

1       **Feasibility of a psychoeducational group intervention to improve parental reflective**  
2                               **functioning and bonding in pregnancy: A randomised trial**

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13       **Author contributions**

14       HC, CD and AJ developed the Baby CHAT group and its materials and designed the study.  
15       HC and CD completed the groups and collected data. HC was responsible for data analysis,  
16       interpretation and drafted and revised the manuscript. CD and AJ supervised the study and  
17       revised the manuscript. NR helped with the development of Baby CHAT group material by  
18       providing and thinking about how we could incorporate scan video footage, also advised on  
19       how to recruit and access participants and study design and edited the ms.

20       **Compliance with ethical standards**

21       Ethical consent was gained from the National Research Ethics Service and the Health  
22       Research Authority. Research and Development approval from NHS sites was also sought.

23 Informed consent was obtained from all individual participants included in the study. Royal  
24 Holloway, University of London ethical approval was also sought.

25 **Geolocation information**

26 This study took place in South-East London.

27 **Acknowledgments**

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35       **Feasibility of a psychoeducational group intervention to improve parental reflective**  
36                   **functioning and bonding in pregnancy: A randomised trial**

37  
38                                   **Abstract**

39  
40    *Objective:* To develop and evaluate Baby CHAT, a single-session psychoeducational  
41    intervention for expectant parents. Baby CHAT aims to improve parental reflective  
42    functioning (RF) and bonding.

43    *Background:* The early years of a child’s life, including pregnancy, are vital for healthy  
44    physical and emotional development. Caregivers who provide responsive and positive  
45    parenting, enhanced through strong bonds and good reflective functioning (RF), can aid  
46    healthy development of their children. However, limited interventions exist aimed at  
47    enhancing RF and bonding in expectant mothers and fathers.

48    *Methods:* The feasibility of Baby CHAT was assessed using a mixed methods randomised  
49    controlled trial (RCT) design. It evaluated uptake and retention of participants, effect size  
50    calculations, and acceptability and satisfaction with Baby CHAT.

51    *Results:* Participants (N=20) were aged 30-39 years (n=17) in their third trimester of  
52    pregnancy (n=12). Nine males and 11 females were recruited. Content analysis of qualitative  
53    feedback after the intervention resulted in four themes; positive group aspects, group  
54    improvements, 4D scan footage, and relating content to my baby.

55    *Conclusions:* Findings indicated that Baby CHAT is enjoyable and useful in helping  
56    expectant parents think about baby as a separate person, with potential to improve prenatal  
57    RF and bonding. However, further research is required to assess the effectiveness of Baby  
58    CHAT to improve bonding and RF. Future studies should investigate Baby CHAT with an  
59    adequately powered study.

60

61 *Keywords:* reflective functioning; bonding; parenting intervention; pregnancy; antenatal; 4D

62 scans

63 **Introduction** Reflective functioning (RF), an individual's ability to think about and interpret  
64 their own and others' actions (Bateman & Fonagy, 2010) and bonding, feelings of an  
65 expectant mother or father towards their baby (Pretorius et al., 2005), can positively improve  
66 early parent-child relationships. Developing good RF in pregnancy means parents can  
67 imagine their unborn fetus as a baby and themselves as parents (Slade, Grienenberger,  
68 Bernbach, Levy & Locker, 2005), facilitating positive transitions into parenthood. When  
69 developed prenatally, RF can help develop stronger parental-child bonds (Sadler, Novick &  
70 Meadows-Oliver, 2016). Parental bonding begins before birth (Glover & Capron, 2017) with  
71 strong maternal-fetal bonds predicting better physical health behaviours during pregnancy  
72 and maternal mental health (Lindgren, 2001) as well as enhancing post-natal bonds (Rossen  
73 et al., 2016). This has potential to increase responsive and sensitive care (Foley & Hughes,  
74 2018). Parents with difficulty developing RF or bonding with their babies (Taylor, Atkins,  
75 Kumar, Adams & Glover, 2005) can be helped with parenting interventions.

### 76 *Reflective functioning interventions*

77 A number of parenting interventions to improve RF have been proposed. These  
78 include a post-natal psychoeducational group, Family-Minds (Bammens, Adkins, & Badger,  
79 2015), that significantly improved parental RF by helping parents understand their own and  
80 others' mental states. The Minding the Baby (MTB) (Sadler et al., 2016) intervention,  
81 encouraged RF by narrating parent-child interactions to help parents consider how they and  
82 baby were feeling. Mothers in the intervention group compared with controls increased their  
83 ability to reflect.

