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Dunn, Abigail Christina orcid.org/0000-0002-7871-8413, Bird, Philippa K, Endacott, Charlotte et al. (3 more authors) (2022) The feasibility of an objective measure of the parent-child relationship in health visiting practice:assessment of the Maternal Postnatal Attachment Scale. Wellcome Open Research. 88. ISSN: 2398-502X

<https://doi.org/10.12688/wellcomeopenres.17552.1>

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RESEARCH ARTICLE

REVISED The feasibility of an objective measure of the parent-child relationship in health visiting practice: assessment of the Maternal Postnatal Attachment Scale [version 2; peer review: 2 approved]

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v2 First published: 11 Mar 2022, 7:88
<https://doi.org/10.12688/wellcomeopenres.17552.1>

Latest published: 07 Nov 2022, 7:88
<https://doi.org/10.12688/wellcomeopenres.17552.2>

Abstract

Background: Positive parent infant relationships are key to achieving long term child outcomes. Identifying parents who may need support is difficult because of a lack of robust assessment tools. Working in partnership with health services we piloted the Maternal Postnatal Attachment Scale (MPAS) in a deprived, multi-ethnic urban community in Bradford, UK. The pilot aimed to assess the clinical utility of MPAS to identify need for support: Was it administered to a representative group of women? Is MPAS valid for this population?

Methods: Data were linked to a cohort study in the pilot area (Born in Bradford's Better Start - BiBBS). Chi Square tests assessed sample representativeness (age, ethnicity, parity, English language, education, deprivation). Exploratory factor analysis explored MPAS' validity.

Results: 563 women in BiBBS were eligible, 210 (37%) completed MPAS. No differences were found between completers and non-completers, suggestive of a representative sample. In total, 336 women (including a number of women living in the service area who had not participated in BiBBS) completed MPAS in the pilot. MPAS had ceiling effects and a satisfactory factor structure could not be identified, indicating poor psychometric properties.

Conclusions: Health visitors were successful in administering MPAS to a representative sample, but the lack of psychometric robustness indicates that MPAS is unsuitable for routine use in this setting. A gap

Open Peer Review

Approval Status

	1	2
version 2		
(revision)	view	view
07 Nov 2022		
version 1		
11 Mar 2022	view	view

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Any reports and responses or comments on the article can be found at the end of the article.

for such a measure remains.

Keywords

parent-infant relationship, child development, infant mental health, psychometrics, validation study



This article is included in the [Born in Bradford](#) gateway.

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Author roles: **Dunn A:** Conceptualization, Formal Analysis, Writing – Original Draft Preparation, Writing – Review & Editing; **Bird PK:** Conceptualization, Writing – Review & Editing; **Endacott C:** Writing – Review & Editing; **Bywater T:** Conceptualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Howes J:** Conceptualization, Writing – Review & Editing; **Dickerson J:** Conceptualization, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: This study has received funding through a peer review process from the National Lottery Community Fund as part of the A Better Start programme. This work was supported by the Wellcome Trust through a Biomedical Resources Grant to the Born in Bradford Study [101597, <https://doi.org/10.35802/101597>]. Authors PKB, AD, JD and TB were supported by the NIHR CLAHRC Yorkshire and Humber (www.clahrc-yh.nihr.ac.uk). JD and TB were supported by the NIHR ARC Yorkshire and Humber (<https://www.arc-yh.nihr.ac.uk/>). The views and opinions expressed are those of the author(s), and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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How to cite this article: Dunn A, Bird PK, Endacott C *et al.* **The feasibility of an objective measure of the parent-child relationship in health visiting practice: assessment of the Maternal Postnatal Attachment Scale [version 2; peer review: 2 approved]** Wellcome Open Research 2022, 7:88 <https://doi.org/10.12688/wellcomeopenres.17552.2>

First published: 11 Mar 2022, 7:88 <https://doi.org/10.12688/wellcomeopenres.17552.1>

REVISED Amendments from Version 1

We have amended the text in the Background section to:

Insecure attachment prevalence rates are estimated to be high at 35% in a Danish community study (Skovgaard, 2010), whilst reactive attachment disorder (RAD) rates in the UK are 1.4% (Minnis et al., 2013). RAD is a rarer social functioning disorder related to abuse and neglect and is associated with significant psychiatric morbidity. Attachment is not routinely assessed in, or beyond, infancy, and prevalence is difficult to gauge because of this, and the lack of robust measures to assess attachment.'

Below we offer more detail around the required sub-samples. The information below has been threaded through the manuscript in the abstract, methods, and results section to facilitate the readers' understanding.

Three sub-samples were needed to fulfil the two objectives – those who had been offered and had completed the MPAS, those who had been offered it and not completed it, and those that had not been offered it.

The research team only had demographic data for parents who were participating in the BiBBS cohort. The BiBBS data enabled us to assess the representativeness of the sample to ensure that our subsequent MPAS psychometric analyses were robust.

There were 833 eligible women across the BSB pilot area, 563 of these were in the BiBBS cohort. In total 435 of the 833 women were offered the MPAS (210/435 were in the BiBBS cohort), and 398 were not offered it (353/398 were in the BiBBS cohort). In total 302 partially/fully completed the MPAS. The psychometric analyses included MPAS data from 198 parents who had fully completed it in English.

Any further responses from the reviewers can be found at the end of the article

Introduction

Background

The ability of a mother to interact with her infant sensitively, whilst attuned to their infant's mental state and level of development is a crucial precursor of a child's ability to develop a secure attachment (Ainsworth et al., 1978; Kim et al., 2017). Secure attachment predicts a child's later social-emotional development (Fearon et al., 2010; Le Bas et al., 2020). Insecure attachment prevalence rates are estimated to be high, at 35% in a Danish community study (Skovgaard, 2010), whilst rates of the rarer social functioning disorder reactive attachment disorder in the UK are 1.4% (Minnis et al., 2013) (reactive attachment disorder is a social functioning disorder related to abuse and neglect and is associated with significant psychiatric morbidity). Attachment is not routinely assessed in, or beyond, infancy, and prevalence is difficult to gauge because of this and the lack of robust measures to assess attachment.

The importance of a healthy parent-infant relationship for children's future development is recognised in the UK in three national clinical guidelines, with assessment, early identification and intervention being key recommendations (NICE guidelines CG192 - antenatal and postnatal mental health (NICE, 2020), NG26 - attachment in children in care (NICE, 2015), and PH40 - social and emotional well-being: the early years (NICE, 2012)).

