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The maternal-fetal relationship: conceptualisation, measurement and application in practice

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Abstract (Word Count: 150)
Pregnancy and the transition to parenthood involve great psychological adaptation, including the development of the woman's relationship with her unborn child - the maternal-fetal relationship (MFR). MFR manifests in a woman's thoughts, feelings, attitudes and behaviours towards her developing baby. Routine psychosocial assessment increasingly features in maternity care. Some argue for assessment to include MFR to target interventions towards those judged to have 'sub-optimal' MFR, to improve health-related behaviours, and to optimise parenting and the child's social and emotional development. There is, however, inconsistency in how MFR has been conceptualised, raising questions about what 'sub-optimal' MFR might look like, and a lack of evidence on its associated risks, and amenability to intervention. To consider the implications of MFR for health professionals and clinical practice we outline what is meant by MFR, how it may be measured, what MFR influences and is influenced by, and why and when MFR may be measured.

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1. Introduction and overview

Pregnancy and the transition to parenthood involve great psychological adaptation. Part of this adaptation is the development of the woman's relationship with her unborn child - the maternal-fetal relationship (MFR) - which manifests in a woman's thoughts, feelings, attitudes and behaviours towards her developing baby. Routine psychosocial assessment increasingly features in maternity care and it has been argued that this could be expanded to include antenatal assessment of MFR to target interventions towards those judged to have 'sub-optimal' MFR, to improve health-related behaviours and optimise parenting and the child's social and emotional development. There is, however, inconsistency in how MFR has been conceptualised, raising questions about what 'sub-optimal' MFR might look like, and a lack of evidence on its associated risks, and amenability to intervention. To consider the implications of MFR for health professionals and clinical practice we outline what is meant by MFR, how it may be measured, what MFR influences and is influenced by, and why and when MFR may be measured.

2. What is MFR?

Pregnancy is a time of physiological, emotional, and psychological adaptation and adjustment [1] for both mothers and fathers. Early work exploring the transition to parenthood suggested that mothers need to achieve several psychological tasks during pregnancy, which include developing a maternal identity (e.g. [2]), differentiation of the self from the fetus and developing an emotional relationship with the fetus [3]. Cranley [4] conceptualised this maternal-fetal relationship (MFR) as maternal ‘attachment’ in 1981, and there has been a steadily increasing body of research since which has grown to include the adaptation experienced by fathers [5].

The terminology used to describe this phenomenon has been the subject of debate in recent years because in developmental psychology, attachment is a term used to describe a system which exists, from an evolutionary standpoint, to keep the child safe by promoting proximity-seeking and care-eliciting behaviours on the part of the child (although adults too can be attached and can seek care from others). The counterpart to attachment, the ‘caregiving system’, exists to promote the provision of care to others when they are distressed [6]. In this developmental sense, the child is ‘attached’ to the caregiver, but the caregiver is not ‘attached’ to the child. Thus, the relationships that parents form with their children before birth, often called ‘bonding’, are likely to be about parental attitudes, projections, cognitions and emotional responses to the pregnancy and developing fetus [7], not about seeking care from that fetus. For this reason, some scholars have argued that

using ‘attachment’ in this context is a misnomer (e.g. [8, 9]), but the term attachment to describe the antenatal relationship has become increasingly accepted.

There appears to be a reasonable consensus in the literature that whatever terminology we use, the construct under investigation is similar, centering around behaviours, thoughts, feelings and actions that demonstrate care and commitment to the developing child [8]. But even here there are differences. Definitions have variously emphasised different parental thoughts about and behaviours towards the fetus: love for [10], affiliation and interaction with [4], and protection of [11]. Most scholars have seen the construct as multi-dimensional (e.g. [4, 10]), but some have conceptualised it as unidimensional (e.g. [12]). There has been discussion too, of whether the concept includes feelings about the pregnancy in addition to feelings about the fetus (e.g. [4]), or whether these things are separate (e.g. [10]). These different conceptualisations have led to the development of different measures.

3. Measuring MFR

Over 30 years of published literature exists on the measurement of MFR. Measurement research has been dominated by verbal self-report tools where women are asked to rate various manifestations of the relationship, e.g. behaviours, feelings, attitudes and thoughts including talking to the baby, talking about the baby, feeling love for the baby, physical preparation, picturing the developing baby. Three main self-report measures are currently in use. A comprehensive review by Van den Bergh & Simons [8] summarises these measures, their psychometric properties and how they link with theoretical understanding and description of the phenomenon. The measures are the Maternal-Fetal Attachment Scale (MFAS, [4]), the Maternal Antenatal Attachment Scale (MAAS, [10]) and the Prenatal Attachment Inventory (PAI, [12]). The measures vary in conceptualisation but all are scored on one or more continuous scales with higher scores being viewed as indicative of higher levels of MFR, and considered more favourable.

