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Research article

The development and validation of the Multidimensional Paternal Perinatal Scale (MPPS)

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ABSTRACT

The limited availability of screening tools for assessing fathers' emotional well-being during the perinatal period warrants the development of a new measure, especially since the existing measurements did not specifically focus on fathers' perinatal experiences. These existing measurements focus on the assessment of clinical symptoms rather than precursors that may negatively impact on perinatal father's well-being. Based on the paternal perinatal conceptual framework, the Multidimensional Paternal Perinatal Scale (MPPS) was developed to identify precursors that contribute to the father's emotional well-being during the perinatal period. This paper examines three steps of measurement development. The first step comprised item development based on the literature and qualitative findings. The second step comprised conducting the qualitative and quantitative judgment analysis of the MPPS content validity. The third step assessed inter-rater reliability. Two versions of the MPPS were developed: the antenatal and postnatal versions. The antenatal version of the MPPS includes 75 items and targets 11 precursors of paternal perinatal emotional well-being, while the postnatal version includes 103 items and targets 13 precursors of poor emotional well-being. The validity analysis showed that both the antenatal and postnatal subscales met content validity requirements. The overall Content Validity Index (CVI) of the antenatal version was equal to .95 for clarity and .99 for relevance, while the postnatal version showed a CVI of .98 for clarity and .93 for relevance. The inter-rater reliability for each of the antenatal and postnatal versions of the MPPS showed an AC2 of .67. The exploratory factor analysis derived a five-factor solution for the ANT-MPPS, and eight-factor solution for POST-MPPS. Both versions of the MPPS showed acceptable internal consistency. Overall, the findings showed adequate indices for content validity and inter-rater reliability of the new Multidimensional Paternal Perinatal Scales. Additionally, the MPPS demonstrated an acceptable construct validity and internal consistency. Results demonstrate that both versions of the scale successfully characterised antecedents of emotional well-being and as such can be used to identify fathers at risk of poor emotional well-being in the antenatal and postnatal environments.

1. Introduction

Goodman (2004) reports that the community prevalence rate of paternal postnatal poor emotional well-being (i.e., depression, anxiety, and stress) is high. Paternal postnatal depression varies between 1.2% and 25% and there is some evidence suggesting that rates are increasing. This prevalence rate of paternal postnatal depression increases to 50 percent when fathers live with mothers experiencing postnatal depression (Ramchandani et al., 2005). A recent meta-analysis conducted by Cameron et al. (2016) provided an updated assessment suggesting that the prevalence of paternal depression is 8.4%. Symptoms of anxiety have also been shown to be common in perinatal fathers. A more recent systematic review found 4%–16% of antenatal fathers are likely to experience anxiety, while 2%–18% of postnatal fathers are likely to report anxiety (Leach et al., 2016). An examination of fathers showed that 14.9% showed psychological distress requiring targeted interventions (Mangialavori et al., 2021). These statistics identify paternal well-being as a community issue that requires tools for screening perinatal fathers for being at risk of poor emotional well-being, and subsequent targeted interventions.

Poor paternal emotional well-being during the perinatal period has a large impact not only on fathers, but also on their families, and the society at large. It has been recognised that fathers' poor emotional well-being has negative impacts on a child's well-being and development.

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For instance, poor paternal perinatal emotional well-being has been linked to a child's hyperactivity, emotional dysregulation and behavioural problems (Davis et al., 2011; van den Berg et al., 2009). Children of depressed fathers are twice as likely to experience psychiatric disorders compared with children of non-depressed fathers (Ramchandani et al., 2008). In addition to the enduring effects on the child, a father's perinatal poor emotional well-being negatively influenced the mothers' emotional well-being. When a father is experiencing poor emotional well-being, the mother is more likely to receive limited emotional and physical support from the father, which impacts on their emotional and intimate relationship (Ramchandani et al., 2005). The impact of poor paternal emotional well-being in fathers is not limited to the child and the mother, but also affects society by reducing fathers' occupational productivity (Hilton et al., 2010). For instance, Deloitte Access Economics (2012) reported on 24,979 Australian fathers experiencing perinatal depression, and estimated a loss of productivity in the order of AUD 223.75 million. These findings highlight the detrimental consequences that poor paternal emotional well-being has on the father's family and the community at large, warranting the development of a measurement for early detection of poor emotional well-being in fathers.

1.1. Existing tools for assessing fathers' poor perinatal emotional well-being

Given the high prevalence rate and the associated negative outcomes on perinatal fathers' emotional well-being, it is important to screen fathers at risk of developing poor emotional well-being (i.e. depression, anxiety and stress). However, the examination of existing measurement tools highlights limitations of currently available measures in early detection of perinatal fathers at risk of developing poor emotional well-being. The two existing tools, Edinburgh Postnatal Depression Scale (EPDS) and Gotland Male Depression Scale (GMDS) measure only the symptoms of depression rather than precursors of poor emotional well-being experienced by perinatal fathers. Furthermore, the two existing tools lack a sound theoretical underpinning and are not sufficiently sensitive for assessing fathers' antenatal and postnatal experiences specifically (Carlberg et al., 2018).That is, the EPDS was originally developed to measure symptoms of depression in mothers, with less focus on somatisation or externalising symptoms, given that these symptoms might be due to childbearing (Cox et al., 1987). This limited focus on fathers' somatic symptoms decreases the sensitivity to identify depression in perinatal fathers, as men are more likely to express depression with somatisation or externalising symptoms. This lack of measurement sensitivity is likely to miss identification in fathers and prevents them from receiving adequate and targeted treatment interventions. The Gotland Male Depression Scale (GMDS) is a screening tool that was originally developed to assess the "depressive equivalent" symptoms in the general male population (Zierau et al., 2002). The GMDS cannot be considered sensitive to the perinatal context given that it focusses on measuring the male "depressive equivalent" symptoms within a general male population.

Additionally, there is evidence that both the EPDS and the GMDS do not detect depression in perinatal fathers, and that some fathers with perinatal depression are not diagnosed. Madsen and Juhl (2007) found that the EPDS detected only 3.1% of fathers experiencing postnatal depression, while the GMDS detected 1.3% of depressed perinatal fathers. When using both tools combined, the EPDS and GMDS detected 2.1% of postnatal fathers experiencing depression. These low detection rates suggest that postnatal fathers experiencing depression remain undetected when using both the GMDS and EPDS screens, which is currently the only assessment tool available. Carlberg et al., (2018) reported similar findings indicating that the EPDS detection of depression in postnatal fathers varied between 8.1% and 13.3%. That is, the higher the cut-off score of the EPDS, the better the EPDS detected postnatal depression in fathers. As for the GMDS, this tool detected 8.6% of fathers with postnatal depression. Carlberg et al. (2018) stated that these findings are difficult to interpret. However, the findings support the notion that "the EPDS and the GMDS measure different aspects of depression and thereby may be associated with different risk factors" (p.727). These low detection rates indicate that both these screens are not sensitive enough for assessing emotional well-being of perinatal fathers. Madsen and Juhl (2007) highlighted the need for a better method to identify fathers with postnatal depression. This paper will address this assessment gap by developing a perinatal father-sensitive tool that is able to assess paternal emotional well-being based on measures of specific perinatal precursors rather than being symptom based.

