

# EFFECT OF PRENATAL STIMULATION PROGRAMMES FOR ENHANCING POSTNATAL BONDING IN PRIMIGRAVIDA MOTHERS FROM THE WESTERN CAPE

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## ABSTRACT

Prenatal stimulation programmes enhance bonding that serves as a protective factor after birth. The Baby Bond stimulation programme is a sensory focused prenatal stimulation programme implemented during the third trimester of pregnancy. The purpose of this study was to determine the effect of this programme during pregnancy on bonding six weeks after birth. This study employed an experimental, pre-test post-



test randomised controlled intervention design. All twelve participants (until saturation was reached) from the Helderberg area, Western Cape, South Africa, completed the Prenatal Attachment Inventory (PAI) as pre-test and received standard prenatal care. The experimental group received The Baby Bond sensory focussed stimulation programme and the control group a non-specific bonding stimulation programme. At six weeks postnatally all mothers completed the Maternal Attachment Inventory (MAI) as post-test. Baseline characteristics were determined with descriptive statistics and the changes observed by means of the Mann Whitney test. Effect size was calculated for practical significance. The average maternal age at pre-testing was 27 years and 31.8 weeks of gestation. The total difference in the pre-test (PAI) of the experimental ( $66.45 \pm 7.04$ ) and control group ( $66.36 \pm 10.03$ ) was not significant ( $p = 1$ ). The mean difference for the post-test (MAI) for the experimental group ( $101.03 \pm 3.62$ ) was also not significantly different to the control group ( $94.85 \pm 11.87$ ;  $p = 0.53$ ). However, a medium practical significant difference ( $d = 0.52$ ) was identified between the experimental and control groups. The data indicated that a sensory focused stimulation programme, such as The Baby Bond, seemed to enhance the bonding process experienced by mothers, suggesting that larger sample sizes should be investigated in future. Expanded inclusion criteria should, however, be considered, including wider age ranges and multi-parity.

**Keywords:** maternal-infant attachment, maternal-infant bonding, neonatal period, perinatal period, perinatal stimulation programme

## INTRODUCTION AND BACKGROUND INFORMATION

A good bond between mother and child is a pro-active and protective factor (Bavolek & Rogers, 2012:7). Bonding refers to the loving relationship between mother and child that grows through their interactions (Myers, 2006:239). Bonding starts at conception and continues throughout childhood (Young, 2013:11). Literature describes various psychological and physical risk factors that can challenge the bonding process, including a history of domestic violence, drug abuse, medical problems, quality of marital relationships, social support and socio-economic status (Sickel, 2013:9–10). Effective bonding protects the baby and future adolescent from emotional and cognitive problems, poor growth during infancy, substance abuse, mental disorders, physical and/or emotional abuse and attention deficit disorder during childhood or adolescence (Honikman, 2011).

Human immunodeficiency virus (HIV), alcohol abuse, depression and low socio-economic status compromise pregnancy outcomes in South Africa (Tomlinson, O’Conner, Le Roux, Steward, Mbewu, Harwood & Rotheram-Borus, 2013:277). High income families, especially women, are at higher risk for moderate to severe mental illnesses, such as anxiety disorder and depression and substance abuse. Alcohol and cannabis are also more prevalent among educated and high income groups (Herman, Stein, Seedat, Heeringa, Moomal & Williams, 2009:342). All of these factors could influence bonding during pregnancy and postnatally, irrespective of socio-economic

status. Therefore, clients seeking private healthcare should be regarded equally at risk for bonding problems due to work stress, stressful and challenging family relationships, depression related to the mentioned stressors, and economic problems present in South Africa. If bonding is established properly, a child's development of secure attachments will be enhanced, helping him/her to overcome potential risk factors and improve society in the long term (Malekpour, 2007:83).

Mothers can improve bonding through interventions, such as prenatal stimulation programmes implemented at the appropriate gestational age (Elliot, 1999:4; Van der Carr & Lehrer, 1988:101). Various programmes have been developed to enhance maternal-infant bonding, including the The Baby Bond sensory focused stimulation programme that is based on literature and focuses on critical sensory developmental stages of the foetus.

