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A comparison of the Fear of Childbirth Scale with the Tilburg Pregnancy Distress Scale to identify childbirth-related fear in a sample of Dutch pregnant women: a diagnostic accuracy comparative cross-sectional study

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Abstract

Background: Because of the considerable negative effects of women’s childbirth-related anxiety, fear and worries, and the time constraints that midwives perceive to assess women’s antenatal emotional wellbeing, it is important that midwives can identify women with a more severe fear of birth with an easy to administer, validated tool.

Objective: To investigate the ability of the two-item Fear of Childbirth Scale (FOBS) to discriminate between pregnant women with and without birth-related fear, compared with the 16-item Tilburg Pregnancy Distress Scale (TPDS).

Methods: A diagnostic accuracy comparative cross-sectional study was performed, comparing two screening tests. Sensitivity, specificity, positive and negative predictive values and accuracy and discriminant property of the FOBS were determined and compared with the TPDS and with the negative affect 11-items TPDS (TPDS-NA) subscale. The TPDS and TPDS-NA were treated as reference standard to establish the discriminative potential of the FOBS for the presence or absence of antenatal birth-related fear.

Participants: A sample of 396 Dutch women with uncomplicated pregnancies.

Results: When compared with the 16-items TPDS, the FOBS showed a higher specificity (95%) than sensitivity (70%) to detect fear of childbirth. The FOBS items had a good predictive ability for fear and worries about the forthcoming birth (79%) and a conclusive ability for negative case-finding (92%). The FOBS showed good accuracy (89%). The FOBS discriminated women who were or were not classified as being fearful according to the TPDS (AUC .86). When compared with the 11 items TPDS-NA subscale, the FOBS validity and accuracy decreased: sensitivity: 51%; specificity 92%; positive predictive ability 65%; negative predictive ability 88%; accuracy 83%; AUC .82.
Conclusion: When compared with the 16-items TPDS, the two-item FOBS shows to be an accurate tool for identifying the presence of antenatal birth-related fear in a sample of Dutch women with uncomplicated pregnancies.

Keywords: antenatal; anxiety; birth; childbirth-related fear; Fear of Birth Scale; Tilburg Pregnancy Distress Scale, tocophobia.
What is already known about the topic?

- Fear of childbirth is common in pregnancy and has detrimental mental health and obstetric effects for women
- Midwives are the ideal healthcare professional to perform antenatal screening for fear of childbirth
- Midwives need an easy to administer, validated tool to identify women with fear of childbirth

What this paper adds?

- This diagnostic accuracy comparative cross-sectional study shows that the two-item FOBS offers the opportunity in midwifery care to adequately identify pregnant women with fear of childbirth, instead of using measures that include manifold items such as the 16-items TPDS.
1. Introduction

Antenatal pregnancy-related anxiety is a unique and a content-specific state anxiety differing from general trait anxiety (Huizink et al., 2004), being characterised by pregnancy-specific concerns and worries and fears about childbirth (Rondung et al., 2016; Brunton et al., 2019). Women may be worried about the health of their baby, the pain during labour, their future role as a mother, about their own appearance, and their changing relationship with their partner (Rondung et al., 2016). Antenatal fear specifically related to the event of childbirth, accounts for a large part of antenatal pregnancy-related anxiety in pregnant women (Klabbers et al., 2017). Although most pregnant women experience some feelings of fear of childbirth (Fenwick et al., 2009), there is also a group of pregnant women who develop severe feelings of childbirth-related fears, anxiety, and worries (Wijma & Wijma, 2016) - that is - tocophobia. Tocophobia has been described as an extreme fear or unreasoning dread of childbirth (Askoy et al., 2015). Factors associated with tocophobia have been reported as anxious personality types, previous sexual abuse, past traumatic birth traumatic experience in health care, previous miscarriages, long duration of infertility, smoking, low social supports and poor partner relationships (O’Connell et al., 2015). In the Netherlands, 16% of healthy pregnant women reported heightened levels of pregnancy-related anxiety in the third trimester of pregnancy, including aspects of the labour and birth process (Fontein-Kuijpers et al., 2016; Westerneng et al., 2017) and 14% reported elevated levels of fear of childbirth at 36 weeks’ gestation (Klabbers et al, 2017). The estimated worldwide prevalence rate for childbirth-related fear has been reported as 14% with increased prevalence rates in recent years (O’Connell et al., 2017). Fear of childbirth can be distinguished in fear that predates pregnancy; fear that results from a previous birth; or as a symptom of antenatal depression (Klabbers et al., 2016). Childbirth-related fear can include fear of pain, fear of being incapable of giving birth, about the risk of injuries, complications and/or mode of birth (Slade et al., 2019), fear of losing control and fear of interactions with healthcare professionals during labour, fear of becoming a parent and fear of death (Klabbers et al., 2016; Slade et al., 2019). Childbirth-related fear can lead to antenatal depression and general anxiety (Fontein-Kuijpers et al., 2017), avoidance or delay of pregnancy (Klabbers et al., 2016), intrapartum pharmacological pain relief (Adams et al, 2012; Koelewijn et al, 2017), a longer duration of labour (Adams et al, 2012), a caesarean section as mode of birth (Adams et al., 2012; Ryding et al., 2015; Koelewijn et al, 2017) and/or a self-reported negative birth experience (Nilsson et al., 2011). There are also several studies showing that pregnancy-specific anxiety (including fear of birth) is related to poor child outcomes and later child (neuro)behavioral problems, that is infant temperamental problems independent of maternal pre- and postnatal general anxiety (Henrichs et al., 2009; Van den Bergh et al., 2017). Women’s antenatal childbirth-anxiety and fear can be so overwhelming that it overshadows pregnancy, and affects the woman’s daily functioning (Lukasse et al., 2014). The above illustrates that the identification of women with severe fear of birth is important so that health professionals are able to provide
supportive, appropriate and timely care and interventions, as alleviating severe anxiety and worries can assist these women in achieving an unfearful or less fearful pregnancy and birth and to reduce the risk to develop persistent anxiety or depression.