84 Fewer RF interventions have been developed for pregnancy. The Peep Reflective  
85 Parenting Programme (Maskell-Graham, 2014) for expectant mothers (28-30 weeks'  
86 gestation) aimed to enhance RF, bonding, and confidence, through helping mothers

87 understand their baby's experience, supporting them to recognise and respond to baby's  
88 behaviours. In their sample of ten mothers RF was enhanced.

### 89 ***Bonding interventions***

90 An attachment-based antenatal group 'Mellow Bumps' (Breustedt & Puckering,  
91 2013), delivered at 20-30 weeks gestation, aimed to decrease mothers' stress and increase  
92 parent-child bonding. Unstructured interviews with four mothers with one or more risk  
93 factors indicated reduced anxiety and depression. However, the authors did not include any  
94 objective measurements for prenatal bonding.

95 Studies using ultrasounds have shown that four-dimensional (4D) scans can help  
96 parents visualize their fetus as a baby and evoke strong feelings of happiness and excitement  
97 (Ji et al., 2005). Two-dimensional (2D), three-dimensional (3D) and 4D scans, are associated  
98 with increased prenatal bonding in mothers (deJong-Pleij et al., 2013; Righetti, Dell'Avanzo,  
99 Grigio & Nicolini, 2005; Rustico, Baietti, Coviello, Orlandi & Nicollini, 2005) but not  
100 fathers (Righetti et al., 2005). Providing a context and understanding to scan images can  
101 enhance parent-fetus bonding by increasing understanding of the images by mothers and  
102 fathers, and help inform stories about the unborn child's experience (Roberts, 2012). This  
103 suggests, adding an explanatory context to scans may help prenatal bonding. Stronger bonds  
104 in pregnancy can enhance healthy maternal behaviours for example exercising, eating a  
105 healthy diet and smoking cessation (Lindgren, 2001).

### 106 ***Developing a new intervention***

107 Most studies examining parenting interventions enhancing bonding and RF are  
108 conducted post-birth, however, promoting prenatal bonding is crucial (Daglar & Nur, 2018)  
109 because prenatal interventions improve the quality of post-natal relationships (Siddiqui &  
110 Hagglöf, 2000). Furthermore, interventions often fail to include fathers, their approaches and  
111 formats vary and none are designed to improve both bonding and RF. Those delivering

112 prenatal care are vital in assessing and promoting maternal–fetal bonding (Daglar & Nur,  
113 2018) however, there are funding and time constraints. No current antenatal psychological  
114 intervention can be delivered in a single session, making it cost-effective and a simple  
115 addition to existing antenatal care. In the current study, we aim to address this gap in the  
116 literature by assessing feasibility of a new intervention.

117         Research using 4D ultrasounds has shown fetuses from 32-weeks show “proto  
118 imitation” of mouth movements, when hearing specific sounds (Reissland, Francis,  
119 Buttanshaw, Austen & Reid, 2016). Indeed, fetuses habituate to sound and light stimulation,  
120 and thereby possibly their memory for such stimulation (Reissland, Francis, Froggatt,  
121 Reames & Girkin, 2018). Additionally, fetal reactions to crossmodal stimulation is affected  
122 by maternal anxiety and depression (Reissland et al., 2018). Hence, this and other research  
123 indicates that fetuses react to stimulation and are preparing to interact socially, pre-birth  
124 (Reissland et al., 2016). We propose incorporating this 4D video footage in a  
125 psychoeducational teaching tool to augment textually delivered information, thereby  
126 increasing its effectiveness in helping parents to apply taught content to their baby.  
127 Visualizing the fetus could help parents conceptualise their baby as a social being with  
128 individual characteristics, which are hypothesized to improve RF (primary outcome) and  
129 prenatal bonding, as well as maternal health behaviours (secondary outcomes).

130         This paper describes development and evaluation of ‘Baby CHAT’, a novel, single-  
131 session group antenatal intervention, incorporating 4D scan video footage developed by  
132 Reissland (2017). It aims to improve RF by helping parents think about the experience and  
133 characteristics of their unborn baby and improve pre-natal bonding by encouraging parents to  
134 do activities with baby pre-birth to enhance emotional ties and feelings of closeness.  
135 Enhancing maternal-fetal bonds should improve maternal health behaviours.

