

The Role of Massage in Stress, Bonding and Development of Babies

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SUMMARY

The focus of the study is on the effect of massage on an infant's stress level, development and the emotional bond between the infant and the mother.

Eight mother-infants dyads were recruited and the infants were between the ages of 3 to 9 months. The dyads were paired to ensure similarity of the groups and divided into an experimental and control group. The research made use of a multi-method, pre and post-test design. The measures used during the pre and post-testing included a biographical questionnaire, the Griffiths Mental Development Scales, the Parenting Stress Index and the Mother-to-Infant Bonding Scale. Personal interviews were conducted with each mother as part of the post-test procedures. Saliva samples from every mother and infant were retrieved on three separate occasions to determine cortisol levels before, during and after the intervention. The experimental group's mothers received training to perform infant massage and were requested to massage their infants at least four times a week for the duration of four months.

The data was processed by the Statistical Consultation Service of the North-West University at Potchefstroom. The non-parametric test, Mann-Whitney U Test, was used to determine any statistical and/or practical significant differences between the experimental and control group before and after implementation of the intervention. The non-parametric test, Wilcoxon Matched-Pairs Signed Rank T-Test, was used to determine the differences within both the experimental and control group. Friedman's ANOVA was used to determine the changes within the groups regarding cortisol levels. As the sample size for this study is small and the possibility of determining statistical significance was slight, the effect sizes were considered for this study.

The study had six aims. The first aim focused on the effect of infant massage on the infants' stress levels as measured through cortisol. No statistical significance could be found and the results revealed that the experimental group's infants' stress levels did not decrease. The second aim investigated

the effect of infant massage on the mothers' stress levels as measured on the Parenting Stress Index and cortisol levels. No statistical significance could be determined but practical significant differences on the Parenting Stress Index indicated decreased maternal stress levels in the experimental group. These results differ from the cortisol levels that revealed the experimental group's mothers to experience higher levels of stress. The third aim focused on the effect of infant massage on the bond between mother and infant and found that the bond improved due to the intervention. The fourth aim investigated the effect of massage on the infants' development and although no statistical significance could be determined, practical significance could be found, indicating improvements on the motor scales for the experimental group. The fifth aim explored the mothers' subjective experience of infant massage as reported through qualitative measures. The sixth aim compared the mothers as participants' experience of infant massage as reported through quantitative measures and through qualitative measures.

Strengths of the study included making use of a multi-method design and following a multi-disciplinary approach. Limitations of the study included a small sample size, the participants' restricted background and difficulty to ensure that the participants comply with the instructions for sampling saliva.

Based on the results from the study, it can be concluded that infant massage have an effect on the mother-infant relationship, the mothers' subjective view of their stress levels and specified areas of the infants' development. According to the results from this study infant massage did not have an effect on the infants and mothers' stress levels as measured through cortisol.

Keywords: infant massage, stress, development, bonding

OPSOMMING

Die fokus van die studie is op die effek van massering op 'n baba se stres vlak, ontwikkeling en die emosionele band tussen die baba en die moeder.

Agt moeder-baba pare is gewerf en die babas se ouderdomme het gewissel van 3 tot 9 maande. Die pare is afgepaar ten einde gelykheid in die groepe te verseker en is daarna verdeel in 'n eksperimentele en 'n kontrole groep. Die studie maak gebruik van 'n multi-metode, pre- en post-toets ontwerp. Die meetinstrumente gebruik tydens die voor- en natoetse sluit in 'n biografiese agtergrondvraelys; die Griffiths Mental Development Scales; die Parenting Stress Index en die Mother-to-Infant Bonding Scale. Daar is persoonlike onderhoude met elke ma gevoer as deel van die na-toets prosedures. Speekselmonsters is tydens drie geleenthede by elke moeder en baba geneem ten einde kortisol vlakke voor, tydens en na die intervensie te bepaal. Die moeders in die eksperimentele groep het babamassering opleiding ontvang en was versoek om hulle babas ten minste vier maal per week te masseer vir die duur van vier maande.

Die data was verwerk deur die Statistiese Konsultasie Diens van die Noord-Wes Universiteit te Potchefstroom. Die nie-parametriese toets, Mann-Whitney U Toets, was gebruik om te bepaal of enige statistiese en/of praktiese betekenisvolle verskille bestaan tussen die groepe voor en na implimentasie van die intervensie. Die nie-parametriese toets, Wilcoxon Matched-Pairs Signed Rank T-Toets, was gebruik om die verskille wat binne die groepe plaasgevind het, te bepaal. Daar was gebruik gemaak van Friedman's ANOVA om die verandering in kortisol vlakke binne elke groep te bepaal. Die studie het gebruik gemaak van effek groottes weens die klein hoeveelheid deelnemers en daar 'n baie skraal moontlikheid was om statistiese betekenisvolheid te bepaal.

Die studie het ses doelwitte omskryf. Die eerste doelwit het gefokus op die effek van babamassering op die babas se stres vlakke soos gemeet deur kortisol. Geen statistiese betekenisvolheid kon bepaal word nie en die

resultate het getoon dat die babas se stresvlakke nie gedaal het nie. Die tweede doelwit het die effek van babamassering op die moeders se stresvlakke soos gemeet deur die Parenting Stress Index en kortisol vlakke ondersoek. Geen statistiese betekenisvolheid kon bepaal word nie maar prakties betekenisvolle verskille op die Parenting Stress Index het aangedui dat die materne stresvlakke in die eksperimentele groep gedaal het. Dit is in teenstelling met resultate van die kortisol vlakke wat aangedui het dat die moeders in die eksperimentele groep hoër vlakke van stres ervaar het. Die derde doelwit het gefokus op die effek van babamassering op die moeder-kind verhouding en gevind dat hulle verhouding verbeter het. Die vierde doelwit het gefokus op die effek van babamassering op die babas se ontwikkeling en alhoewel geen statisties betekenisvolheid bepaal kon word nie, kon praktiese betekenisvolheid bepaal word wat verbetering op die motoriese skaal aangedui het. Die vyfde doelwit het die moeders se subjektiewe ervaring van babamassering, soos gerapporteer deur kwalitatiewe tegnieke, ondersoek. Die sesde doelwit het 'n vergelyking getref tussen die moeders se ervaring van babamassering soos gerapporteer deur kwantitatiewe meetinstrumente en deur kwalitatiewe tegnieke.

Die studie se sterkpunte sluit die gebruik van die gebruik van 'n multi-metode ontwerp en 'n multidissiplinere benadering in. Die beperkings van die studie is geïdentifiseer as die klein hoeveelheid deelnemers, die beperkte agtergrond van die deelnemers en probleme ondervind om te verseker dat die deelnemers gehoor gee aan die instruksies om speeksel te versamel.

Gebaseer op die resultate van die studie kan daar tot die gevolgtrekking gekom word dat babamassering 'n effek het op die moeder-kind verhouding, die moeders se subjektiewe siening van hulle stres vlakke en spesifieke areas van die babas se ontwikkeling. Volgens die resultate het babamassering nie 'n effek op die babas en moeders se stresvlakke, soos gemeet deur kortisol, gehad nie.

Sleutelwoorde: babamassering, stres, ontwikkeling, binding

INDEX

CHAPTER 1

Introduction	1
--------------	---

CHAPTER 2: STRESS

2.1 Introduction	8
2.2 Definitions of stress	8
2.3 Theory of stress	
2.3.1 Environmental approach	10
2.3.2 Psychological approach	10
2.3.3 Biological approach	11
2.3.4 Integration of environmental, psychological and biological approaches	15
2.4 Origins of stress	
2.4.1 Universal stressors	16
2.4.2 Infantile stressors	17
2.5 Effects of stress on development	
2.5.1 Effects of cortisol on carbohydrate metabolism	21
2.5.2 Effects of cortisol on protein metabolism	21
2.5.3 Effect of cortisol on fat metabolism	22
2.5.4 Effect of stress and cortisol on brain development, memory and learning	22
2.5.5 Effect of stress and cortisol on mood	23
2.5.6 Effect of stress and cortisol on the immune system	24
2.5.7 Effect of stress on the respiratory response and cardiovascular systems	24
2.6 Protection factors against stress	
2.6.1 Protection factors for adults / parents	26
2.6.2 Protection factors for infants / children	27
2.7 Measurement of stress	
2.7.1 Psychological measures	28
2.7.2 Physiological measures	29
2.8 Conclusion	30

CHAPTER 3: BONDING AND ATTACHMENT

3.1 Introduction	31
3.2 Definitions	
3.2.1 Bonding	32
3.2.2 Attachment	33
3.3 Bonding	
3.3.1 Development of bonding	34
3.3.1.1 Theoretical perspectives	35
3.3.2 Factors impacting bonding	
3.3.2.1 Positive factors	37
3.3.2.2 Negative factors	38
3.4 Attachment	
3.4.1 Development of attachment	39
3.4.2 Theoretical perspectives	40
3.4.3 Attachment characteristics	41
3.4.3.1 Attachment features	41
3.4.3.2 Phases of attachment	42
3.4.3.3 Attachment patterns	43
3.4.3.4 Factors impacting attachment	
3.4.3.4.1 Positive factors	47
3.4.3.4.2 Negative factors	49
3.5 Effect of bonding and attachment on development	
3.5.1 Brain development	51
3.5.2 Development of emotional regulation	54
3.6 Relationship between bonding, attachment and stress	57
3.7 Measurement of bonding and attachment	59
3.8 Conclusion	60

CHAPTER 4: MESSAGE AND INFANT MESSAGE

4.1 Introduction	61
4.1.1 Definitions	61
4.1.2 Infant massage	62
4.2 Theory of massage	63
4.3 Effect of massage on physiological functioning	

4.3.1 Physiological mechanism of infant massage	65
4.3.2 Immune system	66
4.3.3 Pain	67
4.3.4 Stress and anxiety	69
4.3.5 Attention and concentration	70
4.3.6 Physical development in general	71
4.3.7 Brain development	72
4.4 Effect of massage on psychological functioning	74
4.5 Method of infant massage	77
4.6 Conclusion	78

CHAPTER 5: METHODOLOGY

5.1 Introduction	82
5.2 Aims of the study	82
5.2.1 General aim	82
5.2.2 Specific aims	82
5.3 Research design	83
5.4 Participants	84
5.5 Research procedure	86
5.6 Measures used	87
5.6.1 Quantitative data	87
5.6.1.1 Biographical questionnaire	88
5.6.1.2 Mother-to-Infant Bonding Scale	88
5.6.1.3 Parenting Stress Index	88
5.6.1.4 Griffiths Mental Developmental Scales	91
5.6.1.5 Saliva Cortisol levels	93
5.6.2 Qualitative data	95
5.7 Ethical procedures	96
5.8 Statistical analysis	96
5.8.1 Difference between groups: Pre-test	96
5.8.2 Differences within groups	96
5.8.3 Differences between groups: Post-test	97
5.8.4 Effect sizes and practical significance	97
5.8.5 Hypotheses	98