The above literature highlighted numerous gaps when assessing fathers' emotional well-being. First, there are no existing screening tools that differentiate the type of poor emotional well-being in perinatal fathers (i.e., depression, anxiety, and stress). Second, the existing tools are not father-sensitive, nor specifically developed to assess fathers' emotional well-being within the perinatal context. Third, the existing tools are symptoms-based measurements, and have shown serious limitations in identifying fathers at risk of developing postnatal depression. That is, previous scales assess clinical symptoms while the identification of precursors of paternal perinatal depression has been ignored. In contrast, the development of the Multidimensional Paternal Perinatal Scale (MPPS) was based on a paternal perinatal conceptual framework underpinned by empirical findings. The MPPS is not a symptom-based measure, but focuses on identifying precursors that have been shown to contribute to poor emotional well-being. This screening tool assists in identifying perinatal fathers at risk of developing poor emotional well-being and allows clinicians to target treatment more accurately to the situational issues affecting perinatal fathers. The two versions of the MPPS can be accessed on http://www.mindandbrainresearch.com/.

The MPPS was developed based on the conceptual framework of paternal perinatal experience developed by (Gemayel et al., 2018). This conceptual framework catches most of the predictors of father's poor emotional well-being identified in the literature. The conceptual framework includes several types of factors including:

- Vulnerability factors that are related to the characteristics of the father such as a history of depression, and demographic factors such as unemployment.
- Coping style factors and precipitating factors, which are triggered by the perinatal context.

One of the fundamental distinctions of this conceptual framework is that some precipitating antenatal precursors differs from precipitating postnatal precursors. An example of these precipitating factors are labour concerns and maladjustment to pregnancy, which do not apply to postnatal fathers who already have their baby. In contrast, conflict in the father-child relationship, for instance, is one factor that contributes to poor emotional well-being in postnatal fathers, but not experienced by antenatal fathers as their child is unborn yet. These differences in the precursors of antenatal and postnatal fathers were taken into consideration in the development of the Multidimensional Paternal Perinatal Scale. For this reason, two versions of the MPPS were developed; the antenatal version (ANT-MPPS) targeting the antenatal precursors, and the postnatal version (POST-MPPS) which targets the postnatal precursors. The objective of this paper is to report on the development process of the Multidimensional Paternal Perinatal Scale (MPPS) and to assess its content validity, inter-rater reliability, structural validity, and internal consistency.

2. Methods

This study included three phases; designing the instrument, testing the content validity and assessing the inter-rater reliability based on the judgment of professionals and experts, and finally testing the construct

validity and internal consistency of the MPPS using samples of antenatal and postnatal fathers samples (See Figure 1).

2.1. Stage 1: instrument design

Designing the MPPS included two steps: (1) determining the themes' content and identifying the dimensions; (2) generating items relevant for the specific construct.

2.1.1. Step 1 of stage 1

Determining the Themes' Content and the Construct Dimensions. The perinatal emotional well-being was identified as the construct intended to be measured. To identify the conceptual themes and the underlying dimensions of the selected construct, a combination of two approaches was used; a comprehensive literature review, and interview with fathers who are experiencing the perinatal phenomena. This design was

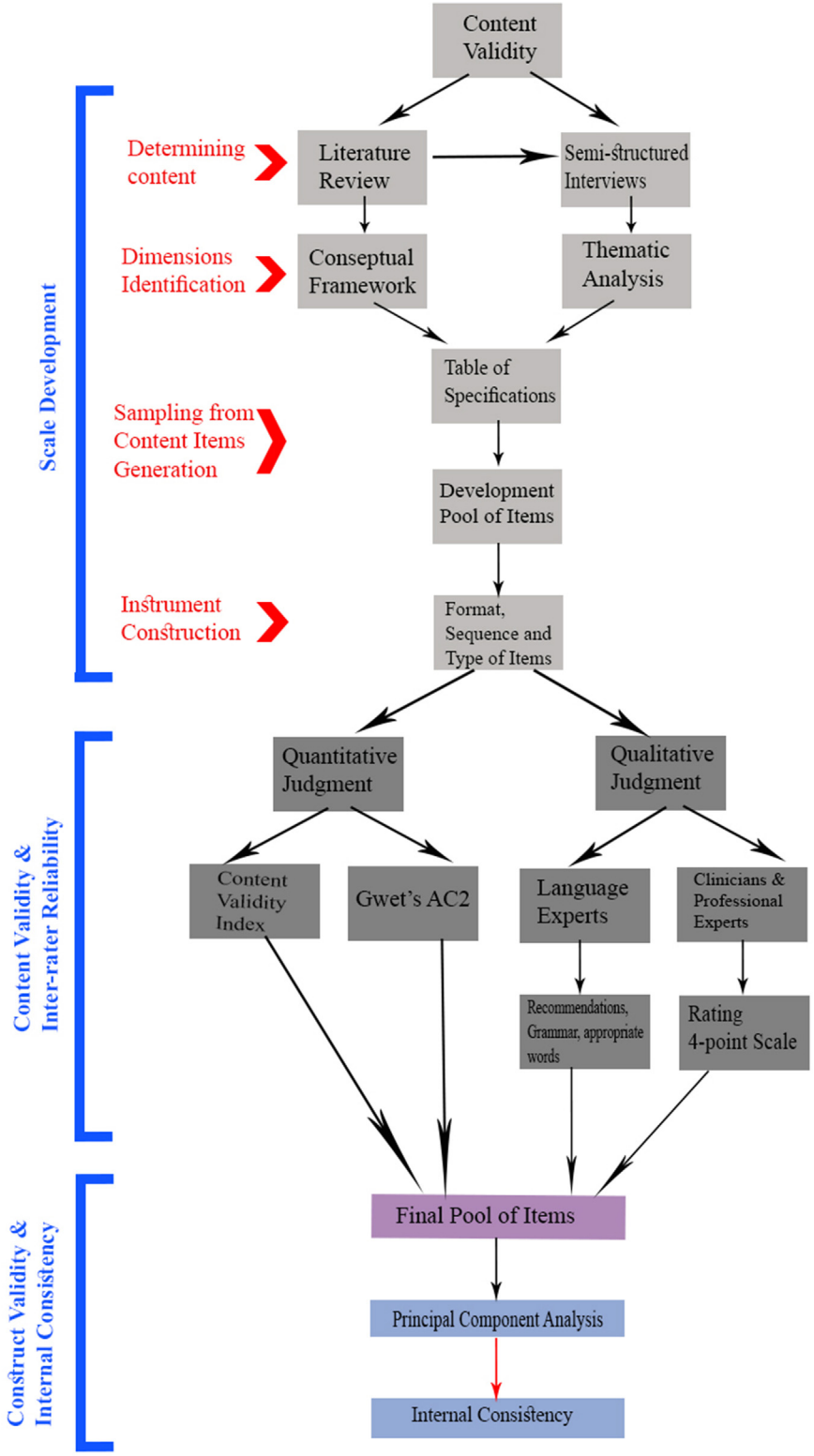

Figure 1. The content validity process adopted in this study to validate the ANT-MPPS and POST-MPPS.

suggested by Zamanzadeh et al. (2015) to gain insights about the dimensions and underlying concepts related to a construct.

In this study, the MPPS is intended to screen fathers at risk of developing mental health problems. However, the limited available literature on fathers' perinatal experiences, and the lack of a targeted conceptual framework for precursors and situational factors, suggested the application of the deductive-inductive approach. Benz et al. (2008) described the deductive-inductive approach for conceptualising the thematic content, i.e. to be consistent with the construct in question, and to ensure items reflect the research question.