136

137 ***Aims***

138           This paper assesses feasibility and acceptability of Baby CHAT, and research  
139 methods for a subsequent trial in order to understand whether Baby CHAT could improve RF  
140 and/or bonding. This study aimed to generate descriptive statistics to assess the feasibility of  
141 proposed methods and intervention, rather than establishing efficacy or generalisability. In  
142 order to test the feasibility of Baby CHAT we assessed: 1) uptake and retention by expectant  
143 parents; 2) acceptability of, and satisfaction with, Baby CHAT; and 3) calculation of effect  
144 sizes to aid future sample sizes.

145 **Method**

146 ***Design***

147           Mixed-methods randomised controlled design to test feasibility of research evaluation  
148 methods and acceptability of Baby CHAT.

149 ***Participants***

150           Opportunity sample (N=20) recruited from two maternity units in South-East London,  
151 following normal 20-week anomaly scans, for single or multiple pregnancies. Both couples  
152 and single parents, including those without their partners. Data was collected from expectant  
153 mothers and fathers. See results (Table 4) for full participant information.

154 ***Intervention development and delivery***

155           The 60-minute ‘Baby CHAT’ intervention comprised psychoeducational material and  
156 was adapted from existing guidelines (Day et al., 2014; see Table 1 for session plan). A  
157 Clinical Psychologist and a Trainee Clinical Psychologist facilitated groups. Fidelity was  
158 ensured using the session plan during groups and fidelity checklist following groups. If  
159 adopted into routine practice, Psychologists, Nurses or Midwives could deliver groups.

160



161 Table 1

162 *Baby CHAT session plan*

Section	Time (mins)	Content
1. Welcome	10	<ul style="list-style-type: none"><li>• Introductions</li><li>• Overview of Baby CHAT</li><li>• Confidentiality</li><li>• Participants share something they are looking forward to about meeting their baby.</li><li>• Baby CHAT booklet given</li></ul>
2. Social and unique baby	15	<ul style="list-style-type: none"><li>• Presentation of information about social development of a baby post-birth (Belsky &amp; De Haan, 2011; Maggi, Irwin, Siddiqi &amp; Hertzman, 2010; NHS Choices, 2016).</li><li>• Video of a six-week old baby interacting with her parents (displaying early baby ‘chat’)</li><li>• Video material showing reciprocal parent-baby interactions highlighted and group discussion encouraged.</li><li>• Parents asked to consider when baby’s social development occurs, for example before or after birth.</li><li>• Presented with information about fetal development during pregnancy (NHS Choices, 2017a; Reissland et al., 2016).</li></ul>
3. Four-Dimensional scan research	15	<ul style="list-style-type: none"><li>• Video clip ‘Your unborn baby and you’ (Reissland, 2017), containing 4D-ultrasound images of fetuses mouthing sounds presented outside the womb.</li><li>• Discussion encouraged, to help parents think about social development of babies from 32-weeks.</li><li>• This could enable parents to consider unborn babies as individuals, with their own experiences to encourage reflective thinking.</li><li>• Think about baby getting ready for when they meet them.</li></ul>
4. Getting to know your baby	5	<ul style="list-style-type: none"><li>• Parents were asked to think about and visualise characteristics of their own baby for example routine</li></ul>

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		<p>in the womb, likes and dislikes, bump name (NHS Choices, 2017b; Hijazi &amp; East, 2009).</p> <ul style="list-style-type: none"> <li>• What have you learnt about your baby so far?</li> <li>• What do you think their personality and temperament is like?</li> <li>• What do you think baby is doing in the womb?</li> <li>• This was to encourage RF by asking parents to think about the experience of their baby (RF) and to further develop feelings of connection (bonding).</li> </ul>
5. Baby CHAT (doing things together)	10	<ul style="list-style-type: none"> <li>• Discussion around activities parents can do with baby before birth for example: <ul style="list-style-type: none"> <li>○ singing</li> <li>○ reading</li> <li>○ talking</li> <li>○ playing music</li> <li>○ mindfulness</li> </ul> </li> <li>• Thinking about good times to do these activities for example choosing more upbeat music if baby is awake and moving around, more sedate activities when baby is less active.</li> <li>• Aim to encourage parents to think about developing a stronger connection with baby (bonding) and about their baby's experience when choosing activities (RF).</li> <li>• <b>Plan when/where/how</b> parents will have a go at one or more of these activities.</li> </ul>
6. Ending	5	<ul style="list-style-type: none"> <li>• Ask everyone to write something positive they will take away from the session about their baby's development.</li> <li>• Aim to reinforce key messages and leave parents with positive feelings at the end of the group.</li> </ul>