## PROBLEM STATEMENT

Viewed against the background of the high prevalence of risk factors in pregnant women associated with a lack of bonding (Tomlinson *et al.*, 2013:277), in South Africa, the absence of bonding may be a serious threat to the society. Good bonding is essential for the development of a holistically healthy child, but many factors could impede the development of such bonding. Literature demonstrates that prenatal stimulation programmes enhance postnatal bonding. The Baby Bond sensory focused stimulation programme is one such intervention that aims to enhance postnatal bonding. The Baby Bond was developed and was based on the latest available evidence for application during the third trimester. However; the effectiveness of The Baby Bond on maternal-infant bonding has not yet been determined, as perceived by South African mothers six weeks after the birth of their babies.

## DEFINITION OF KEY TERMS

**Attachment/Bonding** is the relationship between the mother and the infant that starts to develop prenatally and continues after birth, characterised by the mother's feelings for her infant (Myers, 2006:239, 1156; Sadock, Kaplan & Sadock, 2007:138). For the purpose of this study, the terms bonding and attachment are used interchangeably.

The **neonatal period** is divided into the early neonatal period (from birth to seven days) and the late neonatal period (from eight to 28 days) (Harrison, 2008:1).

The **perinatal period** extends from the 24<sup>th</sup> week of pregnancy to the end of the first week of life (Harrison, 2008:1).

A (prenatal) **stimulation programme** consists of different modes of stimulation, such as auditory (talking to the foetus and stimulating music), tactile (kicking games, movement

of mother) and tasting and smelling (food from the mother's diet) that might affect the foetus at different stages of development (Burke, 2007:84–125; Van de Carr & Lehrer, 1988:91–93). The sensory focused stimulation refers to selected sensory interventions presented at critical pre-determined periods during pregnancy opposed to randomly presented stimuli in a non-specific stimulation programme.

## PURPOSE OF THE STUDY

The purpose of the research was to determine the effect of The Baby Bond, a comprehensive sensory focused stimulation programme, compared with a non-specific stimulation programme, on the bonding as perceived by the mother at six weeks after the infant's birth.

## OBJECTIVE OF THE RESEARCH

The research objective was to determine the effect of The Baby Bond sensory focused stimulation programme on bonding as perceived by the mother six weeks after birth.

## RESEARCH QUESTION

The research question was: How effective was The Baby Bond stimulation programme intervention on mother-infant bonding six weeks after birth?

## RESEARCH DESIGN AND METHOD

### Study design

An experimental, pre-test post-test randomised control intervention study design was used (Stolberg, Normal & Trop, 2004:1539). Eligible participants were randomly assigned to the experimental and control groups (Stolberg *et al.*, 2004:1540). Stattrek.com, as a random-number-generator, was used to randomise the numbers from 1–30, before data collection was conducted. Even numbers between one and 15 were allocated to the control group and odd numbers to the experimental group (Burns & Grove, 2009:350). Both groups received the same previously validated pre-tests and post-tests (Botma, Greeff, Mulaudzi & Wright, 2010:121): the Prenatal Attachment Inventory (PAI) and the Maternal Attachment Inventory (MAI) (Muller 1996:163; Muller, 1993:204). These instruments measure the same outcomes, although at different stages of foetal and infant development.

Intervention studies imply that both the control and experimental groups should be treated similarly with the exception of the intervention (Botma *et al.*, 2010:121). This was achieved through a pre-test, followed by a post-test after the intervention and

strengthened by comparing the results between the control and experimental groups. The intervention was implemented during pregnancy, but the effects were determined after birth. Participants in both groups received standard prenatal care (PNC) as prescribed by the Department of Health (NDOH, 2007a:19). The experimental group received standard prenatal care and The Baby Bond sensory focused stimulation programme, while the control group received standard prenatal care together with a non-specific stimulation programme. The control group was presented with a non-specific stimulation programme for ethical reasons, including that they were not deprived from potential beneficial care, since literature is clear that prenatal stimulation is beneficial, although it is not clear how and when it should be presented. Furthermore the control group had to receive a seemingly similar intervention to prevent the Hawthorne effect, which might influence the results.

## Research site

Pregnant women living in Cape Town, Western Cape Province, South Africa, who utilised private prenatal care (PNC) services, were identified as potential participants for this study. Cape Town was selected as a setting for its variety in cultures, ethnicity and relationship types (heterogeneous and homogeneous). Cape Town has a population of 3 740 026 (Statistics South Africa, 2011) with 62 143 live births per year (NDOH, 2007b). The Helderberg district and Kuilsriver are sub-regions of the Western Cape Province with potential participants suitable for the study. No specific birth statistics for these areas were available from Statistics South Africa.