This study used the precursors of paternal poor emotional well-being identified in the conceptual framework of Gemayel et al. (2018). The identified conceptual framework included factors that have been shown to affect fathers during both the antenatal and postnatal periods. These factors were further investigated via semi-structured interviews with antenatal and postnatal fathers, and the subsequent thematic analysis of the data identified themes and subthemes. Both the explored conceptual framework and the thematic analysis identified 12 situational precursors related to the antenatal period of fathers and an additional 3 situational precursors related to the postnatal period of fathers (Table 1). Given that the antenatal and postnatal precursors are different, two versions of the MPPS were developed: the antenatal version (ANT-MPPS) and the postnatal version (POST-MPPS).

2.1.2. Step 2 of stage 1

Content Item Generation. In order to limit the often-stated researcher bias in qualitative studies, this study adopted Table of Specifications (ToS), which is rigorous method for generating items and assessing the content validity. The ToS method was used to improves the alignment of the items with the concept theme and evaluates the theme by sampling items relevant to a target theme. The ToS also helped to examine the fidelity of the theme by assessing the transparency and trustworthiness of the scale development process. Applying ToS in this study preserved a review path for the data, sampling, and the evaluation (Newman et al., 2013). The ToS, in this study, included the content themes (e.g., name of the themes, definitions of the themes) with fathers' statements from the semi-structured interviews to generate items for each theme.

Instrument Construction. After generating the items, three decisions were made regarding the item sequence, the item format, and the appropriate type of scoring for the instrument construction.

- *Item Sequence.* The literature suggested two types of item sequencing; the random sequencing of items, or grouping items by topic, but seems unclear on which is a more appropriate approach (Chyung et al., 2018). The debate is about whether to group the items together for each construct, or to use random item sequencing. Presenting the items grouped by topic can bias the result by creating an "artificial high consistency" between the item responses and may inflate the internal consistency within the scale items. In contrast, the random sequencing method inflates the inter-scale correlation. Given that neither of these sequencing methods are superior in overcoming inherent biases, this study applied the randomised item sequencing approach.

  Items Format. Item development need to consider the most appropriate format structure for the new items, that is the wording of the items. There are three item format options for a new instrument, ie. negative items, positive items; or a combination of negative and positive items. Chyung et al. (2018) made the arguments for using positive items to enhance accuracy, but may increase acquiescence bias. In contrast, using a mix of negatively and positively worded items may reduce the potential acquiescence bias (Mathews and Shepherd, 2002), but may impact on the validity and reliability of the instrument (Chyung et al., 2018), and cause response set bias (Podsakoff et al., 2003).

  Schriesheim and Hill (1981) recommended the use of negative items despite the potential acquiescence bias (Cronbach, 1942). Yet, there may be good reasons to apply the negative item format when measuring symptoms of depression, where it is impossible to avoid negatively worded items.

  In this study, given that the MPPS is a multidimensional instrument assessing different themes, it is important to select one item format to avoid format-related item loading when developing a multidimensional scale. Given that the MPPS measures negative attributes, the negatively worded response format was applied. Consistent with previous assessments measuring emotional well being, most measures adopted using negative worded items to assess for depression, anxiety and stress such as, Beck depression inventory (Beck et al., 2014)
- *Scoring Type.* Most of the measurement tools include five to seven response set categories (Shaw and Wright, 1967). Some argue individuals can differentiate between seven categories at one time, but a due to memory span limitations a response category beyond seven categories becomes problematic (Colman et al., 1997). Research has shown that using a 7-point Likert scale optimises the reliability of the instrument (Colman et al., 1997), but the 5-point scale was recommended for item readability by many researchers as it reduces levels of frustration among respondents (Babakus and Mangold, 1992; Marton-Williams, 1986). Other researchers have also argued that a 5-point scale has higher reliability than the 7-point scale (Jenkins and Taber, 1977; McKelvie, 1978). Although evidence for either scale format is mixed, this study adopted the 5-point scale format for its readability to reduce frustration in respondents.

2.2. Stage 2: judgment of the MPPS's content

The second step required the items to be rated against the identified targeted constructs (Yaghmale, 2003). A mix of qualitative and quantitative processes was adopted in developing the MPPS measure (Figure 1). In the first step, qualitative data were used to identify the content themes and generate the item pool. In the second step, a panel of two language experts and three clinical experts were assigned to judge the items of the Multidimensional Paternal Perinatal Scale (MPPS). The pool of items was judged by a panel of professionals who are familiar with the measurement's topics. Literature suggests that 3–10 experts should be consulted and warns that as the number of experts' increases, the more the chance of disagreement increases. In this study, we used two approaches to test the content validity of this instrument. The judgment steps included qualitative and quantitative methods.

Table 1. Periods' content theme.

Antenatal content theme	Postnatal content theme
Father-mother relationship conflict	Father-mother relationship conflict
Responsibilities	Responsibilities
Social and lifestyle Changes	Social and lifestyle Changes
Concerns	Concerns
Expectations	Expectations
Partner's emotional well-being	Partner's emotional well-being
Providing support for partner	Providing support for partner
Father-child relationship difficulties	Father-child relationship difficulties
Lack of support	Lack of sleep
Pregnancy Preparedness	Lack of support
Negative perceptions about the partner	Pregnancy Preparedness
Parental Knowledge	Negative perceptions about the partner
	Child perception
	Birth event perception
	Parental Knowledge

2.2.1. Qualitative judgment

Two English language experts were recruited to assess the items qualitatively for grammatical mistakes, difficult vocabulary, and clarity of the items. This step helped to increase the comprehensibility of the instrument and as a consequence the reliability and validity of the instrument (Safikhani et al., 2013). In the second phase of item evaluation, three clinical psychologists were asked to judge the items qualitatively by comparing the face validity of each of the items with fathers' statements from the semi-structured interviews.

2.2.2. Quantitative judgment

The items were also rated for clarity and relevance to the overall constructs, themes and sub-themes by the same three clinical psychologists. They were asked to score each item based on a 4-point ordinal scale represented in Table 2 below.

2.3. Content validity measures

The quantitative assessment of the MPPS contenct validity adopted the Content Validity Index (CVI) (Tojib and Sugianto, 2006). This method was chosen as this study included three experts to measure the degree of agreement on items between experts.

The Item Content Validity Index (I-CVI) helped to judge the degree of rating agreement on each item in terms of clarity and relevance across the three clinical psychologists. The I-CVI value varied between 0 and 1. This study adopted a minimum I-CVI of.78 as suggested by Lynn (1986).

The Scale Content Validity (S-CVI) adopted the Universal Agreement method was adopted in this study since less than five experts were consulted (Polit and Beck, 2006).

The total of agreement from the three experts was divided by the number of items.

As the CVI measure does not deal with the risk of inflated values due to chance agreement, the Kappa calculation was used to evaluate the MPPS items for greater objectivity and to provide information about the degree of agreement beyond the chance among the experts (Wynd et al., 2003). The modified Kappa calculates first the probability of chance, applying the following formula: Pc = [N!/A! (N-A)!]*.5N (Polit et al., 2007). After calculating the probability of chance (Pc), the Kappa value was obtained using formula K=(I-CVI-Pc)/(1- Pc) (Polit et al., 2007). A modified Kappa value of 0.74 and higher was considered as excellent, while a Kappa value of between 0.60 and 0.74 was considered as good and Kappa value between 0.40 and 0.59 was considered fair (Cicchetti, 1981).