The MFAS focuses on ‘the extent to which pregnant women engage in behaviours that represent an affiliation and interaction with their unborn child’ ([4], p. 262). Reflecting concerns that the MFAS placed too great an emphasis on the motherhood role and pregnancy state, the MAAS was developed to focus on feelings and behaviours towards the fetus, scored in terms of the *quality* of attachment (e.g. closeness, pleasure in interaction, tenderness towards the fetus) and *intensity* of preoccupation (time spent thinking about the fetus). In contrast, the PAI focuses on the 'unique affectionate relationship', and focuses on thoughts and feelings rather than behaviours. Measures of the paternal-fetal relationship also exist and these have largely been adapted from measures developed for use in mothers;

for example the Paternal Fetal Attachment Scale modified from the MFAS [13], and the Paternal Antenatal Attachment Scale, modified from the MAAS [10].

The various self-report measures each contain approximately 20 items and have been criticised for lacking application to clinical settings due to length and language requirements (e.g. [14]). Overall, reliability of the 'total' attachment scales in these measures tends to be fairly high, but there are often problems with sub-scales and factor structures, which might reflect differences and difficulties in conceptualising the component parts of the concept [8]. In response to concerns about length and language requirements, researchers in the Netherlands developed the Pictorial Representation of Attachment Measure (PRAM) [15] to offer a brief, non-verbal tool which can be self-completed or talked through with the researcher or practitioner requesting the assessment. Completion requires the respondent to indicate on a visual diagram where they would place the baby in their life at this moment, with shorter distances between the baby and self-thought to indicate greater interpersonal closeness and a higher level of MFR. The tool's authors report convergent validity in mothers and fathers using the MAAS and propose that the PRAM might have an application as a screening tool to identify 'sub-optimal' MFR, but highlight the need to first conduct further research [14].

We lack clinical cut-offs for the measures described above and they are instead generally used to compare higher and lower scores. Another approach to measurement is to focus on women's working models (i.e. representations) rather than their feelings of affection and commitment. This is usually done via a structured interview that generates a narrative, which is subsequently coded and scored. Examples include the Pregnancy Interview-Revised [16], the Working Model of the Child Interview [17] and the Interview of Maternal Representations during Pregnancy-Revised Version [18]. Scoring of structured interviews tends to be used to classify women as having different types or 'styles'; an approach more comparable with assessing attachment through interviews, and one that may better lend itself to providing an indication of clinical concern, as compared with the MFR measures described above. Although structured interviews are comprehensive and informative they are resource-intensive: interviews are long (typically an hour) and the resulting tapes need to be coded by someone with appropriate training. As such, research using these structured interviews has been limited to relatively small sample sizes and the approach would be unsuitable for universal assessment or routine use in clinical settings.

There are several implicit assumptions around measurement that warrant further consideration. First, measurement assumes that individuals are aware of the manifestations

of MFR and able to quantify them. Second, measurement is assumed to be an inert process, but it is likely that there is some degree of measurement reactivity; whereby the process of measurement influences the thing being measured. Third, assessing MFR is a potentially emotive area where social desirability is likely to be a challenge for measurement, and women may be unwilling to disclose their 'true' feelings, particularly in a clinical context. There is also the potential for assessment to itself be a source of anxiety or feelings of guilt and inadequacy around parenting [19]. As argued by Walsh and colleagues, research is needed to explore whether discussion of MFR is meaningful or acceptable to pregnant women; what such discussions should reflect; and how such discussions should take place ([20]). We also need to take into account cultural factors: representations of the baby and self as parent are likely to differ across cultures. Most of the current research is dominated by a western concept and western measures of MFR which may not be applicable in other cultures. Further research is needed here.

4. Antecedents, correlates and consequences of MFR

Overall, demographic factors like age, marital status, income, parity, education and ethnicity do not appear to considerably impact MFR [21]. Evidence exists linking MFR with other variables in pregnancy, most notably pregnancy-specific contextual factors, social support, and physical and psychological health. Some of these variables have commonly been treated as 'predictors' of MFR and others as being dependent on MFR (i.e. considered 'outcomes'). Much of the work examining MFR in pregnancy is cross-sectional and it is difficult to disentangle temporal relationships between constructs; such relationships should instead be considered associations. Although there is a great deal of research which examines these associations, research synthesis demonstrates that findings are often inconsistent [8, 21-23]. Below, we overview below some of the factors found to be associated with MFR, but with the caution in mind that the challenge now is to build models which look at the complexity of how these factors interact with each other, rather than looking at predictors in isolation [8, 20, 24-26].

4.1 Factors associated with MFR

4.1.1 Pregnancy-specific contextual factors

The findings linking obstetric factors and MFR are inconsistent and meta-analyses show trivial to low effect sizes overall [21]. There is little research on pregnancy planning, but research synthesis shows a small effect size on MFR [21]. Further clarity is needed distinguishing between attitudes and behaviours, and examining elements such as the extent to which the pregnancy was planned, intended, timed and wanted [27].