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164 **Measures**

165 *Participant characteristics*

166 Descriptive data collected about age, sex, ethnicity, education, employment status,  
167 previous mental health difficulties, and pregnancy details. A questionnaire about current  
168 parental mental health was included:

169 *Hospital Anxiety and Depression Scale (HADS)* (Zigmond & Snaith, 1983)  
170 Fourteen-item (rated 0-3) self-report scale. Scores range from: 0 (no  
171 anxiety/depression) to 21 (severe anxiety/depression). It screens out physical or somatic  
172 symptoms of depression (Bjelland, Dahl, Haug & Neckelmann, 2002) making it suitable for  
173 pregnant populations (Lee et al., 2007). It has good internal consistency for anxiety ( $\alpha=.83$ )  
174 and depression ( $\alpha=.82$ ) and very good concurrent validity when compared against other  
175 common questionnaires (Bjelland et al., 2002).

#### 176 *Feasibility outcomes*

177 The following information was recorded:

- 178 • Participant uptake and retention
- 179 • Rates of eligible participants
- 180 • Data collection and missing data
- 181 • Feasibility of intervention delivery

#### 182 *Baby CHAT feedback form*

183 The feedback included 9 questions, 3 closed asking about duration of intervention  
184 (too long/about right/too short), timing of the intervention during pregnancy (too early/about  
185 right/too late) and whether participants attended with a partner (yes/no) and 8 open-ended  
186 questions. The questionnaire aim was to gather participants' views on the intervention, for  
187 example usefulness of Baby CHAT, 4D scan footage inclusion, and improvements.

#### 188 *Fidelity Checklist*

189 Facilitators recorded information on the setting, questionnaires, session materials,  
190 initiation and ending of the group, materials and discussions, after completing groups.

#### 191 *Clinical Outcomes*

192 Primary and secondary outcomes were assessed using validated questionnaires.

#### 193 *Primary outcome*

194            *Prenatal Parenting Reflective Functioning Questionnaire* (P-PRFQ) (Pajulo et al.,  
195 2015). Fourteen-item self-report measure to assess parental ability to imagine their fetus as a  
196 baby. Respondents rate statements relating to their unborn baby on a seven-point likert scale  
197 (1= strongly disagree to 7=strongly agree) with a maximum score of 98. Higher scores  
198 represent stronger prenatal RF. The P-PRFQ has acceptable internal consistency ( $\alpha=.77$ ) and  
199 good construct validity, compared to the Pregnancy Interview (Slade, Grunebaum, Haganir,  
200 & Reeves, 2011).

#### 201 *Secondary outcomes*

202            *Maternal and paternal antenatal attachment scales* (MAAS/PAAS, Condon, 1993).  
203 Nineteen-item for mothers and 16-item for fathers, self-report scales to measure attitudes,  
204 feelings and behaviours towards their fetuses. A likert scale (1-5) captures responses, with  
205 stronger attachments indicated by higher scores. Maximum scores differ for the MAAS=95  
206 and PAAS=80. Both measures have good internal consistency (PAAS,  $\alpha=.83$ ; MAAS,  $\alpha=.82$ ;  
207 Condon, 1993) and provide a good measure of overall bonding (Condon & Corkindale,  
208 1998).

209            *Prenatal Health Behaviours Scale* (PHBS) (DeLuca & Lobel, 1995). Twenty-item  
210 scale for expectant mothers to report their pregnancy behaviours. A 5-point scale (0=never to  
211 4=very often) captures responses, with more healthful behaviours indicated by higher scores  
212 (maximum score=80). It has good reliability and validity (DeLuca & Lobel, 1995; Lobel,  
213 DeVincent, Kaminer & Meyer, 2000; Lobel et al., 2008).

#### 214 *Procedure*

215            Participants were recruited using posters and leaflets, by midwives at routine  
216 appointments, from waiting rooms and antenatal workshops. Those who provided contact  
217 details were contacted after a minimum of 48-hours, so they could reflect on the project.  
218 Interested and eligible participants completed and returned consent forms. Participants were

219 randomised, using simple randomisation on a computer programme. Groups were held in  
 220 meeting rooms at a maternity wing.

221 *Intervention group.* At the beginning of the group, participants completed a  
 222 background questionnaire and baseline measures (time 1). At the end of the group meeting,  
 223 they completed post-measures (time 2). Two-weeks later they completed follow-up measures  
 224 (time 3) via email or post (see Table 2).