2.4. Inter-rater reliability

This study applied the Fleiss' Kappa benchmark as it is the most common analytical method used for assessing inter-item reliability for categorical rating by three raters (Gisev et al., 2013). Gwet's AC2 was used in this study to calculate the inter-rater reliability, which is more paradox-resistant than alternative coefficients (Gwet, 2014). The inter-rater reliability was calculated for each version of the Multidimensional Paternal Perinatal Scale. The Landis and Koch Kappa standard scale was applied to interpret the Gwet's AC2. The benchmarks for Gwet's AC2 are slight if the coefficient is less than "0.2; fair, if 0.21–0.40; moderate, if 0.41–0.6; substantial, if 0.61–0.8; and almost perfect, if 0.81–1.00" (Landis and Koch, 1977).

Table 2. The 4-point ordinal scale used to rate content validity.

	Clarity		Relevance
1	Not Clear	1	Not relevant
2	Item needs some revision	2	Item needs some revisions
3	Clear but minor revision needed	3	Relevant but minor revision is needed
4	Very clear	4	Very relevant

2.5. Stage 3: assessing the construct validity and internal consistency

The objective if this stage is to test the construct validity of the MPPS on a sample of antenatal and postnatal father. Also, at this stage, the internal consistency of each version of the MPPS was assessed.

2.6. Participants

The Higher Research Ethics Committee of Charles Sturt University approved the current study (Protocol number: H19012). Sample of fathers in this study were recruited through a Facebook advertisement published all over Australia. This recruitment's method was preferred for recruiting the highest number of participants from different states of Australia. An incentive was provided to participants, which was a chance to win one of two gift cards, valued at $50 each. The collection of the data occurred between April 2019 and September 2019.

The initial pool of items was administered to the first sample of fathers, which included 443 participants. The eligibility criteria included fathers (aged 18 years and older) residing in Australia; fathers caring for a pregnant partner or caring for a mother with a child under 12 months. Data was collected through Qualtrics with 141 antenatal fathers completing the antenatal version of the MPPS (ANT-MPPS) and 302 postnatal fathers completing the postnatal version (POST-MPPS). The average time taken to complete the ANT-MPPS was 16.70 min and 21.33 min to complete the POST-MPPS. The majority of the fathers were married (n = 428, 97%). Most of the fathers were aged between 25 and 34 years old (n = 297, 67%). The majority of fathers self-identified as Australian (n = 366, 83%). The sample characteristics are presented in the appendix.

The refined scale was administered to the second sample of participants, which included 497 participants. The number of participants in the study was 198 antenatal fathers aged between 22 and 55 years old (M = 35.43, SD = 8.16), and 299 postnatal fathers aged between 20 and 50 years old (M = 32.59, SD = 5.74). The participants were antenatal and postnatal fathers living in Australia. The fathers self-identified as Australian, American, New Zealand, Spanish, and other cultural backgrounds (see appendix). Most of the fathers were married or in a de-facto relationship, well-educated and employed.

2.7. Instrumentation

The ANT-MPPS assesses the antenatal precursors and the POST-MPPS examines the postnatal precursors implicated in the development of poor emotional well-being. The participants were asked to rate their current perceptions, emotions and behaviours towards specific perinatal challenges using a 5-point Likert scale, 0 (Totally-Disagree) to 4 (Totally-Agree).

2.8. Statistical analyses

Preliminary analyses were conducted on both samples. The samples adequacies were tested before each analysis to confirm that the sample was adequate for each type of analysis conducted in this study. Participants with missing data were not included. Outliers were deleted from the analysis. Further, the normality of the sample distribution was tested using histograms and Q-Q plots. The test of normality was conducted on the antenatal and postnatal versions of the MPPS and found adequate.

At the first step of this study, a Principal Component Analysis (PCA) was conducted for each version of the Multidimensional Paternal Perinatal Scale using the IBM Statistical Package for the Social Science (SPSS-25). Given that the objective of this study is item reduction, the Principal Component Analysis (PCA) was chosen as a method for this study. The

PCA helps reduce a large set of items to smaller item set while retaining as much as possible of the original items (Fabrigar et al., 1999).

The data set was assessed using KMO anti-image analysis with items with a value lower than .5 being deleted. A parallel analysis was performed using Monte Carlo Software to identify the number of dimensions that needed to be retained. Ledesma and Valero-Mora (2007) reported that the parallel analysis is the method with less variability and sensitivity to the different dimensions than other dimensions retention methods (e.g., Kaiser's eigenvalue, Catell's scree test and Velicer's minimum average partial test). The arbitrary rule of Kaiser's method about having an eigen value greater than one, tends to overestimate the number of dimensions that needs to be retained. Cattell's scree plot cannot be considered accurate, especially when the graph is ambiguous and difficult to interpret. Given these issues with other item retention methods, this study used the parallel analysis 95^{th} percentile random data eigenvalue method to determine the number of retained dimensions. This analysis was followed by a PCA with a Promax rotation. The visual inspection helped to refine the cross-loaded items. The items that cross loaded on more than one dimension with a difference higher than .20 between the loadings, were deleted. Also, the items that loaded less than .5 on a dimension were deleted, as it was considered that these items do not contribute to the respective constructs. Finally, a test of internal consistency reliability for each dimension was conducted, where some additional items were deleted to improve the reliability of the scale.

3. Results

3.1. Results of stage 1: designing the Multidimensional Paternal Perinatal Scale

The qualitative findings of Gemayel et al. (2018) were used to design the Multidimensional Paternal Perinatal Scale (MPPS). That is, based on the qualitative findings Gemayel et al. (2018) that identified potential perinatal precursors affecting fathers' emotional wellbeing, items were developed to target these precursors. These precursors were embedded in a conceptual framework to illustrate the fathers' perinatal experience. The conceptual framework includes "vulnerability factors", "precipitating factors", "socio-cultural factors" and "coping strategies" as potential contributors to low emotional wellbeing experienced by fathers during the perinatal period (Gemayel et al., 2018) The literature has shown that the antenatal experiences of fathers are different from their postnatal experiences. That is, some challenges are experienced differently by antenatal fathers and postnatal fathers (Gemayel et al., 2018). Given these differences, two versions of the scale were developed: namely the antenatal and postnatal versions. The antenatal version addresses the antenatal precursors that expecting fathers may experience; whereas the postnatal version measures the precursors of the postnatal period.

Using the Table of Specification (ToS), definitions of the themes were developed, and several items were created to measure these themes (Table 3).

3.2. Results of stage 2: experts' judgment of the content validity of the Multidimensional Paternal Perinatal Scale

3.2.1. Qualitative judgment of content validity

Two language experts provided several suggestions about the clarity and comprehensibility of the item wording. These suggestions were taken into consideration and the necessary changes were applied to the identified items. The three clinical psychologists with clinical expertise assessed the face validity of each item against the respective theme areas using the ToS format.

3.2.2. Quantitative judgement of content validity

Based on the clinicians' quantitative feedback, the I-CVI was calculated for each item measuring clarity and relevance. Items in the antenatal version of the MPPS with an I-CVI of below 1.0 were removed from the item pool. This affected Item 48, which had an I-CVI of 0.66, and four other-items-were-removed for lack of clarity. Items 11 and 14 received an I-CVI of 0.33 each, and Items 17 and 76 had an I-CVI of 0.66. The remaining 75 items scored an I-CVI of 1 on clarity and relevance. For the postnatal version of MPPS, Items 26 and 96 were deleted for having a clarity I-CVI of 0.66 each, and Items 6, 7, 10, 57, 96, 97, 101 were eliminated for receiving a relevance I-CVI of 0.66 each. The remaining 103 items showed clarity and relevance I-CVIs of 1.

