10)	0 [0 - 1.50]	2.50 [0 - 3.88]	**A: p=0.0313***
PSQI (0-21)	5.50 [3.25 - 6.75]	6.00 [5.00 - 8.00]	A: p=0.2891 B: p=0.2143
PFDI (0-300)	6.25 [0 - 14.06]	25.00 [16.41 - 48.70]	**A: p=0.0010***

All data is reported as 'median [Q1 - Q3]', with [Q1 - Q3] referring to the interquartile range. 0.05 is the used significance level. A: p-value of the Wilcoxon Signed Rank Test; B: p-value of the Paired T-test; C: p-value of the McNemar's test; p<0.05* for A, B and C corresponds to a significant difference between T1 and T3. T1 = trimester one; T3 = trimester three; BMI = body mass index, PLPP = pregnancy-related lumbopelvic pain; NRS = numeric rating scale; PSQI = Pittsburgh Sleep Quality Index; PFDI = Pelvic Floor Distress Inventory; NA = not applicable.

4.2 Changes in questionnaire scores throughout pregnancy

Table 2 presents the questionnaire scores throughout pregnancy. Altogether, seven questionnaires turned out to have a significant difference in total scores or subscales throughout pregnancy. The participants showed a higher perceived disability associated with LPP at T3 compared to T1, confirmed by the MDQ (A: p=0.0078) and QBPDS (A: p=0.0010, B: p=0.0002). Body perception, measured by the FreBAQ, showed a trend towards significance (A: p=0.0508). The pregnant women showed a higher intensity of preoccupation with the fetus, measured by the MAAS (A: p=0.0313, B: p=0.0360) and turned out to have more negative affect (A: p=0.0146) measured by the LAPS throughout pregnancy. At T3, they also had more anxiety, measured by the DASS-21 (A: p=0.0469) and GAD-7 (A: p=0.0156, B: p=0.0163), compared to T1. The same significant increase applied to stress, proven by the DASS-21 (A: p=0.0098, B: p=0.0061). Lastly, we found that pregnant women had more depression at T3 compared to T1 measured by the EDS (A: p=0.0127, B: p=0.0083).

After thorough analysis of the psychological questionnaires, not a single one of the questionnaires concerning the evaluation of fear, pain catastrophizing and pain coping showed a significant difference throughout pregnancy (p> 0.05).

Table 2

Questionnaire scores throughout pregnancy

	T1 (n=12)	T3 (n=12)	T1 vs T3 (n=12)
Questionnaires for the evaluation of body perception and perceived disability associated with PLPP			
MDQ (0-100)	1.00 [0 - 3.50]	12.00 [0 - 23.00]	**A: p=0.0078***
QBPDS (0-100)	6.50 [1.75 - 9.50]	28.00 [14.5 - 50.75]	**A: p=0.0010*** **B: p=0.0002***
FreBAQ (0-36)	1.00 [0 - 4.75]	3.00 [1.00 - 10.00]	A: p=0.0508
Questionnaires for the evaluation of psychological factors			
TSK-17 (17-68)	35.00 [28.25 - 37.75]	31.50 [26.00 - 40.50]	A: p=0.3232 B: p=0.2641
PHODA-SeV (0-100) (n=6)	35.40 [26.37 - 47.53]	43.45 [35.18 - 52.34]	A: p=0.3125 B: p=0.2556
FABQ (0-66)	17.5 [9.00 - 32.75]	20.00 [14.25 - 29.50]	A: p=0.5078 B: p=0.5284
Work (0-42)	6.50 [0.25 - 14.75]	7.00 [0.50 - 14.25]	A: p=0.9102 B: p=0.8596
PA (0-24)	9.00 [4.75 - 12.25]	10.00 [7.25 - 12.75]	A: p=0.2788 B: p=0.2733

PCS (0-52)		5.50 [1.00 - 13.00]	9.00 [3.25 - 21.25]	A: p=0.1973
	Rumination (0-16)	4.00 [1.00 - 6.75]	3.50 [2.25 - 8.50]	A: p=0.8711 B: p=0.5782
	Magnification (0-12)	0 [0 - 3.50]	1.00 [0.25 - 3.50]	A: p=0.0938
	Helplessness (0-24)	1.50 [0 - 4.25]	4.50 [0 - 8.00]	A: p=0.1563
PCI	**Active (25-100)**	57.00 [47.50 - 66.00]	57.00 [48.50 - 60.00]	A: p=0.0723 B: p=0.1531
	Passive (25-100)	43.50 [38.00 - 50.50]	46.50 [36.50 - 51.50]	A: p=0.5684 B: p=0.8177
MAAS (19-95)		75.50 [70.50 - 82.00]	80.50 [75.50 - 84.75]	A: p=0.1123 B: p=0.0801
	Quality of attachment (11-55)	46.50 [43.25 - 49.00]	48.50 [45.00 - 49.00]	A: p=0.3516
	Intensity of preoccupation (8-40)	25.50 [23.00 - 28.50]	29.50 [25.00 - 30.75]	**A: p=0.0313*** **B: p=0.0360***

LOTR (0-24)		17.50 [14.25 - 21.00]	18.50 [16.00 - 20.50]	A: p=0.5566 B: p=0.4727
	Optimism (0-12)	8.50 [7.00 - 10.00]	10.00 [7.25 - 10.00]	A: p=0.5352 B: p=0.5078
	Pessimism (0-12)	3.00 [1.25 - 5.50]	3.00 [1.25 - 4.00]	A: p=0.8555 B: p=0.7100
SOC-13 (13-91)		66.00 [55.25 - 76.25]	65.00 [55.25 - 76.00]	A: p=0.6621 B: p=0.6618
DASS-21	**Depression (0-21)**	0 [0 - 1.75]	0 [0 - 2.50]	A: p=0.5313
	Anxiety (0-21)	0 [0 - 1.00]	1.50 [0 - 3.75]	**A: p=0.0469***
	Stress (0-21)	2.50 [0.25 - 5.00]	6.50 [4.25 - 7.75]	**A: p=0.0098*** **B: p=0.0061***
GAD-7 (0-21)		2.50 [0 - 5.25]	4.50 [1.25 - 6.75]	**A: p=0.0156*** **B: p=0.0163***
LAPS (n=11)	**NA (0-40)**	4.00 [1.00 - 8.00]	7.00 [4.00 - 12.00]	**A: p=0.0146***
	PA (0-40)	32.00 [28.00 - 34.00]	30.00 [23.00 - 32.00]	A: p=0.3906 B: p=0.2088
	Ht (0-40)	36.00 [33.00 - 39.00]	35.50 [29.75 - 36.75]	A: p=0.3691 B: p=0.2250

Cognitive functioning (0-10)	8.00 [7.00 - 8.00]	8.00 [7.00 - 8.00]	A: p=0.1719 B: p=0.1688
Overall functioning (0-10)	9.00 [6.00 - 9.00]	8.00 [6.00 - 8.00]	A: p=0.3828
Meaningfulness of life (0-10)	9.00 [8.00 - 10.00]	9.00 [8.00 - 10.00]	A: p=0.6250
Happiness (0-10)	9.00 [8.00 - 9.00]	9.00 [7.00 - 10.00]	A: p=0.8203 B: p=0.8713
EDS (0-30)	3.00 [1.00 - 4.00]	6.50 [3.25 - 9.75]	**A: p=0.0127*** **B: p=0.0083***
PRAQ-R2 (10-50)	24.00 [14.50 - 29.75]	27.00 [15.00 - 29.50]	A: p=0.7656 B: p=0.6332
Fear of giving birth (3-15)	5.50 [3.00 - 7.00]	6.50 [3.25 - 8.50]	A: p=0.2500 B: p=0.1567
Fear of handicapped child (4-20)	9.00 [5.50 - 14.75]	8.00 [6.25 - 13.00]	A: p=0.4688 B: p=0.2979
Concern own appearance (3-15)	6.50 [5.25 - 10.75]	8.00 [4.00 - 12.75]	A: p=0.6797