## Population

The Helderberg district's population includes many young families of childbearing age and was within an accessible geographical area, enhancing the retention of participants for follow-up visits. The population comprised pregnant women utilising standard private PNC services in the Helderberg and Kuilsrivier areas with first singleton pregnancies considered low risk. Mothers with recurring pregnancies were excluded since the assumption was made that the intervention might be influenced by experiences from previous pregnancies. Participants were between 20–34 years of age (pregnant teenagers and women of advanced ages, which are regarded as high risk pregnancies, were excluded) had completed secondary school education, were in steady relationships and came from middle to high socio-economic groups. These criteria were similar to those used in studies by other researchers (Burke, 2007:28; Carolan, Barry, Gamble, Turner & Mascareñas, 2012:178) and reportedly were effective for enhancing bonding. Participants' gestational stages ranged from 27 to 36 weeks on enrolment with the study to ensure that the intervention commenced during the period suitable for prenatal stimulation interventions, and allowing a period of at least four weeks to conduct the intervention.

## Sample

This study aimed to pilot the sensory focused prenatal stimulation intervention programme with a sample of 30 women. The Statistical Consultation Services at the North-West University (NWU) agreed that 15 women in each group were sufficient for a pilot study since this was the first study to determine the effect of this particular programme. However, only 13 women fit the inclusion criteria and gave informed consent to participate. One participant completed the PAI questionnaire, but birthed within one week thereafter and had to withdraw from the study. Other participants were outside the age group indicated in the inclusion criteria. Many pregnant women within the set maternal age were multi-gravidas as women delay their pregnancies to advance their careers. The final sample comprised only 12 participants. This represented a power of 7% at a significance level of 5%. Similar sample sizes were also observed in other intervention studies (Burke, 2007:5; Van der Carr & Lehrer, 1988:87) and the final sample in this study was therefore considered sufficient by the researchers.

## Recruitment

Private prenatal care providers (gynaecologists, general practitioners and midwives) identified suitable participants who matched the inclusion criteria. These mediators provided volunteer contact information to the principal investigator or provided the researchers details to potential participants. Information brochures regarding the planned study were also posted on various Facebook pages in addition to the personal contact for recruitment as stated.

## Measuring instruments

The researchers used two self-administered questionnaires to collect data from the sample: one for prenatal assessment of attachment (PAI) and one for postnatal assessment of attachment (MAI). Muller developed, validated and used both instruments in a previous study on prenatal and postnatal attachment (Muller 1996:163; Muller, 1993:204) and granted permission for the use of these instruments. Both instruments test the same items, but at different gestational/infant ages, resulting in different names for the instruments representing the time of administration (prenatal or postnatal) (Muller, 1996:161). Items included in the instrument refer to maternal emotions and thoughts about her unborn child or new baby. Burke (2007:34) used the same instruments in a previous study that indicated improved emotional attachment when a stimulation programme was implemented.

## Demographic information

A demographic information questionnaire, collecting pregnancy information, personal details, and level of education, was completed on enrolment into the study to obtain information regarding the participants and to ensure compliance with the inclusion criteria.

### Prenatal Attachment Inventory (PAI)

The PAI consists of 21 items scored on a four-point Likert scale ranging from 4 ('almost always') to 1 ('almost never'), indicating maternal experiences (feelings, thoughts) during pregnancy (Muller, 1993:201, 207). The total score ranges from 21 to 84 and the higher scores indicate higher levels of attachment (Gau & Lee, 2003:179). The Cronbach's alpha coefficient of the total instrument was 0.85 (Muller, 1993:204). The initial instrument (48 questions) was based on available literature and 11 experts assessed the content validity (Muller, 1993:201). The PAI had a strong correlation with the established Maternal Foetal Attachment Scale, showing that the MAI is effective for measuring maternal foetal attachment (Muller, 1993:213).

The instrument had been used in numerous international studies (Burke, 2007:34). However, the researchers could find no studies using this instrument in South Africa.