The Scale Content Validity (S-CVI) of universal agreement (UA) was adopted in this study to assess the universal agreement among all the experts. The ANT-MPPS showed a clarity S-CVI of .95 and a relevance S-CVI of 0.99. The POST-MPPS also showed a clarity S-CVI of .98 and a relevance S-CVI of 0.93. In the validity literature, attaining 80% agreement is considered satisfactory for having confidence in a new measurement tool when assessing face validity, content validity, and expert judgement (Newman et al., 2013). Based on the reported findings, both versions of the MPPS achieved acceptable content validity.

Item evaluation using the Kappa benchmark showed that the ANT-MPPS Item 48 received a Kappa of .47, which indicates that agreement might be due to chance. In the POST-MPPS, Items 6, 7, 10, 57, 96, 97, 101 scored a Kappa of 0.47 each. These items were deleted as they had a Kappa value below .59. This process of assessing items against CVI and Kappa shows that all deleted items were consistently identified by both benchmark measures, which provides a degree of confidence for the accuracy of these analyses.

3.3. Inter-rater reliability

Gwet's AC2 was applied to each version of the MPPS. The results show that each of the ANT-MPPS and POST-MPPS had an overall AC2 of .67, indicating that both versions of the MPPS have an acceptable inter-rater reliability (Gwet, 2014).

3.4. Results of stage 3: examination of MPPS' construct validity and internal consistency

3.4.1. Exploratory factor analysis of ANT-MPPS

Before conducting the Principal Component Analysis, the data was checked for outliers and a test of internal consistency was conducted, which resulted in a Cronbach Alpha of .95. According to Tavakol and Dennick (2011), a Cronbach Alpha of higher than .95 indicates the existence of redundant items. A preliminary assessment was conducted on the antenatal data of the MPPS. The KMO and Bartlett's Test, which is a test of assumptions, showed a Kaiser-Meyer-Olkin Measure of Sampling Adequacy of .822, suggesting sufficient items for each factor. Bartlett's Test of Sphericity demonstrated an approx. Chi-square = 6997.564, df = 2775, p = < .001. These tests confirmed the data suitability for a Principal Component Analysis (PCA). Seventeen dimensions with eigenvalue >1 accounted for 71.68% of the variances.

Analysis of anti-image correlations stemmed in the deletion of two items as their KMOs were less than .5 (Item 54 = .253a, Item 12 = .433a). After deletion of these 2 items, KMO and Bartlett's Test showed a Kaiser-Meyer-Olkin Measure of Sampling Adequacy of .845. After that, the Communalities of less than 0.3 were deleted as they were not significantly adding to the variance.

The parallel analysis using the 95th percentile random data eigenvalue method suggested extracting 5 dimensions. Then, a PCA with an oblique rotation (ProMax) and 5-factor solution was performed. This rotation was chosen since some of the dimensions correlated above .32 and less than -.32. This solution explained 46.83% of the variance. An examination of the pattern matrix helped to further refine the antenatal version of the Multidimensional Paternal Perinatal Scale. The items that cross-loaded on more than one factor with a difference of .20 were deleted. All items that loaded less than .5 were considered non-contributory to the explanation of a single factor uniquely. Moreover,

Table 3. Definition of themes and samples of items.

Precursors	Definition	MPPS Version	Sample Items
Father-mother relationship	The quality of relationship between parents during the antenatal and postnatal periods (e.g., agreements and disagreements about affection, spending time together, and sexual relationship).	Antenatal & Postnatal	Since my partner's pregnancy, my partner and I are often in disagreement./I feel that since the childbirth, my partner has not been spending much time with me./Since childbirth, the sexual relationship between us has reduced significantly.
Responsibilities	Duties, tasks, and obligations that the father has towards the child and the partner during the antenatal and postnatal periods.	Antenatal & Postnatal	I will have several responsibilities for the child following birth./I'm overwhelmed by obligations I have towards my child.
Social and lifestyle changes	The changes that happen to the lifestyle, i.e. way of living (e.g., not doing many activities or going out) and social life (e.g., meeting friends) of new fathers during the antenatal and postnatal periods.	Antenatal & Postnatal	I think my social life has reduced since pregnancy./My lifestyle has changed considerably since childbirth
Concerns	Fathers' worries about the child's health, the birth event and taking care of the child.	Antenatal & Postnatal	I have concerns about the childbirth/I was concerned about our child's health during the birth phase.
Expectations	Father's perception of the mother, the family, and the community expectations towards him.	Antenatal & Postnatal	I feel that the expectations put on me exceed my capacity./I worry about not being a good father./I believe my partner has many expectations of me as a new father.
Partner's emotional well-being	How the new mother's emotional wellbeing (e.g., depression, anxiety, stress) affects the new father during the antenatal and postnatal periods.	Antenatal & Postnatal	My partner is going through emotional issues./It is not easy having to deal with my partner's emotional issues.
Providing support for partner	During the antenatal and postnatal periods, fathers provide support (e.g., emotional, instrumental, financial) for the partner–more than usual.	Antenatal & Postnatal	Since my partner's pregnancy, I have been providing her with extra physical support./I have been giving extra emotional support for my partner since childbirth.
Lack of sleep	Disturbance and lack of sleep that fathers experience during the postnatal period due to the baby crying and waking-up.	Postnatal only	I'm tired from waking up at night when my baby cries
Lack of support	During the perinatal period, new fathers do not find support from the partner, family, community, and government.	Antenatal & Postnatal	I did not find the desired support from health professionals./I want my family to support me as a new father.
Pregnancy Preparedness	Father did not plan or be prepared for having a new child.	Antenatal & Postnatal	I wish the pregnancy had been planned
Negative perceptions about the partner	Negative perceptions or views that the father has of his partner.	Antenatal & Postnatal	I wish my partner stayed the way she was before the pregnancy. I wish I was more prepared to have a new child.
Negative perceptions about the child's perception	Negative perceptions or views that the father has about his child.	Postnatal only	I sometimes get frustrated because of my child's behaviour
Parental Knowledge	Beliefs or judgments that new fathers hold and make of their capabilities to organise and execute a set of tasks related to child parenting.	Antenatal & Postnatal	I wish I had access to information that would help me learn how to take care of our child./I think having too much information about taking care of a child stresses me.

all items that did not load on any of the 5 dimensions were deleted. The PCA refinement process resulted in a 36-item scale and 5-factor solution, explaining 56.77% of the variances. Nonetheless, to provide supplementary validation of the PCA data reduction solution, further factor analysis was conducted on the data. Principal axis factoring with Promax rotation showed a highly similar dimension structure. The dimension and item loadings resulting from the PCA are presented in Table 4 below.

The underlying 5 dimensions identified through the PCA process can be labelled as follows:

Dimension1: Father-Mother Relationship
Dimension 2: Parental Competency
Dimension 3: Father-Mother Sexual Relationship
Dimension 4: Expectations
Dimension 5: Father's support of the mother

An examination of the component matrix showed that most of the dimensions have a negligible association, ranging from 0 to .20. However, there is a weak association between the dimensions of father-

Table 4. Subscale/Item and dimension loadings for the ANT-MPPS.