Many studies do not find an association between mode of conception and MFR (e.g. see [28] for a review), but recent research has found that mothers conceiving through assisted reproductive technology (ART) form more intense relationships with the fetus than mothers conceiving spontaneously once age has been taken into account [29]. Parents conceiving through ART may have experiences which are coupled with some form of perinatal loss such as miscarriage but also loss around conception and parenthood. There may therefore exist parallels between parents whose pregnancies follow ART and/or perinatal loss, as parents may perceive their pregnancies as high risk even where they are considered obstetrically 'normal' (e.g. [30]). [See also chapter on infertility]

Studies do not always find significant differences in terms of MFR between mothers with and without a history of pregnancy loss (e.g. [31]), although some find differences in particular scales, like 'differentiation of self from fetus' [32]. Although some studies have not found a difference between high risk and obstetrically 'normal' pregnancies in terms of MFR (e.g. [33]), some have found lower levels in those hospitalised for high risk of preterm delivery [34], and others have found that amongst those hospitalised for pregnancy complications, positive coping strategies mediate between maternal appraisals of risk and MFR [35]. In future research, further attention needs to be given to the relationship between coping and MFR in pregnancies that are perceived to be high-risk.

4.1.2 Social support and relationships

Women who are satisfied with their social supports have been consistently found to report higher levels of MFR. There is evidence in fathers of a strong association between the strength of the partner relationship and indicators of the parental-fetal relationship [13]. Challenges exist in disentangling these factors. Attitude towards pregnancy and intendedness of pregnancy are associated with social support and relationship with partner (e.g. [36]). In addition, indicators of psychological health are consistently found to be highly correlated with the quality of the partner relationship and with social support [37]; an observation that is found across populations and settings. Bouchard's research [24] was amongst the first to examine moderating effects in predicting the parental-fetal relationship for mothers and fathers, and found that, for mothers, relationship with partner was associated with MFR, but only for those with low levels of neuroticism or less optimal attachment with their own parents. For fathers, relationship quality interacted with high levels parental attachment, but not neuroticism, to predict parental-fetal relationship. Recent research by Maas and her colleagues [38] tested a model which comprised parental (personality and attachment), contextual (partner support and perceived stress) and

expected child (temperament) characteristics, and which found MFR to be multiply determined, with parental characteristics explaining most variance. These recent research findings highlight that we need to consider unique combinations of risk and protective factors in considering pathways to MFR.

4.1.3 Physical and psychological health

MFR is related to health behaviours in pregnancy including balance of rest and exercise, safety measures, nutrition, avoiding harmful substances, obtaining health care, and obtaining information [26]. Research has been dominated by primarily Caucasian middle-class samples, but recent studies suggest that these health behaviours are linked with MFR in low-income African-American families, and that these health behaviours mediate the link between MFR and later neonatal outcome [39]. However, some research shows that high levels of MFR can be associated with assurances of fetal wellbeing, and thus a less strict adherence to healthy behaviours [40]. Another consideration, particularly given suggestions that MFR should be targeted in order to improve health behaviours (e.g. [8]), is that associations between MFR and health behaviours may reflect a third variable that itself should be targeted by intervention. One possible candidate is 'stress' including causes (such as social deprivation and life events) and symptoms (such as depression and anxiety), which have been associated with both MFR and health behaviours [26].

Findings are especially inconsistent when examining the relationship between psychological health and MFR and, although most work finds that MFR is higher in those with lower psychological distress (e.g. [41]), some studies do not find an association (e.g. [1]). Again, we find complex mediating and moderating pathways between factors. Walsh and her colleagues [42] tested a model which found mental health to be a strong predictor of MFR, alongside caregiving style to partner, which itself mediated the link between attachment and MFR. In contrast, Diniz and her colleagues [43] did not find a link between depression and MFR in their sample of Brazilian adolescents, but they did find emotional support to be a key variable associated with MFR.

4.2 Links between MFR and postnatal factors

Alongside considering how factors interact with each other, longitudinal work is needed to better understand the possible effects of MFR. Researchers suggest that “it seems intuitively likely that the feelings parents have during pregnancy about their baby are likely to be associated with later parental and infant behaviour” ([7], p.221). MFR measures in pregnancy have been found to be associated with more optimal child outcomes, and with better psychological health in the postnatal period [44]. There is emerging evidence that

MFR is linked with parenting and child-parent relationship outcomes, but this work is in its infancy and there is a wide range of factors which impact the relationship. Parenting is a constellation of behaviours, emotions and cognitions [45] and we find inconsistent and modest findings between MFR and indicators of parenting, parental representations and parent-child interaction. Siddiqui and Hägglöf [46] found a link between MFR as measured by the PAI and postnatal involvement in interaction but not responsiveness in interaction. Condon et al [47] found continuity between prenatal paternal attachment and postnatal parental 'attachment' measures (thoughts and connections with the baby), but with strong effects from relationship quality and mental health, whilst Müller [12] found only a modest correlation between MFR and postnatal attachment. Thun-Hohenstein et al [48] did not find any significant relationship between maternal antenatal representations and parenting competence in interaction with infants of 12 weeks. They did find significant associations between antenatal representations and regulatory ability in the mothers, and interaction behaviour on the part of the infant. In conclusion, it appears that there are some links between antenatal representations of the child, or connections with the child, and some postnatal outcomes, but we need more research to explicate these complex links and mechanisms more fully.