In the Netherlands, midwives are ideally placed to engage with pregnant women and to talk about their feelings, worries, concerns and fear of the upcoming birth (Fontein-Kuipers et al., 2014). Midwives have been identified as designated healthcare professionals to screen for the presence of impaired emotional wellbeing and psychological assessments are recommended as part of routine antenatal care (NICE, 2014). Women have identified midwife-led counselling as empowering and have also perceived that it increases their confidence when facing birth (Larsson, 2017). In the United Kingdom (UK), the NHS long term plan (Centre for Mental Health, 2019) aims to increase access to evidence-based care for women with perinatal mental health concerns through maternity outreach clinics which integrate midwifery care and psychological services. It is important to find a tool to accurately identify women with severe fear of childbirth within the midwifery-led context – as until now screening for childbirth-related fear is not integrated in routine midwifery practice (Fontein-Kuipers et al., 2014). Midwives, however, perceive lack of time as a barrier to assess women’s antenatal emotional wellbeing (Fontein-Kuipers et al., 2014; Evans et al., 2017). Midwives and childbearing women might benefit from a pragmatic, standardised, brief, accessible, easy to administer and appropriate tool to identify women with fear of childbirth (Fontein-Kuipers & Jomeen, 2019). An example of such a tool in midwifery antenatal care are the Whooley items, which have shown to adequately identify women with depression and trait-anxiety among a Dutch antenatal population but showed limited diagnostic accuracy for pregnancy and birth-related anxiety (Fontein-Kuipers & Jomeen, 2019).

Various instruments to measure fear of childbirth do exist. Because the Dutch childbearing population has a specific attitude towards childbirth (de Vries et al., 2013), the 16-items Tilburg Pregnancy Distress Scale (TPDS) has been developed and validated in a Dutch pregnant population to capture the experience of childbirth-related fear of Dutch women (Pop et al., 2011; Boekhorst et al., 2019). Psychometric and discriminative properties of the TPDS have reported in numerous studies which evaluated the TPDS as good in terms of test-retest reliability, internal consistency, construct and concurrent validity (Ertugrul et al., 2014; Çapi & Pasinlioglu 2015; Evans et al., 2015; Boekhorst et al., 2019; Volpato et al., 2019). At the moment of the current study, the TPDS was the best available diagnostic tool in the Netherlands. As midwives are known to have limited time to administer measures with manifold items such as the TPDS (Fontein-Kuipers et al., 2014; Sanders et al., 2016; Higgins et al., 2018), there seems to be a need for a tool that is easy and quick to fill in. A feasible tool that is easy and fast to administer, is the Fear of Birth Scale (FOBS), a two-item visual analogue scale that is used to
measure worry and fear among pregnant women in midwifery practice (Haines et al., 2015; Ternstrom et al., 2016; O’Connell et al, 2017). Before it can be considered or recommended to implement this tool in Dutch antenatal care, the FOBS needs to be validated for its utility. Various studies have highlighted the limited research investigating psychometric properties of pregnancy and birth-specific anxiety measures (Meades & Ayers, 2011; Alderdice et al., 2012; Morrell et al., 2013; Evans et al., 2015).