225 Table 2

226 *Intervention questionnaires completed across time-points*

	Mothers			Fathers		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
HADS	√	√	√	√	√	√
P-PRFQ	√	√	√	√	√	√
MAAS/PAAS	√	√	√	√	√	√
PHBS	√		√			
Feedback form		√			√	

228 *Wait-list control.* Wait-list control participants completed the background  
 229 questionnaire and baseline measures (time 1) via post or email. Two-weeks later they  
 230 completed follow-up measures (time 2) (see Table 3). Following completion of two datasets  
 231 participants were invited to attend Baby CHAT. Of control completers (n=8), six attended a  
 232 group.

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238 Table 3

239 *Control participant questionnaires completed across time-points*

240

	Mothers		Fathers	
	Time 1	Time 2	Time 1	Time 2
HADS	√	√	√	√
P-PRFQ	√	√	√	√
MAAS/PAAS	√	√	√	√
PHBS	√	√		

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241

242 *Data Analysis*

243 *Participant characteristics.* Data for drop-out participants was included in the  
244 descriptive analysis to provide information on participant retention and characteristics.

245 *Feasibility outcomes.* Reported as total number of participants and enhanced by  
246 qualitative analysis of feedback questionnaires, examined using content analysis  
247 (Vaismoradi, Turunen & Bondas, 2013). Content analysis assessed numbers of similar  
248 answers from different respondents, and provided an overview of opinions and experiences of  
249 group members regarding the intervention.

250 *Clinical outcomes.* Outliers were checked on quantitative measures. One outlier was  
251 noted in follow-up data for intervention participants. For information, analysis was run with  
252 and without the outlier. To refine likely effect sizes and inform future sample size  
253 calculations for subsequent trials Cohen's D was calculated for the PPRFQ, MAAS and  
254 PAAS. Baseline and follow-up means and standard deviations (SD) were used for  
255 intervention participants. The PHBS sample was too small for effect size calculations.

256           This study was not powered to test for statistical significance; therefore no efficacy  
257 statistical tests were performed. Means and standard deviations (SDs) for all quantitative  
258 measures are reported.

## 259 **Results**

### 260 *Participant Characteristics*

261           Demographic data was collected from the 20 participants who completed at least one  
262 dataset (see Table 4).

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Characteristic		Intervention n=11	Control n=9	Total N=20	Drop-out n=6
Age range:	Less than 29 years	1	1	2	0
	30-39 years	10	7	17	6
	40-50 years	0	1	1	0
Sex:	Male	5	4	9	2
	Female	6	5	11	4
Ethnicity:	White	8	8	16	4
	Black/Black British	1	0	1	0
	Mixed	1	1	2	2
	Other	1	0	1	0
Marital Status:	Single	7	0	7	4
	Married	4	9	13	2
Education:	A/AS Level	2	2	4	1
	First degree (BSc/BA)	3	3	6	2
	Higher degree (MA/PHD)	5	4	9	3
	NVQ/HNC/HND	1	0	1	0
Mental health Difficulties:	Yes	4	2	6	2
Gestation	2 <sup>nd</sup> Trimester	3	5	8	4
	3 <sup>rd</sup> Trimester	8	4	12	2
First pregnancy:	Yes	10	6	16	4
Pregnancy:	Single	11	9	20	6
Other children:	Yes	1	2	3	1
Miscarriage:	Yes	0	3	3	1
Terminations:	Yes	1	0	1	1



283 No participants scored above cut-off for severe anxiety (HADS-A) or depression  
 284 (HADS-D) (16 and above; Snaith & Zigmond, 1994) (See Table 5). Three scored within the  
 285 moderate anxiety range (11-14), one in the control and two in intervention conditions.

286 Table 5

287 *HADS scores across conditions and time-points*

	Baseline		Post		Follow-up	
	n	Mean(SD)	n	Mean(SD)	n	Mean(SD)
<b>Intervention</b>						
HADS-A	11	5.27(4.20)	10	5.10(3.76)	6	3.67(4.59)
HADS-D	11	2.64(2.20)	10	2.70(2.31)	6	1.50(3.21)
<b>Control</b>						
HADS-A	9	5.10(2.71)	-	-	8	4.13(2.64)
HADS-D	9	1.44(1.94)	-	-	8	2.00(2.07)

288

289 *Feasibility outcomes*

290 *Uptake and retention*

291 Research was completed between October 2017 and January 2018. Forty-six people  
 292 expressed interest when approached by the researcher (n=34) or contacted the researcher  
 293 (n=12). Thirty-three (72%) agreed to take part, with 28 (85%) consenting and being  
 294 randomised (n=9; 27% conversion from researcher approaching, n=11; 92% conversion from  
 295 them contacting researcher). Fifteen (54%) were randomised to the intervention condition  
 296 and 13 (46%) to the wait-list control. Eleven (73%) intervention participants completed the  
 297 group, baseline and post measures, and six completed follow-up measures. Nine (69%) wait-  
 298 list participants completed baseline data, with 8 retained at follow-up (see Figure 1).