### Maternal Attachment Inventory (MAI)

The MAI consists of 26 items, using a four-point Likert scale ranging from 4 ('almost always') to 1 ('almost never'), indicating the frequency of maternal engagement in activities or their feelings (Muller, 1996:163). Higher total scores indicate higher maternal attachment. The initial instrument was derived from available literature and content validity was assessed by 12 experts (Muller, 1996:163). A Cronbach's alpha of 0.85 indicated good internal consistency (Muller, 1996:164). The instrument's test results proved a correlation between the MAI and other instruments used to measure maternal feelings and separation anxiety (Muller 1996:165), confirming that the MAI is effective for measuring postpartum affectionate attachment/ bonding.

### Data collection procedures

Data collection took place between November 2013 and September 2014. All participants completed a demographic and PAI questionnaire as a pre-test. Individuals who met the inclusion criteria were assigned a number from the randomised table and were consequently allocated to the control or experimental group. Participants received The Baby Bond or a non-specific stimulation programme, depending on their group allocation, together with standard PNC.

The participants and mediators were blinded to the intervention assigned to them, since both groups received standard PNC, as well as a written stimulation programme that is self-administered without any explanation. Both interventions addressed maternal

diet, everyday talking to the foetus and breathing exercises to calm the mother. The control group of five participants received a non-specific stimulation intervention, which entailed stimulation through everyday activities, presented in a non-specific manner and random intervals. The Baby Bond on the contrary provided control participants with structured stimulation activities at specific gestational ages and introduced at pre-determined time intervals during the day and week. The stimulation activities in The Baby Bond were self-administered in the comfort of their own home, where they have access to the environment and instruments needed to implement the variety of stimulations they can choose from.

The Baby Bond programme was peer reviewed by a registered nurse and midwife, and an international certified childbirth/postnatal educator and doula. The programme was also given to a pregnant woman to review for clarity and feasibility before use. The researchers considered the feedback from both these reviewers and made appropriate changes to The Baby Bond intervention programme as presented in Table 1.

**Table 1:** The Baby Bond Sensory Focused Stimulation programme

Foetal Senses	Type of stimulation specified by The Baby Bond programme
Chemosensory system	The mother's diet should be rich in protein, vitamins and minerals.
Auditory	Auditory stimulation such as the mother's low pitched voice and music should be provided during the day. Music should be played twice or three times per day while sitting, lying or rocking. Examples of such music include lullabies, such as 'A lion sleeps tonight' and music that contains criteria of clear harmony and rhythm. The father should read rhymes once daily.
Somatosensory system (Tactile)	Tactile stimulation includes the mother touching her abdomen, massaging her abdomen lightly, playing the kicking game and tapping on the abdomen twice daily during different sessions. When the mother rocks or moves up and down in a harmonious pattern, the foetus is also stimulated by the womb and amniotic fluid, a form of tactile stimulation.
Vestibular system	Vestibular stimulation, such as rocking in a rocking chair or moving in a harmonious pattern from left to right should be done once daily. Mothers should realise that their babies' vestibular systems are stimulated when the mothers walk and when their babies move, stretch and kick in the womb.
Neural system	Stimulation of the other systems also implies neural system stimulation. The neural system develops during these stimulations and continues to develop after birth (Yamada <i>et al.</i> , 2013).



Foetal Senses	Type of stimulation specified by The Baby Bond programme
Visual system	No visual stimulation is recommended, as this system is too immature to handle stimulation (Glass, 2002:2).

After completion of the intervention, all participants gave birth to live infants and at six weeks postpartum completed the MAI post-test, implying a 100% response rate.

The demographic data questionnaire included compliance items. After the mothers had completed the MAI post-test, they provided feedback to these questions about the number of days and time spent on each session of the programme.

## Reliability and validity

The Statistical Consultation Services of the North-West University, Potchefstroom campus, calculated the reliability of these instruments. The 21 item PAI scored 0.75, but due to question three ('I enjoy feeling the baby move') having a negative correlation, it was removed and reliability recalculated. The Cronbach alpha coefficient for the adjusted 20 item PAI was 0.77, which indicates good internal consistency. The 26 item MAI scored 0.94, but due to question 14 ('I tell others about my baby') having a negative correlation, it was removed and reliability recalculated. The adjusted Cronbach alpha coefficient for the 25 item MAI was then 0.95, indicating good internal consistency.

In order to address threats to internal validity, the participants were randomly allocated to experimental and control groups, to prevent selection bias. All participants knew that there would be a randomly assigned experimental and control group receiving different stimulation programmes.

Only first-time mothers attending standard PNC clinics participated in the study to prevent mothers' experiences of previous pregnancies from influencing this study's findings. The Hawthorne effect was addressed because the control group also implemented a simple form of stimulation programme.