TPDS (0-48)		11.00 [5.50 - 19.00]	11.50 [6.25 - 17.75]	A: p=0.6885 B: p=0.8695
	Partner involvement (0-33)	4.00 [2.25 - 6.50]	3.00 [1.25 - 7.00]	A: p=0.5391
	Negative affect (0-15)	7.50 [4.00 - 10.75]	8.50 [4.50 - 10.00]	A: p=0.4614 B: p=0.5313

All data is reported as 'median [Q1 - Q3]', with [Q1 - Q3] referring to the interquartile range. 0.05 is the used significance level. A: p-value of the Wilcoxon Signed Rank Test; B: p-value of the Paired T-test; p<0.05* for A and B corresponds to a significant difference between T1 and T3. T1 = trimester one; T3 = trimester three; PLPP = pregnancy-related lumbopelvic pain; MDQ = Modified low back pain Disability Questionnaire; QBPDS = Quebec Back Pain Disability Scale; FreBAQ = Fremantle Back Awareness Questionnaire; TSK = Tampa Scale for Kinesiophobia; PHODA-SeV = Photograph Series of Daily Activities- Short Electronic Version; FABQ = Fear-Avoidance Beliefs Questionnaire; PA = Physical activity; PCS = Pain Catastrophizing Scale; PCI = Pain Coping Inventory; MAAS = Maternal Antenatal Attachment Scale; LOT-R = Life Orientation Test Revised; SOC-13 = Sense of Coherence scale; DASS-21 = Depression Anxiety Stress Scale; GAD-7 = Generalized Anxiety Disorders scale; LAPS = Leuven Affect and Pleasure Scale; NA = negative affect; PA = positive affect; Ht = Hedonic tone; EDS = Edinburgh Depression Scale; PRAQ-R2 = Pregnancy-Related Anxiety Questionnaire Revised; TPDS = Tilburg Pregnancy Distress Scale.

4.3 Correlation between body perception and perceived disability and pain intensity associated with PLPP

Correlations between body perception (FreBAQ) and perceived pain and disability associated with PLPP (NRS, MDQ and QBPDS) were assessed (Table 3).

At T1, body perception correlated significantly with pain intensity (NRS) ($p=0.0151$) confirmed by a Spearman's correlation coefficient (ρ) of 0.68. Another significant correlation at T1 regarding body perception was found for one of the disability questionnaires, namely the MDQ ($p=0.0291$), indicated by a correlation coefficient (ρ) of 0.63. We also found the difference scores in body perception to be correlated significantly with the difference scores of both the disability questionnaires, namely the MDQ ($p=0.0119$) and QBPDS ($p=0.0202$) shown by correlation coefficients of respectively 0.70 and 0.66.

Table 3

Correlation between body perception and perceived pain and disability associated with PLPP at the first and third trimester of pregnancy

		Spearman's correlation coefficient (ρ)	Pairwise Pearson correlation coefficient (r)	P-value
FreBAQ and NRS				
	T1	0.68	NA	**0.0151***
	T3	0.16	NA	0.6194
	T3-T1	-0.20	NA	0.5246
FreBAQ and MDQ				
	T1	0.63	NA	**0.0291***
	T3	0.51	NA	0.0896
	T3-T1	NA	0.70	**0.0119***
FreBAQ and QBPDS				
	T1	0.52	NA	0.0828
	T3	0.52	NA	0.0860
	T3-T1	NA	0.66	**0.0202***

Spearman's correlation coefficient (ρ) used for not normally distributed data, Pairwise Pearson correlation coefficient (r) used for normally distributed data. P<0.05* corresponds to a significant correlation. FreBAQ = Fremantle Back Awareness Questionnaire; NRS = Numeric Rating Scale; MDQ = Modified low back pain Disability Questionnaire; QBPDS = Quebec Back Pain Disability Scale; T1 = trimester one; T3 = trimester three; NA = not applicable.

4.4 Correlation between body perception and psychological factors

Correlations between body perception (FreBAQ) and psychological factors with significant differences throughout pregnancy were assessed (Table 4).

Body perception correlated significantly with anxiety and stress at T3. For anxiety, measured by the GAD-7, a significant correlation was proven by a correlation coefficient (ρ) of 0.71. For stress, measured by the DASS-21 subscale stress, a significant correlation was proven by a correlation coefficient (ρ) of 0.65 at T3.

Table 4

Correlation between body perception and psychological factors at the first and third trimester of pregnancy

	Spearman's correlation coefficient (ρ)	Pairwise Pearson correlation coefficient (r)	P-value
FreBAQ and MAAS-Intensity of preoccupation			
T1	0.24	NA	0.4622
T3	0.14	NA	0.6681
T3-T1	NA	-0.22	0.4883
FreBAQ and DASS-21-anxiety			
T1	0.27	NA	0.4022
T3	0.30	NA	0.3386
T3-T1	0.23	NA	0.4766
FreBAQ and DASS-21-stress			
T1	0.06	NA	0.8422
T3	0.64	NA	**0.0247***
T3-T1	NA	0.09	0.7815

FreBAQ and GAD-7			
T1	0.21	NA	0.5206
T3	0.71	NA	**0.0091***
T3-T1	NA	0.28	0.3766
FreBAQ and LAPS-NA			
T1	-0.36	NA	0.2822
T3	0.09	NA	0.7932
T3-T1	0.02	NA	0.9463
FreBAQ and EDS			
T1	-0.06	NA	0.8487
T3	-0.53	NA	0.0792
T3-T1	NA	0.37	0.2298

Spearman's correlation coefficient (ρ) used for not normally distributed data, Pairwise Pearson correlation coefficient (r) used for normally distributed data. P<0.05* corresponds to a significant correlation. FreBAQ = Fremantle Back Awareness Questionnaire; EDS = Edinburgh Depression Scale; GAD-7 = Generalized Anxiety Disorders scale; DASS-21 = Depression Anxiety Stress Scale; LAPS = Leuven Affect and Pleasure Scale; NA = negative affect; MAAS = Maternal Antenatal Attachment Scale; T1 = trimester one; T3 = trimester three; NA = not applicable.

5. DISCUSSION

5.1 Main findings

First, we investigated whether body perception and a number of psychological variables changed throughout the course of pregnancy in pregnant women with and without PLPP. We hypothesized that we would find significant changes for body perception, pain intensity and disability associated with PLPP, fear-avoidance beliefs and pregnancy-related anxiety and stress. We did in fact find significant changes from T1 to T3 for pain intensity, disability and pregnancy-related anxiety and one of the depression-related questionnaires. However, we did not find significant changes for fear-avoidance beliefs and pregnancy-related stress. Body perception also did not significantly change over time, but showed a tendency towards significance.

Next, we observed the correlation of body perception with pain intensity and disability. We hypothesized that we would find a correlation for both factors, more specifically we expected a more disturbed body perception to be correlated with a higher pain intensity and more disability. From our findings, we can conclude that there is indeed a correlation at T1 between body perception and pain intensity on the one hand and body perception and disability on the other hand.

Furthermore, we investigated the correlation between body perception and psychological questionnaires that changed significantly over time. Not all psychological variables seemed to be correlated with body perception, we only found a correlation at T3 between body perception and the GAD-7 for the evaluation of pregnancy-related anxiety and between body perception and the subscale stress of the DASS-21.

Lastly, we examined the correlation between the difference scores (T1-T3) for body perception and the difference scores for the questionnaires that changed significantly throughout the pregnancy. We found a significant correlation between the difference scores of body perception with the difference scores of both disability questionnaires. The correlations of the difference scores of body perception with the difference scores of pain intensity or the psychological questionnaires were not significant.