5.8.6 Summary	99
---------------	----

CHAPTER 6: RESULTS AND DISCUSSION

6.1 Introduction	100
6.2 Results and discussion	100
6.2.1 Aim 1: The effect of infant massage on infants' stress level	100
6.2.1.1 Cortisol levels of infants: comparison between experimental and control group regarding first and third measurement	101
6.2.1.2 Descriptive statistics	101
6.2.1.3 Cortisol levels of infants: comparison within experimental and control groups regarding first and third measurement	103
6.2.2 Aim 2: The effect of infant massage on mothers' stress levels	104
6.2.2.1 Parenting Stress Index	104
6.2.2.1.1 Parenting Stress Index: pre-test comparison of experimental and control groups	105
6.2.2.1.2 Descriptive statistics	106
6.2.2.1.3 Parenting Stress Index: post-test comparison of experimental and control groups	112
6.2.2.1.4 Parenting Stress Index: pre and post-test comparison within experimental and control groups	115
6.2.2.2 Cortisol	118
6.2.2.2.1 Cortisol levels of mothers: comparison between experimental and control groups regarding first and third measurement	118
6.2.2.2.2 Descriptive statistics	119
6.2.2.2.3 Cortisol levels of mothers: comparison within experimental and control groups regarding first and third measurement	120
6.2.3 Aim 3: The effect of infant massage on the mother-infant relationship	121
6.2.3.1 Mother-to-Infant Bonding Scale	122
6.2.3.2 Attachment subscale (Parenting Stress Index)	126
6.2.3.2.1 Attachment: pre and post-test comparison of experimental and control groups	127
6.2.3.2.2 Descriptive statistics	127

6.2.3.2.3 Attachment: pre and post-test comparison within experimental and control groups	128
6.2.4 Aim 4: The effect of infant massage on infants' general development	130
6.2.4.1 Griffiths Mental Development Scales: pre-test comparison between experimental and control groups	130
6.2.4.2 Descriptive statistics	131
6.2.4.3 Griffiths Mental Development Scales: post-test comparison of experimental and control groups	133
6.2.4.4 Griffiths Mental Development Scales: pre and post-test comparison within experimental and control groups	135
6.2.5 Aim 5: Determine the mothers' subjective experience of their infants, themselves and mother-infant interaction as reported through qualitative measures during post-testing	137
6.2.5.1 Experimental group	138
6.2.5.1.1 Mothers' experiences	138
6.2.5.1.2 Infants' experiences as perceived by mothers in experimental group	140
6.2.5.2 Control group	141
6.2.5.2.1 Mothers' experience	142
6.2.5.2.2 Infants' experience as perceived by mothers in control group	143
6.2.5.3 Discussion: The mothers' subjective experience of their infants, themselves and mother-infant interaction as reported through qualitative measures during post-testing	144
6.2.6 Aim 6: Compare the mothers as participants' experience of their infants, themselves and mother-infant interaction as reported through quantitative measures and through qualitative measures	147
6.2.6.1 Experimental group	147
6.2.6.2 Control group	150
6.3 Evaluation of aims and hypotheses	152
6.3.1 Aim 1: The effect of infant massage on infants' stress levels	152
6.3.2 Aim 2: The effect of infant massage on mothers' stress levels	153

6.3.3	Aim 3: The effect of infant massage on the mother-infant relationship	154
6.3.4	Aim 4: The effect of infant massage on infants' general development	154
6.3.5	Aim 5: Determine the mothers' subjective experience of their infants, themselves and mother-infant interaction as reported through qualitative measures during post-testing	155
6.3.6	Aim 6: Compare the mothers as participants' experience of their infants, themselves and mother-infant interaction as reported through quantitative measures and through qualitative measures	155
6.4	Summary	156

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1	Introduction	157
7.2	Summary of literature and objectives	157
7.2.1	Conclusions from literature review	
7.2.1.1	Stress	157
7.2.1.2	Bonding	158
7.2.1.3	Development	160
7.2.2	Implementation of infant massage as intervention and the empirical research	161
7.2.2.1	Summary of the research project	161
7.2.3	Conclusion of the empirical study	162
7.3	Strengths of the study	164
7.4	Limitations of the study	164
7.5	Recommendations for future research	165
7.6	Conclusion	166

REFERENCES	167
-------------------	-----

APPENDIX A	183
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INDEX OF TABLES

Table 1: Participants' Biographical Detail	83
Table 2: Non-Parametric Mann-Whitney U Test: Comparison For Experimental and Control Groups	101
Table 3: Descriptive Statistics of Infants' Cortisol Levels	102
Table 4: Friedman ANOVA and Kendall Coefficient of Concordance: Experimental and Control Groups	103
Table 5: Non-Parametric Mann-Whitney U Test: Comparison for Experimental and Control Groups	105
Table 6: Parenting Stress Index: Experimental and Control Groups with Respect to Pre and Post-testing	106
Table 7: Non-Parametric Mann-Whitney U Test: Comparison of Experimental and Control Groups	112
Table 8: Non-Parametric Wilcoxon Rank Test: Experimental Group Pre and Post-test Results	115
Table 9: Non-Parametric Wilcoxon Rank Test: Control Group Pre and Post-test Results	116
Table 10: Non-Parametric Mann-Whitney U Test: Comparison Of Experimental and Control Groups	118
Table 11: Descriptive Statistics of Mothers' Results	119
Table 12: Friedman ANOVA and Kendall Coefficient of Concordance: Mothers of Experimental and Control Groups	120
Table 13: Frequency Table: Comparison of Experimental and Control Groups with Respect to Pre and Post-testing	122
Table 14: Non-parametric Mann- Whitney U test: Experimental and Control Groups Pre and Post-test	127
Table 15: Descriptive Statistics: Attachment Subscale	128
Table 16: Non-Parametric Wilcoxon Rank Test: Differences within Experimental and Control Groups	128
Table 17: Non-Parametric Mann-Whitney U Test: Comparison of Experimental and Control Groups	130
Table 18: Descriptive Statistics of Infants' General Development	131
Table 19: Non-Parametric Mann-Whitney U Test: Comparison for Experimental and Control Groups	134

Table 20: Non-Parametric Wilcoxon Rank Test: Experimental Group	
Pre and Post-tests	135
Table 21: Non-Parametric Wilcoxon Rank Test: Control Group	
Pre and Post-tests	136

CHAPTER 1

INTRODUCTION: ORIENTATION, MOTIVATION AND AIM

Whenever I held my newborn baby in my arms, I used to think that what I said and did to him could have an influence not only on him but on all whom he met, not only for a day or a month or a year, but for all eternity – a very challenging and exciting thought for a mother.

- Rose Kennedy

What's done to children, they will do to society.

- Karl Menninger

It is known that the dyadic interaction between mother and infant serve several important functions. It is especially for the infant that it provides protection, survival, promotion of social understanding, development of attachment, acquisition of language as well as emotional regulation (Bornstein & Tamis-LeMonda, 2001). It can be speculated that by enriching the type of interaction mother and infant share, both parties will benefit on different levels of functioning. Swain, Lorberbaum, Kose and Strathern (2007) suggest that more research should be conducted where the focus will be on the effectiveness of early intervention programme examining how it will affect aspects such as brain development, problem-solving skills, stress response, parenting ability and even vulnerability to psychopathology.

For the purpose of this study, the focus areas are the infant's stress levels and development as well as the emotional bond existing between mother and infant. These areas are applicable to all infants regarding aspects such as gender, cultural background and socio-economic status. This is evident from the various studies conducted in various countries which all focused on these specific aspects. Despite the diversity of populations involved in the studies, it is possible to identify certain patterns repeating throughout the results. The first patterns appear when the focus is on the physical causes of infantile

stress revealing that an infant's experience of teething, blocked sinuses and colic can be the reason for a rise in cortisol levels (Kenny, 2000). On a psychological level stress can occur when the infant realises that the parent or caregiver is distant, unavailable and unable to provide in the infant's needs (Gerhardt, 2004; Infant Massage Service, 2006). Some factors influencing the parent's ability to provide in the infant's needs include a lack of time and freedom, external stressors and intruders. Anne M. Jernberg (1979) focused specifically on mother-child relationships and determined that it is possible that a bad fit can occur between mother and child when the child's energy level differs from the mother's level or in cases where the child has a physical disability. Due to certain factors such as mood disorders, it might be difficult for the parent to initiate the behaviour necessary to promote healthy interactions, which causes a problem fulfilling in the infant's needs. Since the infant is completely dependent on the parent in order to survive, realising this fact causes a great deal of stress for the infant (Jernberg, 1979).

However, even though it would be preferred that the infant or individual experiences as little stress as possible, stress in itself is not always harmful. Studying the mechanism of stress it is possible to see that at first the body's reaction to a stressor acts as a form of protection. Cortisol is a glucocorticoid hormone secreted by the adrenal glands during stressful situations (Guyton & Hall, 2006; White-Traut, 2004). During a stressful period the body will sense a threat and respond by activating the hypothalamic-pituitary-adrenal (HPA) system, preparing the body to react appropriately by receiving the necessary energy. This mechanism is triggered when corticotrophin-releasing hormone (CRH) stimulates the anterior pituitary gland to secrete adrenal corticotrophin hormone (ACTH) into the general circulation, which in turn causes the adrenal cortex to secrete glucocorticoids such as cortisol (Gervitz, 2000; Kalman & Grahn, 2004). Cortisol increases the enzymes necessary to convert amino acids into glucose and thus mobilizes glucose in times of need (Guyton & Hall, 2006). Not only does the HPA system increase available energy supplies, it also suppresses other systems operating in time of non-threat, such as digestion, growth, memory, learning, information processing and sexual behaviour (Sims, Guilfoyle & Parry, 2005). The rate of glucose

utilization in most cells decreases in response to cortisol and causes a higher blood glucose concentration (Guyton & Hall, 2006; Kalman & Grahn, 2004). By suppressing these systems, the HPA protects the coping resources from being overwhelmed during a time of threat through minimizing demands from it. After the threat has been removed, the cortisol levels return to the basal levels after some time (Kalman & Grahn, 2004). A homeostatic model of stress by Hans Selye, called the "Generalized Adaptation Syndrome" (GAS), explains the body's ability to maintain healthy homeostasis through necessary adjustments, enabling the body to handle any threats or stressors. The model also shows how prolonged stress situations (increased levels of cortisol) can lead to physiological exhaustion (Gervitz, 2000).