## Data analysis

Statistical Package for Social Sciences (SPSS) program version 22.0 was used to compile descriptive statistics from the experimental and control groups. The Mann Whitney U-test was performed to determine the significant differences between pre-tests and post-tests. The effect size was then calculated with a small effect  $d = 0.2$ , moderate effect  $d = 0.5$  and large effect  $d = 0.8$  (Field, 2013:80). The level of significance was set at  $p \leq 0.05$ .

## ETHICAL CONSIDERATIONS

Ethical approval was granted by the Health Research Ethics Committee, Faculty of Health Sciences at the North-West University (NWU-00141-13-A1). Ethical considerations, as described in the Declaration of Helsinki, Nuremberg Code and South Africa's Medical Research Council were followed (Botma *et al.*, 2010:3).

Participants received verbal and written information before voluntary consent was obtained (Benatar, Bhoola, Cleaton-Jones, De Klerk, Du Toit, Herman, Labuschagne, Leibowitz, Louw, Matsiliza, MBewu, Orr, Poggenpoel, Roberts, Van Niekerk, Van Oosten & Van Wyk, 2007:17). Voluntary participation and the right to withdraw at any time, without any prejudice, were emphasised (Burns & Grove, 2009:202; Benatar *et al.*, 2007:22, 33). By numbering the inventories, privacy, anonymity and confidentiality were assured (Burns & Grove, 2009:194, 196–197; Benatar *et al.*, 2007:37).

The control as well as the experimental group received a stimulation programme of some sorts, together with standard prenatal care as prescribed by the NDoH, to prevent the Hawthorne effect, but also to ensure that no participants were deprived of potential positive effects of a stimulation intervention. Results are published or presented in such a fashion that all participants will remain unidentifiable. The participants received feedback about the research findings. The data would be kept under lock and key on a password-protected computer for six years, where all written data will be shredded and electronically stored data will be permanently deleted.

## RESULTS

Twelve participants, seven in the experimental and five in the control group, completed questionnaires (see table 2). Participants' ages ranged between 18 and 34 years. Eight participants were married and four were in stable relationships. The participants volunteered to participate at different gestational ages from 24 to 36 weeks. Both groups had similar demographic profiles.

**Table 2:** Demographic data of the study participants

Variables	Frequency (n)	Experimental (n)	Control (n)
Sample size	12	7	5
Marital status			
Married	8	5	3
Single (Stable relationship)	4	2	2
Age (years)			
17–29	7	4	3

30–34	5	3	2
	N	Mean	SD
Gestational age (weeks)	12	31.8	3.6

Table 3 presents the pre-test's (PAI's) and post-test's (MAI) findings, respectively, for the control and experimental groups. The PAI items that scored the highest (8 and more) and therefore indicated good attachment, included: 'I enjoy feeling the baby move', 'I know things I do make a difference to the baby', 'I feel love for the baby' and 'I get very excited when I think about the baby'. In response to question 11 ('I can make my baby move'), five participants answered 'almost always', one 'often', five 'sometimes' and one 'almost never'. In response to the statement 'I share secrets with my baby' only one mother said 'always' and two said 'often'.

**Table 3:** Comparison between PAI = Prenatal Attachment Inventory; MAI = Maternal Attachment Inventory

Prenatal Attachment Inventory's findings						
QUESTIONS	ALMOST ALWAYS	OFTEN	SOMETIMES	ALMOST NEVER		
1 I wonder what my baby looks like	5	3	3	1		
2 I imagine calling my baby by name	4	6	0	2		
3 I enjoy feeling the baby move	11	0	1	0		
4 I think that the baby already has a personality	6	4	1	1		
5 I let other people put their hands on my tummy to feel the baby move	3	6	2	1		
6 I know things I do make a difference to the baby	10	2	0	0		
7 I plan the things I will do with my baby	5	5	1	1		
8 I tell others what the baby does inside me	7	4	1	0		
9 I imagine what part of the baby I'm touching	5	4	2	1		
10 I know when the baby is asleep	6	5	1	0		
11 I can make my baby move	5	1	5	1		
12 I buy/make things for the baby	7	3	1	1		
13 I feel love for the baby	9	1	1	1		
14 I try to imagine what the baby is doing in there	6	5	1	0		
Prenatal emotional attachment						
15 I like to sit with my arms around my tummy	5	7	0	0		