However, despite the clear importance of early identification and intervention NICE guidance acknowledges that no tools have been identified for use for the 0–12 months postnatal period – a critical time point to allow early identification and prevention of issues. The tools recommended by NICE for identification in pre-school children require clinical expertise and observations making them expensive for use in universal services (NG 26, NICE, 2015). Two recent reviews of self-report tools for measuring maternal dimensions of the parent-infant relationship concluded that no available measures could be recommended for use, in the main due to the lack of evidence about the clinical utility and psychometric properties of the tools (Mathews et al., 2019; Wittkowski et al., 2020).

NICE Guidance (NG26) notes this gap in their research recommendations where they state the need to “Develop reliable and valid screening assessment tools for attachment and sensitivity that can be made available and used in routine health, social care and education settings”(NICE, 2015).

In the UK all children and their parents receive a minimum of five mandated visits from a health visitor from pregnancy up to 2.5 years of age to support the child's safety and development (see Box 1 for further details on the role of health visitors). Early parent-infant relationship is recognised as one of the main priorities for health visiting in Early years high impact area 2: Maternal and family mental health (PHE, 2020). However, as far as we are aware, the majority of health visitors across the UK rely on personal observations and professional judgement to identify issues with the parent-child relationship (Appleton et al., 2013; Wilson et al., 2010). Such assessments are subjective and hard to validate. In addition, such observations are recorded in free text rather than coded sections of a healthcare record making extraction of such assessments on a population level challenging. A lack of validated and coded recording may impact on the chances of high quality, joined up clinical care for mother and baby, and limits the ability of researchers and health organisations to characterise prevalence and epidemiology more accurately, identify local levels of need and plan for service provision.

Box 1. The role of health visiting

Health visiting in England is a universal service which visits all children in the home at least five times between 28 weeks of pregnancy and five years of age. Health visitors (Specialist Community Public Health Nurses) are the main health professional in contact with young families and have a key role in health promotion and health needs assessment. There are no eligibility criteria to be met for health visiting and it is provided universally and is free at the point of use. Health visitors are post registration nurses who have taken a one-year masters level specialist training and undertake all health needs assessments of families although some elements of support are offered by less qualified staff. As well as proactive health visiting support focused on child development, maternal health and family transition families also have access to primary care through General Practitioners and emergency care via hospitals.

In Bradford, as a part of the Better Start Bradford programme, (see Box 2), the decision was made to pilot the implementation

of an objective and validated assessment tool into universal health visiting practice within an inner-city area of Bradford. Given the lack of recommendations for a tool, the research team worked together with the health visiting service to complete a brief review of potential measures focussing on evidence of validity and reliability as well as potential clinical utility. This review used the same methodology as a larger review by the team (Blower *et al.*, 2019). A number of measures were considered (Brockington *et al.*, 2001; Cuijilts *et al.*, 2016; Høivik *et al.*, 2013; Müller, 1994; Taylor *et al.*, 2005). The Maternal Postnatal Attachment Scale (MPAS) (Condon & Corkindale, 1998) was selected as the best option (from the few existing appropriate measures) for the pilot based on previous research with this measure, its psychometric properties, and because it is freely and easily available.

Box 2. Better Start Bradford

Better Start Bradford is a ten year (2015–2025), £49 million investment by the National Lottery Community Fund in three deprived and ethnically diverse areas of Bradford, UK. It aims to give children a better start in life by providing services that offer preventative early interventions to parents and children aged 0–4 years. Interventions include universal parenting programmes, and more targeted support where needed including an intervention to improve mother-child relationships called Little Minds Matter.

Born in Bradford's Better Start (BiBBS) is a prospective interventional birth cohort study that was initiated to evaluate the impact of the Better start Bradford interventions. BiBBS recruits women during pregnancy who live in the Better Start Bradford areas. An in-depth questionnaire at recruitment collects information on the socio-emotional and economic circumstances of the women and their families; and women also consent to linkage of their and their baby's routine health and education data as well as Better Start Bradford project data (Dickerson *et al.*, 2016). An interim cohort profile of BiBBS (n=2,626) demonstrated that the participants in this cohort are representative of the eligible pregnant population (Dickerson *et al.*, 2022)

Better Start Bradford's success is in part reliant on early identification and appropriate referrals into services. BiBBS success is also, in part, reliant on outcomes collected within routine health data using validated tools. At the initiation of this programme, there was no validated objective measure of the mother-child relationship in the health visiting service making referrals into the Little Minds Matter project, and measuring the impact of services on this measure, challenging. It was for these reasons that the pilot described in this paper was undertaken.

Further information: <https://www.betterstartbradford.org.uk/>; www.borninbradford.nhs.uk

The MPAS

The MPAS was developed by John Condon and colleagues in Australia (Condon & Corkindale, 1998). It is a 19-item measure suitable for use with mothers in the first postnatal year. The items are a mixture of forward and reverse scored items with either 2, 3, 4 or 5 answer categories. Each item is equally weighted so some of the item response categories has decimal scoring. The maximum score is 95, and the theoretical

minimum is 19. Lower scores indicate more problematic responses. The MPAS does not have validated cut off points for problematic or concerning relationships and is not intended for use as a diagnostic tool on its own, but as a supportive indication within a holistic assessment.

The developer of the MPAS has assessed that validity of the measure and it is described as suitable for use in research and clinical practice (Condon & Corkindale, 1998). A sample of 238 women recruited antenatally completed MPAS at three different timepoints (4 weeks, 4 months, and 8 months). Stability of the measure over time was acceptable (all Pearson correlation coefficients significant at $p < 0.001$) and internal consistency of the measure was acceptably high ($\alpha > 0.7$). Factor analysis found that the items loaded onto three factors: Quality of attachment, Absence of hostility and Pleasure in interaction (Condon & Corkindale, 1998).

MPAS has not been widely validated, with only five studies which validate the measure (Condon & Corkindale, 1998; Feldstein *et al.*, 2004; Riera-Martín *et al.*, 2018; Scopesi *et al.*, 2004; van Bussell *et al.*, 2010). These studies were all included in the review by Wittkowski and colleagues (2020) which concluded that the MPAS (and the other included measures) lack evidence of validation, and that if using the measures consideration needs to be given to the robustness of the findings.

The aim of this paper was to assess the clinical utility of the MPAS in universal health visiting services in a disadvantaged and ethnically diverse population.