Subscale and items	Loadings
Father-mother relationship (Variance = 10.77%, α = .94)	
I find it difficult to deal with my partner's emotional issues.	.941
I am struggling with the emotional issues of my partner.	.894
It is a challenge having to deal with my duties towards my partner.	.880
I find it challenging to give support for my partner since pregnancy.	.793
Since her pregnancy, I find it challenging to carry out my partner's requests.	.771
Because of my partner's emotional issues, my responsibilities are overwhelming.	.771
Since her pregnancy, I find my partner somewhat demanding.	.720
Since my partner's pregnancy, my partner and I have been facing relationship conflicts.	.719
Since my partner's pregnancy, my partner and I are often in disagreement.	.697
My partner is going through emotional issues.	.680
I am tired of supporting my partner, since her pregnancy.	.665
Since the pregnancy, I am finding it difficult to deal with the changes in my lifestyle.	.653
I feel that since the pregnancy, my lifestyle changes are causing me stress.	.651
I have not found the rightful support as a new father.	.593
I have financial concerns about taking care of our child.	.547
Parental Competency (Variance = 3.58%, α = .85)	
I wish I knew how to take care of our newborn.	.812
I wish I had access to information that would help me learn how to take care of our child.	.775
I should attend antenatal classes and read books that teach me how I must take care of our child.	.765
I must learn how to take care of our child.	.749
I need someone such as; my partner, a family member or a friend so they can explain to me how I can take care of our child.	.747
I wish I was more prepared to have a new child.	.643
Father-mother sexual relationship (Variance = 2.49%, α = .84)	
Since my partner's pregnancy, the change in our sexual relationship is disturbing me.	.833
Since my partner's pregnancy, I am unable to deal with the changes in our sexual relationship.	.788
Since my partner's pregnancy, I have become dissatisfied by the change in our sexual relationship.	.766
Since the pregnancy, I have a mix of both positive and negative feelings towards the change in our sexual relationship.	.691
Since the pregnancy, I am incapable of accepting the changes in our sexual relationship.	.681
I am worried that my partner will have a caesarean.	.562
Expectations (Variance = 1.90%, α = .71)	
I think my family expects a lot from me as a new father.	.714
I have high expectations of myself as a new father	.705
I assume the community has many expectations of me as a new father.	.631
As a new father, I believe my partner expects a lot from me.	.614
I have numerous obligations and commitments towards my partner.	.595
Father's support to the mother (Variance = 1.68%, α = .63)	
Since my partner's pregnancy, I am providing her with extra emotional support.	.781
I got used to providing extra support to my partner.	.693
Since my partner's pregnancy, I am providing her with extra physical support.	.638
I am trying my best to help my partner cope with her emotional issues.	.574
Overall Scale ANT-MPPS (Variance = 56.77%)	

Note. Variance = stated as a percentage of the total variance accounted for by the subscale. Cronbach's alpha is reported for each subscale, the overall scale and interpreted as ".60–.69 = poor-reliability; .70–.79 = moderate/fair reliability; .80–.89 = moderately high/good reliability; .90 and over = high/excellent" (Murphy and Davidshofer, 2001, p.13).

mother relationship and expectations (r = .362). Additionally, a moderate association is found between the dimensions of father-mother relationship and father-mother sexual relationship dimensions (r = .551). The associations can be seen in Table 5 below.

The internal consistency of each subscale was also tested. The internal consistency of the ANT-MPPS subscales ranged from acceptable to excellent reliability (range between .708 to .941). Only the father providing support to the partner showed a low Cronbach alpha value of

Table 5. Dimensions correlation matrix of ANT-MPPS.

Dimensions	Father-Mother Relationship	Parental Competency	Father-Mother Sexual Relationship	Expectations	Father's support to the mother
Father-Mother Relationship	1.000				
Parental competency	0.208	1.000			
Father-Mother Sexual Relationship	0.551	0.141	1.000		
Expectations	0.362	0.206	0.119	1.000	
Father's support to the mother	0.110	0.013	0.017	0.102	1.000

.635. Given that the ANT-MPPS is a multidimensional measure, this study focused on the internal consistency for each sub-scale with the correlation matrix above showing that each sub-scale examines a unique construct (Table 5).

3.4.2. Exploratory factor analysis of the POST-MPS

Item reduction of the postnatal version of the Multidimensional Paternal Perinatal Scale started with a Principal Component Analysis (PCA). A preliminary analysis was performed to test the adequacy of the sample. Before the Principal Component Analysis (PCA) the data was analysed for PCA suitability using the KMO and Bartlett's test The Kaiser-Meyer-Olkin Measure of .886 and the Bartlett's Test of Sphericity demonstrated an approx. Chi-square = 16846.983, df = 5253, p = < .001 permit PCA analysis. The PCA with Varimax rotation showed 25 dimensions with eigenvalue >1 and accounted for 67.573% of the variances.

Inspection of anti-image correlations stemmed in the deletion of two items as their KMO was less than .5 (Item 77 = .429a, item 82 = .439a). After deleting these 2 items, KMO and Bartlett's Test showed a Kaiser-Meyer-Olkin Measure of Sampling Adequacy of .890.

A parallel analysis was performed to identify the number of dimensions that had to be extracted. Using the 95th percentile random data eigenvalue, the parallel analysis suggested extracting 8 dimensions. Then, a PCA with an oblique rotation (ProMax) and 8-factor solution was performed. As some of the 8 sub-scales were correlated, an oblique rotation (Promax) was performed.

Items that did not load on the 8 dimensions and items that loaded on more than one factor with a difference of .20 were also removed The final measure resulted in a 50-item scale with eight sub-scales, explaining 55% of the variance.

The dimensions and items loading that resulted from the PCA are presented in Table 6 below.

The underlying 8 dimensions identified through the PCA process can be labelled as the following

Dimension 1: Father-Mother Relationship
Dimension 2: Birth Event Concerns
Dimension 3: Fatherhood Changes
Dimension 4: Parental Competency
Dimension 5: Lack of Support
Dimension 6: Partner's emotional wellbeing
Dimension 7: Fatherhood responsibilities
Dimension 8: Expectations

The examination of the component's matrix demonstrates low to moderate association between the dimensions as depicted in summary Table 7.

The internal consistency of the POST-MPPS subscales ranged from acceptable to excellent reliability (between .60 and .91).

4. Discussion

4.1. Content validity & inter-rater reliability

The antenatal and postnatal versions of the Multidimensional Paternal Perinatal Scale (MPPS) appear to have good content validity. Most of the ANT-MPPS and POST-MPPS items demonstrated an excellent Kappa and an appropriate I-CVI. As for the overall content validity of the ANT-MPPS and POST-MPPS, both demonstrated a satisfactory content validity, given that their S-CVI was higher than 80% (Newman et al., 2013). The agreement between the experts ranged between 93% and 99%. This provides further confidence in the newly developed measurement tool. Additionally, the use of mixed methods to establish the content validity of ANT-MPPS and POST-MPPS improved its evaluation, as suggested by Flick (2011). The content validity was confirmed through the assessment of the inter-rater reliability. The ANT-MPPS and POST-MPPS demonstrated a substantial inter-rater reliability, given that both versions of the MPPS have an AC2 of.67 (Gwet, 2014).

The content validity process resulted in a 75-item scale for the antenatal version of the Multidimensional Paternal Perinatal Scale (ANT-MPPS). The 11 antenatal precursors sub-scales include; father-mother relationship, responsibilities, the lifestyle and social, lack of parental knowledge, pregnancy preparedness, lack of support, negative perception about the partner, partner's low emotional well-being, providing support to the partner, expectations, concerns, and father-child relationship. The postnatal version of MPPS consists of 103 items addressing 13 postnatal precursor sub-scales. The POST-MPPS differs from the ANT-MPPS by two additional precursor sub-scales related specifically to the postnatal period, namely, lack of sleep and having negative perceptions about the child.