16	I dream about the baby	3	2	6	1	
17	I know why the baby is moving	3	4	4	1	
18	I stroke the baby through my tummy	6	4	2	0	
19	I share secrets with the baby	1	2	4	5	
20	I know the baby hears me	7	3	2	0	
21	I get very excited when I think about the baby	8	3	1	0	

Variables	Total group		Experimental		Control		Man-Whitney U-test	
	<i>Mea</i>	<i>SD</i>	<i>SD</i>	<i>Mea</i>	<i>SD</i>	<i>Mea</i>	<i>SD</i>	
	<i>n</i>			<i>n</i>		<i>n</i>		
PAI	66.4	7.97	66.45	7.04	66.3	10.03	1.000	
	1				6			

<b>Maternal Attachment Inventory's findings</b>						
	<b>QUESTIONS</b>	<b>ALMOST ALWAYS</b>	<b>OFTEN</b>	<b>SOMETIMES</b>	<b>ALMOST NEVER</b>	
1	I feel love for my baby	6	0	1	0	0
2	I feel warm and happy with my baby	6	0	1	0	0
3	I want to spend special time with my baby	6	0	1	0	0
4	I look forward to being with my baby	6	1	0	0	0
5	Just seeing my baby makes me feel good	5	2	0	0	0
6	I know my baby needs me	7	0	0	0	0
7	I think my baby is cute	7	0	0	0	0
8	I'm glad this baby is mine	6	0	1	0	0
9	I feel special when my baby smiles	7	0	0	0	0
10	I like to look into my baby's eyes	6	1	0	0	0
11	I enjoy holding my baby	6	1	0	0	0
12	I watch my baby sleep	3	4	0	1	0
13	I want my baby near me	5	1	2	1	0
14	I tell others about my baby	5	1	0	1	0
15	It's fun being with my baby	4	2	0	1	0
16	I enjoy having my baby cuddle me	6	1	0	0	0
17	I'm proud of my baby	6	1	0	0	0
18	I like to see my baby do new things	7	0	0	0	0
19	My thoughts are full of my baby	4	2	0	1	0

20	I know my baby's personality	5	3	0	1	2	1	0
21	I want my baby to trust me	7	5	0	0	0	0	0
22	I know I am important to my baby	6	4	0	1	1	0	0
23	I understand my baby's signals	2	3	5	2	0	0	0
24	I give my baby special attention	4	5	3	0	0	0	0
25	I comfort my baby when he/she is crying	7	5	0	0	0	0	0
26	Loving my baby is easy	6	5	0	0	1	0	0
	<b>Control group</b>	<b>Experimental group</b>						
<b>Variables</b>	<b>Total group</b>	<b>Experimental</b>		<b>Control</b>		<b>Man-Whitney U-test</b>		
	<i>Mea</i>	<i>SD</i>	<i>Mea</i>	<i>SD</i>	<i>Mea</i>	<i>SD</i>		
	<i>n</i>		<i>n</i>		<i>n</i>			
MAI	98.4	8.28	101.03	3.62	94.8	11.8	0.53	
	5				5	7		

From the 26 questions in the MAI, eight and more participants chose ‘almost always’ for 24 of the questions, indicating high attachment. The other two questions were: ‘I watch my baby sleep’ and ‘I understand my baby’s signals’. No participant answered ‘almost never’ to any question.

The Mann Whitney U-test identified no statistically significant differences between the two groups’ pre-natal and postnatal bonding. The results of  $p = 1.0$  for PAI indicated no significant difference between groups, and  $p = 0.530$  for MAI revealed an insignificant increased MAI score for the control group. This indicates that The Baby Bond sensory focused stimulation programme did not have significantly more benefits for bonding than the alternative programme.

## Effect size and practical difference

Cohen’s  $d$  was calculated by dividing the difference in the mean scores by the standard deviation of the control group, resulting in  $d = 0.2$  (small),  $d = 0.5$  (medium) and  $d = 0.8$  (large) (Field, 2013:80). Although no statistically significant changes occurred, a medium practical significant difference was evident between the groups (Field: 2013:82). The Cohen’s  $d$  value of 0.52 in the MAI indicated a medium effect between the groups, implying that bonding was slightly better among the experimental group than among the control group.