Specific objectives were to:

- Explore how feasible and acceptable implementation of this tool was within standard health visiting practice in a disadvantaged and ethnically diverse population
- Evaluate the validity and reliability of the tool when used within standard health visiting practice in a disadvantaged and ethnically diverse population

Methods

This was a quantitative study using descriptive statistics to assess the clinical utility of the tool, and using exploratory factor analysis to assess the structural validity and internal consistency of the tool.

Implementation of the MPAS pilot

The MPAS was piloted as a universal assessment at the 3–4-month health visiting contact, over a 1-year period between 8th May 2017 and 8th May 2018. The 3–4 month contact is not one of the nationally mandated contacts but is an additional universal contact offered in Bradford. For women who did not speak English, there were options of an Urdu translated MPAS, administered by a bilingual health visitor, or support from a bilingual health visitor or interpreter for other languages.

Several health visitors in the Better Start Bradford (BSB) area speak community languages and work predominately with families in these languages.

Training on MPAS administration and scoring, and what to do if concerns were identified, was provided by local perinatal mental health specialists. A referral pathway into local perinatal mental health services, discrete interventions and children's services was developed.

Health visitors were asked to record: if the MPAS was offered; if declined, the reasons for this; whether it was self-completed, completed with the help of the health visitor or with an interpreter; and the language used to complete the tool.

MPAS sample eligibility

All women with babies, living in the pilot BSB areas, who had a 3–4-month health visitor contact were eligible to complete the MPAS. Of those who were eligible, women who had a reference to the MPAS assessment in their health record were defined as having been offered the assessment. Those who had no record of any questions being completed were defined as not participating, and reasons for non-participation were reviewed.

To assess clinical utility, those who had one or more questions completed in their health record were defined as having

participated in the MPAS assessment, and those who completed 15 or more of the 19 questions were defined as having completed the MPAS.

Pilot study eligibility

a) Clinical utility

All women seen by health visitors for a 3–4 month visit within the time period of the pilot (8th May 2017 and 8th May 2018) for whom routine health data was available were included in the analysis of coverage and completion. For the representativeness analysis, BiBBS participants who had an infant aged 3–4 months between the 8th May 2017 and 8th May 2018 (the time period of the pilot study) and were living in the Better Start Bradford area were included.

b) Validity & Reliability

The same routine health data used for the coverage and completion analyses were used for the factor analysis. However, participants who did not complete the MPAS in English were excluded, as were all participants who did not complete all 19 questions (see [Figure 1](#)).

Data sources

Routine health visitor data for all eligible women was anonymised and shared with the research team.

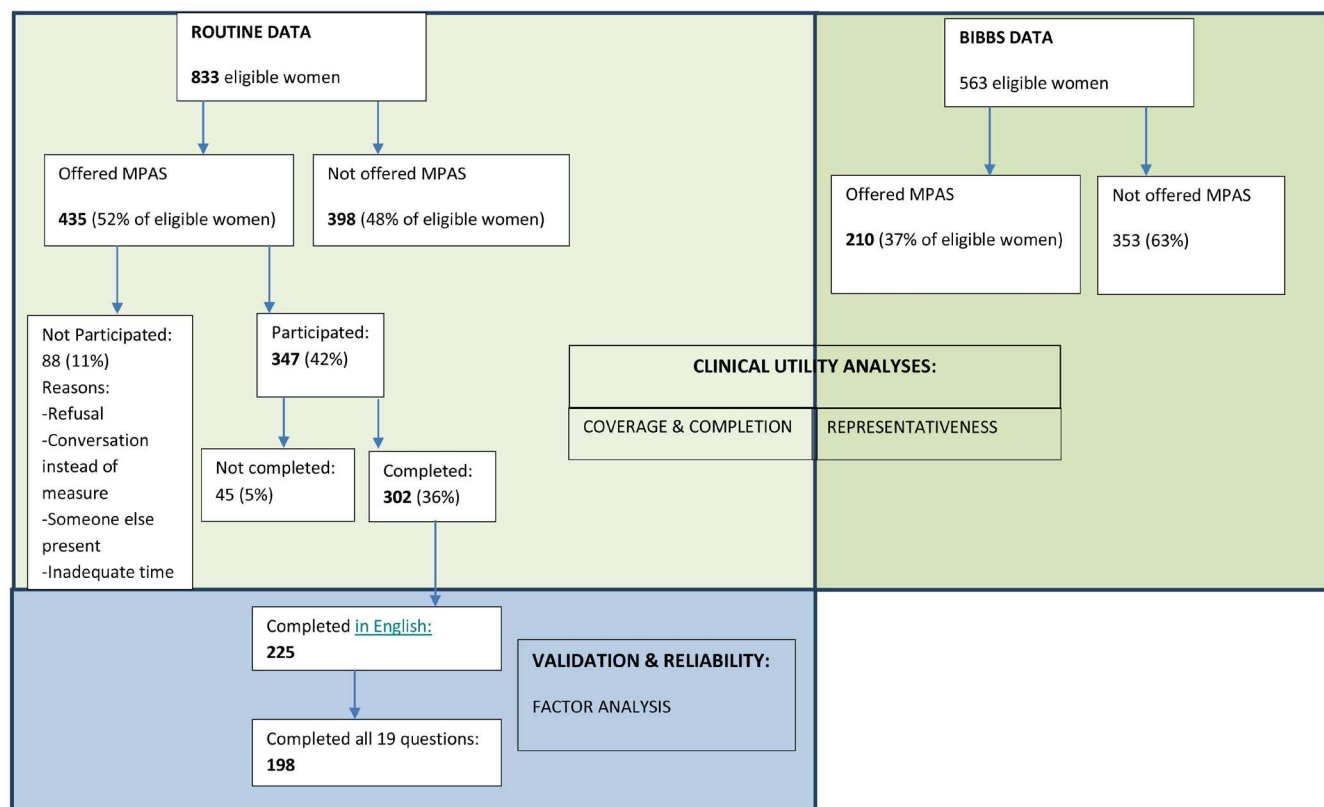


Figure 1. Flow of participants in the MPAS pilot study broken down by the samples used in the clinical utility and validation analyses.

For the representativeness analysis, data on the characteristics of eligible women in the pilot area were obtained using the BiBBS research cohort (see [Box 2](#)). Data included sociodemographic characteristics for all women with infants aged 3–4 months. As part of the BiBBS cohort, routine health visiting data (including MPAS data) were linked to cohort data. This enabled a comparison of women in the cohort who did and did not participate in the MPAS assessment.