5.2 Changes in questionnaire scores throughout pregnancy

5.2.1 Pain intensity

Significantly more pregnant women suffered from PLPP as pregnancy progressed, associated with a higher pain intensity (NRS) at T3 compared to T1. This finding is in line with previous research. Kristiansson et al. (1996) found that the prevalence rates for pregnant women who developed back pain during pregnancy increased from 19% to 47% and 49% at 12, 24 and 36 weeks respectively. Furthermore, they found that pain intensity progressed as the pain duration increased (Kristiansson et al., 1996). Also, Mota et al. (2015) reported that the incidence of LBP increased as pregnancy progressed and that the pain intensity increased throughout pregnancy. Lardon et al. (2018) found that for women reporting PLPP at one point during pregnancy, pain intensity significantly increased over the course of pregnancy, with pain severity being significantly higher at trimester two (T2) and T3 compared to T1.

5.2.2 Disability

The MDQ and QBPDS, two questionnaires evaluating perceived disability associated with LPP, showed significantly higher scores at T3 compared to T1, meaning that the disability for pregnant women with LPP increased throughout pregnancy. Denteneer et al. (2018) calculated the minimal detectable change (MDC) (i.e., the minimal difference in value that needs to be observed, to be considered actual change) of the MDQ at 8.80 in a population of non-specific chronic LBP patients. We exceeded this value in our study, with a difference of 10.17. Therefore, our finding is in line with Rabiee and Sarchamie (2018), who reported that disability increased as pregnancy progressed, with maximum disability at T3.

5.2.3 Body perception

We suspect that due to the small sample size of this study, our findings regarding body perception (FreBAQ), were not significant, but showed a tendency towards a significant decrease throughout pregnancy. To our knowledge, there are no previous longitudinal studies investigating body perception throughout the course of pregnancy. However, there were a few cross-sectional studies conducted on the matter. The study of Wand et al. (2017) found that body perception was more disturbed in women experiencing PLPP in the third trimester

of pregnancy, than those who were not. The same results were found by Goossens et al. (2021), who reported that body perception was more disturbed in women experiencing LPP during late pregnancy than pain-free women. Interestingly, they also found that a more distorted body perception during late pregnancy predicted the presence of LPP in the postpartum period.

5.2.4 Psychological variables

In the existing literature, there is a variation in the reported prevalence rates for depressive symptoms during pregnancy. The systematic review of Bennett et al. (2004) reported depression prevalence rates of 7.4%, 12.8% and 12% at T1, T2 and T3 consecutively. Contradictory, Teixeira et al. (2009) found that depressive symptoms decreased from T1 to T2 and again from T2 to T3. In a recent systematic review, Okagbue et al. (2019) reported that antepartum depression is highest in the third trimester of pregnancy and lowest in the second trimester. In our study, we found on the one hand that depressive symptoms increased as pregnancy progressed, with higher scores on the EDS at T3 compared to T1. But on the other hand, this finding was not confirmed by the subscale depression of the DASS-21, since no significant difference was found here.

As for anxiety, the study by Lee et al. (2007) reported anxiety levels to be higher in the first and third trimester than in the second trimester of pregnancy. The results of Teixeira et al. (2009) confirmed these findings, with more anxiety in the first and third trimester of pregnancy, compared to the second trimester. We found a higher incidence of anxiety symptoms at T3 versus T1, measured by the GAD-7 and the subscale anxiety of the DASS-21. Due to the steady increase in scores from T1 to T3 for the GAD-7 and anxiety subscale of the DASS-21, we think it is rather unlikely that these women would have reported lower anxiety levels at the second trimester.

We also found an increase from T1 to T3 for the MAAS, specifically for the subscale evaluating the preoccupation with the fetus. However, van Bussel et al. (2010) found both subscales of the MAAS to be increasing throughout pregnancy. In our findings, pregnant women already reported high quality attachment at T1, which only slightly increased at T3. Maas et al. (2014) investigated possible determinants of maternal fetal attachment (MFA), measured by the

MAAS. They found that more agreeable, conscientious and extravert pregnant women, had more feelings of attachment with the unborn child. Other factors associated with higher levels of MFA were lower income, primiparous women and a younger maternal age. Furthermore, higher levels of perceived stress and expecting a dull child were associated with lower levels of MFA (Maas et al., 2014).

And lastly, the negative affect subscale of the LAPS also increased significantly from T1 to T3. To our knowledge, we seem to be the first study to examine the preoccupation with the unborn child and negative affect throughout pregnancy.

5.3 Correlation between body perception and perceived disability and pain intensity associated with PLPP

In our study, body perception (FreBAQ) and pain intensity (NRS) significantly correlated with each other at T1. The correlation at T3 and the difference scores were not statistically significant. Again, we hypothesize that this is a consequence of our small sample size.

Next, we found a significant correlation at T1 between body perception (FreBAQ) and one of the disability questionnaires, namely the MDQ. Also, a significant difference between the difference scores of the FreBAQ and both the MDQ and the QBPDS was discovered.

In previous research, Wand et al. (2017) found that body perception and pain intensity were significantly correlated at T3, suggesting that a more disturbed body perception is associated with higher pain intensity later on in pregnancy. Goossens et al. (2021) reported that in pregnant women with LPP a more distorted body perception correlated with higher pain intensity. Furthermore, they found that pregnant women with LPP and moderate disability showed a more disturbed body perception than pain-free women and women with little to no disability. Beales et al. (2016) found that pregnant women with moderate disability due to LPP had a disturbed body perception, compared to pain-free postpartum women.

To our knowledge, other longitudinal evidence on the correlation between body perception and disability or pain intensity throughout pregnancy is not yet available. In a population of LBP patients, Wand et al. (2016) found a correlation between body perception and pain intensity, as well as between body perception and disability.

5.4 Correlation between body perception and psychological factors

From the five psychological questionnaires that significantly changed throughout pregnancy, only two correlated significantly with body perception (FreBAQ) at T3, namely the GAD-7, for the measurement of anxiety and the subscale stress of the DASS-21.

However, for all other psychological questionnaires, we did not find significant correlations with body perception. We presume that this could be assigned to a number of reasons. Firstly, due to our small sample size, we must consider whether our findings would have been significant if a bigger sample size would have been used. In a previous study, body perception correlated with fear avoidance beliefs, pain catastrophizing and psychological distress in a group of LBP patients (n=251) (Wand et al., 2016). In a cohort of patients with Complex Regional Pain Syndrome (CRPS) (n=60), a correlation was found between the severity of body perception disturbances (BPD) and depression, anxiety and stress (Schulte-Goecking et al., 2022). Secondly, pregnant women may feel that their emotions and cognitions are part of a normal pregnancy and therefore underestimated their feelings while filling in the questionnaires.

Concerning body perception disturbances in a CRPS population, Schulte-Goecking et al. (2022) stated that "*Psychological symptoms interact with the physical illness, and with alterations in the brain, in a reciprocal, bidirectional manner, such that depression, anxiety, and stress may increase the severity of BPD and the intensity of pain and disability associated with CRPS, as well as alterations in brain activity and cortical mass, which then may amplify depression, anxiety, and stress in a vicious spiral, thereby diminishing experienced quality of life."* We hypothesize that this could also be applicable for our findings, meaning that anxiety and stress increase the disturbances in body perception and that the changes in the brain caused by body perception, amplify the feelings of anxiety and stress.

This suggests that in assessing and treating pregnant women with LPP and the accompanying disturbances in body perception, attention should also be paid to psychological variables such as anxiety and stress.

5.5 Strengths and weaknesses

A first weakness of this study can be addressed as a sampling bias. Our participants were only recruited from different hospitals in Limburg (Belgium) and through the family and acquaintances of the researchers. This specific location makes it hard to generalize our findings to a larger population.