The harmful effects of stress become evident when the individual experiences excessive and prolonged stress situations. Chronic elevations in glucocorticoids can damage the hippocampus's neurones involved in the negative feedback regulation of the HPA axis. Problems associated with prolonged elevated cortisol levels are memory problems, health problems, hypertension, a weaker immune system, socio-emotional problems and major depression (Gervitz, 2000; Kalman & Grahn, 2004; Sims et al., 2005).

It would seem that stress may have an influence on the development of bonding and attachment between an infant and the parent. Kennell and McGrath (2005) define bonding as the unique, specific and enduring relationship between two people. The term bonding is used to describe the emotional tie from the parent to the infant (Shafer, 2002). Marshall Klaus and John Kennell were some of the first to study the development of bonding from the parent to the infant. They created awareness on the importance of bonding by showing how crucial it is that bonding is established between mother and infant since the infant is fully dependent on its mother for survival, development, support and protection (Klaus & Kennell, 1976; Moyse, 2005; Taylor et al., 2005).

The process of bonding starts as early as in pregnancy. It is known as maternal-foetal bonding and has a profound effect on maternal-infant

interaction (Zeitlin, Dhanjal & Colmsee, 1999). During pregnancy the mother will start to prepare herself for her role as mother and create a mental representation of her infant. She will entertain fantasies about the infant's characteristics and start to develop feelings of attachment (Pearce & Ayers, 2005; Taylor et al., 2005; Zeitlin et al., 1999). Research by Pearce and Ayers (2005) found that both the expectations and evaluations of the infant's characteristics had a significant effect on the mother-infant bond after birth. Post partum, other factors such eye-to-eye contact and touch also contribute to the establishment of successful bonding (Kennell & McGrath, 2005; Klaus & Kennel, 1976).

However, any stressor that leaves the mother feeling unloved or unsupported or causes distress concerning health and survival of her infant or herself may prevent the maternal-foetal bond from forming (Zeitlin et al., 1999). After birth the bonding process between mother and infant may be affected negatively if the mother is still very young, depressed or abuses substances. This keeps the mother from initiating actions necessary to promote healthy interactions between her and the child. These distortions of the normal parent-child interactive system cause disruption of the whole system. Problems concerning fulfilling the child's physical and emotional needs arise and it can result in dire consequences for the mother-infant relationship (Jernberg, 1979). It would seem that bonding has a substantial impact on the forming of attachment (Taylor et al., 2005).

Attachment, according to Levy and Orlans (2000), can be defined as an emotional relationship between two persons characterised by a desire by both to maintain closeness. The term "attachment" is used when describing the development of an emotional tie from the infant to the parent. The attachment process is described as a mutual regulatory system, implicating that parent and infant influence each other over time. Parental behaviour such as holding, rocking, smiling and keeping eye contact will activate instinctual attachment behaviours in the infant. Research suggests that a positive response from the infant acts a positive stimulant for the mother and enhances sensitive parenting when negative responses may reduce sensitive

parenting. A sensitive mother will be able to understand the infant's shift in behaviour such as displaying negative affect, as the infant's way of communicating his/her distress and need for comfort from the mother. By detecting and attending to these shifts, the mother will be able help the infant to regulate his/her emotions and to support the progress of secure attachment (Gerhardt, 2004; Mills-Koonce et al., 2007). Secure attachment to a parent not only provides safety and protection but also helps the infant to develop in all his/her aspects of functioning (Fraley, 2004; Levy & Orlans, 2000). Longitudinal studies show that securely attached children have better relationships with their peer group, show more resilience during stressful periods, are more confident, are able to function independently and have the capacity for empathy. It can be concluded that secure attachment contributes to broadening of the child's perspectives, capacities and skills (Fraley, 2004; Levy & Orlans, 2000; Mikulincer, Shaver & Pereg, 2003).

It all forms part of the infant's personality and social development. Other areas of development include physical and cognitive development. All infants experience development in these areas but the quality and quantity of development depends on the type of stimulation experienced and genetic background. For the purpose of this study the focus will be on an intervention programme in the form of the act of infant massage, which promises to enrich the quality of the mother-infant interaction and promote each one's wellbeing on both physical and mental level (IMIS, 2006). Great volumes of research studying infant massage revealed the many benefits it has on various aspects of an infant's functioning (Caulfield, 2000; Diego & Hernandez-Reif, 2005; IMIS, 2006).

Studying the effect of massage on physical development, various studies proved that physical touch in the form of massage provides tactile stimulation which stimulates mechanoreceptors in the skin. Through repeated massage new and more synapses form between neurons (Gerhardt, 2004). Neural pathways are formed, amplifying conduction of impulses especially between sensory and emotional areas (Gerhardt, 2004; Widmaier, Raff & Strang, 2006). The process through which the pathways become specialised requires

that different size neurons and synaptic structures develop. This enables the neurons to react in a discriminatory way on tactile stimulation (Field, Diego & Hernandez-Reif, 2005).

Shifting the focus to cognitive and social development, it was found that tactile stimulation offers a base for higher order processes necessary for the learning process. The development of perceptions that provide meaning to the individual's life are influenced by the first exposure to tactile stimulation (Liaw, 2000). Part of this perception is of a social nature. There are indications that a child's social intelligence is more sensitive to the type of interactions and experiences at the ages six to eighteen months. The formed neural pathways are used to organise the different types of social experiences and to predict interactions with other people (Gerhardt, 2004).

It seems as if no research has been done on the connection between stress, bonding and development as dependent variables and massage as independent variable. The focus of the study will be on these three variables. The general aim of this study is to determine the effect of infant massage on the infants and mothers' stress levels, the infants' general development and the quality of bonding between the infant and the mother. In order to accomplish this aim the study will investigate each variable and the outline of the study is as follows:

- Chapter 2

The focus of Chapter 2 is on stress, exploring the dynamics and underlying mechanisms of stress in order to understand the different sources of stress, coping mechanisms used to deal with stressors, the effects of stress on an individual's development and protection factors.

- Chapter 3

Chapter 3 focuses on the dynamics of bonding and attachment, factors promoting and hampering both concepts as well as the effect of bonding and attachment on an individual's development.

- Chapter 4

In Chapter 4 the concept of massage and infant massage will be discussed, focusing specifically on its effect on the individual's development on both a physiological and a psychological level.

- Chapter 5

Chapter 5 explains the methodology of the study with regards to a description of the research design, participants, measures used and statistical analysis.

- Chapter 6

The results of the qualitative and quantitative data and the discussion thereof are provided Chapter 6.

- Chapter 7

Chapter 7 provides the conclusion of the study.

CHAPTER 2

STRESS

2.1 INTRODUCTION

The dynamics of stress have been a popular area of interest for research and multiple theories are used to explain the origins and effect of stress in people's lives. Stress's primary function is one of adaptation, triggering important adaptive functions that will promote health, well-being and survival by enabling a person to deal with emergencies or changes in environmental conditions. However, it is necessary for stress levels to stay within limits because the consequences of excessive stress levels can be extremely harmful to the extent that it can be life-threatening (Goldstein & McEwen, 2001; Koolhaas, de Boer & Buwalda, 2006; Santos & Spadari-Bratfisch, 2006; Sparrow, 2007). Just as there are various factors influencing an individual's experience of stress there are also various protection factors which act both as buffers and help to lessen the effects of stress. The aim of an intervention focusing on stress is to either reduce any stress enhancing factors or promote protection factors. It will, therefore, be necessary to investigate the dynamics of stress to ensure that the intervention addresses the appropriate components in order to guarantee success. In order to understand the meaning and implications of the term "stress", it will be necessary to formulate a definition that will include all aspects of stress.

2.2 DEFINITIONS OF STRESS

The complexity and diverse nature of stress require definitions that depict every component as well as stress in total. Starting with the biological side of stress, quite a large number of definitions can be found. One of the first to describe stress in biological terms was Hans Selye who defined stress as the non-specific response of the organism to aggressive agents (Santos & Spadari-Bratfisch, 2006). Goldstein and McEwen (2001) explain Selye's definition by describing stress as the event which takes place when an

organism senses either disruption or a threat of disruption of homeostasis, which in the end leads to compensatory reaction. According to Tachè and Bonaz (2007), stress is a term used to refer to an external pressure exerted on systems of human homeostasis. It can also be used to refer to the physiological reaction mediated by the hypothalamic-pituitary-adrenal axis together with the adjustments in cardiovascular and immune system, brain function and certain behaviour patterns.

There are other definitions that focus more on the psychological side of stress. Goldstein and McEwen (2001) did not only define stress in biological terms, but also came to the conclusion that stress can be seen as a condition where the expectations about the internal or external environment differ from the current or expected perceptions of these environments. This discrepancy between observed or sensed reality and prior expectations elicit patterned, compensatory responses. Nash and Theborge (2006) are of the opinion that depending on the context, the term “stress” can refer to a stimulus (this being the amount and importance of life events); or a response (the physiological response during demanding times); or the presence of an emotional condition or lastly, the lack of coping systems.

Clark, Bond and Hecker (2007) combined all of the previous mentioned definitions by viewing stress as the combination of the person’s cognitive, emotional, behavioural and psychological responses when confronted with stressors.

Taking in consideration all of the definitions provided, the researcher proposes that, for the purpose of this study, stress can be viewed as the individual’s response on a biological, emotional, cognitive and behavioural level when confronted with a perceived physical or psychological stressor that threatens the body’s homeostatic systems.

It is clear that the definition consists of various components. The reasons for components’ inclusion will be clear once various theories surrounding stress, explaining both the origin and implications of stress, are examined.

2.3 THEORY OF STRESS

To aid with the investigation of the dynamics of stress, three different approaches will be used. These approaches provide complementary views and are known as the environmental approach, the psychological approach and the biological approach.

2.3.1 ENVIRONMENTAL APPROACH

The environmental approach focuses on the number and magnitude of key life events that a person experiences in a certain period of time and the adaptive demands these events pose. Every experience carries a different weight, meaning that not all life events have the same effect on a person, thus causing the person to experience different levels of stress depending on the level of change or adaptation required (Clark et al., 2007). Thomas Holmes and Richard Rahe assembled a social readjustment rating scale in an effort to determine the level of adjustment certain life events required. In the end they compiled a list of the total of 43 life events associated with varying degrees of disruption and stress. The life event requiring the highest level of adjustment is the death of a spouse, followed by divorce and marital separation from a mate (Sadock & Sadock, 2007). This correlates with research by Koolhaas et al. (2006) which states that disturbed social relations measure as the strongest stressor as measured by the extent of the physiological stress response.

2.3.2 PSYCHOLOGICAL APPROACH

The psychological approach focuses on how the individual perceives and evaluates the different life events. It states that when an individual first becomes aware of a stressor, primary appraisal will take place to determine whether the stressor is harmless or threatening. Should the latter be true and a coping strategy is required, a secondary appraisal takes place. During this time it is firstly determined how controllable the stressor is and secondly, how able the system will be to cope with the stressor using the available coping

resources. The available resources, which could be personal, social and material of nature, as well as the perceived and actual ability to cope effectively, determine the best course of action in order to deal with the situation. In other words, it determines the extent of the stress response (Clark et al., 2007; Nash & Theborge, 2006).