It is often suggested that antenatal attachment can predict later attachment on behalf of the child. Secure infant attachment, most often measured through the 'gold standard' of the 'Strange Situation' [49] is associated with better functioning in many areas, including emotional, social and cognitive development [49], and so if we could find an indicator before birth, we might be able to target intervention. Some studies have found an association between working models of the child in pregnancy and later attachment security (e.g. [50]), but we currently have no strong evidence that MFR as measured by self-report on the part of the mother is linked with more secure attachment in infancy for children.

5. Why measure MFR

Many studies which examine associations between MFR and other perinatal factors conclude that if MFR in the antenatal period is associated with wellbeing and positive health practices in pregnancy, and more optimal outcomes for children and parents post-birth, then intervening in the maternal-fetal relationship or representations thereof might have positive outcomes throughout this period, and might be a useful place to start. It has been proposed that problems with MFR may be targeted by interventions spanning several areas, including, understanding and managing reactions to antenatal screening and perinatal loss, promoting parents' antenatal health behaviours (and subsequent birth and infant health outcomes), and the parent-infant relationship (and subsequent child's development) [8].

What constitutes a pathological maternal-fetal relationship remains “almost entirely unexplored” ([51], p.10). MFR is most often scored on a continuum, and we have few indications of scores or cut-offs which would indicate a clinical difficulty (either at the ‘low’ end or the ‘high’ end). Thus, it remains that, in the clinical environment, difficulties should be clinically determined rather than relying on scores on a screening instrument. In addition, we do not well enough understand the long term outcomes of ‘problematic’ levels of MFR, or for whom they might pose a risk. We also find that some subscales of MFR are more commonly linked with difficulty or adjustment than others. Much of the research seems to suggest that when using the MAAS measure, the *quality* subscale is linked with functioning, especially psychological wellbeing, whereas associations with *intensity* subscale are much less clear and need further attention in research, although some suggest this scale is linked more strongly with external factors [52]. There is little evidence that low levels are linked with major difficulties in any arena or to provide justification for intervention. Of course, this is not to say that there may not be times where it might be useful to use measures of MFR in conjunction with, or to aid clinical decision making, or indeed to provide a starting point for clinical interview. Research by Condon [53] suggests that there are cases of deliberate harm towards the fetus in terms of active or passive abuse. Pollock and Percy [54] investigated a high risk sample of pregnant women. They used Condon’s alternative categorical scoring method which combines scores on the *quality* and *intensity* dimensions to form four styles: negative disinterested, negative preoccupied, positive disinterested and positive preoccupied. Pollock and Percy found that all but two of the 40 mothers had a ‘negative’ antenatal attachment style and those with a negatively preoccupied MFR pattern (low levels of quality, and high levels of intensity) were more likely to report irritation with the fetus. These mothers were also more likely to report an urge to harm the fetus, although this did not reach statistical significance and actual levels of abuse were not measured. This research shows that high scores, particularly on the *intensity* scale might not always be optimal, and Laxton-Kane and Slade [25] suggest that we might devote future research to investigating ‘styles’ of MFR, rather than ‘levels’.

Another approach may be to offer intervention on the basis of possible risk factors or characteristics, rather than individual assessment of MFR. This is the current approach for 'attachment-based interventions' which aim to support the parent in being available, responsive, and sensitive to the child's needs and generally target groups considered 'at-risk' of insecure attachment based on certain characteristics; for example, being homeless, a care leaver or a young parent. Possible groups that may be targeted by intervention could include those who have experienced perinatal loss, those with high-risk pregnancies, those

experiencing psychological distress, those with attachment difficulties in their family of origin, and those whose health behaviours increase the risk of poor pregnancy and infant outcomes. These different areas of need would require different interventions and would differ in their mechanisms and intended outcomes, although some women may fall into multiple groups. Even if eligibility were not based on individual assessment of MFR, we may still want to measure MFR in order to understand how the intervention works (or fails to work) and capture change following an intervention - thus accurate assessment and indicators of clinically significant change are still needed and currently lacking.