The TPDS was developed and validated among Dutch women and practitioners to create a scale primarily reflecting pregnant women’s experiences of birth-related anxiety and fear (Pop et al., 2011). Although the TPDS is a Dutch developed scale tested within a Dutch childbearing population, the scale is also being used in the UK, Portugal, Brazil, Spain, Turkey and Indonesia (Boekhorst et al., 2019). So far, the FOBS has mainly been used in Sweden and Australia (Haines et al., 2012; Haines et al., 2015; Ternström et al., 2015; Hildingsson et al., 2018) and also concerns a measurement tool addressing birth-related fear from the woman’s perspective - similar to the TPDS. The FOBS is being recognised to be a culturally transferrable tool (Haines et al., 2015). Considered from a multicultural perspective, it is of international interest to compare two scales that are used and validated in culturally different childbearing populations.

2. Aim.
To investigate the ability of the two-item Fear of Childbirth Scale (FOBS) to discriminate between women with and without antenatal birth-related fear, compared with the 16-items Tilburg Pregnancy Distress Scale (TPDS).

3. Methodology
3.1. Design
We performed a diagnostic accuracy comparative cross-sectional study among a sample of Dutch low-risk pregnant women. In this design all participants are all exposed to the same studied test and reference test and the test results in all study subjects are compared with the reference standard (Knottnerus and Mursi, 2003). The data was collected using online self-completed questionnaires. The data were collected between 12 September and 29 November 2018, after the index test (FOBS) and reference standard (TPDS, TPDS-NA) were selected (Knottnerus and Mursi, 2003). We used the Limesurvey software to collect the data. A link to the survey and Quick Response (QR) code were distributed to the participants. The primary outcome variable was the presence or absence of childbirth-related fear and the secondary outcome variable was the presence or absence of negative affect. Reference standards and index test results were available to the researchers.

3.2. Sampling
We did not know in advance which women were experiencing childbirth-related fear but aimed to include participants clinically representative of a Dutch low-risk pregnant population but with similar clinical characteristics. We included women in the Netherlands who received midwife-led primary care. Women receiving this type of care are women with healthy uncomplicated/low risk pregnancies who do not require obstetric care. We included women with a good comprehension of the Dutch language, 18 years of age or older and during any trimester of pregnancy. Women receiving secondary or tertiary care were excluded because it can be expected that when antenatal complications are present or threaten to arise, those women are more susceptible for childbirth-related fear that is related to worries about the woman’s and baby’s health (McCoyd et al., 2019). We used a list-based sampling frame, consecutively recruiting pregnant women through the social media platforms such as websites and Facebook accounts of midwifery practices in the South-West region of the Netherlands, allowing snowballing. To minimise bias, the recruitment title was formulated as “What are your thoughts when you think about labour and birth?”. The title purposively did not include words as ‘anxiety’, ‘worries’ or ‘fear’, to avoid over-representation of women with antenatal birth-related fear.

3.3. Ethics
This study is part of a (interregional) project conducted in the Netherlands and Flanders and the study protocol was reviewed and approved by the Ethics Committee Social and Human Sciences Antwerp (Reference number EA_SHW_17_40_03). According to Dutch legislation, additional ethical approval was not considered necessary (CCMO, 2002). The study was performed in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments and in accordance with the the Higher Education-protocol Assurance Research (Vereniging Hogescholen, 2015). Participation was voluntary and informed consent was obtained before the questionnaire could be completed. Privacy and confidentiality were protected.

3.4. Measurement
3.4.1.1. Fear of Birth Scale (FOBS) – description of the scale
The FOBS is a two-item visual analogue scale, asking to rate feelings about the approaching birth with the question: “How do you feel right now about the approaching birth?” The degree of worry and of fear are assessed in two separate items. Both elements worry and fear are indicated on a 0 to 100 mm scale, with ‘calm’ to ‘worried’ and ‘no fear’ to ‘strong fear’ representing the anchors of the two scales (Haines et al., 2011) based on the Rouhe Visual Analogue Scale (VAS) (Rouhe et al., 2009). (See box 1). The FOBS has been validated in primigravid and multigravid samples of Swedish and Australian populations (Haines et al., 2012; Haines et al., 2015; Ternström et al., 2015; Hildingsson et al., 2019).
3.4.1.2. Fear of Birth Scale (FOBS) – procedure for translation

A bilingual midwifery expert translated the two FOBS-items from English into Dutch. Back-translation was performed by a lay person, unfamiliar with the FOBS. No significant differences in meaning were found between the original English version and the back-translated version. Twelve pregnant women, randomly approached in the existing network of the first author, tested the items for (unambiguous) wording and comprehensibility. The women were encouraged to share their thoughts immediately after answering the two questions, similar to the thinking aloud technique used by Ternström and colleagues (2016). No changes were made.