2.3.3 BIOLOGICAL APPROACH

The biological approach focuses on the activation of responsive physiological systems during times of stress. The hypothalamic-pituitary-adrenocortical (HPA) axis and the sympathetic-adrenal medullary (SAM) system have been the main focal point of various studies focusing on the effect of stress on the body. The field of psychoneuroimmunology directed attention to the correlation between the immune system and stress (Clark et al., 2007; Widmaier et al., 2006). According to the biological approach, everyday life events, whether positive or negative, will create challenges and it will therefore be necessary for the person to respond appropriately. In order to sustain life, every living being must be able to maintain a constant internal equilibrium despite a variable external environment. Without this balance the individual's well-being is at risk, so much so that not only health but also the individual's life could be threatened. This internal balance is referred to as homeostasis and consists of three basic components namely a detector, control centre and effector. These components are part of a dynamic process where the detector reports changes to the control centre and the centre then changes its output to the effector. This maintains homeostasis (Santos & Spadari-Bratfisch, 2006, Waugh & Grant, 2001). It was thought that when homeostasis is threatened, the various behavioural and physiological systems would try to restore the previous constant condition. This is known as the stress response (Haley & Stansbury, 2003).

However, a new concept called allostasis was introduced and it helped to provide an understanding about the dynamic interaction between an organism and its environment (McEwen, 2005; Santos & Spadari-Bratfisch, 2006). The difference between homeostasis and allostasis can be explained as follows:

where homeostasis requires that physiological systems such as blood oxygen levels must be kept within strict limits in order to preserve life, allostasis involves the processes that maintain homeostasis through interactive change (Nash & Theborge, 2006). The mechanisms involved in allostasis are able to predict the level of change required to meet anticipated demands and then change the controlled physiological variable accordingly. The concept also explains how the activation of effector systems will encourage adaptation to a new equilibrium (Haley & Stansbury, 2003; McEwen, 2005; Santos & Spadari-Bratfisch, 2006).

Allostasis can thus be described as the stability accomplished through change (McEwen, 2005). When all the systems involved are elevated in a sustained manner, such as hypertension, it is referred to as an allostatic state. The collective effect of this allostatic state is known as allostatic load (Nash & Theborge, 2006). Thus, “allostatic load” refers to the effects of prolonged uninterrupted or intermitted activation of effectors involved in allostasis, literally described as the “cumulative wear and tear to the brain and body” (Goldstein & McEwen, 2001; Koolhaas et al., 2006). Every system in the body responds with allostasis in order to adapt. This is necessary for short term regulation of all physiological systems, but during times the need for it becomes excessive, the regulatory system can be harmed in such a way that illness can occur (Clark et al., 2007). Allostatic overload is the term used when referring to situations where allostatic load is excessive. It can cause the system to become maladaptive and be the reason why pathologies in the form of stress related diseases may develop. Allostatic overload can be the result of chronic exposure to stress, poor adjustment to repetitive stressors and inability to stop allostatic responses after the termination of a stressor. Should these responses be inadequately handled, allostatic overload results and pathology can emerge (McEwen, 2005; Nash & Theborge, 2006; Sadock & Sadock, 2007).

This explains how stress could contribute to the development of cardiovascular disorders, autoimmune diseases, chronic fatigue syndrome, psychiatric illnesses (depression, memory problems), and hypertension as

well as less effective immune systems (Gerhardt, 2004; Koolhaas et al., 2006; Santos & Spadari-Bratfisch, 2006; Sims et al., 2005). It is necessary to remember that the manner in which people handle life challenges can complicate the pathophysiological consequences. This includes the consumption of tobacco, alcohol and drugs, by exercising, sleep and eating behaviour and the use of medicine (Nash & Thebarge, 2006).

2.3.3.1 SYSTEMS AND STAGES OF THE STRESS RESPONSE

Research found that when an individual experiences a stress response, it takes place in stages and that different systems are involved in the process.

According to Nash and Thebarge (2006), the stress response is organised in a hierarchy. The lowest process is activated first and in the event that its compensatory measures are not adequate, the next process is then activated. The body's tissues and organs are situated on the first level, containing their own independent intrinsic and reflex control mechanisms. The autonomic nervous system and endocrine messengers will exercise limited peripheral reflex control over the organs during times when the organs' external environment has changed. The higher level process, which involves the brainstem autonomic nuclei, hypothalamus, cortex and limbic system, is activated to provide integrated control (Nash & Thebarge, 2006).

The two main systems involved in the stress response are the sympathetic nervous and adrenomedullary hormonal system (SNSAM) and the hypothalamic-pituitary-adrenal (HPA) axis (McEwen, 2005; Santos & Spadari-Bratfisch, 2006). The HPA axis is a combination of the pituitary and adrenal cortices, hypothalamus, regulatory neuronal inputs, hormones and the factors responsible for the hormonal release. It is responsible for the hormonal control, nervous system activity, the expenditure of energy and modulation of the immune system (Nash & Thebarge, 2006; Young, 2004). The "Generalized Adaptation Syndrome" by Hans Selye uses these systems to explain a stereotyped physiological response to a stressor. It was proposed that the physiological response to stress is consistent in all individuals. The

process is divided into three stages where the first stage is known as the alarm phase. During this phase noradrenergic systems in the brain are activated, releasing catecholamines from the autonomic nervous system (Nash & Theberge, 2006; Sadock & Sadock, 2007). The hypothalamus will also respond to stress by secreting corticotrophin-releasing hormone (CRH), which stimulates the anterior pituitary gland to secrete adrenal corticotrophin hormone (ACTH) and β -endorphin into the general circulation, targeting the adrenal cortex. (Gervitz, 2000; Kalman & Grahn, 2004; Nash & Theberge, 2006; Sadock & Sadock, 2007). The endorphins (β -endorphin) are hormones which play an important role during the reducing of pain during stressful times. ACTH binds to receptors on the adrenocortical cells causing the adrenal cortex to secrete glucocorticotrophins such as cortisol. Cortisol is a steroid hormone capable of performing many actions to assist the body to cope during stressful times (Nash & Theberge, 2006). Cortisol increases the amount of enzymes necessary to convert amino acids into glucose and in doing so, mobilizes glucose in times of need. This process is known as gluconeogenesis (Guyton & Hall, 2006). Not only does the HPA system increase available energy supplies, it also suppresses other systems operating in time of non-threat, such as digestion, growth, memory, learning, information processing and sexual behaviour (Sims et al., 2005).

The second stage, known as sustained resistance, is characterised by optimal and sustained defence and adaptation. The third stage is called the exhaustion phase and occurs when the stressor persists. It is during situations like these that the person's mental and physical health can become threatened to the extent that illness or death can occur (McEwen, 2005). However, Selye's General Adaptation Syndrome, which is traditionally interpreted in such a way that it is understood that all types of stressors evoke identical stereotyped responses of the stress medium, can no longer be seen as the absolute truth (McEwen, 2005). The psychophysiological stress theory, designed by Henry Selye, attributes physiological processes to specific reactions to stress. It suggests that HPA activation occurs during times when a person is feeling helpless under stress while neurosympathetic adrenomedullary activation occurs during fight-flight behaviour. This view is

supported by a psychoneuroendocrine reaction specificity proposed by Ursin (1998). According to this specificity, a distinction can be made between active defence (catecholaminergic) and passive defence (cortisol) (Kaspers & Scholtz, 2004).

2.3.4 INTEGRATION OF ENVIRONMENTAL, PSYCHOLOGICAL AND BIOLOGICAL APPROACHES

An understanding and integration of the three approaches can now offer a more complete explanation of the underlying mechanism of stress and how it contributes to physiological and psychological pathology.

Research has shown that the endocrine and neural responses differ depending on whether the stressor's origin is physical, chemical or psychological. According to Power (2004), most current theories are known as process models which view stress as an indication of the interaction taking place between environmental events, appraisal and coping processes. Depending on the type and intensity of stressor, the person's perception of it, own coping abilities and resources available, the effects of stress may vary. (Power, 2004; Santos & Spadari-Bratfisch, 2006). It is thought by some that rather than the physical nature of the stressor, it is the degree to which the stimulus can be predicted and controlled (psychological nature) that influences the level of stresses experienced (Gülpmar & Yeğen, 2004; Koolhaas et al., 2006). However, other studies suggest that the physical nature of stressors (this being the intensity, frequency and duration of the stressor) should also be taken in consideration with the psychological nature and individual factors. These three components determine whether a person will use either an active or passive behavioural strategy when dealing with stressors (Gülpmar & Yeğen, 2004).

According to Clark et al. (2007), it is possible to formulate an integrated approach concerning the development of either pathology or diseases. As mentioned before, when a person encounters a psychological stressor it results in a physiological reaction. In the presence of a stressor the first step

in the process involves the secretion of certain chemical messengers such as cortisol and epinephrine. These are termed primary mediators and they regulate selected primary effects such as the activities of enzymes and receptors. The next step is the secondary outcomes which are the integrated processes that reflect the collective result of primary effects. These outcomes are organ and tissue specific. The tertiary outcomes are the actual illnesses or disorders setting in as result of the allostatic load (Clark et al., 2007).

An integration of the environmental, psychological and biological approaches offers a comprehensive explanation on the dynamics of stress. The extensive background provides the opportunity to identify more specific stressors.

2.4 ORIGIN OF STRESS

For the purpose of this study the focus will be on the origin of universal stressors as well as infantile and parenting stressors.

2.4.1 GENERAL STRESSORS

Previous research identified certain factors that can act as stressors in general for most people. The stressors can be found on different levels of the person's daily life. Regarding physical stressors it was found that the stressors responsible for rises in cortisol secretion include trauma, infection, intense heat or cold, and the intake of sympathomimetic drugs and surgery (Guyton & Hall, 2006). The experience of pain and anxiety is also seen as stressors. When a person is experiencing pain and anxiety an increase in the levels of circulating catecholamines (Santos & Spadari-Bratfisch, 2006), adrenocorticotrophic hormone, growth hormone, prolactin, antidiuretic hormone, aldosterone, cortisol, glucagons, prostaglandins and free fatty acids is seen (McRee et al., 2007). Focusing on stress factors in the family or marriage system, research demonstrates how stress in this domain can potentially increase an individual's susceptibility to physical and emotional distress. During studies done on South African social workers it was found that general factors in the family system which contributed to occupational

stress were career conflicts, stresses related to discussing work concerns with family members, husbands' devaluation of their wives' career and salary, post graduate studies and negative aspects of living status (Ross & Deverell, 2004). These life stressors are thought of as specific stress factors.