A second weakness of our research would be the small sample size. Fourteen pregnant women were included of which only 12 were used in the statistical analysis due to missing data. This is another factor that makes generalization of our findings difficult. Furthermore, some results did only reach a tendency towards statistical significance, which perhaps would have been different if a larger sample size was used (i.e., FreBAQ), although this should be interpreted with caution. This study is part of a larger ongoing research project, which means the participants are still being recruited as we speak. This bias can therefore easily be avoided in further research.

A third weakness of our study can be found in the statistical analysis. We performed multiple tests and explored multiple correlations on the same sample. Given the exploratory nature of our research and considering the high number of questionnaires administered in our study sample, we did not correct the significance level with the Bonferroni correction.

A last weakness is the number of questionnaires. Seventeen questionnaires were administered consecutively. For this reason, we should take response burden into account, in other words, the burden experienced by a participant to fill out a questionnaire (Rolstad et al., 2011). The meta-analysis of Rolstad et al. (2011) found that response rates were relatively lower for longer questionnaires in comparison to shorter ones. Not only this, but also administering several questionnaires in a row may increase the response burden (Rolstad et al., 2011). To counteract this in future research, we would opt to choose for shorter, validated versions of questionnaires and to omit questionnaires with overlapping aims or items. The large number of questionnaires can on the other hand also be seen as a strength. We administered three questionnaires for the evaluation of body perception and disability associated with LPP and 14 for the evaluation of psychosocial variables. This allowed us to form a comprehensive overview of all the psychosocial factors we deemed important.

To date, there are no longitudinal studies investigating body perception and the correlation with disability, pain intensity or psychological variables throughout the complete course of pregnancy. To our knowledge, we are the first to set up such an investigation. There is more research of this nature needed with larger sample sizes. This way, our results may or may not be confirmed and the knowledge on the subject can be broadened.

5.6 Clinical implications

It is clear that body perception has an influence on the pain and disability experienced by the women throughout pregnancy as it increases from the first toward the third trimester. Furthermore, a positive correlation between body perception and several psychological factors at T3 was discovered, meaning that a more disturbed body perception correlated with worse scores on the psychological questionnaires. It is important to observe these factors to a greater extent during pregnancy. We suggest the development of a screening with specific questionnaires for psychological factors and the determination of specific cut-off values for each questionnaire. This way we can intervene forehanded when a significant risk is determined and prevent the further development of psychological problems.

As physical therapy students we are advocates for an active approach to handle musculoskeletal conditions. Therefore, we believe that physical activity may also be important for pregnant women with LPP. The systematic review by Chan et al. (2019) found that active interventions have a positive effect on the alleviation of pregnancy-related pain, including LBP and PGP. Furthermore, these interventions also showed to have a positive influence on psychological factors such as anxiety, stress and depression.

6. CONCLUSION

Pregnant women showed a higher pain intensity and more disability associated with LPP throughout pregnancy. Also, anxiety and depression were higher in pregnant women at T3 compared to T1.

Secondly, we conclude that there was a correlation between body perception and pain intensity and disability associated with LPP, meaning that a more disturbed body perception corresponded with more pain and disability. Furthermore, there was a correlation between body perception and certain psychological factors, which implies that a more disturbed body perception corresponds to more stress and anxiety.

Further research with a greater sample size is strongly recommended to expand and confirm our findings with stronger correlations.

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PART 2 APPENDIX

1. VERKLARING OP EER

Verklaring op Eer

Ondergetekende, student aan de Universiteit Hasselt (UHasselt), faculteit Revalidatiewetenschappen en Kinesitherapie aanvaardt de volgende voorwaarden en bepalingen van deze verklaring:

1. Ik ben ingeschreven als student aan de UHasselt in de opleiding Revalidatiewetenschappen en kinesitherapie, waarbij ik de kans krijg om in het kader van mijn opleiding mee te werken aan onderzoek van de faculteit Revalidatiewetenschappen en Kinesitherapie aan de UHasselt. Dit onderzoek wordt beleid door Prof. Dr. Lotte Janssens en Dr. Nina Goossens en kadert binnen het opleidingsonderdeel Wetenschappelijke stage/Masterproef deel 2. Ik zal in het kader van dit onderzoek creaties, schetsen, ontwerpen, prototypes en/of onderzoeksresultaten tot stand brengen in het domein van het musculoskeletale revalidatie (hierna: "De Onderzoeksresultaten").

2. Bij de creatie van De Onderzoeksresultaten doe ik beroep op de achtergrondkennis, vertrouwelijke informatie[1], universitaire middelen en faciliteiten van UHasselt (hierna: de "Expertise").

3. Ik zal de Expertise, met inbegrip van vertrouwelijke informatie, uitsluitend aanwenden voor het uitvoeren van hogergenoemd onderzoek binnen UHasselt. Ik zal hierbij steeds de toepasselijke regelgeving, in het bijzonder de Algemene Verordening Gegevensbescherming (EU 2016-679), in acht nemen.

4. Ik zal de Expertise (i) voor geen enkele andere doelstelling gebruiken, en (ii) niet zonder voorafgaande schriftelijke toestemming van UHasselt op directe of indirecte wijze publiek maken.

5. Aangezien ik in het kader van mijn onderzoek beroep doe op de Expertise van de UHasselt, draag ik hierbij alle bestaande en toekomstige intellectuele eigendomsrechten op De Onderzoeksresultaten over aan de UHasselt. Deze overdracht omvat alle vormen van intellectuele eigendomsrechten, zoals onder meer – zonder daartoe beperkt te zijn – het auteursrecht, octrooirecht, merkenrecht, modellenrecht en knowhow. De overdracht geschiedt in de meest volledige omvang, voor de gehele wereld en voor de gehele beschermingsduur van de betrokken rechten.

[1] Vertrouwelijke informatie betekent alle informatie en data door de UHasselt meegedeeld aan de student voor de uitvoering van deze overeenkomst, inclusief alle persoonsgegevens in de zin van de Algemene Verordening Gegevensbescherming (EU 2016/679), met uitzondering van de informatie die (a) reeds algemeen bekend is; (b) reeds in het bezit was van de student voor de mededeling ervan door de UHasselt; (c) de student verkregen heeft van een derde zonder enige geheimhoudingsplicht; (d) de student onafhankelijk heeft ontwikkeld zonder gebruik te maken van de vertrouwelijke informatie van de UHasselt; (e) wettelijk of als gevolg van een rechterlijke beslissing moet worden bekendgemaakt, op voorwaarde dat de student de UHasselt hiervan schriftelijk en zo snel mogelijk op de hoogte brengt.

6. In zoverre De Onderzoeksresultaten auteursrechtelijk beschermd zijn, omvat bovenstaande overdracht onder meer de volgende exploitatiewijzen, en dit steeds voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding:

   - het recht om De Onderzoeksresultaten vast te (laten) leggen door alle technieken en op alle dragers;
   - het recht om De Onderzoeksresultaten geheel of gedeeltelijk te (laten) reproduceren, openbaar te (laten) maken, uit te (laten) geven, te (laten) exploiteren en te (laten) verspreiden in eender welke vorm, in een onbeperkt aantal exemplaren;
   - het recht om De Onderzoeksresultaten te (laten) verspreiden en mee te (laten) delen aan het publiek door alle technieken met inbegrip van de kabel, de satelliet, het internet en alle vormen van computernetwerken;
   - het recht De Onderzoeksresultaten geheel of gedeeltelijk te (laten) bewerken of te (laten) vertalen en het (laten) reproduceren van die bewerkingen of vertalingen;
   - het recht De Onderzoeksresultaten te (laten) bewerken of (laten) wijzigen, onder meer door het reproduceren van bepaalde elementen door alle technieken en/of door het wijzigen van bepaalde parameters (zoals de kleuren en de afmetingen).

   De overdracht van rechten voor deze exploitatiewijzen heeft ook betrekking op toekomstige onderzoeksresultaten tot stand gekomen tijdens het onderzoek aan UHasselt, eveneens voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding.