Box 1. Fear of Birth Scale (FOBS)

<table>
<thead>
<tr>
<th>How do you feel right now about the approaching birth?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please mark with an X on the lines below.</td>
</tr>
<tr>
<td>Calm</td>
</tr>
<tr>
<td>No fear</td>
</tr>
<tr>
<td>Worried</td>
</tr>
<tr>
<td>Strong fear</td>
</tr>
</tbody>
</table>

3.4.2. 16-items Tilburg Pregnancy Distress Scale (TPDS)

The TPDS consists of 16 items and two subscales as it explores the negative affect (TPDS-NA) (11 items) related to the woman’s pregnancy and birth and it explores the woman’s perception of partner involvement (5 items TPDS-PI). The TPDS uses a 4-point rating scale generating a total score ranging from 0 to 48, with higher scores indicating increased birth-related anxiety and fear (Pop et al., 2011). In the Dutch validation study among 599 pregnant women, the TPDS showed good psychometric properties (Pop et al., 2011; Boekhorst et al. 2019).

3.5. Data Analysis

We calculated Cronbach’s alpha to measure internal consistency of all 16 TPDS items and the results were considered as acceptable at $\alpha > .7$, good at $\alpha > .8$ and excellent at $\alpha > .9$ (Field, 2013). When fewer than 10% of the values for an item were missing, values were imputed with sample means. TPDS items 3, 5-7, 9-14 and 16 were reverse coded. We summed the scores of the 16 TPDS and the 11 TPDS-NA items. Based on the total TPDS scores $> 17$, we identified pregnant women with high birth-related fear. Based on the TPDS-NA scores $> 12$, we identified women who reported a heightened negative affect related to labour and birth, the postpartum and general health (Pop et al., 2011). The two-item FOBS values were averaged to give a total score ranging from 0 to 100, with high scores indicating higher levels of worry and fear about the forthcoming birth. We used a total FOBS score $\geq 60$ as a cut-off point to identify women with high levels of worry and fear of childbirth (Hildingsson et al., 2018; Hildingsson et al., 2019). Pearson correlation coefficients were used to investigate the associations between
scores on the continuous measure of the FOBS and the TPDS and TPDS-NA. According to Cohen (1988), \( r < .3 \) are considered small effects, \( .3 > r < .5 \) moderate effects, and \( r > .5 \) large effects. To measure differences between the scores of multiparous and nulliparous women, analysis of variance and Kruskall-Wallis tests were performed.

Scores above the cut-off values were recoded as a binary value of “high levels of birth-related fear” when above cut-off level and “low levels of fear” when below cut-off level. Levels above cut-off points were considered a positive test. We ascertained the rates of “true” and “false” positives and “true” and “false” negatives for the FOBS and TPDS. External validity was assessed using 2 x 2 contingency tables of weighted prevalences. We considered the FOBS items as case-finding questions to assess fear of childbirth. Here, the TPDS and TPDS-NA were treated as the reference standard against which the test was compared; using a positive response to the FOBS as the criterion for the presence of antenatal childbirth-related fear. We performed a primary analysis with the 16-items TPDS and a secondary analysis with the subscale TPDS-NA. As the overall TPDS scale includes items on both distress and the experience of partner involvement we intended to explore in what way the distress items alone (i.e. the TPDS-NA scale) can identify pregnancy-related anxiety.

We used the receiver operating characteristics (ROC) analysis to determine the accuracy of the FOBS, which are reported as area under the curve (AUC). We used Swets' criteria to assess the AUC (Swets, 1988). The AUC of .5 to .6 is defined as bad performance, .6 to .7 as poor performance, .7 to .8 as satisfactory performance, .8 to .9 as good performance, and .9 to 1.0 as excellent performance discriminant ability to correctly classify those with and without childbirth-related fears and worries (Swets, 1988). Statistical analyses were performed using SPSS 25.0 and the MedCalc Diagnostic test evaluation calculator (https://www.medcalc.org/calc/diagnostic_test.php). The validity outcomes based on both cut-off values were compared.

3.6. Sample size
Based on the sample mean and standard deviation from previous studies (Haines et al., 2012; Haines et al., 2015; Ternström et al., 2015; Ternström et al., 2016; Hildingsson et al., 2018; Hildingsson et al., 2019) with a 95 Confidence Interval (CI), we required a minimum of 386 participants to collect data representative of the population.