2.4.2 INFANTILE STRESSORS

Research has shown how the activation of the stress response system in early childhood could be related to a range of psychological factors and physiological modifications during childhood and adolescence (Turner-Cobb, 2005). During the beginning stages of an infant's life, a variety of events on both physical and psychological level can act as stressors.

2.4.2.1 PHYSICAL FACTORS ACTING AS STRESSORS

Physical factors that may contribute to physical distress in an infant range from certain medical procedures such as injections to blocked sinuses, the process of teething (Gerhardt, 2004; Kenny, 2000) and illnesses such as middle ear infection. According to Bove (2005), middle ear infections may coincide with teething as the upper respiratory passages' fluid production increases. Another factor which plays a big role is infantile colic. It is a common clinical condition characterised by excessive, high-pitched crying usually together with a flushed face, passing of gas and the infant curling up his/her legs and can be described in terms of mild, moderate or severe. There are different views on the origin of colic. On biological level it is suggested that one reason is lactose intolerance where the body is unable to break down all of the lactose in food causing significant amounts of lactose to enter the large bowel. This acts as a breeding ground for lactobacilli and bifidobacteria in the colon and during the fermentation process of these bacteria both hydrogen and lactic acid are rapidly produced. The hydrogen increases swelling of the colon which causes pain and discomfort (Savino, 2007). However, there are some research studies that show that organic diseases, such as lactose intolerance, only account for only about 5% of infants with colic. One explanation offered to understand colic from a non-

disease perspective states that “colic is an early clinical manifestation of a more reactive, less regulated temperament” (Prudhomme White, Gunnar, Larson, Donzella & Barr, 2000, p. 863). Temperament is the term used to refer to a reflection of either biological or constitutionally based difference in reactivity and regulation. It has also been suggested that colic can be one of the results of an unfavourable environment created by inexperienced and anxious parents (Savino, 2007). When studying this suggestion, the findings lead to the discussion in the following section, focusing on the psychological factors.

2.4.2.2 PSYCHOLOGICAL FACTORS ACTING AS STRESSORS

On a psychological level it would seem that the relationship between the parent and child would be the biggest factor in terms of infantile stress. The parent-child relationship is regarded as one of the most important factors and resources regarding infantile stress. The infant will usually search for protection from familiar, trustworthy adults after the initial biological stress reaction is experienced. When the parents react appropriately to the distressed infant, the parents can influence the infant's stress reaction and help their child to cope with the stressful situation (Power, 2004; Sparrow, 2007). It can be concluded that social support plays a very important role in the infant's ability to cope with stress. On a psychological level stress can be caused when the infant realises that the parent is not able to satisfy his needs. Limited resources prevent the infant from survival on its own and the infant is dependent on his primary caregiver for food, shelter and security. From the parents' side, a failure to provide adequately in the infant's needs creates a sense of helplessness and loss of power, increasing stress levels and subsequently increasing cortisol levels (Gerhardt, 2004; IMIS, 2006). This has been shown through studies where infants were left with an unfamiliar person who only attended to the infants when they cried or fussed. When this same person provided nurturing and stimulation, the infants' cortisol levels dropped to similar cortisol levels seen in infants who did not experience maternal deprivation (Turner-Cobb, 2005). It was proved by research studying psychological dwarfism, a result of severe abuse and neglect, that the stress

produced by the disruption in the parent-child relationship had such a significant influence on the child's central nervous system and hypothalamus that secretion of growth hormone was inhibited. This caused reversible growth delay. However, once the child received proper care and treatment, rapid gain in growth and development occurred (Blackwell, 2000).

2.4.2.2.1 FACTORS IMPACTING PARENT-CHILD RELATIONSHIP

From the literature it is possible to identify three main groups of factors impacting the parent-child relationship. They are divided into the infant's characteristics, parental characteristics and situational / demographic factors.

- **CHILD CHARACTERISTICS**

Anne M. Jernberg, whose groundbreaking studies concern the mother-child relationship, came to the conclusion that a "bad" fit could exist between caregiver and child. In some circumstances the child may not be able to respond to the caretaker in the desired manner, which in turn influences the parent's attitude towards the child. According to Jernberg and Booth (2001), factors such as the infant's temperament, ability to self-regulate and thresholds to incoming stimuli have the biggest influence. Infants with a less regulated and more reactive temperament are more likely to display more repeated and more intense negative affect, less predictability in responding and are more difficult to sooth. This could promote a feeling of incompetence and stress in the parent (Prudhomme White et al., 2000).

It may happen that the child does not have the capacity to respond to the parent. The child may be physically impaired and, therefore, struggle to participate in the kind of interaction that would usually promote secure attachment (Jernberg, 1979; Jernberg & Booth, 2001). Research established that hyperactivity or passivity can have a detrimental effect (Jernberg, 1979). It is often found that children who are passive or under reactive are difficult to engage in parent-child activities, leaving the parents feeling frustrated and disappointed. Other conditions such as autism and pervasive development

disorders are examples of constitutionally based neurological problems, making it extremely difficult for the child to communicate and relate to others. It places a big burden on the parent-child relationship (Jernberg & Booth, 2001).

• PARENTAL CHARACTERISTICS

There are several factors that can disrupt the parent-child relationship. When a parent experiences health related problems it may possibly prevent the parent from initiating behaviour that can promote secure attachment. It might be the case that the parent abuses substances, experiences physical pain or suffers from depression (Balbernie, 2001; Jernberg & Booth, 2001; Power, 2004). In the event of maternal depression, the mother may not be able to supply the necessary responsive care the infant needs. Studies focusing on the effect of long-term and severe maternal depression discovered that the child experienced emotional and cognitive difficulties from infancy through to early school years (Milgrom, Ericksen, McCarthy & Gemmill, 2006; Van Doesum, Hosman & Riksen-Walraven, 2005). This could be explained by reduced activity in the left frontal region of the infant's brain, this area usually associated with the overt expression of emotions. It is essential to provide the correct stimulation in order to attain optimal brain development and, since the depressed mother is not always able to provide the necessary interpersonal exchanges, deterioration of unused synapses occur, resulting in reduced brain activity (Balbernie, 2001).

If the parent is still very young, feels ambivalent about parenthood or did not receive the necessary attentive care as child him-/herself, it is often very difficult for this parent to attend to the child's needs (Jernberg & Booth, 2001). The parent struggles to initiate actions necessary to promote healthy interactions between him or herself and the infant. These distortions of the normal parent-child interactive system cause disruption of the whole system. Problems concerning the fulfilment of the child's needs arise and since the infant is completely dependent on his or her parent to survive, this discovery is very stressful for the infant (Jernberg, 1979).

- **SITUATIONAL OR DEMOGRAPHIC LIFE STRESS**

The parent's ability to provide in the infant's needs could be influenced by several factors such as external stress, shortage of time and freedom and other persons who could act as intruders, all of which have a negative impact on the healthy mother-child relationship (Jernberg, 1979; Jernberg & Booth, 2001). Another factor which poses a serious threat to an infant's well-being is poverty. Balbernie (2001) sees poverty as the one factor that can serve as the single highest social risk in a child's life. The risk factors associated with poverty (substandard stimulation or quality of relationship between parent and child influenced by stress levels or absence from home) have the potential to alter the infant's brain structure, resulting in the gradual decline in mental, motor and social-emotional development.

Various studies investigated the effect of divorce and separation on the persons involved. Through the process of a divorce the family as a unit is terminated and results in painful loss for everyone in that family. It is not just loss that needs to be dealt with. The changes associated with divorce relate to a change in living arrangements, change of school, friends, socio-economic status and addition of step-family members (Cohen, 2002; Power, 2004). Referring back to the environmental approach to stress discussed earlier in this chapter, it is easy to understand that the event of divorce is rated as the life event requiring the second highest level of adjustment. It, therefore, classifies as the second most disruptive and stressful life event by researchers and consequently has a significant negative impact on the forming of secure attachment.

Taking in consideration all the various factors that can serve as stressors for both infant and parent and how they can disrupt the parent-child relationship, it seems necessary to search for solutions that will not only facilitate a situation where both parties of the dyad gain a better understanding of each other but is also cost and time effective. Without an effective strategy to handle stressors, it is possible that high stress levels, and hereby implicating high cortisol levels, might occur and that it can have dire consequences.

2.5 EFFECT OF STRESS ON DEVELOPMENT

The discussion on the theory of stress provides the explanation about the mechanism of the stress response. Keeping that mechanism in mind, it is now easier to explain the effects of stress on a person's functioning and development. For the purpose of the study the focus will be mainly on cortisol as bio-marker for stress and its effect on the body.

2.5.1 EFFECTS OF CORTISOL ON CARBOHYDRATE METABOLISM

In order to understand the complete effect of stress on development it is firstly important to understand the effect of cortisol on a person's body. Cortisol has the ability to stimulate the process of gluconeogenesis performed by the liver. During this process carbohydrates are formed from proteins and other substances by increasing the enzymes required to convert amino acids into glucose in the liver cells and mobilizing amino acids from the extrahepatic tissues mainly found in muscle. In the end more amino acids are available to be converted into glucose. Glucose is used as an energy source and vital for all bodily functions. During times of emergency glucose can be mobilized and consumed during times of need. Cortisol lowers the cells' use of glucose and, together with the increased rate of gluconeogenesis, causes the blood glucose concentration to increase, which in turn stimulates the secretion of insulin. Interestingly enough, the body tissues are not as sensitive to the effect of insulin in the presence of high levels of glucocorticoids (cortisol). Less glucose is absorbed and used by the tissues, thus maintaining a high concentration of blood glucose (Guyton & Hall, 2006; Widmaier et al., 2006). In the end, the available glucose will be kept for survival and not used to sustain development.

2.5.2 EFFECTS OF CORTISOL ON PROTEIN METABOLISM

Cortisol plays a big role in the reduction of protein stores in body cells, except the liver cells. Protein synthesis is decreased and catabolism of the proteins available in cells is increased, affecting the protein synthesis of especially

muscle and lymphoid tissue. It can become problematic during high concentrations of cortisol because the muscles can become so weak that the person will experience difficulty when trying to stand up (Guyton & Hall, 2006; Widmaier et al., 2006).

2.5.3 EFFECTS OF CORTISOL ON FAT METABOLISM

Cortisol promotes the mobilization of fatty acids from adipose tissue (stimulation of the triacylglycerol catabolism), increasing the concentration of free fatty acids in the plasma, making it more readily available to the body tissues to use as energy. It also has a direct effect on promoting oxidation of fatty acids in the cells. It has been discovered that excess cortisol secretion can lead to the development of an atypical type of obesity. It is speculated that the excess stimulation of food intake causes a larger amount of fat being generated than the amount being used by the body (Guyton & Hall, 2006; Widmaier et al., 2006).