   Ik behoud daarbij steeds het recht op naamvermelding als (mede)auteur van de betreffende Onderzoeksresultaten.

7. Ik zal alle onderzoeksdata, ideeën en uitvoeringen neerschrijven in een "laboratory notebook" en deze gegevens niet vrijgeven, tenzij met uitdrukkelijke toestemming van mijn UHasseltbegeleider Prof. Dr. Lotte Janssens en Dr. Nina Goossens.

8. Na de eindevaluatie van mijn onderzoek aan de UHasselt zal ik alle verkregen vertrouwelijke informatie, materialen, en kopieën daarvan, die nog in mijn bezit zouden zijn, aan UHasselt terugbezorgen.

Gelezen voor akkoord en goedgekeurd,

Naam: Lambrechts Margo

Adres: Piringenstraat 70, 3700 Tongeren

Geboortedatum en –plaats : 19/05/2000 te Tongeren

Datum: 23 mei 2022

Handtekening:

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3. Ik zal de Expertise, met inbegrip van vertrouwelijke informatie, uitsluitend aanwenden voor het uitvoeren van hogergenoemd onderzoek binnen UHasselt. Ik zal hierbij steeds de toepasselijke regelgeving, in het bijzonder de Algemene Verordening Gegevensbescherming (EU 2016-679), in acht nemen.

4. Ik zal de Expertise (i) voor geen enkele andere doelstelling gebruiken, en (ii) niet zonder voorafgaande schriftelijke toestemming van UHasselt op directe of indirecte wijze publiek maken.

5. Aangezien ik in het kader van mijn onderzoek beroep doe op de Expertise van de UHasselt, draag ik hierbij alle bestaande en toekomstige intellectuele eigendomsrechten op De Onderzoeksresultaten over aan de UHasselt. Deze overdracht omvat alle vormen van intellectuele eigendomsrechten, zoals onder meer – zonder daartoe beperkt te zijn – het auteursrecht, octrooirecht, merkenrecht, modellenrecht en knowhow. De overdracht geschiedt in de meest volledige omvang, voor de gehele wereld en voor de gehele beschermingsduur van de betrokken rechten.

6. In zoverre De Onderzoeksresultaten auteursrechtelijk beschermd zijn, omvat bovenstaande overdracht onder meer de volgende exploitatiewijzen, en dit steeds voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding:

   - het recht om De Onderzoeksresultaten vast te (laten) leggen door alle technieken en op alle dragers;

[2] Vertrouwelijke informatie betekent alle informatie en data door de UHasselt meegedeeld aan de student voor de uitvoering van deze overeenkomst, inclusief alle persoonsgegevens in de zin van de Algemene Verordening Gegevensbescherming (EU 2016/679), met uitzondering van de informatie die (a) reeds algemeen bekend is; (b) reeds in het bezit was van de student voor de mededeling ervan door de UHasselt; (c) de student verkregen heeft van een derde zonder enige geheimhoudingsplicht; (d) de student onafhankelijk heeft ontwikkeld zonder gebruik te maken van de vertrouwelijke informatie van de UHasselt; (e) wettelijk of als gevolg van een rechterlijke beslissing moet worden bekendgemaakt, op voorwaarde dat de student de UHasselt hiervan schriftelijk en zo snel mogelijk op de hoogte brengt.

- het recht om De Onderzoeksresultaten geheel of gedeeltelijk te (laten) reproduceren, openbaar te (laten) maken, uit te (laten) geven, te (laten) exploiteren en te (laten) verspreiden in eender welke vorm, in een onbeperkt aantal exemplaren;
- het recht om De Onderzoeksresultaten te (laten) verspreiden en mee te (laten) delen aan het publiek door alle technieken met inbegrip van de kabel, de satelliet, het internet en alle vormen van computernetwerken;
- het recht De Onderzoeksresultaten geheel of gedeeltelijk te (laten) bewerken of te (laten) vertalen en het (laten) reproduceren van die bewerkingen of vertalingen;
- het recht De Onderzoeksresultaten te (laten) bewerken of (laten) wijzigen, onder meer door het reproduceren van bepaalde elementen door alle technieken en/of door het wijzigen van bepaalde parameters (zoals de kleuren en de afmetingen).

De overdracht van rechten voor deze exploitatiewijzen heeft ook betrekking op toekomstige onderzoeksresultaten tot stand gekomen tijdens het onderzoek aan UHasselt, eveneens voor de hele beschermingsduur, voor de gehele wereld en zonder vergoeding.

Ik behoud daarbij steeds het recht op naamvermelding als (mede)auteur van de betreffende Onderzoeksresultaten.

7. Ik zal alle onderzoeksdata, ideeën en uitvoeringen neerschrijven in een "laboratory notebook" en deze gegevens niet vrijgeven, tenzij met uitdrukkelijke toestemming van mijn UHasseltbegeleider Prof. Dr. Lotte Janssens en Dr. Nina Goossens.

8. Na de eindevaluatie van mijn onderzoek aan de UHasselt zal ik alle verkregen vertrouwelijke informatie, materialen, en kopieën daarvan, die nog in mijn bezit zouden zijn, aan UHasselt terugbezorgen.

Gelezen voor akkoord en goedgekeurd,

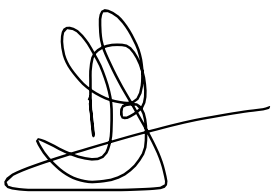
Naam: Julie Boosten

Adres: Bilzersteenweg 363, 3700 Tongeren

Geboortedatum en –plaats : 16/04/1999 te Tongeren

Datum: 23 mei 2022

Handtekening:



2. INSCHRIJVINGSFORMULIER + GOEDKEURING

UHASSELT
KNOWLEDGE IN ACTION

Inschrijvingsformulier verdediging masterproef academiejaar 2021-2022,
Registration form jury Master's thesis academic year 2021-2022,

GEGEVENS STUDENT - *INFORMATION STUDENT*

Faculteit/School: **Faculteit Revalidatiewetenschappen**
Faculty/School: ***Rehabilitation Sciences***

Stamnummer + naam: **1747483 Lambrechts Margo**
Student number + name

Opleiding/*Programme*: **2 ma revalid. & kine inwendige**

INSTRUCTIES - *INSTRUCTIONS*

Neem onderstaande informatie grondig door.

Print dit document en vul het aan met DRUKLETTERS.

In tijden van van online onderwijs door COVID-19 verstuur je het document (scan of leesbare foto) ingevuld via mail naar je promotor. Je promotor bezorgt het aan de juiste dienst voor verdere afhandeling.

Vul luik A aan. Bezorg het formulier aan je promotoren voor de aanvullingen in luik B. Zorg dat het formulier ondertekend en gedateerd wordt door jezelf en je promotoren in luik D en dien het in bij de juiste dienst volgens de afspraken in jouw opleiding.
Zonder dit inschrijvingsformulier krijg je geen toegang tot upload/verdediging van je masterproef.

Please read the information below carefully.

Print this document and complete it by hand writing, using CAPITAL LETTERS.

In times of COVID-19 and during the online courses you send the document (scan or readable photo) by email to your supervisor. Your supervisor delivers the document to the appropriate department.

Fill out part A. Send the form to your supervisors for the additions in part B. Make sure that the form is signed and dated by yourself and your supervisors in part D and submit it to the appropriate department in accordance with the agreements in your study programme.
Without this registration form, you will not have access to the upload/defense of your master's thesis.