299 (Insert fig 1)

300 **Fig 1** Flow diagram to show participant uptake and retention

301 *Questionnaire compliance*

302           There were no missing responses from quantitative questionnaires. One intervention  
303 participant did not complete the HADS at time 2. On the qualitative feedback questionnaire,  
304 missing responses to open-ended questions were low (7%).

305 *Intervention evaluation*

306           The fidelity checklist identified that group timings needed amending. Part 2 ‘social  
307 and unique baby’ overran by approximately 15 minutes, meaning parts 5 and 6 were rushed.  
308 All groups overran by approximately 30 minutes and it was not possible to complete the plan  
309 of ‘when/where/how’ participants would complete activities, due to insufficient time

310 *Feedback Questionnaire*

311           See Table 6 for responses from closed questions on the feedback questionnaire.

312 Table 6

313 *Closed question responses from feedback questionnaire*

Question	Response N=11
<b>Attended with a partner</b>	Yes 6
	No 5
<b>Timing of group in pregnancy</b>	Too early 0
	About right 9
	Too late 2
<b>Length of the group</b>	Too long 0
	About right 10
	Too short 1

314

315 *Content Analysis*

316           We used content analysis (Vaismoradi et al., 2013) to evaluate open-ended  
317 questionnaire data from all intervention participants (n=11). Data was read by two  
318 independent researchers and emerging themes categorised. The number of group members  
319 who reported each theme was recorded with quotes to contextualise themes (see Table 7).

320 Table 7

321 *Summary of themes from feedback questionnaire*

Theme	N	Illustrative quotes (participant ID)
<b>Positive Group Aspects</b>		
Right timing in pregnancy	10	<p>‘Past 33 weeks (worrying stage), not too tired, have more energy’(P3)</p> <p>‘Found it really good to be in a group where mothers to be were at different stages in pregnancy’(P4)</p> <p>‘Good timing as baby is moving more and I'm beginning to wonder more about its development’(P11)</p>
Discussions/shared experience	6	<p>‘Really good discussions and didn’t feel rushed’(P4)</p> <p>‘Could have talked all day and discussed what's been happening during pregnancy’(P7)</p> <p>‘I had experienced/could relate to a lot of the things we discussed’(P9)</p>
Helpful booklet	6	<p>‘Excellent, great tips/ideas in a very digestible format’(P3)</p> <p>‘Lots of info and good you can write your views’(P4)</p> <p>‘clear concise and not too overwhelming as you can be bombarded with information in pregnancy’(P8)</p>
Good session length	3	<p>‘Perfect length after long day at work’(P3)</p> <p>‘It was right, we all had the opportunity to speak...’(P2)</p>
Validating experience	3	<p>‘...this session has helped to reinforce what I am doing so far has a purpose’(P7)</p> <p>‘...felt nice to validate some of the things we’ve been doing’(P8)</p>

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**Group Improvements:**

- |                    |   |  |
|--------------------|---|--|
| Length/Structure   | 7 | ‘Have more of them! Thought it was great!! Would love follow up group meetings with same group if possible please!!’(P4)<br>‘Too short’(P5)<br>‘Allocate more time for the whole thing as it seems to overrun 1 hour’(P6)<br>‘Maybe a follow-up session (perhaps after babies are born)’(P9) |
| Changes to content | 3 | ‘...more time discussing life changes after birth’(P2)<br>‘How to be more social with baby and going through the special Baby CHAT pack’(P8)   |

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**4D Scan footage**

- |                           |   |   |
|---------------------------|---|---|
| Amazing baby              | 7 | ‘It is impressive to see all the activity that is going on in there!’(P2)<br>‘Amazing and fascinating!’(P3)<br>‘...seeing the baby mouth a word was fascinating’(P4)<br>‘Really brought things to life for me’ (P8)       |
| Baby’s facial expressions | 4 | ‘Really amazing facial expressions’(P6)<br>‘I particularly liked the facial expressions which I hadn’t really thought about at all’(P8)<br>‘Great- seeing the face move to the voices and it playing with new faces’(P11) |
| Baby interacting in womb  | 2 | ‘Fascinating to think how much they’re interacting and moving without realising’(P8)<br>‘Seeing the face move to the voices and it playing with new faces’(P11)   |
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**Relating content to my****baby:**