2.5.4 EFFECT OF STRESS AND CORTISOL ON BRAIN DEVELOPMENT, MEMORY AND LEARNING

Cortisol has direct negative feedback effects on the hypothalamus and anterior pituitary gland, regulating the plasma concentration of cortisol (Guyton & Hall, 2006). The HPA axis is regulated via cortisol when endogenous cortisol binds to glucocorticoid receptors in the central and pituitary components of the axis, providing negative feedback regulation. Regulation of the HPA axis also takes place when the secretory cells within the paraventricular nucleus receive hormonal inputs from the amygdala, hippocampus and nuclei within the midbrain. It is the function of these regulatory mechanisms to determine basal levels and circadian fluctuations in cortisol levels (Young, 2004). However, chronic elevations in glucocorticoids during stress damage the hippocampus neurons involved in the negative feedback regulation of the HPA axis. It causes an increase in glucocorticoids and even further hippocampal damage. As the hippocampus is responsible for memory and learning processes, it is possible that high levels of stress can

lead to poorer performances in tests assessing mental and motor abilities (Blackwell, 2000). Research has shown that chronic administration of glucocorticoids and significant atrophy of hippocampal neurons leads to deficits in learning and memory (Young, 2004).

The stress response itself can also have an effect on the brain structure. Secretion of adrenalin and cortisol in response to a stressor can promote and improve memory for the specific situation, thus helping the person to remember in the future and steer clear of the stressor. Chronic stress can cause some neurons to deteriorate, causing memory to become impaired while other neurons grow that will enhance fear (McEwen, 2005). In the case of chronic stress, such as neglect or abuse of an infant, the brainstem and midbrain becomes under-modulated. These areas are responsible for the control of immediate reactions to perceived danger. Both areas are involved in monitoring the environment and regulating the level of alertness. If the areas cannot function optimally the infant may become hypervigilant, continuously scanning the environment for possible threats to homeostasis and react on stimuli which usually will go by unnoticed by others (Balbernie, 2001). Types of behaviour which can be expected in such a case are hyperactivity, impulsive behaviour, anxiety and poor emotional control.

2.5.5 EFFECT OF STRESS AND CORTISOL ON MOOD

Increased levels of cortisol seem to have an effect on a person's mood. Research has shown that people suffering from depression suffered from hypercortisolism. It was suggested that the cortisol negative feedback effect was not as effective as before due to a decrease in responsiveness or the down regulation of corticosteroid receptors in the HPA-axis. This occurs when the HPA-axis is hyperactive due to hypersecretion of corticotrophin releasing hormone (CRH), causing an increase of cortisol levels in the plasma, urine and cerebrospinal fluid. It also causes an exaggerated cortisol response to ACTH and enlargement of the pituitary and adrenal glands. This is characteristic of a person suffering from a severe mood disorder. Another characteristic of cortisol is the neurodegenerative effect it has on the brain,

causing cognitive deficits observed in sufferers of mood disorders (Kalman & Grahn, 2004; Young, 2004).

2.5.6 EFFECT OF STRESS AND CORTISOL ON THE IMMUNE SYSTEM

Cortisol is a powerful immunoregulator and anti-inflammatory agent. It helps to prevent the immune system from reacting excessively to injuries, damaging tissues (Nash & Thebarger, 2006; Widmaier et al., 2006). It enhances the deployment of the immune cells to the specific place in the body where a pathogen is present. However, in the case of excessive cortisol levels it is known that cortisol suppresses the immune system (McEwen, 2005). Studies on the effect of stress on the immune system came to the conclusion that stressful life events make a person more vulnerable to infectious diseases (Bauer, 2005). There are less T lymphocytes, eosinophils, natural killer cells, mitogen responses, interferon production and antibody responses present in the presence of high cortisol levels. It also causes significant atrophy of the lymphoid tissue due to the repression of protein synthesis. As a result the amount of T cells and antibodies provided by the lymphoid tissue decreases, lowering the immunity for viruses, bacteria and other foreign invaders of the body (Guyton & Hall, 2006; Sadock & Sadock, 2007). Research by Bauer (2005) studied the effect of chronic stress on the immune systems of elderly caregivers looking after demented patients. When the results were compared to those of healthy elderly and young adults, it was found that the immunological changes were similar to increased cortisol levels. The suggestion was made that chronic stress and cortisol can accelerate human immunosenescence. In other words, chronic stress and high levels of cortisol can age one's immune system, making the person more vulnerable to illnesses.

2.5.7 EFFECT OF STRESS ON THE RESPIRATORY RESPONSE AND CARDIOVASCULAR SYSTEMS

When a person is exposed to stress, especially prolonged stress, it can happen that the person starts to hyperventilate. It means that the person is

breathing at a faster rate than metabolically needed, potentially leading to alteration of the acid/base balance (pH balance). When the pH balance is disturbed, symptoms such as dyspnea, fatigue, anxiety and panic are experienced. According to Gervitz (2000), cortical blood flow becomes reduced, creating the possibility that vasoconstriction can occur; activating the cardiovascular system and possibly constricting the coronary artery in the end. It is of absolute importance that the blood pH levels are regulated seeing that the alkalinity of the blood pH levels determines the amount of oxygen released. The more alkaline the pH levels becomes, the more oxygen bounds to the haemoglobin molecule, making it more difficult to provide the organs with oxygen (Gervitz, 2000).

It can now be concluded that there are multiple origins for stress and that the effect of stress can be very significant on an individual's development and functioning. It is the opinion of the researcher that every person is exposed to stressors in some form and, therefore, experience some level of stress on a daily basis. However, it would seem that some individuals are better adept at coping with daily stressors. It is vital to investigate this phenomenon so that is possible to determine which factors act as protection against stressors and in doing so, limit the harmful effects of stress. With regard to the aim of this study, knowledge of the different factors will prove to be helpful when identifying an intervention to address them.

2.6 PROTECTIVE FACTORS AGAINST STRESS

From research conducted on factors acting as buffers against stress, it is possible to identify various aspects which can be divided into protection factors mostly applicable to adults or parents and those mostly applicable to infants or children.

2.6.1 PROTECTIVE FACTORS FOR ADULTS / PARENTS

In general, studies done on the relationship between basal cortisol levels and social support came to the conclusion that the individuals with the highest social support levels had lower cortisol levels than those without strong social support. According to Rosal, King, Ma and Reed (2004), the HPA axis may be one of the biochemical pathways by which high levels of social support can act as a barrier and protect the person's health from the negative impact of stress. The way in which social support can alter thoughts and feelings, facilitate a sense of meaning and cultivate health promoting behaviours is also thought to affect a person's wellbeing indirectly. It was determined that family support, cohesion, discussion of work concerns with family members, the chance to discuss any feelings of frustrations and positive aspects of living status (living with others or living alone) openly all helped to reduce work stress (Ross & Devereil, 2004).

Other factors that will keep parental stress at bay are proven to be a combination of empathy, closeness, emotional warmth and affection. Autonomy and freedom to be independent is also associated with lower stress levels. When a parent feels more competent in the parental role, experiences emotional intimacy with the infant, has good social support and integration and is healthy, it is likely that the parent experiences lower stress levels. In the case where the parent's expectations about the infant's physical, emotional and intellectual characteristics are met and the infant displays appropriate autonomy and positive affective functioning, it is expected that the parent will hold a positive view of parenthood (Willinger, Driendorfer-Radner, Willnauer, Jörgl & Hager, 2005).

A study by Tu, Lupien and Walker (2006) focused on the effect of breastfeeding on stress levels of multiparous mothers (mothers with more than one child). Both primiparous mothers (first-time mothers) and multiparous mothers, who were either breast or bottle feeding their infants, were asked to watch two films, one a neutral and one an emotional film. The last film was specifically designed to elicit cortisol secretion. The results

showed that in response to the film, the cortisol levels of the multiparous mothers were significantly lower than the primiparous mothers' cortisol levels. They concluded that the type of infant feeding has a big effect on the mother's cortisol response. Breastfeeding also has the added effect that oxytocin is released in the mother and this is associated with reduced maternal stress levels and adjusted patterns of maternal behaviour (Swain et al., 2007).

2.6.2 PROTECTIVE FACTORS FOR INFANTS / CHILDREN

In the case of infants it was found that the infant's level of self-esteem, intelligence, internal locus of control and temperament serves as protective factors which will buffer the effect of stress. Other factors such as social class, social support and the quality of the parent-infant relationship also determines to which extent the infant will react on the stressor. Several studies have shown that the parent-infant relationship plays the biggest role by far in the infant's ability to cope with stressful times (Power, 2004).

It is now possible to see that, just as there are various factors that can act as stressors, various factors carry out protective functions. Using this information as guideline it will now be possible to identify and implement an intervention which will ultimately promote protection factors, helping both the parent and ultimately the infant to deal with the stress factors in more effective ways.

2.7 MEASUREMENT OF STRESS

The measurement of an individual's stress levels can be done using both psychological and physiological measures. Both ways have certain benefits and can be used in complimentary ways to each other.

2.7.1 PSYCHOLOGICAL MEASURES

There are various scales and inventories available which can be used to measure the individual's experience of stress. These instruments are mostly self-reporting of nature and, therefore, provide an estimate of the individual's

subjective perspective of the experienced stress level. As it is necessary for the respondent to possess a certain level of literacy in order to answer a self-report measure, it will usually be used on educated, adult populations (Foxcroft & Roodt, 2005). One such a scale is the Perceived Stress Scale. This scale is used to provide a global appraisal of stress by measuring the degree in which the person views life as unpredictable, experiences a lack of control as well as the degree in which the person experiences his/her own life to be overloaded (Clark et al., 2007). Another measure is the Trier Inventory for Assessment of Chronic Stress which specifically assesses the impact of stress upon an individual's health (Kaspers & Scholtz, 2004). The Hassles Scale can also be used to measure stress as it measures the experience of daily objective stressors in areas such as work, health, family, friends, environment, practical considerations and chance occurrences (Rosal et al., 2004). Seeing as all of these measures are of a self-reporting nature they are suitable to be used on adult participants.

For the purpose of this study, the Parenting Stress Index will be used. Abidin (1995) identified three major sources domains of parenting stressors. These are child characteristics, parent characteristics and situational or demographic life stress. The Parenting Stress Index (PSI) was developed to measure these aspects, guided by four assumptions. The first assumption states that the PSI would be built on the existing knowledge base. Secondly it is assumed that the PSI would incorporate the existing knowledge base with the clinical issues of identification and diagnosis of individual parent-child systems under stress. In the third place, it is assumed that the origins of stress are additive and lastly, those stressors' origin and kind are multidimensional (Abidin, 1995). According to numerous studies on the development of behaviour problems in children, the one factor that contributes the most can be identified as the existence of excessively stressful characteristics of the misbehaving child. Stress in the parenting system during the child's first three years of life is proven to have a significant influence on the child's emotional and behavioural development. It can now be concluded that it would be beneficial for all parties involved when stress in the parent-child system can be identified as soon as possible and intervention is implemented to reduce

the stress levels. This can lead to reducing the chance of emotional and behavioural disturbances developing amongst children in the future.