Analysis

Objective 1: Feasibility and acceptability of implementation

An acceptable measure would be one which health visitors are willing to ask, and one which women are willing to complete ([de Vet et al., 2011](#)). Three key factors were explored, as recommended by [de Vet et al. \(2011\)](#):

- a) Coverage: What percentage of eligible women took part in the MPAS pilot?
- b) Completion: What percentage of eligible women completed the tool? Adequate completion was defined as 85% women or higher completing at least 15/19 questions.
- c) Representativeness: Are there differences in the characteristics of women who took part in the pilot and completed the MPAS, compared to women who were eligible but did not take part?

For a) and b), descriptive statistics were calculated for all eligible women (women with a 3–4-month health visitor check during the pilot period) using routine service data. For c), we compared age, ethnicity, English language ability, education and material deprivation in the BiBBS data using a Chi Square test for differences in proportion. Missing data led to a casewise deletion.

Objective 2: Validity and reliability of the tool

The content validity of the MPAS was established in the original development study ([Condon & Corkindale, 1998](#)), but there is limited evidence about other measurement properties. Therefore, the structural validity and internal consistency of the MPAS were assessed in the pilot using exploratory factor analysis ([de Vet et al., 2011](#); [Mokkink et al., 2018](#); [Prinsen et al., 2018](#); [Terwee et al., 2018](#)).

This method used a staged approach that: 1) determined the missingness and variation of scores on individual MPAS items; 2) identified the level of correlation between items, and; 3) provided an interpretation of the structural validity and internal consistency.

In stage 1, items which did not show any variation were identified and removed from the analysis. The remaining items were taken forward into stage 2 where a correlation matrix using Pearson correlation coefficients was constructed. For Structural Validity, any items that did not correlate with at least one other item with a coefficient > 0.2 were identified and removed from the analysis, and similarly any items with a coefficient

of > 0.9 were identified and removed. No restrictions were made as to the number of factors to be returned by the analysis.

Assessment of the adequacy of the sample for factor analysis was made using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which should be above 0.5, and Bartlett's test of sphericity, which should be significant. Exploratory factor analysis was selected because using MPAS in routine service and using MPAS in the UK were both new uses of the tool. Items were required to load onto their factor with a loading of at least 0.5, and items which did not meet this threshold were deleted from the measure item by item. Items which have loading of over 0.3 onto multiple factors in the final measure will be considered for deletion but may be retained. Eigenvalues were calculated, and a Scree plot was created to determine the number of factors to retain in the analysis. A threshold of a minimum combined proportion of variance of $>50\%$ explained by the factors was set.

For internal consistency Cronbach's alpha were calculated for each subscale of the above factor analysis, with an expected minimum of 0.7 and of >0.9 being desirable. When the Cronbach's alpha was not satisfactory, items with poor correlation were deleted and the Cronbach alpha was recalculated.

All data were analysed using SPSS (v24) ([IBM Corp, 2016](#)).

Ethics approval

The Health Research Authority confirmed that the pilot of the MPAS is considered to be service evaluation, not research, and as such does not require review by an NHS Research Ethics Committee (HRA decision 60/88/81 February 2017). The BiBBS study received ethical approval by Bradford Leeds NHS Research Ethics Committee (15/YH/0455), and research governance approval from Bradford Teaching Hospitals NHS Foundation Trust. All data were anonymised prior to analysis and are stored securely at the Bradford NHS Teaching Hospital.

Results

Objective 1: Feasibility and acceptability of implementation

During the study period, 37 health visitors were working in the pilot area and 833 women had a 3–4-month visit. In total, 35 of 37 (95%) health visitors completed at least one MPAS assessment, and the number completed per health visitor ranged from 1 to 66.

Of the 833 eligible women, 435 (52%) had been offered the MPAS and of these, 347 (42% of total eligible women and 80% of those offered the MPAS) women participated in the assessment. Reasons for not participating included refusal, having a conversation instead of using the measure, another person present, and inadequate time. Of the 347 who participated, 302 (87%) completed the assessment.

563 BiBBS participants were eligible for this study. Of these women, 210 had been offered the MPAS assessment. There were no significant differences between women who were and were not offered an MPAS for any of the characteristics examined (See [Table 1](#)).

Objective 2: Validity and reliability of the tool

198 MPAS assessments were available for the factor analysis (see [Figure 1](#)). Overall, MPAS scores were skewed, with the vast proportion of women scoring very high, indicative of no concern ([Figure 2](#)). 21% of women who completed the MPAS in English scored the maximum score of 95 on the tool.

Item response was high. The highest proportion of observed missing data (in 6.7% of cases) was for question 9 (“When I leave the baby...”). This item level missingness is not high enough to suggest that the item should be dropped ([de Vet et al., 2011](#)).

Item variation identified that for 9 of the 19 questions, at least one of the response categories was not used by any of

the participants. In the case of question 14 “I now think of the baby as...”, all 198 women selected the response “very much my own baby”. Due to the lack of variation in response in question 14 this item was dropped from the next stage of analysis.

[Table 2](#) shows the correlation matrix of the remaining 18 items of the MPAS. Items 7 (“When I am with the baby and other people are present, I feel proud of the baby...”) and 12 (“When I am with the baby: ... try to prolong time I spend with...”) were not correlated with any of the other MPAS items with correlation coefficients <0.2 and were removed from further analysis. The factor analysis moved forward with 16 items (i.e. without question 7, 12 and 14).

Examination of the scree plot ([Figure 3](#)) shows that there is an indication that a three-factor solution similar to that identified by [Condon & Corkindale \(1998\)](#), may be relevant in this population, however, this three-factor solution only explained 41% of the variance. A six factor solution based on all factors with an eigenvalue of >1 explains 67% of the variance.

Table 1. MPAS attempted with socio-demographics.