4. Results
4.1. Characteristics participants
We collected demographic and personal characteristics of the participants in the same
questionnaire, including information on: age, gestation, parity, relationship, ethnicity, occupation and education level. The participants in our study were aged between 19 and 45 years (Mean 30.3; ± 3.83), were predominantly of Dutch origin (97%), while 3% of the sample were not born in the Netherlands or had at least one parent been born in another Western or non-Western country. Most of the participants (65%) had received higher education, were predominantly employed (84%) and in a relationship (99%). The women in our study had a mean gestational age of 26 weeks (± 8.81; range 9 to 41 weeks), 39% of the participants were nulliparous and 61% were parous women, i.e. women who never have given birth and women who have given birth once or more respectively.

4.2. Birth-related fears and worries

We received 396 completed questionnaires (response rate 80%). The questionnaire was predominantly completed by women in the second and third trimester of pregnancy (92.6%) (See Table 1).

The mean total score of the TPDS was 12.54 (± 6.6; range 0 to 37). In both TPDS as well as FOBS, approximately 20% of the participants reported scores above cut-off levels. Visual interpretation of histograms and Q–Q plots showed that the TPDS scores were normally distributed. There were no missing values. Parous women had significant higher mean total TPDS scores and TPDS-NA subscale scores compared to nulliparous women ($p < .05; p < .01$, see also Table 1). The FOBS’ scores showed no significant differences with regard to parity ($p < .28$). No significant differences were found between the scores above the TPDS, TPDS-NA or FOBS cut-off values of nulliparous and parous women ($p < .08$).
Table 1. Demographic and personal characteristics participants (n= 396)

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD ±) range</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age in years</strong></td>
<td>30.28 (±3.83)</td>
<td>19-45</td>
</tr>
<tr>
<td><strong>Gestational age in weeks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimester 1 (&lt;13 weeks)</td>
<td>26.3 (±8.81)</td>
<td>9-41</td>
</tr>
<tr>
<td>Trimester 2 (13-27 weeks)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimester 3 (≥28 weeks)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nulliparous</strong></td>
<td>156 (39.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Parous</strong></td>
<td>240 (60.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Living with partner</strong></td>
<td>392 (99)</td>
<td></td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working (paid) job</td>
<td>333 (84.1)</td>
<td></td>
</tr>
<tr>
<td>Unpaid job</td>
<td>59 (14.9)</td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>4 (1)</td>
<td></td>
</tr>
<tr>
<td><strong>Ethnicity</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch</td>
<td>383 (96.7)</td>
<td></td>
</tr>
<tr>
<td>Other Western country</td>
<td>8 (2)</td>
<td></td>
</tr>
<tr>
<td>Non-Western country</td>
<td>5 (1.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low level of education</td>
<td>42 (10.6)</td>
<td></td>
</tr>
<tr>
<td>Medium level of education</td>
<td>98 (24.7)</td>
<td></td>
</tr>
<tr>
<td>High level of education</td>
<td>256 (64.7)</td>
<td></td>
</tr>
<tr>
<td><strong>TPDS total scores</strong></td>
<td>12.54 (±6.6)</td>
<td>0-37</td>
</tr>
<tr>
<td>Nulliparous&lt;sup&gt;a&lt;/sup&gt;</td>
<td>11.53 (±5.87)</td>
<td>2-29&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Parous&lt;sup&gt;b&lt;/sup&gt;</td>
<td>13.2 (±7)</td>
<td>0-37&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>TPDS scores &gt; 17</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparous&lt;sup&gt;a&lt;/sup&gt;</td>
<td>79 (19.9)</td>
<td></td>
</tr>
<tr>
<td>Parous&lt;sup&gt;b&lt;/sup&gt;</td>
<td>28 (17.9)</td>
<td></td>
</tr>
<tr>
<td><strong>TPDS-NA scores</strong></td>
<td>9.52 (±4.5)</td>
<td>3-30</td>
</tr>
<tr>
<td>Nulliparous&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9.79 (±3.8)</td>
<td>4-25&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Parous&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.37 (±5)</td>
<td>3-30&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>TPDS-NA scores &gt; 12</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparous&lt;sup&gt;a&lt;/sup&gt;</td>
<td>78 (19.7)</td>
<td></td>
</tr>
<tr>
<td>Multiparous&lt;sup&gt;b&lt;/sup&gt;</td>
<td>33 (21.2)</td>
<td></td>
</tr>
<tr>
<td><strong>FOBS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calm (0) – worried (100)</td>
<td>43.3 (±29)</td>
<td>0-100</td>
</tr>
<tr>
<td>Score ≥ 60</td>
<td>83 (21)</td>
<td></td>
</tr>
<tr>
<td>No fear (0) – strong fear (100)</td>
<td>40.8 (±27.8)</td>
<td>0-100</td>
</tr>
<tr>
<td>Score ≥ 60</td>
<td>86 (21.7)</td>
<td></td>
</tr>
<tr>
<td>FOBS total scores</td>
<td>42 (±24.7)</td>
<td>0-100</td>
</tr>
<tr>
<td>Score ≥ 60</td>
<td>89 (22.5)</td>
<td></td>
</tr>
<tr>
<td>Nulliparous&lt;sup&gt;a&lt;/sup&gt;</td>
<td>39.8 (±23.1)</td>
<td>0-100</td>
</tr>
<tr>
<td>Parous&lt;sup&gt;b&lt;/sup&gt;</td>
<td>43.5 (±25.6)</td>
<td>0-100</td>
</tr>
<tr>
<td>Nulliparous&lt;sup&gt;a&lt;/sup&gt;</td>
<td>33 (21.2)</td>
<td></td>
</tr>
<tr>
<td>Multiparous&lt;sup&gt;b&lt;/sup&gt;</td>
<td>45 (18.8)</td>
<td></td>
</tr>
</tbody>
</table>
4.3. Internal consistency TPDS
The 16-item TPDS had an \( \alpha \) coefficient of .80 and the TPDS-NA subscale had a \( \alpha \) coefficient of .71, showing good and acceptable internal consistency (Field, 2013).