2.7.2 PHYSIOLOGICAL MEASURES

Physiological measures for stress include the measurement of stress through the studying of both urinary and salivary cortisol levels (Clark et al., 2007; De Weerth & Van Geert, 2002; Goldberg et al., 2003; Kaspers & Scholtz, 2004). These measurements can be performed on any individual in any age group ranging from infancy to the elderly. Due to the many different factors that can influence stress responses and thus cortisol levels, it is necessary to retrieve samples containing cortisol in such a way that (a) minimal intrusion takes place, (b) the participant finds it easy to follow the method in acquiring the sample, and (c) that the detection of cortisol is reliable and valid (Neu, Goldstein, Gao & Laudenslager, 2007).

For the purpose of the study it was decided to make use of salivary cortisol as a biomarker of stress and it is considered as very reliable (Garde & Hansen, 2005). Measuring salivary cortisol was proven to be very valuable when examining HPA axis activity during stressful conditions as the method meets the three requirements as mentioned previously. There are many advantages to measuring stress through saliva. Firstly, collecting saliva is easy as the participant is only required to chew on the cotton wool or Salivette H tampons. This is a minimally intrusive procedure and will, therefore, reduce the risk of eliciting a stress response such as during the event of drawing blood or anticipation of a blood draw. It contributes to the validity and reliability of the cortisol concentrations of the samples. The procedure makes it easy for a caregiver or parent to collect samples from an infant. Thirdly, samples can be either stored at room temperature or in a household refrigerator until it can be delivered to the laboratory for further analysis. Research done by Garde and Hansen (2005) showed that centrifuged saliva samples for analysis could be stored for 3 months at 5°C or a -20°C to -80°C for a year and that no effect on

the cortisol concentration could be detected when samples were thawed and frozen repeatedly (Garde & Hansen, 2005; Neu et al., 2007).

2.8 CONCLUSION

Stress is a multifaceted concept that can refer to a person's physical, physiological and emotional reaction to a perceived physical or psychological stressor that threatens the body's homeostatic state. There are many stressors on biological, psychological and environmental levels that requires a person to possess effective coping strategies and the necessary resources to deal with the required change. A realisation that either one or both coping strategies and resources are lacking or ineffective increases the stress levels. Although stress's main function is one of adaptation and helps the body to react appropriately in response to a stressor, prolonged stress's consequences can have harmful effects in more ways than one. As the high stress and cortisol levels influence aspects such as blood glucose levels, protein metabolism, brain development, mood and immunity, it will be necessary to find and implement a cost and time effective intervention to promote protection factors, alleviating stress in both infant and mother. By doing that, it can be speculated that the stress levels in the mother-infant dyad will be lower, providing the dyad with an opportunity to spend more quality time with each other and promoting optimal development as well as optimal physical and psychological wellbeing.

CHAPTER 3

BONDING AND ATTACHMENT

3.1 INTRODUCTION

When individuals form strong interpersonal bonds with significant others it means that the parties involved understand the needs of the others and are able to provide care and protection. It also means that they will be thoughtful of the other individual's interests and desires (Swain et al., 2007). One such a type of relationship that has been the focus of various studies is the one between infant and caretaker. Bowlby was one of the first to focus on this early relationship and he pioneered the view that it is possible, through the information gathered from that relationship, to make predictions about the child's future personality development as well as future interpersonal relationships. Therefore, the quality of parent-infant relationship has significant consequences for later development and personality functioning (Berger, 1999; Hardy, 2007; Sadock & Sadock, 2007). It will be necessary to understand how this relationship develops so that it is possible to use this information when implementing interventions that can address all components essential to promote the forming of a healthy relationship. Seeing as a relationship usually involves at least two individuals and the type of the relationship depends on the attitude of the individuals towards each other, it will be essential to launch an investigation into the development of a relationship from both parties' perspective (Sadock & Sadock, 2007). To aid with this investigation and to prevent confusion, the terms "bonding" and "attachment" will be used to distinguish between the formation of the relationship from the infant to the mother and formation of the relationship from the parent to the infant.

3.2 DEFINITIONS OF BONDING AND ATTACHMENT

For the purpose of this study, the focus will mostly fall on bonding, especially the underlying dynamics and implications. In order to identify the specific components, it will be necessary to establish a comprehensive definition of bonding.

3.2.1 BONDING

Kennell and McGrath (2005) define bonding as the unique, specific and enduring relationship between two people. The term bonding is used to describe the emotional tie from the parent to the infant. This close emotional relationship is characterised by mutual affection and by both parties expressing the desire to maintain proximity (Shafer, 2002).

Feldman, Weller, Leckman, Kuint and Eidelman (1999, p. 930) describe bonding as follows: "Maternal bonding is characterized by a unique mental stand behavioural repertoire that is directed to maintain the mother's physical and psychological proximity to the child".

From these definitions it is possible to identify certain similarities. It is, therefore, the current researcher's conclusion that bonding can be defined as the emotional tie that develops from the primary caregiver, in most cases the mother, to the infant and that it is characterised by a need to maintain both physical and psychological proximity to each other in the dyad.

The difference between bonding and attachment will become clear through the definition of attachment, which will also offer an overview on all the components involved in the process of attachment.

3.2.2 ATTACHMENT

Goldberg (2000) defines attachment as the emotional tie that comes into existence between two individuals when one or both expect that the other will care and provide protection in times of need.

The definition for attachment as formulated by John Bowlby is more specific since it states that it is the emotional bond that develops between an infant and a primary caregiver (Sonkin, 2005).

Attachment, according to Sadock and Sadock (2007), can be defined as the emotional attitude or tone that exists between a child and the caregiver and can be seen through the infant seeking and clinging behaviour towards the caregiver.

For the purpose of the study the current researcher proposes that the term attachment refers to the development of the relationship from the infant to the attachment figure and that there is an expectation that the attachment figure will care for the child in the dyad.

The definitions of both bonding and attachment provide an outline of the various components making up the relationship between parent and infant. In order to understand the rational behind the insertion of the various components fully, further investigation into the theory behind bonding and attachment will take place. For the purpose of this study the main focus will be on bonding. However, it will be necessary to launch an investigation into the phenomenon of attachment in order to understand the way in which bonding and attachment influence each other and the impact of this on the dyad's functioning.

The investigation will start with the concept of bonding in terms of the underlying dynamics and factors known to impact bonding.

3.3 BONDING

The process of bonding would seem to be a complex system, developing on multiple levels and influenced by various factors. It will, therefore, be necessary to gain knowledge of the process of the development of bonding.

3.3.1 DEVELOPMENT OF BONDING

In 1970 Marshall Klaus and John Kennell, both professors of Paediatrics, studied the development of bonding from the parent to the infant. They were of the opinion that the first few hours and days after birth are the critical time for the mother and infant to develop a positive bond (Klaus & Kennell, 1976). They also speculated that unsuccessful bonding can have long lasting negative consequences. They were eager to discover how the bonding grew, developed and matured and what could distort, disturb, promote or enhance bonding. From their research, and other studies inspired by their work, it is acknowledged that it is crucial that bonding is established between mother and infant since the infant is fully dependent on its mother for survival, development, support and protection and a failure to establish bonding can have dire effects (Klaus & Kennell, 1976; Moyse, 2005; Taylor, Atkins, Kumar, Adams & Glover, 2005). The results from their research have changed the way the Western health care profession took care of mothers and infants. It has currently become common practice to allow the infant to stay in the same room as the mother, thus giving them more opportunities to interact and form a positive bond. Some researchers agree with Klaus and Kennel in believing that the process of bonding starts during the first hours to days after the child's birth (Stack, 2001). Other studies come to the conclusion that the process of bonding starts as early as in pregnancy. It is known as maternal-foetal bonding and has a profound effect on maternal-infant interaction (Zeitlin et al., 1999).

3.3.1.1 THEORETICAL PERSPECTIVES

There are theoretical perspectives that support the necessity of examining bonding from a mother-to-infant viewpoint rather than just the infant-to-mother viewpoint. The first one is a neurobiological model on bond formation by Insel (1997) and the second, a psychoanalytical description of the mother's mental processes during the process of bonding by Donald Winnicott (1956).

3.3.1.1.1 INSEL'S NEUROBIOLOGICAL MODEL

Insel's model focuses on behaviour and is based on results seen in animal studies. It proposes that the types of social bonding are moderated by a specific neurobiological system. According to the model, parenting is regulated by the parent's own early life experience as well as hormones and neurotransmitters. Prolactin, vasopressin, dopamine and oxytocin are some of these neurotransmitters stimulating parental care. The focus mainly falls on oxytocin, a neuropeptide whose main functions include uterine contractions during birth and production of breast milk during nursing. It is also needed to promote the development of maternal bonding behaviour such as nursing, physical touch and grooming (Feldman et al., 1999). Studies on maternal behaviour in rodents revealed that suckling as well as audiovisual and olfactory stimuli are associated with an increased appearance of oxytocin receptors in certain areas of the brain. These areas are very involved in manifestation of social and maternal behaviour and include the red nucleus of the stria terminalis, central nucleus of amygdala, a hypothalamic paraventricular nucleus, ventral tegmental area and lateral septum (Swain et al., 2007). A variety of cortical regions, including the inferior frontal, premotor, insular, tempo-parietal and cingulate cortices are the brain areas involved in parental empathy. Empathy can be defined as the appropriate perception, experience and response to another person's emotion (Swain et al., 2007). In order to show empathy, it is first necessary to form a model of another's mind which will help to predict the other's behaviour and emotions. In order for a parent to be able to demonstrate empathy to the infant, it is essential that the parent is capable of understanding and predicting the infant's mental states,

behaviours and experience of appropriate emotions. This will help the parent to understand the infant's nonverbal communication of his/needs and act accordingly (Swain et al., 2007).

3.3.1.1.2 WINNICOTT'S PSYCHOANALYTICAL MODEL

Donald Winnicott formulated the concept of "good enough mothering" (Fonagy & Target, 2005, p.339). His model considers mental representations and looks at the psychological dimensions of preoccupation, mental exclusivity and anxiety. According to the model, it is crucial for the sake of the development of maternal attachment that the mother "has obsessive-like involvement" with her infant as well as hypervigilance for the infant's safety (Feldman et al., 1999, p. 930). This aids the mother in providing in all of the infant's physiological and psychological needs, improving the infant's survival, health and resiliency. An inability to do so can be seen as a risk factor that can have a negative effect on the emerging attachment patterns (Feldman et al., 1999; Swain et al., 2007).