- |                            |   |  |
|----------------------------|---|--|
| Importance of interacting  | 6 | ‘I know baby can hear my voice and is probably responding with facial expressions. Definitely with kicks and movements’(P7)<br>‘Yes that the baby could be influenced from outside and respond’(P10)<br>‘Made me think about what it is doing/feeling’(P11)                        |
| Future activities          | 6 | ‘I will definitely think more about ‘special times’ and reflecting on their (baby’s) mood/temperament to think about/choose ideas of what to do’(P8)<br>‘Lots of info to use in the future’(P10)<br>‘The activities-making time for a routine/interaction with the pregnancy’(P11) |
| Becoming social            | 5 | ‘How the baby thinks when young’(P1)<br>‘Importance of communication pre/post-birth’(P3)<br>‘The conversation with your baby is important and worthwhile’(P10)   |
| Imagining self as a parent | 4 | ‘...reflect on how I am feeling now about my baby’s birth’(P3)<br>‘After birth my baby will be more social and familiar with myself and partner’s voice’(P7)<br>‘About how to communicate with a relative new-born’(P9)  |

323 *Clinical outcomes*

324 Means and SDs were calculated for all participants across time-points (see Table 8)

325 Table 8

326 *Means and SDs for intervention and control groups*

	n	Mean(SD)	n	Mean(SD)	n	Mean(SD)
	Baseline		Post		Follow-up	
<b>Reflective Functioning</b>						
PPQRF (Intervention)	11	69.27(10.73)	11	70.72(11.11)	6	69.17(15.78)
Outlier removed					5	75.2(10.73)
PPQRF (Control)	9	56.22(11.21)	-	-	8	58.00(11.71)
<b>Bonding</b>						
MAAS (Intervention)	6	80.50(4.18)	6	80.43(4.83)	3	87.67(7.02)
MAAS (Control)	5	77.4(5.90)	-	-	4	79.00(7.62)
PAAS (Intervention)	5	66.60(3.36)	5	68.8(4.49)	3	71.00(9.64)
PAAS (Control)	4	59.50(4.2)	-	-	4	61.00(8.25)
<b>Maternal Health</b>						
PHBS (Intervention)	6	57.00(6.20)	-	-	3	61.00(7.00)
PHBS (Control)	5	62.00(2.92)	-	-	4	62.00(3.37)

327

328 *Effect sizes*

329 To calculate within-group effect sizes, means and SDS for baseline and follow-up

330 data were used (see Table 7). This continuous data was normally distributed, so Cohen's D

331 was appropriate (Lakens, 2013). The PPRFQ showed a very small effect size ( $d=0.007$ ).

332 Without the outlier PPRFQ data showed a medium effect size ( $d=0.68$ ). MAAS/PAAS mean

333 scores ( $d=0.77$ ) showed a medium effect size.

## 334 **Discussion**

335 This study assessed feasibility and acceptability of ‘Baby CHAT’, a novel intervention to  
336 improve RF and bonding in expectant parents. Findings indicated participants can be  
337 accessed and recruited. Eighty-five percent of potential participants consented to participate  
338 in the study and were randomised. The intervention was well received by parents as indicated  
339 by their positive feedback. However, there was difficulty retaining intervention participants at  
340 follow-up. The efficacy of Baby CHAT needs to be assessed in an appropriately powered,  
341 trial. Feasibility of research methods, acceptability of the intervention, clinical implications  
342 and strengths and limitations are discussed.

### 343 *Feasibility of research methods*

#### 344 *Uptake*

345 A high proportion of people who agreed to take part converted to participants (85%).  
346 Those who contacted the researcher were more likely to become active participants (92%),  
347 which could be because people were more motivated. More people were approached by the  
348 researcher, however the conversion rate for them participating was lower (27%).

#### 349 *Retention*

350 Control participants were successfully retained at follow-up. However, this was more  
351 difficult with intervention participants (45% dropout). Drop out participants were more likely  
352 to be women, in their second trimester. Two intervention participants who dropped out were  
353 33 and 36 weeks’ gestation, meaning they could have given birth before completing follow-  
354 up measures or that participants’ motivation decreased after group attendance. Previous  
355 research has also suggested practical reasons, like time constraints, could explain retention  
356 difficulties (Frew et al., 2014). Future Baby CHAT research should consider how  
357 intervention follow-up retention could be improved and should allow for this proportion of  
358 drop-out.