			MPAS Not Attempted	MPAS Attempted	TOTAL
MATERNAL AGE	16–25	Count	100	40	140
		% within Mother_Age_Bands	71.40%	28.60%	100.00%
	26–30	Count	124	82	206
		% within Mother_Age_Bands	60.20%	39.80%	100.00%
	31–35	Count	85	62	147
		% within Mother_Age_Bands	57.80%	42.20%	100.00%
	36–45	Count	44	26	70
		% within Mother_Age_Bands	62.90%	37.10%	100.00%
	TOTAL	Count	353	210	563
		% within Mother_Age_Bands	62.70%	37.30%	100.00%
ETHNICITY	Asian/Asian British Pakistani	Count	203	142	345
		% within Ethnicity_Bands	58.80%	41.20%	100.00%
	White British	Count	44	13	57
		% within Ethnicity_Bands	77.20%	22.80%	100.00%
	White Other	Count	30	15	45
		% within Ethnicity_Bands	66.70%	33.30%	100.00%
	Other	Count	72	39	111
		% within Ethnicity_Bands	64.90%	35.10%	100.00%
	Total	Count	349	209	558
		% within Ethnicity_Bands	62.50%	37.50%	100.00%

			MPAS Not Attempted	MPAS Attempted	TOTAL
ENGLISH LISTENING ABILITY	Not at all	Count	3	2	5
		% within English_Listening_Ability	60.00%	40.00%	100.00%
	A little bit	Count	42	16	58
		% within English_Listening_Ability	72.40%	27.60%	100.00%
	Some	Count	34	15	49
		% within English_Listening_Ability	69.40%	30.60%	100.00%
	Quite well	Count	54	43	97
		% within English_Listening_Ability	55.70%	44.30%	100.00%
	Very well	Count	81	62	143
		% within English_Listening_Ability	56.60%	43.40%	100.00%
	Total	Count	214	138	352
		% within English_Listening_Ability	60.80%	39.20%	100.00%
ENGLISH SPEAKING ABILITY	Not at all	Count	12	3	15
		% within English_Speaking_Ability	80.00%	20.00%	100.00%
	A little bit	Count	56	24	80
		% within English_Speaking_Ability	70.00%	30.00%	100.00%
	Some	Count	35	24	59
		% within English_Speaking_Ability	59.30%	40.70%	100.00%
	Quite well	Count	40	31	71
		% within English_Speaking_Ability	56.30%	43.70%	100.00%
	Very well	Count	72	56	128
		% within English_Speaking_Ability	56.30%	43.80%	100.00%
	Total	Count	215	138	353
		% within English_Speaking_Ability	60.90%	39.10%	100.00%
EDUCATION	Don't Know	Count	7	3	10
		% within Education_Bands	70.00%	30.00%	100.00%
	No qualifications	Count	38	18	56
		% within Education_Bands	67.90%	32.10%	100.00%
	5 or fewer GCSEs	Count	105	61	166
		% within Education_Bands	63.30%	36.70%	100.00%
	5 or more GCSEs	Count	48	24	72
		% within Education_Bands	66.70%	33.30%	100.00%
	A levels or equivalent	Count	38	22	60
		% within Education_Bands	63.30%	36.70%	100.00%
	Degree or equivalent	Count	100	74	174
		% within Education_Bands	57.50%	42.50%	100.00%
	Total	Count	336	202	538
		% within Education_Bands	62.50%	37.50%	100.00%

			MPAS Not Attempted	MPAS Attempted	TOTAL
SELF REPORTED FINANCIAL STAU	Do not wish to answer	Count	8	11	19
		% within Financially_Managing_Bands	42.10%	57.90%	100.00%
	Don't know	Count	3	3	6
		% within Financially_Managing_Bands	50.00%	50.00%	100.00%
	Finding it very difficult	Count	5	3	8
		% within Financially_Managing_Bands	62.50%	37.50%	100.00%
	Finding it quite difficult	Count	20	8	28
		% within Financially_Managing_Bands	71.40%	28.60%	100.00%
	Just about getting by	Count	65	24	89
		% within Financially_Managing_Bands	73.00%	27.00%	100.00%
	Doing alright	Count	131	75	206
		% within Financially_Managing_Bands	63.60%	36.40%	100.00%
PARITY	Living comfortably	Count	117	85	202
		% within Financially_Managing_Bands	57.90%	42.10%	100.00%
	Total	Count	349	209	558
		% within Financially_Managing_Bands	62.50%	37.50%	100.00%
	Primip	Count	69	36	105
		% within Parity_Bands	65.70%	34.30%	100.00%
	Non Primip	Count	148	85	233
		% within Parity_Bands	63.50%	36.50%	100.00%
	Total	Count	217	121	338
		% within Parity_Bands	64.20%	35.80%	100.00%

However, on further examination, (Table 3), factor six has only one variable loading onto it. Removing this variable (question 2), another variable (question 9) no longer loads onto the factor solution, leaving factor five with one variable loading onto it (question 4). Removing these three variables leads to a 10-item scale with a four factor solution that explains 60% of the variance. Whilst this solution meets the KMO test for sampling adequacy, and Bartlett's test of sphericity, interpreting the factor structure highlights that, as well as a relatively large number of factors from just ten items, there are three items (8,15,18) which are loading (at >0.3, but less than <0.5) onto multiple factors impairing interpretation of the factor structure of the tool. As no meaningful

factors can be extracted from the MPAS data there is no ability to assess the internal consistency of the extracted factors.

Discussion

This study assessed the clinical utility, validity and reliability of the MPAS in universal health visiting services in Bradford. This is the first time that this assessment tool has been used in clinical practice anywhere (to the authors' knowledge at the time of writing), and in a disadvantaged and ethnically diverse population. In the pilot, health visitors' use of the tool was inconsistent and only 52% of eligible women were offered an MPAS assessment by the health visitor at the 3–4-month visit. There was considerable variation between health visitors in how