4.2. The construct validity and internal consistency of antenatal version of the Multidimensional Paternal Perinatal Scale (ANT-MPPS)

4.2.1. Identified dimensions in ANT-MPPS

The findings of this study demonstrate that the ANT-MPPS has five well defined and internally consistent sub-scales, which includes 35 items. According to DeVellis (2016), each sub-scale is named based on the items reflecting the highest loading. The 5 sub-scales for the ANT-MPPS are named: father-mother relationship, parental competency, father-mother sexual relationship, expectations and father's support of the mother.

4.2.2. ANT-MPSS dimension internal consistency

The five sub-scales of ANT-MPPS are internally consistent. The internal consistency of each subscale in the antenatal version showed an acceptable Cronbach's alpha above .70. Only the father support to the mother dimension demonstrated a poor Cronbach's alpha of .635. This could be due to the low number of items (Tavakol and Dennick, 2011), as in this dimension, there were only three items.

4.2.3. Evaluation of the ANT-MPPS precursors

The antenatal version of the MPPS consisted originally of eleven precursors based on the qualitative information which assisted in the development of the item pool. The subsequent principal component analysis reorganised the items based on statistical loadings across 5 different dimensions; the father-mother relationship, which includes the time that the father and mother spend together and the changes in the sexual relationship since the pregnancy; the responsibilities that the father feels for the mother and the child; lifestyle and social changes; parental knowledge; pregnancy preparedness; lack of support; negative perception about the partner; the partner's emotional well-being; providing support to the partner; and the father's self-expectations as well as the expectations that the community and the mother put on the father; child birth event and the child care concerns; and lastly, father-child relationship.

Father-mother relationship. The findings established that all three items loaded on ‘father-mother relationship’ related to a) father and mother enjoyed each other's company, the partner's emotional well-being, father providing support to the partner, and lifestyle and social changes. The father-mother relationship dimension accounted for the largest accounted variance in the antenatal version of the Multidimensional Paternal Perinatal Scale (ANT-MPPS). This finding is consistent with previous studies, in which high correlations suggests that father's marital relationship dissatisfaction contributed to low emotional well-being (Bielawska-Batorowicz and Kossakowska-Petrycka, 2006; Boyce et al., 2007).

Father-mother Sexual Relationship. Although sexual relationship changes are related to the mother the items enquiring about this challenge loaded on a different dimension than father-mother relationship. This dimension was labelled “father-mother sexual relationship”. This finding suggests that fathers consider sexual relationship changes as a

Table 6. Subscale/Item and Dimension's Loadings for the POST-MPPS.

Subscale and items	Loadings
Father-mother relationship (Variance = 10.38%, α = .91)	
The changes in the sexual relationship with my partner since childbirth, is worrying to me.	.946
Since childbirth, I'm worried about the sexual relationship's changes with my partner	.918
I find it extremely hard to accept the sexual relationship changes with my partner, since childbirth.	.893
I find that, since childbirth, I am unable to deal with the changes in our sexual relationship.	.832
Since childbirth, the sexual relationship between us has reduced significantly.	.725
Since the childbirth, I keep feeling ignored by my partner.	.649
I feel frustrated at my partner for spending less time with me.	.645
Since the childbirth, I am not feeling as close to my partner as before.	.633
I feel that since the childbirth, my partner is not spending much time with me.	.608
Birth event concerns (Variance = 3.41%, α = .82)	
I was very worried during the birth event.	.852
I was overwhelmed by the complication that occurred during the childbirth event.	.761
I was anxious during the childbirth process.	.754
I thought I would lose my partner during the birth event.	.675
I was concerned about our child's health during the birth phase.	.633
I was distressed because my partner had a caesarean.	.556
I had a mix feeling of both positive and negative during the birth event.	.546
I felt extremely frustrated during the birth phase.	.527
Fatherhood changes (Variance = 3.01%, α = .83)	
I am tired when I have to wake up to the baby during the night.	.792
My lifestyle has changed considerably since childbirth	.766
I find it is difficult to adjust to the lack of sleep.	.656
I feel I am tired after spending time with our child.	.652
My social life has changed considerably since childbirth.	.644
I do much less activities than I used to before childbirth.	.630
I am fatigued by the responsibilities I have for our child.	.609
I found that being a father is stressful.	.523
Parental competency (Variance = 2.56%, α = .82)	
I need to learn how to take care of our child.	.769
I need prenatal classes that can teach and guide me on how to take care of our child.	.734
I wish I knew how to take care of my newborn.	.705
I need someone like my partner, a family member or a friend to teach me how to take care of our child.	.630
I think having information on taking care of a child would help me in parenting.	.620
I wish I had access to information that would help teach me to take care of our child.	.551
I am concerned about taking care of our child.	.505
Lack of support (Variance = 2.24%, α = .85)	
I did not find the desired support from health professionals.	.885
I did not find suitable support from health professionals.	.867
I do not think the health professionals were supportive during the birth event.	.706
I did not find the support needed.	.656
I have not found the appropriate support as a new father.	.639
Partner's emotional well-being (Variance = 2.00%, α = .74)	
My partner is going through emotional issues.	.814
Because my partner is experiencing emotional issues, I have more responsibilities than usual.	.724
I am trying to support my partner through her emotional issues.	.667
It is not easy having to deal with my partner's emotional issues.	.585
I noticed that my partner has changed since childbirth.	.554
Responsibilities (Variance = 1.67%, α = .61)	
I am providing our child with emotional support.	.715
I got accustomed to providing extra support to my partner.	.602
Following our baby's birth, I have numerous physical responsibilities such as; taking care of, changing nappies, feeding, bathing and much more.	.583
I got accustomed to our child.	.580
I have several responsibilities towards our child.	.572
Expectations (Variance = 1.56%, α = .71)	
I think the community have high expectations of me as a new father.	.829
I think my family have high expectations of me as a new father.	.816
I believe my partner has many expectations of me as a new father.	.622
Overall Scale POST-MPPS (Variance = 54.73%)	

Note. Variance = stated as a percentage of the total variance accounted for by the subscale. Cronbach's alpha is reported for each subscale, the overall scale and interpreted as ".60–.69- = poor reliability; .70–.79 = moderate/fair reliability; .80–.89 = moderately high/good reliability; .90 and over = high/excellent" (Murphy and Davidshofer, 2001, p.13).

distinct challenge and seemed independent from other types of father-mother relationship. This is supported by the findings from the semi-structured interviews where fathers expressed the view that their reduced sexual relationship was influenced by their believes of protecting the unborn child by limiting the frequency of their sexual intercourse. These changes in the sexual relationship with the partner were seen as challenging by fathers and are likely to impact on their emotional well-being. This assertion is supported by Boyce et al. (2007) and Buist et al. (2003) who reported that sexual relationship changes are a factor for low emotional wellbeing of perinatal fathers.

Parental competency. The dimension of parental competency comprised items related to parental knowledge, childcare concerns and pregnancy preparedness. Boyce et al. (2007) suggested that parental knowledge act as a protective factor against poor emotional well-being in perinatal fathers. In this study, the lack of parental knowledge associated with the expressed concerns of antenatal fathers to cope with the demands of the newborn is examined by the parental competency sub-scale. As the pregnancy preparedness items loaded on the same sub-scale suggests that the lack of knowledge might also be linked with being unprepared to become a father.