4.4. Concurrent validity
The two FOBS items were strongly correlated with a correlation coefficient of \( r .68 (p < .001) \). The FOBS and the TPDS were also strongly correlated with a correlation coefficient of \( r .63 (p < .001) \). The FOBS and the TPDS-NA were moderately negatively correlated with a correlation coefficient of \( r -.46 (p < .001) \).

4.5. Diagnostic accuracy of the FOBS
Agreement between the FOBS and TPDS were analysed using standard diagnostic performance measures: sensitivity (the proportion of true positives correctly identified by the test), specificity (the proportion of true negatives correctly identified by the test), likelihood ratio (shows how much more likely a woman is to get a positive test if she experiences for of childbirth, compared with a woman without fear of childbirth), positive predictive value (the proportion of women with positive test results who are correctly identified) and negative predictive value (the proportion of women with negative test results who are correctly identified). The FOBS items showed a higher specificity than sensitivity: Thirty per cent of women with birth-related fears and worries would go undetected when using the FOBS, while 5 per cent would be incorrectly identified as being worried and fearful. The likelihood ratios indicated that positive FOBS results showed strong evidence to identify women with worries and fears regarding the forthcoming birth. The positive predictive value showed a good predictive ability of the FOBS for antenatal birth-related fears and worries. The negative predictive value showed a rather conclusive ability for negative case-finding results. The FOBS showed good accuracy (Table 2). The discriminant validity of the FOBS is presented in figure 1 and 2. The ROC curves were plotted in function of the false positive rate and showed that the FOBS discriminated women who were or were not classified as being fearful or worried according to the TPDS. The area under the curve AUC .86 (figure 1), measured that the FOBS parameter distinguished between women the presence and absence of birth-related fear against the reference standard cases (TPDS), indicating high discriminant ability and thus good accuracy as a diagnostic test. We observed almost identical
results when the TPDS-NA subscale was used as comparative measure, albeit that sensitivity reduced notably. In this case the sensitivity of the FOBS was 55% and the specificity was 92% (see Table 2 for more detail) and the AUC was .82 (figure 2).

Table 2. TPDS and TPDS NA as indicators for FOBS

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value TPDS all items</th>
<th>Value TPDS NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>True positive (n)</td>
<td>62</td>
<td>49</td>
</tr>
<tr>
<td>False negative (n)</td>
<td>27</td>
<td>40</td>
</tr>
<tr>
<td>False positive (n)</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>True negative (n)</td>
<td>290</td>
<td>281</td>
</tr>
<tr>
<td>Sensitivity (95% CI)</td>
<td>69.66% (59.01 to 78.97)</td>
<td>55.06% (44.14 to 65.62)</td>
</tr>
<tr>
<td>Specificity (95% CI)</td>
<td>94.46% (91.28 to 96.74)</td>
<td>91.53% (87.84 to 94.39)</td>
</tr>
<tr>
<td>Positive Likelihood Ratio</td>
<td>12.58 (7.77 to 20.37)</td>
<td>6.50 (4.30 to 9.82)</td>
</tr>
<tr>
<td>Negative Likelihood Ratio</td>
<td>.32 (.23 to .44)</td>
<td>.49 (.39 to .62)</td>
</tr>
<tr>
<td>PPV (95% CI)</td>
<td>78.48% (69.25 to 85.52)</td>
<td>65.33% (55.50 to 74.01)</td>
</tr>
<tr>
<td>NPV (95% CI)</td>
<td>91.48% (88.68 to 93.64)</td>
<td>87.54% (84.77 to 89.86)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>88.89% (85.37 to 91.81)</td>
<td>83.33% (79.29 to 86.87)</td>
</tr>
</tbody>
</table>

PPV = Positive predictive value; NPV = Negative predictive value

Figure 1. ROC FOBS compared to TPDS
5. Discussion
The scales of the FOBS were shown to be able to effectively and accurately in identifying women with and without birth related fear. These characteristics of the FOBS would make it possible to efficiently identify women needing more extensive evaluation of their antenatal mental functioning and also reduce the number of unnecessary subsequent extensive evaluations.