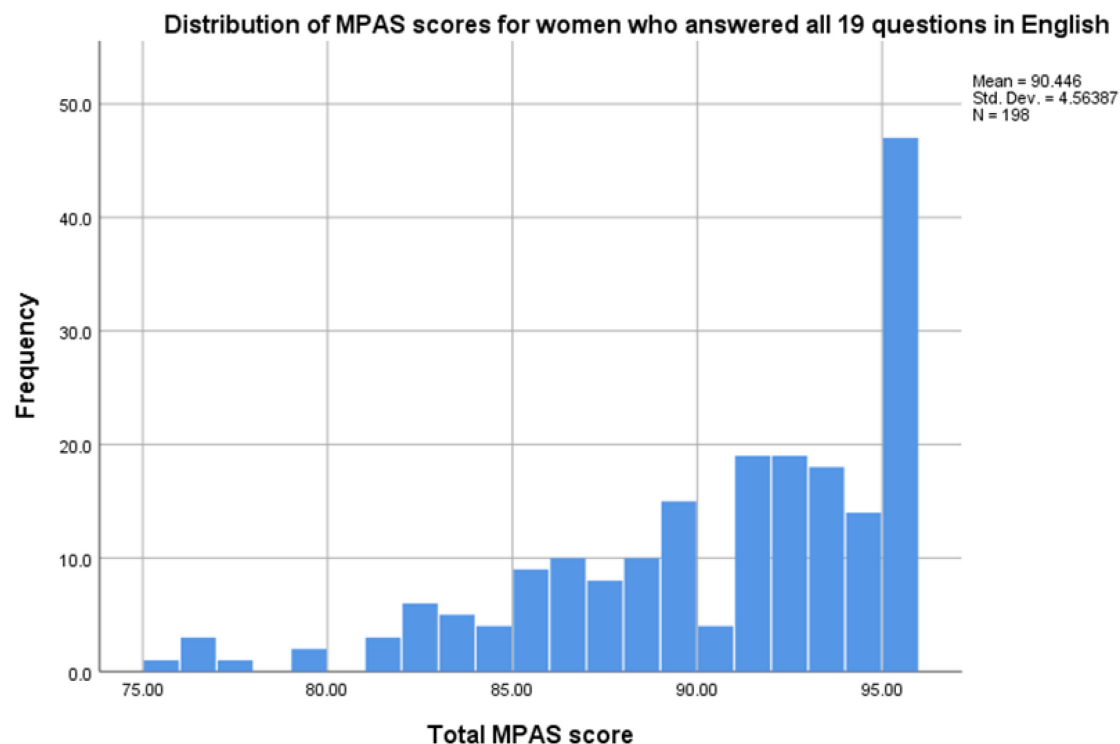


Figure 2. Distribution of MPAS scores for women who answered all 19 questions in English.

often they used the MPAS with their case load, with some health visitors never recording using it, and one using the tool 66 times during the pilot. There were no socio-demographic differences in who was and was not offered the MPAS, suggesting that health visitors were not being biased in who they offered the assessment to. Of those offered the MPAS, 80% participated and 87% completed suggesting that, when offered, it is acceptable. However, the distribution of the scores was highly skewed with little variance and no indication of any concerns detected in the scores. Furthermore, the analysis on the validity of the MPAS tool in this population failed to find evidence of internal consistency or structural validity. The findings suggest that women in the pilot study population did not interpret or respond to the MPAS questions as intended.

Further in-depth exploration of these findings is required to understand why some health visitors used the tool inconsistently, and what the barriers were to completing the tool with almost half of the eligible population. It is important to understand whether the barriers related to the design of the tool or to contextual factors that could be addressed to improve uptake.

Further exploration is also required to understand the lack of variance in the scores in the pilot study. Whilst this could relate to a lack of validity with women perhaps not understanding

or interpreting the questions as intended due to cultural and/or language differences. There may however also be reluctance for women to disclose concerns about their relationship with their baby to health professionals. Previous research completed with a similar population has shown that women from ethnic minorities are less likely to have their perinatal mental health identified by health professionals due to a complex interplay of reluctance to disclose (e.g. due to stigma, fear of having their baby taken away), difficulty in identification by health professionals (e.g. use of interpreters, lack of time etc.) and problems in capturing issues on IT systems (Prady *et al.*, 2021; Prady *et al.*, 2016a; Prady *et al.*, 2016b).

An additional research study has explored these explanations using qualitative interviews with health visitors during this pilot study. The linked paper by Bird *et al.* (2022) explores these issues further. Key findings from this paper suggest that although health visitors welcomed the opportunity to discuss the parent infant relationship and there were benefits to using a structured tool, there were also considerable challenges that hindered implementation of the MPAS in a valid and reliable way. Health visitors had concerns around the length of time required to administer the tool, the complexity of the language and the intrusiveness of some questions. These concerns were exacerbated when translation was used. The context that health visitors were working in and lack of time for home visits also posed challenges. Together,

Table 2. Correlation matrix of 18 MPAS items.

Question number	1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17	18	19
1	1	0.161	0.056	0.207	0.244	0.211	0.048	-0.059	0.283	0.166	0.108	0.055	0.072	0.127	0.287	0.273	0.134	0.177
2	0.161	1	0.208	0.123	0.056	0.137	0.102	-0.028	0.128	0.085	0.137	0.097	0.016	0.066	0.078	-0.020	-0.009	0.016
3	0.056	0.208	1	0.249	-0.034	-0.028	-0.083	-0.034	0.170	0.111	0.242	0.086	0.444	0.186	0.065	0.060	0.251	0.111
4	0.207	0.123	0.249	1	0.156	0.164	-0.071	-0.042	0.026	0.152	0.053	-0.034	-0.015	0.102	0.177	0.280	0.018	0.363
5	0.244	0.056	-0.034	0.156	1	0.320	0.014	-0.045	0.236	0.199	0.218	0.110	0.027	0.111	0.193	0.218	0.216	0.175
6	0.211	0.137	-0.028	0.164	0.320	1	-0.004	-0.038	-0.018	0.070	0.019	-0.031	0.024	0.067	0.063	0.061	0.124	0.086
7	0.048	0.102	-0.083	-0.071	0.014	-0.004	1	-0.045	0.112	0.078	-0.035	-0.037	0.131	0.168	0.088	0.105	-0.074	0.061
8	-0.059	-0.028	-0.034	-0.042	-0.045	-0.038	-0.045	1	0.031	-0.033	-0.053	-0.013	-0.034	0.214	0.024	-0.050	0.031	-0.041
9	0.283	0.128	0.170	0.026	0.236	-0.018	0.112	0.031	1	0.188	0.361	0.075	0.189	0.104	0.131	0.066	0.237	0.145
10	0.166	0.085	0.111	0.152	0.199	0.070	0.078	-0.033	0.188	1	0.224	-0.027	0.105	0.202	0.225	0.135	0.189	0.368
11	0.108	0.137	0.242	0.053	0.218	0.019	-0.035	-0.053	0.361	0.224	1	0.184	0.295	0.082	0.184	-0.027	0.181	0.221
12	0.055	0.097	0.086	-0.034	0.110	-0.031	-0.037	-0.013	0.075	-0.027	0.184	1	0.082	-0.038	0.198	-0.041	0.182	-0.033
13	0.072	0.016	0.444	-0.015	0.027	0.024	0.131	-0.034	0.189	0.105	0.295	0.082	1	0.037	0.085	0.068	0.237	0.076
15	0.127	0.066	0.186	0.102	0.111	0.067	0.168	0.214	0.104	0.202	0.082	-0.038	0.037	1	0.324	0.295	0.052	0.202
16	0.287	0.078	0.065	0.177	0.193	0.063	0.088	0.024	0.131	0.225	0.184	0.198	0.085	0.324	1	0.239	0.275	0.109
17	0.273	-0.020	0.060	0.280	0.218	0.061	0.105	-0.050	0.066	0.135	-0.027	-0.041	0.068	0.295	0.239	1	0.166	0.194
18	0.134	-0.009	0.251	0.018	0.216	0.124	-0.074	0.031	0.237	0.189	0.181	0.182	0.237	0.052	0.275	0.166	1	0.121
19	0.177	0.016	0.111	0.363	0.175	0.086	0.061	-0.041	0.145	0.368	0.221	-0.033	0.076	0.202	0.109	0.194	0.121	1