LUIK A - VERPLICHT - IN TE VULLEN DOOR DE STUDENT
PART A - MANDATORY - TO BE FILLED OUT BY THE STUDENT

Titel van Masterproef/*Title of Master's thesis:*

O behouden - *keep*

☒ wijzigen - *change to:* THE CORRELATION OF BODY PERCEPTION WITH PAIN INTENSITY, DISABILITY AND PSYCHOLOGICAL FACTORS IN THE FIRST AND THIRD TRIMESTER OF PREGNANCY AMONG MULTIPAROUS WOMEN

UHvoorlev5 29/05/2022

O behouden - *keep*

O wijzigen - *change to*:

In geval van samenwerking tussen studenten, naam van de medestudent(en)/*In case of group work, name of fellow student(s)*:

X behouden - *keep* JULIE BOOSTEN

O wijzigen - *change to:*

LUIK B - VERPLICHT - IN TE VULLEN DOOR DE PROMOTOR(EN)
PART B - MANDATORY - TO BE FILLED OUT BY THE SUPERVISOR(S)

Wijziging gegevens masterproef in luik A/*Change information Master's thesis in part A:*

X goedgekeurd - *approved*

O goedgekeurd mits wijziging van - *approved if modification of:*

Scriptie/*Thesis:*

X openbaar (beschikbaar in de document server van de universiteit)- *public (available in document server of university)*

O vertrouwelijk (niet beschikbaar in de document server van de universiteit) - *confidential (not available in document server of university)*

Juryverdediging/*Jury Defense:*

De promotor(en) geeft (geven) de student(en) het niet-bindend advies om de bovenvermelde masterproef in de bovenvermelde periode/*The supervisor(s) give(s) the student(s) the non-binding advice:*

X te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

X de verdediging is openbaar/*in public*

O de verdediging is niet openbaar/*not in public*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

LUIK C - OPTIONEEL - IN TE VULLEN DOOR STUDENT, alleen als hij luik B wil overrulen
PART C - OPTIONAL - TO BE FILLED OUT BY THE STUDENT, only if he wants to overrule part B

In tegenstelling tot het niet-bindend advies van de promotor(en) wenst de student de bovenvermelde masterproef in de bovenvermelde periode/*In contrast to the non-binding advice put forward by the supervisor(s), the student wishes:*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

O te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

UHvoorlev5 29/05/2022

LUIK D - VERPLICHT - IN TE VULLEN DOOR DE STUDENT EN DE PROMOTOR(EN)
PART D - MANDATORY - TO BE FILLED OUT BY THE STUDENT AND THE SUPERVISOR(S)

Datum en handtekening student(en)
Date and signature student(s)

30-05-2022

Datum en handtekening promotor(en)
Date and signature supervisor(s)

30-05-2022

Inschrijvingsformulier verdediging masterproef academiejaar 2021-2022,
Registration form jury Master's thesis academic year 2021-2022,

GEGEVENS STUDENT - *INFORMATION STUDENT*

Faculteit/School: **Faculteit Revalidatiewetenschappen**
Faculty/School: ***Rehabilitation Sciences***

Stamnummer + naam: **1746731 Boosten Julie**
Student number + name

Opleiding/*Programme*: **2 ma revalid. & kine musc.**

INSTRUCTIES - *INSTRUCTIONS*

Neem onderstaande informatie grondig door.

Print dit document en vul het aan met DRUKLETTERS.

In tijden van van online onderwijs door COVID-19 verstuur je het document (scan of leesbare foto) ingevuld via mail naar je promotor. Je promotor bezorgt het aan de juiste dienst voor verdere afhandeling.

Vul luik A aan. Bezorg het formulier aan je promotoren voor de aanvullingen in luik B. Zorg dat het formulier ondertekend en gedateerd wordt door jezelf en je promotoren in luik D en dien het in bij de juiste dienst volgens de afspraken in jouw opleiding.
Zonder dit inschrijvingsformulier krijg je geen toegang tot upload/verdediging van je masterproef.

Please read the information below carefully.

Print this document and complete it by hand writing, using CAPITAL LETTERS.

In times of COVID-19 and during the online courses you send the document (scan or readable photo) by email to your supervisor. Your supervisor delivers the document to the appropriate department.

Fill out part A. Send the form to your supervisors for the additions in part B. Make sure that the form is signed and dated by yourself and your supervisors in part D and submit it to the appropriate department in accordance with the agreements in your study programme.
Without this registration form, you will not have access to the upload/defense of your master's thesis.

LUIK A - VERPLICHT - IN TE VULLEN DOOR DE STUDENT
PART A - MANDATORY - TO BE FILLED OUT BY THE STUDENT

Titel van Masterproef/*Title of Master's thesis:*

O behouden - *keep*

● wijzigen - *change to:* THE CORRELATION OF BODY PERCEPTION WITH PAIN INTENSITY, DISABILITY AND PSYCHOLOGICAL FACTORS IN THE FIRST AND THIRD TRIMESTER OF PREGNANCY AMONG MULTIPAROUS WOMEN

/:

O behouden - *keep*

O wijzigen - *change to*:

In geval van samenwerking tussen studenten, naam van de medestudent(en)/*In case of group work, name of fellow student(s)*:

Ø behouden - *keep* MARGO LAMBRECHTS

O wijzigen - *change to:*

LUIK B - VERPLICHT - IN TE VULLEN DOOR DE PROMOTOR(EN)
PART B - MANDATORY - TO BE FILLED OUT BY THE SUPERVISOR(S)

Wijziging gegevens masterproef in luik A/*Change information Master's thesis in part A:*

X goedgekeurd - *approved*

O goedgekeurd mits wijziging van - *approved if modification of:*

Scriptie/*Thesis:*

X openbaar (beschikbaar in de document server van de universiteit)- *public (available in document server of university)*

O vertrouwelijk (niet beschikbaar in de document server van de universiteit) - *confidential (not available in document server of university)*

Juryverdediging/*Jury Defense:*

De promotor(en) geeft (geven) de student(en) het niet-bindend advies om de bovenvermelde masterproef in de bovenvermelde periode/*The supervisor(s) give(s) the student(s) the non-binding advice:*

X te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

X de verdediging is openbaar/*in public*

O de verdediging is niet openbaar/*not in public*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

LUIK C - OPTIONEEL - IN TE VULLEN DOOR STUDENT, alleen als hij luik B wil overrulen
PART C - OPTIONAL - TO BE FILLED OUT BY THE STUDENT, only if he wants to overrule part B

In tegenstelling tot het niet-bindend advies van de promotor(en) wenst de student de bovenvermelde masterproef in de bovenvermelde periode/*In contrast to the non-binding advice put forward by the supervisor(s), the student wishes:*

O niet te verdedigen/*not to defend the aforementioned Master's thesis within the aforementioned period of time*

O te verdedigen/*to defend the aforementioned Master's thesis within the aforementioned period of time*

UHvoorlev5 23/05/2022

LUIK D - VERPLICHT - IN TE VULLEN DOOR DE STUDENT EN DE PROMOTOR(EN)
PART D - MANDATORY - TO BE FILLED OUT BY THE STUDENT AND THE SUPERVISOR(S)

Datum en handtekening student(en)
Date and signature student(s)

30/05/2022

Datum en handtekening promotor(en)
Date and signature supervisor(s)

30-05-2022

3. INVENTARISATIEFORMULIER

www.uhasselt.be
Campus Hasselt | Martelarenlaan 42 | BE-3500 Hasselt
Campus Diepenbeek | Agoralaan gebouw D | BE-3590 Diepenbeek
T + 32(0)11 26 81 11 | E-mail: info@uhasselt.be

UHASSELT
KNOWLEDGE IN ACTION

INVENTARISATIEFORMULIER WETENSCHAPPELIJKE STAGE DEEL 2

DATUM	INHOUD OVERLEG	HANDTEKENINGEN
Wo 29/09/2021	Mail: info i.v.m. opstart MP2	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten Student(e): Frauke Vercalsteren Student(e): Laura Jochmans
Ma 04/10/2021	Google Meets: info i.v.m. opstart MP2 (rekrutering, onderwerp MP…)	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten Student(e): Frauke Vercalsteren Student(e): Laura Jochmans
Di 12/10/2021	Mail: extra info omtrent rekrutering en inplannen participanten	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Woe 10/11/2021	Mail: communicatie afgenomen vragenlijsten	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Woe 01/12/2021	Mail: communicatie onderzoeksvraag en data	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Ma 24/01/2022	Mail: communicatie methode en introductie	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Di 01/02/2022	Mail: communicatie deadlines MP2	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten

Woe 09/03/2022 - Di 29/03/2022	Mails: communicatie versies statistiek/resultaten MP2	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Woe 30/03/2022	Google Meets: statistiek/resultaten MP2	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Vrij 18/03/2022	Mail: vragenlijsten methode	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Woe 13/04/2022	Mail: communicatie vragen introductie en methode	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Ma 09/05/2022 - Do 12/05/2022	Mail: discussie, abstract en conclusie	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Zo 15/05/2022- Di 17/05/2022	Mail: Eerste draft volledige versie	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten
Ma 23/05/2022	Mail: finale versie volledige masterproef + communicatie titel, inventarisatieformulier, inschrijvingsformulier etc.	Promotor: Prof. dr. Lotte Janssens Copromotor: Dr. Nina Goossens Student(e): Margo Lambrechts Student(e): Julie Boosten

In te vullen door de promotor(en) en eventuele copromotor aan het einde van MP2:

Naam Student(e): ……Margo Lambrechts en Julie Boosten…

Datum:……30/05/2022…….. Titel Masterproef: the correlation of body perception with pain intensity, disability and psychological factors in the first and third trimester of pregnancy among multiparous women

1) Geef aan in hoeverre de student(e) onderstaande competenties zelfstandig uitvoerde: - NVT: De student(e) leverde hierin geen bijdrage, aangezien hij/zij in een reeds lopende studie meewerkte.
- 1: De student(e) was niet zelfstandig en sterk afhankelijk van medestudent(e) of promotor en teamleden bij de uitwerking en uitvoering.
- 2: De student(e) had veel hulp en ondersteuning nodig bij de uitwerking en uitvoering. - 3: De student(e) was redelijk zelfstandig bij de uitwerking en uitvoering
- 4: De student(e) had weinig tot geringe hulp nodig bij de uitwerking en uitvoering. - 5: De student(e) werkte zeer zelfstandig en had slechts zeer sporadisch hulp en bijsturing nodig van de promotor of zijn team bij de uitwerking en uitvoering.

Competenties	**NVT**	**1**	**2**	**3**	**4**	**5**
Opstelling onderzoeksvraag	X	O	O	O	O	O
Methodologische uitwerking	X	O	O	O	O	O
Data acquisitie	O	O	O	O	X	O
Data management	O	O	O	X	O	O
Dataverwerking/Statistiek	O	O	X	O	O	O
Rapportage	O	O	O	X	O	O

2) Niet-bindend advies: Student(e) krijgt toelating/~~geen toelating~~ (schrappen wat niet past) om bovenvermelde Wetenschappelijke stage/masterproef deel 2 te verdedigen in bovenvermelde periode. Deze eventuele toelating houdt geen garantie in dat de student geslaagd is voor dit opleidingsonderdeel.

3) Deze wetenschappelijke stage/masterproef deel 2 mag wel/~~niet~~ (schrappen wat niet past) openbaar verdedigd worden.

4) Deze wetenschappelijke stage/masterproef deel 2 mag wel/~~niet~~ (schrappen wat niet past) opgenomen worden in de bibliotheek en docserver van de UHasselt.

Datum en handtekening student(e)	Datum en handtekening promotor(en)	Datum en handtekening Co-promotor(en)
30/05/2022	30/05/2022	

Van: **Lotte JANSSENS** lotte.janssens@uhasselt.be
Onderwerp: Re: Finale versie MP2
Datum: 30 mei 2022 om 11:10
Aan: Julie Boosten julie.boosten@student.uhasselt.be

OK, daar was ik inderdaad niet van op de hoogte want alle andere studenten vroegen ook een handtekening, maar geen probleem.
Dan kunnen jullie de gehandtekende documenten gewoon indienen in plaats van email. Dit komt op hetzelfde neer.
mvg,
Lotte Janssens

Op ma 30 mei 2022 om 11:05 schreef Julie Boosten <julie.boosten@student.uhasselt.be>:
Dag Mevr. Janssens,

Voor het indienen van de inschrijvingsformulieren gelden nog steeds dezelfde regels zoals vorig jaar tijdens de COVID-19 periode.
Dit wil zeggen dat u de documenten niet hoeft te ondertekenen, maar dat we een bevestiging via mail nodig hebben.
Ik voeg een screenshot met de nodige uitleg hieronder even toe!

Stap 2: E-mail het inschrijvingsformulier naar de promotor en vraag om een akkoord ov het "inschrijvingsformulier voor de verdediging van een masterproef". De promotor gee op dat moment het niet-bindend advies om de masterproef in te dienen tijdens de eerst respectievelijk tweede zittijd. Dit advies wordt genoteerd op het inschrijvingsformuli voor de verdediging van de masterproef. De promotor zal via e-mail zijn akkoord geve door een kort antwoord terug te sturen (geen handtekening op het document). Jull dienen de bevestigingsmail van de promotor (maak een screenshot of sla de e-mail op a pdf) + het inschrijvingsformulier digitaal door te sturen via google forms.

We hadden u dit eerder moeten toelichten, waarvoor onze excuses!

Groetjes,
Julie en Margo

Op ma 30 mei 2022 om 10:01 schreef Lotte JANSSENS <lotte.janssens@uhasselt.be>:
Beste Julie en Margo,
Bijgevoegd de aangevulde inschrijvingsformulieren.
Veel succes verder en tot binnenkort!
mvg,
Lotte Janssens

Op ma 30 mei 2022 om 09:50 schreef Julie Boosten <julie.boosten@student.uhasselt.be>:
Dag Mevr. Janssens,

Bijgevoegd kan u de inschrijvingsformulieren terugvinden.

Groetjes,
Julie en Margo

Op ma 30 mei 2022 om 08:53 schreef Lotte JANSSENS <lotte.janssens@uhasselt.be>:
Beste Julie en Margo,
Bijgevoegd het inventarisatieformulier met handtekening.
Pearson staat in de 2de beslissingsboom? indien jullie achten dat de gebruikte statistiek niet (helemaal) in de beslissingsboom staat, voeg dan beknopt het stukje leerstof toe uit cursus statistiek waarop jullie gebaseerd hebben, met verwijzing naar in welke cursus en waar.
Akkoord met de titel; sturen jullie het inschrijvingsformulier dan nog door?
mvg,
Lotte Janssens

Op ma 23 mei 2022 om 21:09 schreef Julie Boosten <julie.boosten@student.uhasselt.be>:
Beste Mevr. Janssens,

Margo en ik hebben uw opmerkingen zo goed mogelijk verwerkt en de nodige aanpassingen gedaan! In bijlage voegen we de nieuwe versie van onze masterproef toe.