6. When to measure MFR

The timing at which measurement could and should be undertaken depends on its purpose. Early intervention requires early assessment. Maternity care in the UK and other high-income countries has moved towards increasingly detailed antenatal psychosocial assessment in order to shape care pathways according to identified need. In the UK, psychosocial assessment is undertaken at the booking visit (the first formal antenatal appointment) and includes assessment of mental health, social support, involvement of social care and other services, residential status and health behaviours (including substance use and smoking). Targets (UK) now exist for the booking visit to be conducted by 10-12 weeks gestation [55].

The need for early intervention must be balanced with the accuracy of results. MFR tools lack validation in early pregnancy as measurement of MFR has focused on later pregnancy, although exceptions exist (e.g. [42]). This in part reflects the timing of the events that contribute to the development of the mother-child relationship, including the significance of quickening, with fetal movements generally being felt from around the middle of pregnancy (18-20 weeks in primigravida and 15-17 weeks in multigravida). Peppers and Knapp [56] described nine contributory events in MFR development, of which the first five happen before the birth: planning, confirming and accepting the pregnancy; feeling the fetus (fetal movements); accepting the fetus as an individual; giving birth; seeing the baby; touching the baby; and, giving care to the baby. With the introduction of ultrasound scanning, seeing the fetus has become an additional event that contributes to the relationship's development [57], and one which routinely first takes place before fetal movements have been felt unless a woman has attended for antenatal care relatively late. The occurrence and timing of events and associated trajectory of MFR development may thus vary with changes in clinical practice. In addition, it should be noted that not all of these events apply to all women or in all pregnancies, and events may vary with contextual factors such as intendedness of

pregnancy and gestation at which pregnancy is confirmed, yet this remains under-researched.

It has been argued that the existing measures can be adapted for use in early pregnancy by simply omitting those items that apply only to the later stages (e.g. those concerning fetal movements) or using weighted means [8]. It is possible, however, that the situation is more complex than different items being relevant at different time points and the trajectory of MFR development may not be suited to measurement in early pregnancy.

Alongside concerns around the accuracy of early measurement and its ability to identify women who may benefit from intervention, little is known about how these factors may vary with maternal characteristics; for example, in women where there is a perceived or actual risk to the viability of the pregnancy. There is evidence of 'emotional cushioning' following perinatal loss whereby women's MFR in a subsequent pregnancy may be delayed as a self-protective mechanism [58]. Women who are informed about prenatal serum screening in pregnancy, compared with those who are not informed, delay MFR until testing is complete [59]. This process of the holding back of emotions has been described as ‘the tentative pregnancy’ [58]. Similar processes may be observed in women whose conception follows ART and women whose pregnancies are considered obstetrically high-risk. Critically, it remains unknown whether the outcomes for these mothers and their children are different to those where a pregnancy does not follow perinatal loss and is not considered high-risk.

Using tools in early pregnancy that lack validation for this specific time period has the potential to unnecessarily burden women and healthcare systems by over-identifying women whose MFR may progress in such a way that it is no longer considered 'sub-optimal' at a later point in the pregnancy. It may therefore be that repeated assessment would be needed before determining concerns about a woman's MFR. In addition, trajectories may differ between individuals and between pregnancies in the same individual without being problematic. MFR is more likely to be higher in first time pregnancies and the limited research on measurement across all three trimesters indicates that levels of MFR rise after the first trimester and remain relatively stable over the second to third trimesters [10, 42]. Further work is needed to better understand these processes.

Trajectories of MFR development may also vary between mothers and fathers; measurement (and any intervention) may therefore be appropriate at different stages in fathers. Specifically, ultrasound scans have been identified as a key event in the development of the paternal-fetal relationship [57] and therefore may provide an opportunity

for assessment and, where appropriate, intervention targeting the parental-fetal relationship and health behaviour change.

7. Implications for healthcare professionals

The argument for antenatal assessment of MFR in order to target interventions makes several assumptions that need to be questioned: that 'sub-optimal' MFR exists, that MFR can be accurately measured (i.e. that individuals are conscious/aware of the manifestations and able to quantify them), that women will disclose in a clinical context, and that women (and health professionals) would find it acceptable to target interventions on the basis of assessment.

There is currently insufficient evidence to support 'screening' for potential 'sub-optimal' MFR in clinical practice. In addition, there exist some considerations that echo concerns raised in relation to antenatal mental health assessment more generally; specifically, that it is unethical to introduce assessment without appropriate management, and that we need to be mindful of over-pathologising women [60]. In terms of identifying 'risk' or pathological concerns, rather than considering the introduction of a self-report measure to quantify levels of MFR, it may be fruitful to identify certain indicators that may be considered 'red flags'; for example denial or concealing of the pregnancy, not engaging with antenatal care, or thoughts of harming the baby (an item on the MAAS). Existing measures of MFR such as the PRAM may currently be more appropriately used as a communication device to discuss the context of a woman's pregnancy, and offer an enabling environment in which to voice her views and any concerns that could be revisited throughout maternity care [61]. Here too is an opportunity to involve fathers and partners in discussions which may help to support them and promote their engagement; an aspiration identified in policy (e.g. [62]).