* Correlations between items of higher than 0.2 are highlighted

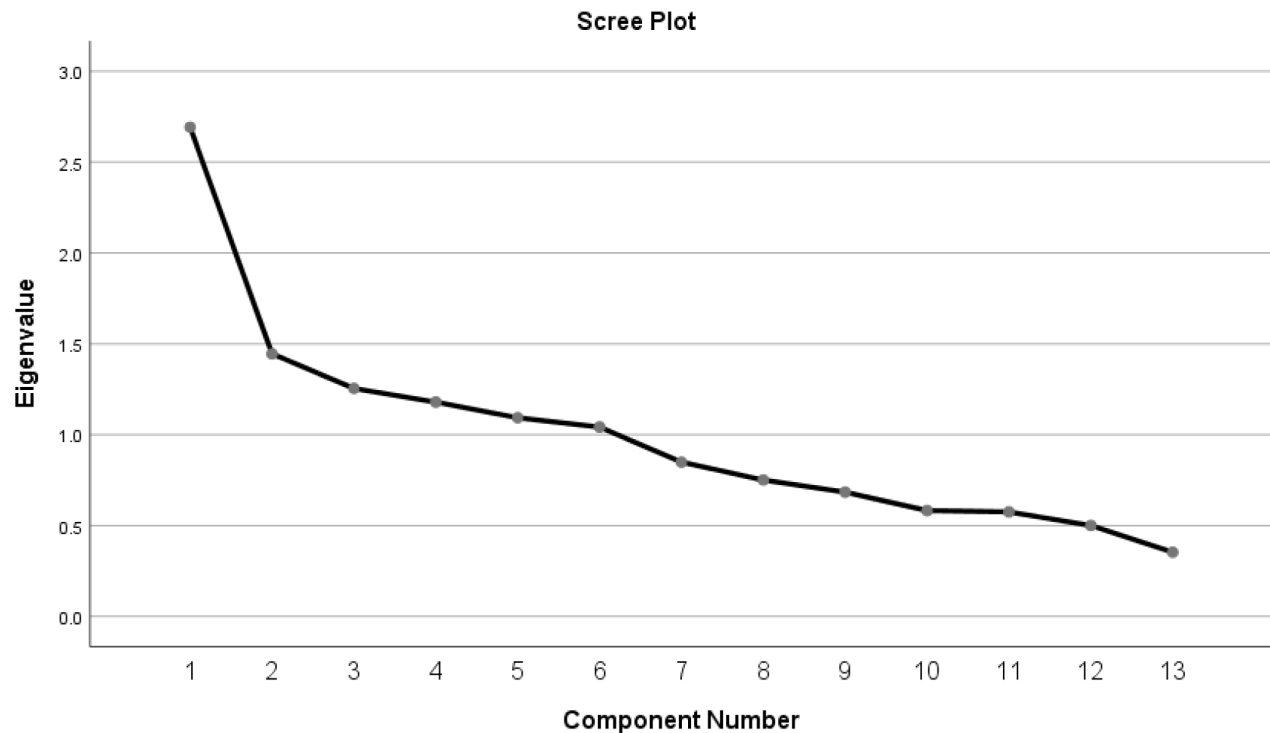


Figure 3. Scree plot.

Table 3. Factor loadings in six factor solution.

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	2.692	20.706	20.706
2	1.445	11.117	31.823
3	1.254	9.647	41.471
4	1.179	9.069	50.539
5	1.093	8.408	58.947
6	1.042	8.016	66.963
7	.849	6.530	73.492
8	.750	5.773	79.265
9	.684	5.259	84.524
10	.583	4.483	89.007
11	.575	4.424	93.431
12	.501	3.851	97.282
13	.353	2.718	100.000

the papers highlight the need for a robust, valid measure to assess parent-child relationships in routine practice, with coproduction to ensure clinical utility and acceptability.

Strengths of this study include the evaluation of the use of the MPAS in routine health visiting practice, meaning that findings relate to 'real world' use of the measure. The evaluation builds on a successful partnership between the service and evaluation teams, from working together to identify a suitable measure through to evaluation and implementation of findings into practice. This meant that the evaluation considered both theoretical and operational perspectives.

There are two key limitations to this study. Firstly, the BSB population has an unusual profile. The population in BSB are very ethnically diverse (only 10% of the women giving birth in the area identify as White British) and economically deprived, live in an urban area, and are not representative of the wider UK population. As such the findings may not be valid for less deprived, less ethnically diverse, or more suburban/rural communities. It is vital that any objective tool is feasible to implement and meaningful to use with all women and health professionals.

Secondly, the routine setting of the study meant we were reliant on health visiting data, not all of which we had full access to. We had no information about the 50% of eligible women who had contact with a health visitor but who had no information recorded as to if they were asked to complete MPAS. Not knowing why MPAS was not asked in these cases limits our ability to understand how acceptable and useful the MPAS was to both women and health visitors. These limitations mean that caution must be exercised when generalising the findings of the BSB pilot.

Conclusions

The MPAS was administered to a representative sample by health visitors, but acceptability was low, and the MPAS had poor psychometric properties. Qualitative research (Bird *et al.*, 2022) confirms that the MPAS was not fully understood by the sample, rendering it unacceptable for the Bradford context. Although health visitors welcomed the opportunity to discuss the parent infant relationship, there were also considerable challenges. This included concerns around the complexity and length of the tool itself and the time-pressured context that health visitors were working in.

Implications for practice and/or further research

Based on the findings from this paper, and Bird *et al.* (2022), the gap for a robust, valid measure to assess parent-child relationships in routine practice remains, at least in Bradford. Considering this, we coproduced a tool with health visitors, service staff and with input from parents, based on the learning from the current study, and have piloted it in routine care (Bywater *et al.*, 2022).

Data availability

The data are stored securely by Born in Bradford (BiB) at the Bradford Institute for Health Research (BIHR). Data sharing is not applicable to this article, because the participants did not give permission for their data, collected during the service evaluation (not research), to be shared. However, restricted

access to an anonymised data set will be considered on a case by case basis, dependant on the relevance of the research question and its' ability to be answered using the existing data.