It can be concluded that the PAI and MAI are suitable instruments to use in determining maternal-infant bonding pre-birth and post-birth, and are therefore also suitable to use when determining the effect of stimulation intervention programmes presented during pregnancy on bonding after birth.

## DISCUSSION OF RESULTS

The main finding for this investigation on the effect of The Baby Bond stimulation focused programme on bonding indicated no effect for either the intervention or the control group. Previous research reported that prenatal stimulation programmes enhanced bonding (Burke, 2007:28; Carolan *et al.*, 2012:1778; Van de Carr & Lehrer, 1988:95–97), serving as pro-active and protective factors. Bonding secures attachment between mother and child, enhancing the infant’s physical and psychological development (Honikman, 2011). The Baby Bond sensory focused stimulation programme, implemented as a pro-active method to enhance postnatal bonding, in this study, has the same characteristics as similar programmes that proved to be effective in bonding (duration of sessions, intervals of stimulation, types of stimulation, mothers’ level of education, age and gravida) (Burke, 2007:28; Carolan *et al.*, 2012:178; Van de Carr & Lehrer, 1988:95–97).

In the current study, the intervention had a moderate effect on bonding six weeks postpartum. There was a statistically insignificant difference in the mean scores of the



PAI and the MAI for the experimental group. A medium change, possibly indicating improved bonding, was identified in the experimental group, similar to previous studies' findings that a stimulation programme enhanced bonding, improved social and motor development, foetal memory and taste preferences (Burke, 2007:28; Carolan *et al.*, 2012:178; Malekpour, 2007:92; Can de Carr & Lehrer, 1988:95–97).

This study aimed to implement The Baby Bond sensory stimulation programme for a minimum period of four weeks at frequencies of three stimulations per day for 5–10 minutes each day. Similar frequencies were used in previous studies (Van der Carr & Lehrer, 1988:87). The period of implementation is different from previous studies for The Baby Bond sensory stimulation programme is only implemented from the third trimester, due to foetal development, while other programmes are implemented in the second trimester (Browne, 2008:181; Elliot, 1999:125; Foster & Verny, 2007:273; Graven & Browne, 2008:169).

The participants did not accurately complete the questions regarding their participation in the study, completed with the MAI. Participants answered differently to the question: 'how often did you follow the stimulation program?' Some answered in sentences; others said sometimes, others three times a day and others every day. This results in no conclusive statistics on the implementation of the stimulation programme.

Although the findings from this study show practical significant changes due to The Baby Bond intervention, the results have to be interpreted against the following limitations: small sample size, duration of the intervention, maternal age and high socio-economic status with women more educated and open to bonding. Therefore smaller changes are generally observed compared with groups not at risk of neglected bonding.

## CONCLUSION

The Baby Bond sensory stimulation programme did not significantly increase bonding six weeks post-birth, however, it indicated a moderate effect, supporting further studies with larger samples. The subjective nature of the questionnaires may have also contributed to the lack of conclusive results. The mediators identified the maternal age for first pregnancies used in this study as a limitation in the selection criteria. Presenting an antenatal stimulation programme during the third trimester is useful and applying the intervention at a frequency of three times a day seems to be practical for participants and justifiable to show an effect towards improved bonding. It is clear that The Baby Bond did not do any harm, however, further studies are indicated to determine the statistical and practical significance of the program.

## RECOMMENDATIONS

Future research on The Baby Bond sensory focused stimulation programme should consider the adaptation of the inclusion criteria, such as including different maternal

ages, including both first time mothers as well as multi-gravidas and indicating this information as part of the biographical data to allow for more comparisons to be made.

Larger sample sizes might provide statistically significant findings. Additional qualitative data should provide a rich description about the bonding phenomenon, especially after birth. Sensory stimulation programmes should be presented during the third trimester of pregnancy for a minimum period of four weeks at frequencies of three stimulations per day of 5–10 minutes each. Additional measures for compliance to the stimulation programme should be built into the design of future studies. It is clear that The Baby Bond did not do any harm. However, further studies are indicated to determine the statistical and practical significance of the programme. Future research is suggested comparing these results with a third group of mothers who were not exposed to either the control stimulation or The Baby Bond sensory focused stimulation programme.

## LIMITATIONS OF THE STUDY

Participants did not accurately complete the MAI questions regarding their participation in the study, resulting in inconclusive statistics on the frequency of the implemented stimulation programme. The duration of intervention and the small sample size could have influenced this study's results.

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