Expectations. This sub-scale included items that explores expectations by the mother, family and society of fathers. As conceptualised in the framework of Gemayel et al. (2018), today society is evolving and fathers' are expected to be more practically involved with raising the child and assisting their partners during the perinatal period (e.g., helping with the household chores). Fathers are likely to find these expectations challenging and difficult to fulfil. Fathers may feel overwhelmed when the exceed their capacities (Barclay and Lupton, 1999), which may negatively influence their emotional well-being.

The Providing Support to the Partner dimension assessed the emotional, financial, and physical support provided by antenatal fathers. Historically, fathering attitude focused on providing only material support (Gemayel et al., 2018), while contemporary fathers as demonstrated in this study are expected to provide not only financially, but also physical and emotional support to their partner.

4.3. The construct validity and internal consistency of postnatal version of the Multidimensional Paternal Perinatal Scale (POST-MPPS)

4.3.1. Identified dimensions in POST-MPPS

The POST-MPPS has eight well defined and internally consistent sub-scales, which includes 50 items. Similarly to the ANT-MPSS, the sub-scales were labelled based on the recommendation of DeVellis (2016) with the highest loading items of the dimensions determining the naming of the sub-scale; father-mother relationship, birth event concerns, fatherhood changes, parental competency, lack of support, partner's emotional wellbeing, fatherhood responsibilities and expectations.

4.3.2. POST-MPPS dimension internal consistency

The POST-MPPS sub-scales are internally consistent with each subscale in the postnatal version showing an acceptable Cronbach's alpha of above .70. Only the fatherhood responsibilities dimension showed a Cronbach's alpha of .60. Tavakol and Dennick (2011) explained that the main reasons of poor Cronbach's alpha are low-item numbers, poor inter-relatedness between items, or heterogeneous-constructs. In this study, the poor Cronbach's alpha might be related to heterogeneousness of the items within this sub-scale. That is the fatherhood responsibilities sub-scale has only four items measuring the emotional and physical responsibilities of fathers towards their child, while one item addresses the father's responsibilities towards the partner. The fatherhood responsibilities sub-scale may require further attention in future studies.

4.3.3. Evaluation of the POST-MPPS precursors

As part of the sub-scale evaluation, it is important to consider the Post-MPPS sub-scale consistencies and inconsistencies with the previous literature and the conceptualised framework.

Father-mother Relationship enquires about two precursors; the time that the father spends with his partner and the sexual relationship changes. These precursors explained most of the variance, which indicates the centrality of the mother-father relationship in the postnatal experience. These findings are not surprising because previous literature (Bielawska-Batorowicz and Kossakowska-Petrycka, 2006) highlighted the importance of marital satisfaction and the effect it has on the father's postnatal emotional well-being.

Birth Event Concerns. The 'birth-event concerns' addresses the father's perceptions about the birth event, and his concerns of the birth event. Excessive worries and concerns about the birth event might negatively affect father's emotional well-being, especially when the birth event is coupled with complications (Greenhalgh et al., 2000; Pedersen et al., 1981). In such situations, fathers are likely to experience a mix of negative and positive feelings.

Fatherhood Changes. After the childbirth, fathers reported changes in terms of their social life and their lifestyle. The items related to these changes loaded on one dimension labelled "fatherhood changes". The conceptual framework suggests that unprepared fathers found changes in their daily life following the child's birth as a demanding challenge. That is, fathers tend to feel overwhelmed by the needs of the baby, experience stress and anxiety, which might affect their emotional well-being (Gemayel et al., 2018).

Table 7. Dimensions correlation matrix of POST-MPPS.

Dimension	Father-Mother Relationship	Birth Event Concerns	Fatherhood Changes	Parental Competency	Lack of Support	Partner's emotional wellbeing	Fatherhood responsibilities	Expectations
Father-Mother Relationship	1							
Birth Event Concerns	0.185	1						
Fatherhood Changes	0.404	0.187	1					
Parental competency	0.265	0.264	0.267	1				
Lack of Support	0.286	0.314	0.276	0.221	1			
Partner's emotional wellbeing	0.463	0.22	0.373	0.206	0.306	1		
Fatherhood responsibilities	-0.339	-0.124	-0.099	-0.11	-0.207	-0.185	1	
Expectations	0.297	0.223	0.297	0.171	0.286	0.348	-0.13	1

Parental Competency relate to parental knowledge and concerns about the child's care. Boyce et al. (2007) highlighted the importance of parental knowledge in the perinatal period, which protects fathers against developing low emotional well-being during the postnatal period.

Lack of Support assesses the level of support fathers received during the birth event and the subsequent postnatal period. The items were developed from the qualitative information, via the semi-structured interviews, where several postnatal fathers expressed their frustration at the lack of support, especially the lack of support from health professionals during the birth event and the first year after the childbirth. Consistent with this study, Gao et al. (2009) reported a high correlation between lack of support and low emotional well-being.

Partner's Emotional Well-Being. A mother's postpartum depression is considered one of the main factors affecting postnatal fathers' emotional well-being (Dudley et al., 2001; Paulson and Sharnail, 2010). This study has acknowledged the influence of the mother's emotional well-being on postnatal fathers. The developed scale showed good internal consistency in assessing the influence of the partner's well-being on fathers.

Responsibilities is a sub-scale that comprised items related to the responsibilities expected from fathers for their partner and child. Marsiglio et al. (2000) have investigated the challenge and responsibilities required from fathers. The responsibility subscale measuring father's expected responsibilities by the partner demonstrated good internal consistency. The items addressing the father's emotional support to the mother and the provision of care for the newborn received the highest loading.

Expectations sub-scale included items that related to partner, family and community expectations. Davey et al. (2006) reported that social expectations about parenthood can often be difficult for fathers. Inability to fulfil these expectations may lead to additional emotional stress.

4.4. Limitations and future directions

One of the limitations of this study is that the results of the content validity are contingent on the level of professional expertise of the panellists. The second limitation related to the difference in sample size for the measures. The sample sizes for the applied exploratory factor analysis (EFA) for the ANT-MPPS was small (141 participants) indicating a limitation of the EFA according to Comrey and Lee (2013). They suggest a sample of 300 to be adequate. The POST-MPPS had a sample size of 302 indicating adequate power. This study assessed only the construct validity and the internal consistency of the MPPS, therefore future studies are warranted to test the external validity, criterion validity, responsiveness, interpretability and concurrent validity of MPPS.

4.5. Conclusion

This paper reported on the development of both the ANT-MPPS and POST-MPPS and evaluated their content validity. This process for developing the MPPS applied a combination of qualitative and quantitative approaches. The resultant MPPS items showed a high content validity and an acceptable inter-rater reliability for both antenatal and postnatal versions. Additionally, this study confirmed the construct validity and internal consistency of the ANT-MPPS and POST-MPPS. This new measure is to assist clinicians in identifying fathers at risk and for providing more targeted treatment interventions. It assists clinicians and researchers in identifying specific precursors that have been implicated in affecting emotional well-being in perinatal fathers. Identifying these precursors is useful in providing an effective treatment plan, as a treatment can address the identified issues, e.g., providing educational input in father with limited parental competency. This paper provides evidence that the items and the developed sub-scales of the MPPS are appropriate and comprehensive to the paternal perinatal well-being concept.

Declarations

Author contribution statement

Daisy Gemayel: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Karl Wiener: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Anthony Saliba: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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