We used the TPDS as comparative measure with and without the partner support subscale (TPDS-PI) (Pop et al., 2011). Intuitively, the TPDS-NA subscale may be the one most closely related to the particular constructs of fear of childbirth. However, excluding the partner support subscale did not support this concept as overall sensitivity to childbirth-related fear was reduced, suggesting that the origins of antenatal birth-related fears and worries are known to be diverse and include social / partner support (Klabbers et al., 2016; Slade et al., 2019). Because of the significant correlations between the TPDS and FOBS in this study, it can be suggested that
antenatal birth-related fear is rather contextual, not solely focused on the birth (Ternström et al., 2017). This suggests that self-reports of antenatal birth-related fear are influenced by other factors than only birth itself. Our exploration of the TPDS-NA subscale confirmed this thought.

In that respect, the TPDS items provide more insight in the origin or cause of women’s fears and worries when compared to the FOBS. However, women have expressed that in particular disclosing details about their negative feelings towards the unborn child may cause discomfort (Evans et al., 2017). Otherwise, the FOBS showed good evidence to identify women who have antenatal extreme fears and worries about birth in a way that meets women’s needs by using a cut-off point indicating referral without concern of being criticised or being stigmatised. Similar to the Whooley items, the FOBS scores can serve as a tool serving as a start for a dialogue about the woman’s fears and worries (Ternström et al., 2016) and can lead to self-disclosure, which is known to be a positive coping strategy of pregnant women regarding their antenatal emotional wellbeing (Fontein-Kuipers et al, 2015). Women have identified that the use of anxiety and fear instruments helps to prompt an open discussion with their midwife and that midwives can help women to discuss their mental health concerns by providing a safe and supportive context and clearly communicating the purpose of screening tools (Evans et al., 2017). An earlier study showed the need in Dutch antenatal services for a standardised, brief, easy to administer tool to identify women with fear of childbirth, in addition to the Whooley items (Fontein-Kuipers & Jomeen, 2019). Our study has shown that the FOBS would be an appropriate tool to fulfil this purpose. Additionally, our results suggest that the identification of women with fear of birth using the FOBS offers the opportunity for women identified to receive additional support from their midwife.

Addressing feelings and emotions concerning pregnancy or the forthcoming labour and birth reflects the midwife’s unique supportive role in primary antenatal care. However, to facilitate an adequate discussion of women’s emotional wellbeing, an effective and supportive relationship between the woman and the midwife needs to be promoted. This will help women to feel confident to openly and honest discuss their feelings and be supported to, to access further professional services. Continuity of carer can build such a relationship pattern between women and midwives and promote women’s emotional wellbeing (Sandall et al., 2016). To aid the discussion, midwives benefit from training and knowledge of the FOBS, from understanding the importance of discussing birth-related fear and fear, the skills to sensitively address the topic and from knowledge of referral and support services. Undergraduate and post-graduate teaching programmes for midwives should include an awareness of antenatal birth-related fear as well as training in using the effective use of the FOBS. Hence, communication between the woman and the midwife should not be replaced by screening or case-finding tools.
Discussing and preparing for labour and birth usually takes place in the third trimester of pregnancy (NICE, 2008). The representation of women with a mean gestational age of 26 weeks of our participants highlights that women think about labour and birth before the third trimester. This interpretation is likely to be more applicable to parous women (Huizink et al., 2016). An earlier study showed that 16% of pregnant women self-reported pregnancy and birth-related anxiety during the first trimester of pregnancy (Fontein-Kuipers & Jomeen, 2019). This emphasises that it is of merit for women to discuss their birth-related fear and worries sooner rather than later during pregnancy.

5.1. Methodologic strengths and limitations

This is the first study to offer clinically meaningful information on the use of the FOBS among low-risk pregnant women in Dutch midwifery care. The strengths of this study included the use of an adequately powered sample of low-risk pregnant women in midwifery care and of validated questionnaires designed to measure pregnancy and birth-related fear. Our study also had potential limitations that need to be discussed.