8. Summary

MFR-based screening may only be appropriate when we better understand what is being measured, how to facilitate MFR, and what the potential outcomes might be. Further research is needed before we are in a position to harness the potential of MFR for clinical application. This includes a need for greater conceptual clarity, greater understanding of the development and impact of MFR in the perinatal period and beyond, and how it may vary across cultures. Applied research is also needed to develop and test interventions in a clinical setting, with embedded consideration of resource implications and other factors influencing implementation. This is not to say that MFR is not a useful, valid, or important concept. An understanding of what is known about MFR can aid professionals in their support of parents and in decision making. Similarly, an understanding of what we still need

to know will help drive research and practice to provide appropriate, acceptable, and timely support and care.

Key points

- The terminology used to describe the relationship between a mother (or father) and the unborn child has been the subject of debate but most authors agree that it centers around the parent's behaviours, thoughts, feelings, and actions that demonstrate care and commitment to the developing child.
- There is a link between maternal-fetal relationship (MFR) and health behaviours in pregnancy including balance of rest and exercise, safety measures, nutrition, avoiding harmful substances, obtaining health care, and obtaining information. There is also emerging evidence that MFR is linked with some indices of postnatal parenting and child-parent relationship outcomes but currently there is no strong evidence that MFR as measured by self-report on the part of the mother is linked with attachment security in children.
- Women who are satisfied with their social supports have been consistently found to report higher levels of MFR and there is evidence in fathers of an association between the strength of the partner relationship and indicators of the parental-fetal relationship.
- Research is needed to explore whether discussion of MFR is meaningful or acceptable to pregnant women; what such discussions should reflect; and how such discussions should take place.
- The most commonly used tools for measuring MFR are the Maternal-Fetal Attachment Scale (MFAS), the Maternal Antenatal Attachment Scale (MAAS) and the Prenatal Attachment Inventory (PAI), all of which are verbal self-report measures.
- Most current research is dominated by concepts and measures of MFR developed in western contexts which may not be applicable in some cultures.
- It may be advisable for future research to explore 'styles' in addition to 'levels' of MFR.
- Ideally women at risk of adverse outcomes should be identified in early pregnancy to receive timely support but MFR tools generally lack validation in very early pregnancy. We do not yet well enough understand the long term outcomes of 'problematic' levels of MFR.
- There is currently insufficient evidence to support 'screening' for potential 'sub-optimal' MFR in clinical practice and research is needed to explore the application of MFR assessment as a communication device or aid to clinical decision-making.

References

1. Hart, R. and C.A. McMahon, *Mood state and psychological adjustment to pregnancy.* Archives of Womens Mental Health, 2006. **9**(6): p. 329-337.
2. Rubin, R., *Maternal tasks in pregnancy.* Maternal-Child Nursing Journal, 1975. **4**(3): p. 143-153.
3. Valentine, D.P., *The experience of pregnancy: A developmental process.* Family Relations, 1982. **31**(2): p. 243-248.
4. Cranley, M.S., *Development of a tool for the measurement of maternal attachment during pregnancy.* Nursing Research, 1981. **30**(5): p. 281-284.
5. Condon, J.T., *The parental-foetal relationship. A comparison of male and female expectant parents.* Journal of Psychosomatic Obstetrics and Gynaecology, 1985. **4**: p. 271-284.
6. Bowlby, J., *Attachment and loss. Volume 1: Attachment*. 1982.
7. Redshaw, M. and C. Martin, *Babies, 'bonding' and ideas about parental 'attachment'.* Journal of Reproductive and Infant Psychology, 2013. **31**(3): p. 219-221.
8. Van den Bergh, B. and A. Simons, *A review of scales to measure the mother-foetus relationship.* Journal of Reproductive and Infant Psychology, 2009. **27**(2): p. 114-126.
9. Walsh, J., *Definitions matter: If maternal-fetal relationships are not attachment, what are they?* Archives of Womens Mental Health, 2010. **13**(5): p. 449-451.
10. Condon, J.T., *The assessement of antenatal emotional attachment - Development of a questionnaire instrument.* British Journal of Medical Psychology, 1993. **66**(2): p. 167-183.
11. Sandbrook, S.P. and E.N. Adamson-Macedo, *Maternal-fetal attachment: searching for a new definition.* Neuroendocrinology Letters, 2004. **25**: p. 169-182.
12. Müller, M.E., *Development of the prenatal attachment inventory.* Western Journal of Nursing Research, 1993. **15**(2): p. 199-215.
13. Weaver, R.H. and M.S. Cranley, *An exploration of paternal-fetal attachmnet behavior.* Nursing Research, 1983. **32**(2): p. 68-72.
14. van Bakel, H.J.A., et al., *Pictorial representation of attachment: measuring the parent–fetus relationship in expectant mothers and fathers. .* BMC Pregnancy and Childbirth, 2013. **13**: p. 138-147.
15. van Bakel, H.J.A., C.M.J.M. Vreeswijk, and A.J.B.M. Maas, *Verbal and pictorial representations of the antenatal mother-foetus relationship. Proceedings of the 29th Society for Reproductive and Infant Psychology Conference, University of Newcastle. (Abstract).* Journal of Reproductive and Infant Psychology, 2009. **27**(3): p. 323.
16. Slade, A., et al., *The Parent Development Interview- Revised: Unpublished protocol.* 2004, The City University of New York: New York.
17. Zeanah, C.H., et al., *Mothers' representations of their infants are concordant with infant attachment classifications.* Developmental Issues in Psychiatry and Psychology, 1994. **1**: p. 1-14.
18. Ammaniti, M. and R. Tambelli, *Prenatal self-report questionnaires, scales and interviews.*, in *Parenthood and mental health. A bridge between infant and adult psychiatry.*, S. Tyano, et al., Editors. 2010, Wiley-Blackwell: Oxford.
19. Jomeen, J., *Choice and control in contemporary childbirth: Understanding through Women's Experiences*. 2010, London: Radcliffe.
20. Walsh, J., et al., *Maternal–fetal relationships and psychological health: emerging research directions.* Journal of Reproductive and Infant Psychology, 2013. **31**(5): p. 490-499.
21. Yarcheski, A., et al., *A meta-analytic study of predictors of maternal-fetal attachment.* International Journal of Nursing Studies, 2009. **46**(5): p. 708-715.
22. Alhusen, J.L., *A literature update on maternal-fetal attachment.* JOGNN-Journal of Obstetric Gynecologic and Neonatal Nursing, 2008. **37**(3): p. 315-328.