Before you contact BiB, please make sure you have read our [Guidance for Collaborators](#). The decision for restricted access will be made by our BiB Executive Committee, which reviews proposals on a monthly basis, and we will endeavour to respond to your request as soon as possible. You can find out about all of the different datasets which are available [here](#). If you are unsure if we have the data that you need please contact a member of the BiB team (borninbradford@bthft.nhs.uk).

Once you have formulated your request please complete the 'Expression of Interest' form available [here](#) and email the BiB research team (borninbradford@bthft.nhs.uk). Please indicate clearly that you are applying for the restricted dataset used in this article. If your request is approved, we will ask you to sign a [collaboration agreement](#); if your request involves biological samples, we will ask you to complete a [material transfer agreement](#).

Acknowledgements

The authors acknowledge the help of Kathryn Willan and Joyti Panesar-Sharma in the preparation of the dataset used. The authors would like to state that this manuscript was published as a pre-print and available at <https://doi.org/10.1101/2021.11.30.21267061>.

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Open Peer Review

Current Peer Review Status:  

Version 2

Reviewer Report 14 November 2022

<https://doi.org/10.21956/wellcomeopenres.20368.r53197>

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Nicola A. Savory 

Maternity Unit, University Hospital of Wales, Heath Park, Cardiff and Vale University Health Board, Cardiff, UK

Thank you for the changes which make this article easier for the reader to understand.
I have no further comments to make.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: My areas of research include, maternity care throughout the perinatal period. Within this I have reviewed service provision, maternal and midwives experiences and mental health. Methods include multiple method research, questionnaires, interviews and focus groups, use of routine data.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 07 November 2022

<https://doi.org/10.21956/wellcomeopenres.20368.r53196>

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Eleonora Bielawska-Batorowicz 

Department of Clinical Psychology and Psychopathology, Faculty of Educational Sciences, Institute of Psychology, University of Lodz, Lodz, Poland

I accept the amended version of the paper

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: reproductive psychology, parental prenatal and postnatal attachment, reproductive mental health, psychology of menopause

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 12 July 2022

<https://doi.org/10.21956/wellcomeopenres.19409.r51297>

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Nicola A. Savory

Maternity Unit, University Hospital of Wales, Heath Park, Cardiff and Vale University Health Board, Cardiff, UK

Reviewers comments

Thank you for the opportunity to review this manuscript which seeks to look at the feasibility/acceptability, validity, and reliability of a screening tool to assess parent-infant relationships. The gap in evidence for a new tool for maternal-infant attachment is clearly laid out. A description of the role of the health visitor in the UK is provided for international readers. There is mention of the clinical relevance and need for a validated screening tool.

This is a well-written paper. I only have two comments.

1. In the introduction, there is mention of prevalence rates for insecure attachment or attachment disorders. There is such a significant difference in these prevalence rates 1.4% and 35%. Could a sentence be added to explain the possible reasons for this difference. Was it related to reporting methods, were they well reported papers?
2. The other comment relates to the ease of reading the manuscript. I have read the methods/results section a couple of times and I am still trying to distinguish if there are two different groups – those eligible to participate and BiBBS participants. Or are the BiBBS participants a sub-group of the total number of participants? It is not clear in the Abstract which only reports on 563 women in BiBBS group. Could this be made clearer for the reader throughout the paper?

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: My areas of research include, maternity care throughout the perinatal period. Within this I have reviewed service provision, maternal and midwives experiences and mental health. Methods include multiple method research, questionnaires, interviews and focus groups, use of routine data.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 20 Oct 2022

Charlotte Endacott, University of York, York, UK

Thank you for seeking more clarity on this point. Below we offer more detail around the required sub-samples. The information below has been threaded through the manuscript in the abstract, methods, and results section to facilitate the readers' understanding. Three sub-samples were needed to fulfil the two objectives – those who had been offered and had completed the MPAS, those who had been offered it and not completed it, and those that had not been offered it.

The research team only had demographic data for parents who were participating in the BiBBS cohort. The BiBBS data enabled us to assess the representativeness of the sample to ensure that our subsequent MPAS psychometric analyses were robust.

There were 833 eligible women across the BSB pilot area, 563 of these were in the BiBBS cohort. In total 435 of the 833 women were offered the MPAS (210/435 were in the BiBBS cohort), and 398 were not offered it (353/398 were in the BiBBS cohort). In total 302 partially/fully completed the MPAS. The psychometric analyses included MPAS data from

198 parents who had fully completed it in English.

Competing Interests: No competing interests were disclosed.

Reviewer Report 20 April 2022

<https://doi.org/10.21956/wellcomeopenres.19409.r49695>

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Eleonora Bielawska-Batorowicz 

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The measurement of postnatal parental attachment requires a reliable tool and even more so in the context of screening in the health visiting setting. The manuscript describes the process of validation of one of the measures of postnatal maternal attachment (Maternal Postnatal Attachment Scale by Condon & Corkindale) in the sample of women from a disadvantaged and ethnically diverse community. The aims and rationale of the study are clearly stated and the methodology is properly described. It is interesting that the analyses were conducted in two ways:

1. by assessing the feasibility and acceptability of implementation of MPAS in a routine health visiting practice and,
2. by assessing the validity and reliability of MPAS. The results of both analyses are properly presented and illustrated by figures, tables, and relevant statistical data.

Although I do not consider myself to be an expert in statistical analyses, the way the validity and reliability of MPAS have been evaluated seems to be properly designed and conducted. Therefore the findings are convincing and conclusions appropriate for the data presented in the text. The strength and limitations were clearly discussed therefore the final conclusions on the feasibility of the usage of MPAS in health visiting practice (especially in the studied community) and its validity are appropriate for the results of the study. It is interesting that the Authors follow their findings by engaging in the construction and validation of another tool aimed to assess the parent-child relationship in the context of routine postnatal health care.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: reproductive psychology, parental prenatal and postnatal attachment, reproductive mental health, psychology of menopause

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 20 Oct 2022

Charlotte Endacott, University of York, York, UK

Thank you for your comment – we have amended the text to:

Insecure attachment prevalence rates are estimated to be high, at 35% in a Danish community study ([Skovgaard, 2010](#)), while rates of the rarer social functioning disorder reactive attachment disorder in the UK are 1.4% ([Minnis et al., 2013](#)) (reactive attachment disorder is a social functioning disorder associated with abuse and neglect and is associated with significant psychiatric morbidity). Attachment is not routinely assessed in, or beyond, infancy, and prevalence is difficult to gauge because of this and the lack of robust measures to assess attachment'

Competing Interests: No competing interests were disclosed.