First, the self-selective nature of our study population might have led to sampling bias. It is likely that women with insufficient proficiency of the Dutch (written) language or who feel ashamed or embarrassed about their emotions, as birth is socially regarded as a happy event, did not respond to the call for this study. We primarily used (social)media-recruitment where participants entered the study through self-referral rather than being systematically identified through referral from healthcare professionals. Self-selected samples are not necessarily a limitation, especially if the psychometric measures are specifically designed around self-reporting (Paulhus & Vazire, 2011). Additionally, because of the cross-sectional design of the study, post-test probabilities were unknown a priori sample selection bias can be ignored (Knottnerus and Mursi, 2003). Nevertheless, our sample was not fully representative of the Dutch low-risk pregnant population as our sample included fewer women with non-Dutch backgrounds and more women with high levels of education when compared to the general Dutch childbearing population (Statistics Netherlands, 2016: Perined, 2019). Limited representation can be caused by our sampling strategy through social media platforms. Future research should apply population-based systematic recruitment strategies to include diverse groups of pregnant women in a representative manner, e.g. other ethnicities or women with low educational levels, to replicate the accuracy of the FOBS among those groups.

Second, the sample included more parous than nulliparous women. This is similar to previous studies in this area of study (Pop et al., 2011; Ternström et al., 2015; Hildingsson et al., 2018; Hildingsson et al., 2019). Moreover, the distribution of parity in the current sample is similar to that of the Dutch childbearing population (Perined, 2019). As the predictive value of the FOBS is
based on post-test probability, it can be affected by the prevalence of birth-related fear causing a measurement error. However, both our TPDS and FOBS mean scores were similar compared with mid and late pregnancy scores from previous studies (Haines et al., 2012; Ertugrul et al., 2014; Çapik & Pasinlioglu, 2015; Haines et al., 2015; Ternström et al., 2015; Ternström et al., 2016; Hildingsson et al., 2018; Hildingsson et al., 2019; Volpato et al., 2019).

The inclusion of more parous women can be explained by the self-selective nature of the study, assuming parous women to have different expectations of birth compared to nulliparous women (Toohill et al., 2014). There might have been women with negative or traumatic birth experiences among the parous women in our sample or women who experience high levels of parenting stress, influencing their levels of fear. These women might have responded in disproportionate numbers to recruitment posts. However, not all the scores in our study showed to be significantly higher in parous women. On the one hand, nulliparous women tend to score higher on questions related to specific anxiety of giving birth (Huizink et al., 2016) due to low self-efficacy expectancy (Huizink et al., 2016). On the other hand, general higher mean scores have been observed in parous women with a history of an emergency caesarean section or among women with negative previous birth experiences (Rouhe et al., 2009; O’Connell et al., 2015; Haines et al., 2015). As we did not assess the main underlying reasons contributing to fear of childbirth, nor did we assess the participants’ previous birth experiences, we do not know if or to what extent this has influenced our findings. Assessment of previous mode of birth among parous women might be recommended for future studies when measuring birth-related fear. Third, our study population did not include high-risk pregnant women so it remains unclear whether the FOBS would be an appropriate measure to use in antenatal women with complicated pregnancies requiring obstetric-led care. Further studies with case mix are warranted because interpretation of our study results is limited to a homogenous population of low-risk Western well-educated pregnant women – as different sensitivities and specificities can be obtained in different groups or more diverse populations (Van Stralen et al., 2009).

Four, a methodological limitation of our study concerns internal validity lacking comparison with diagnostic interviews. This would offer a richer understanding of the utility and specific meaning of the FOBS items in midwifery practice.

5.2. Conclusion
The FOBS shows good evidence as an appropriate tool for the identification of women with more severe antenatal fear and worries about birth in a sample of Dutch women with uncomplicated pregnancies. Comparing the FOBS with the TPDS, including and excluding the TPDS-PI scale, shows that the FOBS is able to represent women’s more contextual negative thoughts and emotions regarding pregnancy, the postpartum, general health and perceived partner
involvement. The use of routine psychosocial assessment such as the FOBS may offer an opportunity to prompt an open discussion around women’s concerns and worries about labour and birth with their midwife, during any antenatal point in time, and by this facilitate additional support to women displaying these fears. Hence, the use of the FOBS in midwifery practice benefits if effective education is provided to (student)midwives. The FOBS embodies the opportunity to meet the needs of pregnant women and of midwives. Future research among more heterogenous pregnant women, including women with non-Dutch backgrounds, women with a low education level, nulliparous and high-risk pregnant women, as well as collecting data on previous birth experiences and the use of diagnostic interviews is recommended.

Ethical approval
The study protocol was reviewed and approved by the Ethics Committee Social and Human Sciences Antwerp (Reference number EA_SHW_17_40_03).

Conflicts of interest
None.

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