359 *Questionnaires*

360 Quantitative questionnaires were valid, reliable, and acceptable to participants,  
361 evidenced by few omitted responses. However, the intervention does not target health  
362 behaviours, so the PHBS may not be needed. Additionally, the post intervention data may be  
363 superfluous because measures are designed to capture feelings over the previous two-weeks.  
364 Therefore, future studies should only collect intervention data at baseline and two-week  
365 follow-up.

366 The PPRFQ follow-up intervention data showed one outlier, with a lower score than  
367 previous responses (baseline=72, post=74, follow-up=39). This did not match bonding scores  
368 or qualitative feedback from this participant. The lower follow-up RF score could suggest  
369 that after reflecting on the group their RF decreased.

370 *Effect size*

371 Varying effect sizes were calculated across measures ranging from very small to  
372 medium. This makes it difficult to provide recommendations for future trials. Due to the  
373 small sample and variation in calculations, a conservative estimate for future trials is  
374 preferable, therefore, a small to medium effect size is recommended.

375 ***Intervention Acceptability***

376 Baby CHAT was acceptable to participants who reported valuing group content and  
377 discussions. They described being surprised at their baby's social capabilities and reported  
378 they could relate content to their baby. This suggests Baby CHAT enabled participants to  
379 think about their baby as a social being, which is important in developing RF. It could change  
380 the way they respond to their baby, for example making time for activities like singing that  
381 may enhance bonding, and enhance responsive parenting abilities (Smaling et al., 2016). The  
382 theme 'imagining self as a parent' suggests participants displayed a key element of RF, to  
383 think about themselves as a parent to their unborn baby (Slade et al., 2005).



384           Qualitative feedback also provided suggestions for improvements, for example to  
385 extend group length and for further sessions. A follow-up session may give participants the  
386 opportunity to further discuss activities, which could increase the impact of the intervention  
387 to improve RF and bonding.

### 388 *Clinical Implications*

389           Baby CHAT shows promise as a brief antenatal parenting intervention with potential  
390 to positively influence RF and bonding. Traditional antenatal interventions often focus on  
391 physical aspects of pregnancy (McMillan, Barlow, & Redshaw, 2009) however;  
392 psychological preparation for parenthood is equally important (Winston & Chicot, 2016).  
393 Baby CHAT can provide an intervention to help expectant parents with psychological  
394 adjustments. Improving RF and bonding enables parents to become responsive and sensitive  
395 caregivers (Sadler et al., 2016) which promotes healthy infant development (Underdown &  
396 Barlow, 2012). Therefore, it could protect children against mental or physical health  
397 difficulties, which could have lasting benefits into adulthood. This preventative strategy  
398 could reduce pressures on mental health services. This brief cost-effective group could be  
399 easily be incorporated into existing antenatal care. The time-limited nature of Baby CHAT is  
400 designed keeping in mind time constraints of NHS clinicians’.

### 401 *Strengths and limitations*

402           To our knowledge, this is the first intervention aiming to enhance RF and bonding in  
403 both expectant parents in a single group session. Findings suggest Baby CHAT is valued by  
404 expectant parents and could be an important addition to antenatal care. However, a larger  
405 scale RCT should assess efficacy. Research involving fathers is sparse (Panter-Brick et al.,  
406 2014), however we recruited similar numbers of expectant mothers and fathers which is a  
407 positive step in increasing fathers’ involvement in parenting research.

408           The small sample limits generalisability and no qualitative feedback was gained from  
409 participants about study design. The sample included mostly well-educated, middle or upper  
410 socio-economic status rather than other groups. Further Baby CHAT research should seek to  
411 assess its usefulness in more diverse socio-economic populations.

#### 412 **Conclusion**

413 The current study demonstrates feasibility and acceptability of Baby CHAT, a novel  
414 psychoeducational parenting intervention for expectant couples. Baby CHAT may improve  
415 RF and bonding in expectant parents, which could have positive outcomes for babies. Further  
416 research should test efficacy and effectiveness, in a larger-scale study by examining the  
417 impact of Baby CHAT on RF and bonding in a large diverse sample. Future research could  
418 also include clinical populations for example those with mental health difficulties. This  
419 feasibility study is an important first step in understanding the positive effects of Baby CHAT  
420 on antenatal care and could have significant value in clinical settings for antenatal  
421 populations.

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