23. Cannella, B.L., *Maternal-fetal attachment: An integrative review.* Journal of Advanced Nursing, 2005. **50**(1): p. 60-68.
24. Bouchard, G., *The role of psychosocial variables in prenatal attachment: an examination of moderational effects.* Journal of Reproductive and Infant Psychology, 2011. **29**(3): p. 197-207.
25. Laxton-Kane, M. and P. Slade, *The role of maternal prenatal attachment in a woman's experience of pregnancy and implications for the process of care.* Journal of Reproductive and Infant Psychology, 2002. **20**(4): p. 253-266.
26. Lindgren, K., *Relationships among maternal-fetal attachment, prenatal depression, and health practices in pregnancy.* Research in Nursing & Health, 2001. **24**(3): p. 203-217.
27. Klerman, V.T., *The intendedness of pregnancy: A concept in transition.* Maternal and Child Health Journal, 2000. **4**(3): p. 155-162.
28. Hammarberg, K., J. Fisher, and K. Wynter, *Psychological and social aspects of pregnancy, childbirth and early parenting after assisted conception: a systematic review.* Human Reproduction Update, 2008. **14**(5): p. 395-414.
29. McMahon, C.A., et al., *Age at first birth, mode of conception and psychological wellbeing in pregnancy: findings from the parental age and transition to parenthood Australia (PATPA) study.* Human Reproduction, 2011. **26**(6): p. 1389-1398.
30. McMahon, C.A., et al., *'Don't count your chickens': A comparative study of the experience of pregnancy after IVF conception.* Journal of Reproductive and Infant Psychology, 1999. **17**(4): p. 345-356.
31. Tsartsara, E. and M.P. Johnson, *The impact of miscarriage on women's pregnancy-specific anxiety and feelings of prenatal maternal–fetal attachment during the course of a subsequent pregnancy: An exploratory follow-up study.* Journal of Psychosomatic Obstetrics & Gynecology, 2006. **27**(3): p. 173-182.
32. Mehran, P., et al., *History of perinatal loss and maternal–fetal attachment behaviors.* Women and Birth, 2013. **26**(3): p. 185-189.
33. Kemp, V.H. and C.K. Page, *Maternal prenatal attachment in normal and high-risk pregnancies.* Journal of Obstetric, Gynecologic, & Neonatal Nursing, 1987. **16**(3): p. 179-184.
34. Pisoni, C., et al., *Risk and protective factors in maternal–fetal attachment development.* Early human development, 2014. **90**: p. S45-S46.
35. White, O., et al., *Maternal appraisals of risk, coping and prenatal attachment among women hospitalised with pregnancy complications.* Journal of reproductive and Infant Psychology, 2008. **26**(2): p. 74-85.
36. Kroelinger, C.D. and K.S. Oths, *Partner support and pregnancy wantedness.* Birth, 2000. **27**(2): p. 112-119.
37. Pilkington, P.D., et al., *Modifiable partner factors associated with perinatal depression and anxiety: A systematic review and meta-analysis.* Journal of Affective Disorders, 2015.
38. Maas, A.J.B., et al., *Determinants of maternal fetal attachment in women from a community-based sample.* Journal of Reproductive and Infant Psychology, 2014. **32**(1): p. 5-24.
39. Alhusen, J.L., et al., *The influence of maternal–fetal attachment and health practices on neonatal outcomes in low-income, urban women.* Research in Nursing & Health, 2012. **35**(2): p. 112-120.
40. Ross, E., *Maternal–fetal attachment and engagement with antenatal advice.* British journal of Midwifery, 2012. **20**(8): p. 566-575.
41. McFarland, J., et al., *Major depressive disorder during pregnancy and emotional attachment to the fetus.* Archives of Womens Mental Health, 2011. **14**(5): p. 425-434.
42. Walsh, J., E.G. Hepper, and B.J. Marshall, *Investigating attachment, caregiving, and mental health: a model of maternal-fetal relationships.* BMC Pregnancy and Childbirth, 2014. **14**(383).