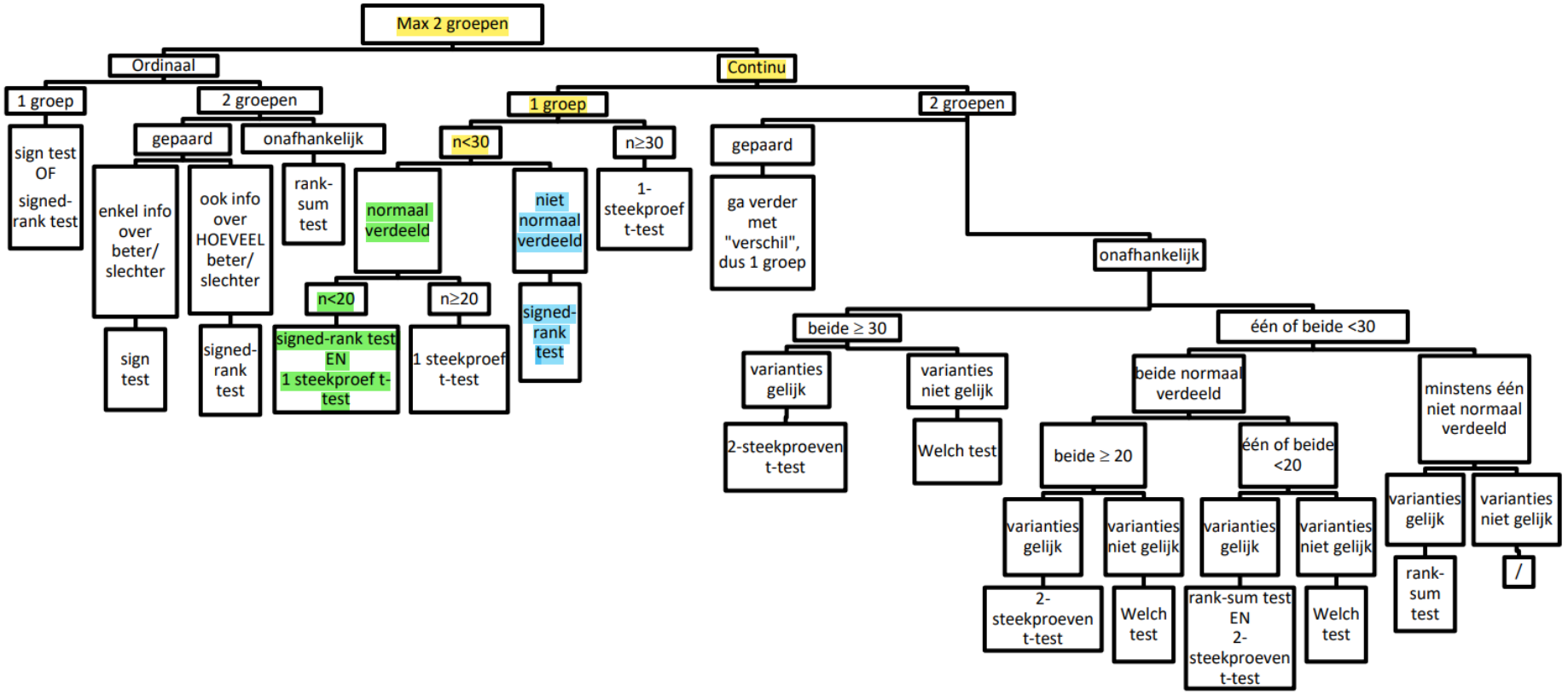
Verder zijn er nog enkele documenten die we in orde moeten brengen:

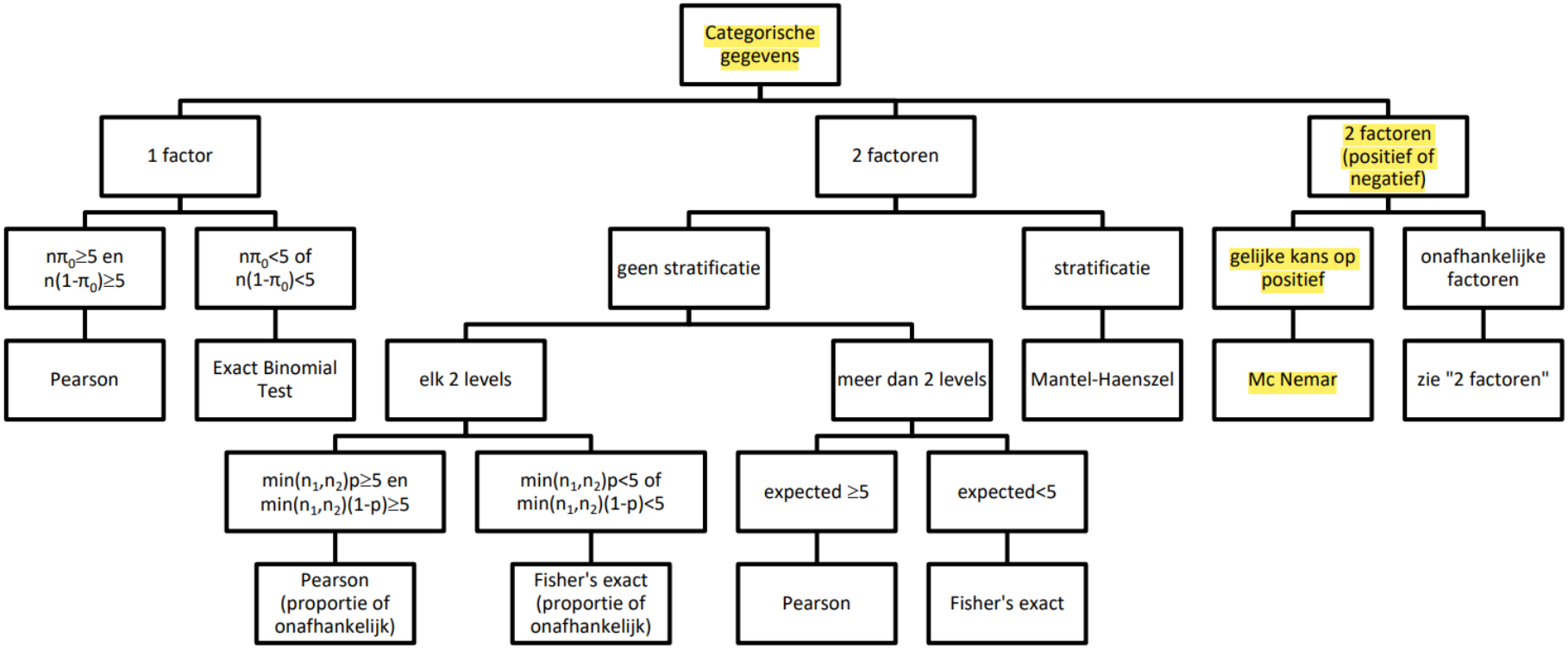
- Voor het inschrijvingsformulier hebben we een officiële titel nodig. Zelf dachten we aan: "the correlation of body perception with pain intensity, disability and psychological factors in the first and third trimester of pregnancy among multiparous women". We horen graag of dit goed is voor u!
- Margo en ik hebben het inventarisatieformulier steeds aangevuld maar er zijn ook nog enkele items die door jullie aangevuld dienen te worden. Het formulier bevindt zich op google drive in het mapje PGP- 2e master, of via de deze link: https://docs.google.com/document/d/1abXMa8IfHdkbjVY78znRtJZ88jptXmaAzocxKM6Zr6I/edit?usp=sharing
- Verder moeten we ook de beslissingsboom die we gevolgd hebben toevoegen als bijlage. Aangezien de correlaties in geen enkele van de beslissingsbomen staat, weten we niet goed welke we best toevoegen?

Indien alles voor jullie in orde is, hebben we enkel nog jullie formele goedkeuring nodig.

Groetjes,
Julie en Margo

4. BESLISSINGSBOOM STATISTIEK




Categorische gegevens
1 factor
2 factoren
2 factoren (positief of negatief)
$n\pi_0 \geq 5$ en $n(1-\pi_0) \geq 5$
$n\pi_0 < 5$ of $n(1-\pi_0) < 5$
geen stratificatie
stratificatie
gelijke kans op positief
onafhankelijke factoren
Pearson
Exact Binomial Test
elk 2 levels
meer dan 2 levels
Mantel-Haenszel
Mc Nemar
zie "2 factoren"
$\min(n_1,n_2)p \geq 5$ en $\min(n_1,n_2)(1-p) \geq 5$
$\min(n_1,n_2)p < 5$ of $\min(n_1,n_2)(1-p) < 5$
expected ≥5
expected<5
Pearson (proportie of onafhankelijk)
Fisher's exact (proportie of onafhankelijk)
Pearson
Fisher's exact