43. Diniz, E., S.H. Koller, and B.L. Volling, *Social support and maternal depression from pregnancy to postpartum: the association with positive maternal behaviours among Brazilian adolescent mothers.* Early Child Development and Care 2014. **185**(7): p. 1053-1066.
44. Alhusen, J.L., M.J. Hayat, and D. Gross, *A longitudinal study of maternal attachment and infant developmental outcomes.* Archives of women's mental health, 2013. **16**(6): p. 521-529.
45. Jones, J.D., J. Cassidy, and P.R. Shaver, *Parents' Self-Reported Attachment Styles A Review of Links with Parenting Behaviors, Emotions, and Cognitions.* Personality and Social Psychology Review, 2014. **19**(1): p. 44-76.
46. Siddiqui, A. and B. Hägglöf, *Does maternal prenatal attachment predict postnatal mother-infant interaction?* Early Human Development, 2000. **59**(1): p. 13-25.
47. Condon, J.T., et al., *A longitudinal study of father-to-infant attachment: antecedents and correlates.* Journal of Reproductive and Infant Psychology, 2013. **31**(1): p. 15-30.
48. Thun-Hohenstein, L., et al., *Antenatal mental representations about the child and mother–infant interaction at three months post partum.* European Child & Adolescent Psychiatry, 2008. **17**(1): p. 9-19.
49. Ainsworth, M.D.S., et al., *Patterns of attachment: A psychological study of the strange situation*. 1978, London: Lawrence Erlbaum.
50. Crawford, A. and D. Benoit, *Caregivers' disrupted representations of the unborn child predict later infant–caregiver disorganized attachment and disrupted interactions.* Infant Mental Health Journal, 2009. **30**(2): p. 124-144.
51. Condon, J.T., *Women's mental health: A "wish-list" for the DSM V.* Archives of Women's Mental Health, 2010. **13**(null): p. 5-10.
52. Condon, J.T. and C. Corkindale, *The correlates of antenatal attachment in pregnant women.* British Journal of Medical Psychology, 1997. **70**: p. 359-372.
53. Condon, J.T., *The spectrum of fetal abuse in pregnant women.* Journal of Nervous Mental Disorders, 1986. **174**(9): p. 509-516.
54. Pollock, P.H. and A. Percy, *Maternal antenatal attachment style and potential fetal abuse.* Child Abuse & Neglect, 1999. **23**(12): p. 1345-1357.
55. National Collaborating Centre for Women's and Children's Health, *Antenatal care: Routine care for the healthy pregnant woman.* 2008, RCOG Press: London.
56. Peppers, L.G. and R.J. Knapp, *Motherhood and mourning: Perinatal death.* 1980, New York: Praeger Publishers.
57. Ekelin, M., E. Crang-Svalenius, and A. Dykes, *A qualitative study of mothers' and fathers' experiences of routine ultrasound examination in Sweden.* Midwifery, 2004. **20**: p. 335-344.
58. Côté-Arsenault, D. and K. Donato, *Emotional cushioning in pregnancy after perinatal loss.* Journal of Reproductive and Infant Psychology, 2011. **29**(1): p. 81-92.
59. Rowe, H., J. Fisher, and J. Quinlivan, *Women who are well informed about prenatal genetic screening delay emotional attachment to their fetus.* Journal of Psychosomatic Obstetrics and Gynecology, 2009. **30**(1): p. 34-41.
60. Austin, M.-P., *Marcé International Society position statement on psychosocial assessment and depression screening in perinatal women.* Best Practice & Research Clinical Obstetrics & Gynaecology, 2014. **28**(1): p. 179-187.
61. Darwin, Z., L. McGowan, and L.C. Edozien, *Measuring the Maternal-Fetal Relationship (MFR) in early pregnancy. Proceedings of the 30th Society for Reproductive and Infant Psychology Conference, University of Leuven. (Abstract).* Journal of Reproductive & Infant Psychology, 2010. **28**: p. e1-e19.
62. Department of Health, *Health Child Programme: Pregnancy and the first five years of life.* 2009, Department of Health: London.