Bowlby proposed and promoted an integration of the perspectives of both Insel and Winnicott as the best way to understand infant attachment. Both theoretical perspectives highlight a unique mental set and observable behaviour displayed by the mother. The sole purpose of this repertoire is to ensure that mother and infant maintain proximity on both physiological and psychological level (Feldman et al., 1999).

The theoretical perspectives increase one's awareness of the different types of factors that can impact bonding in both in a positive and negative way. It is important that these factors should be explored and the knowledge gained used to generate an intervention which will be able to endorse the positive factors and reduce negative factors.

3.3.2 FACTORS IMPACTING BONDING

3.3.2.1 POSITIVE FACTORS

During pregnancy the mother will start to prepare herself for her role as mother and create a mental representation of her infant. She will entertain fantasies about the infant's characteristics and start to develop feelings of bonding (Pearce & Ayers, 2005; Taylor et al., 2005; Zeitlin et al., 1999). Research by Pearce and Ayers (2005) found that both the expectations and evaluations of the infant's characteristics had a significant effect on the mother-infant bond after birth. Post partum, other factors such eye-to-eye contact and the quality and amount of touch (skin to skin contact) also contribute to the establishment of successful bonding. It is also suggested by a small number of studies that gender may have an effect on the quality of the parent-infant relationship. Same-gender dyads may be able to develop synchronous interactions, thus develop secure attachment more easily than opposite-gender parent-infant dyads. (Kennell & McGrath, 2005; Klaus & Kennell, 1976; Sadock & Sadock, 2007; Schoppe-Sullivan et al., 2006; Stack, 2001).

Another factor impacting bonding is the parents' perception of their own bonding experience as infant. It is suggested to have a significant influence on the quality of relationship existing between them and the infant. The mothers who experienced optimal bonding with their own parents reported lower parental stress levels and were able to be empathic, affectionate and close toward the infant to a higher extent than mothers who did not have the same childhood experience. The former mentioned mothers also reported emotional warmth and affection as well as autonomy and allowance of independence contributed to lower levels of parenting stress (Willinger et al., 2005). It proves to be beneficial for both parent and infant when optimal bonding has taken place, especially as it has a big impact on stress.

3.3.2.2 NEGATIVE FACTORS

Any stressor that leaves the mother feeling unloved or unsupported or causes distress concerning health and survival of either her infant or herself may prevent the maternal-foetal bond from forming (Zeitlin et al., 1999). After birth the bonding process between mother and infant may be negatively affected if the mother is still very young, depressed, experience ambivalence about motherhood or abuses substances. This keeps the mother from initiating actions necessary to promote healthy interactions between her and the infant (Rosenblum, Mazet & Bénony, 1997). These distortions of the normal parent-child interactive system cause disruption of the whole system. Problems concerning fulfilment of the infant's physical and emotional needs arise and since the infant is completely dependent on the parent to survive, this discovery is very stressful for the infant (Klaus & Kennel, 1976; Jernberg, 1979; Swain et al., 2007).

Other factors that will have a negative impact on the forming of bonding and attachment (attachment disorder) can be divided into three categories. It is parental/caregiver contributions (for example abuse and neglect, psychological disorders, depression, immaturity etc.), child contributions (such as being born prematurely, difficult temperament, physical defects etc.) as well as socio-economic and environmental contributions (poverty, stressful work and home environment etc.) (Levy & Orlans, 2000; Swain et al., 2007). Investigations concerning parental/caregiver contributions show that maternal psychopathology, especially depression and substance abuse, could have an effect on the mother-infant bond (Mäntymaa et al., 2006; Rosenblum et al., 1997; Swain et al., 2007). The mother's inability to attend to the regulating of her infant's emotions, either by soothing or stimulating, because of her own emotion-regulating difficulties, will hamper the infant's ability to regulate his/her own mood states (Gerhardt, 2004).

In conclusion, the term "bonding" is used to refer to the emotional tie that develops from the mother to the infant. This is not just a psychological phenomenon but also causes changes in the individuals on a physiological

level involving modifications in the brain and hormone levels. There are several factors that can have both a positive and negative impact on the forming and maintaining on bonding. By enhancing the positive factors and limiting the negative factors, a good quality bonding occurs between mother and infant. The benefits of the good relationship between them are visible throughout the child's life and play a role in the child's relationship with her or his own children.

3.4 ATTACHMENT

It would seem that bonding has a substantial impact on the forming of attachment (Taylor et al., 2005). Referring back to the definition of attachment accepted for this study, attachment is the formation of a relationship from the infant to the mother. In order to understand in which ways attachment is similar and yet different from bonding, it will be crucial to understand how attachment develops.

3.4.1 DEVELOPMENT OF ATTACHMENT

Levy and Orlans (2000) describe the attachment process as a mutual regulatory system, meaning that parent and infant influence each other over time. Bowlby was of the opinion that the extent of proximity or distance between mother and infant could be used to understand infant behaviour (Feldman et al., 1999). Results from research focusing on early parental love revealed that parents felt obligated to adjust their own behaviour in order to suit the perceived needs of the infant (Swain et al., 2007). Parental behaviour such as holding, rocking, smiling and keeping eye contact will activate instinctual attachment behaviours in the infant. Previous research suggests that a positive response from the infant acts as a positive stimulant for the mother and enhances sensitive parenting where negative responses may reduce sensitive parenting. A sensitive mother will be able to understand the infant's shift in behaviour, such as displaying negative affect, as the infant's way of communicating his/her distress and need for comfort from the mother. By detecting and attending to these shifts the mother will be able help the

infant to regulate his/her emotions, supporting the progress of secure attachment (Bornstein & Tamis-LeMonda, 2001; Gerhardt, 2004; Mills-Koonce et al., 2007). The parent's warm and sensitive response to the infant's distress signals lets the infant develop a favourable responding style to soothing behaviour (Willinger et al., 2005). Bowlby (1969) investigated how the socio-emotional learning is internalised by the infant so that a lasting capacity for regulation of emotional states is developed and that the infant can generate and maintain states of emotional security (Shore, 2001b).

3.4.2 THEORETICAL PERSPECTIVES

There are two theoretical perspectives that promote understanding of the process of attachment. The first one is known as the developmental psychology perspective and the second one as the psychoanalytical perspective.

3.4.2.1 DEVELOPMENTAL PSYCHOLOGY

The first one, called the developmental psychology perspective, states that the early relationship between infant and caregiver facilitates the formation of an internal working model of attachment for relationships. The internal working model consists of internalised expectations regarding the individual self as well as other (Adam, Gunnar & Tanaka, 2004). Thus, the model includes concepts of the self and other as well as expectations of the relationship. The attachment style is progressively integrated into the individual's psychological organisation. The internal working model can be influenced and changed by new experiences, but the way the new information is integrated into the model depends on the model's existing nature (Goldberg, 2000; Hardy, 2007). Over time it evolves into a general working model and these internal models do not only have a significant influence on interpersonal relationships, but also play an important role in how people interpret their social world and help to guide behaviour in new situations. It is thought that internal working models work unconsciously and that they can

affect the person's mental state (Huston & Ronsekrantz Aronson, 2005; Pielage, Gerlsman & Schaap, 2000; Willinger et al., 2005).

3.4.2.2 PSYCHOANALYTIC PERSPECTIVE

The second theory explaining the process of attachment is the psychoanalytic perspective. According to this perspective, representations of both the self and other objects (other people) are formed by the early childhood experiences. It is mainly through the transactions between mother and infant that the infant forms these representations (Shore, 2001a) and all future affective exchanges will be influenced by this. This is especially evident in cases where the infant experiences relational trauma due to the fact that the mother is incapable of providing in her child's needs. The infant's posttraumatic response is incorporated in the personality (Feldman et al., 1999; Shore, 2001b).

It can, therefore, be concluded that the development of attachment is dependent on the type and quality of relationships experienced in infancy. It is through these relationships that the infant forms and internalises certain perspectives and expectations of the self and others. Regardless of the nature of the views regarding the self and others, will it play a significant role in the individual's future relationships. Keeping this in mind, it will now be necessary to focus on the characteristics of attachment in order to discover what consequences can be expected depending on the type of mother-infant relationship.

3.4.3 ATTACHMENT CHARACTERISTICS

The term "attachment" refers to a complex concept, best understood when explored in terms of its features, the way in which attachment develops and the influential factors determining the type of attachment that forms. Gaining a better understanding of the dynamics of attachment will prove to be beneficial when choosing an intervention in order to enrich attachment between mother and infant.

3.4.3.1 ATTACHMENT FEATURES

The attachment behavioural system, as described by John Bowlby, is thought to be one of four behavioural systems inherent to an organism to ensure survival. The infant will use any means necessary, whether it is behaviourally or cognitively, to ensure that close proximity to the caregiver is maintained. The type of interaction which forms between infant and parent is dependent on the interaction between the dyad as well as the approach to attachment. There are four features defining the attachment bond. The first one is known as the maintaining of proximity (Shorey, 2005; Sonkin, 2005). Proximity is the term used to refer to “synchronous function of the various regulators to maintain biological homeostasis” (Feldman et al., 1999, p. 930). The second feature is called “separation distress” and the third as “safe haven”, meaning that the infant will return to the caregiver when facing a stressor or feeling anxious. The last feature is known as the “secure base” which leads to the conclusion that the infant will explore the world safe in the knowledge that the caregiver will protect him/her from danger (Sonkin, 2005).

3.4.3.2 PHASES OF ATTACHMENT

There are four phases in the process of attachment. The first phase is known as the pre-attachment stage and lasts from birth to eight or twelve weeks. During this phase the infant becomes orientated to the mother, following her with his eyes and reacting toward the mother's voice by turning and moving rhythmically. In the second phase, lasting from eight to twelve weeks to six months, the infant becomes attached to both the mother and other people in the nearby environment, such as other parent and family members. This is called the “attachment in making” phase. From the ages of 6 to 24 months it is possible to see the “clear-cut attachment” phase where separation from the mother will cause the infant to cry and send out distress signals. Upon termination of the separation period the infant will stop crying and then cling to the mother. The fourth and final stage occurs when the infant is 25 months and older. It can be described as a goal-directed partnership. The infant now develops a sense of autonomy and sees the mother as independent. The

type of relationship that develops is more complex as the infant is now not only able to use and attend to social cues, but also respond accordingly (Berger, 1999; Sadock & Sadock, 2007; Sonkin, 2005).

3.4.3.3 ATTACHMENT PATTERNS

Attachment styles according to Mikulincer et al. (2003, p. 79) can be defined as:

“...the systematic pattern of relational expectations, emotions, and behaviour that results from internalizations of a particular history of attachment experiences and consequent reliance on a particular attachment-related strategy of affect regulation”.

According to Hardy (2007), it is intrinsically part of an infant's nature to form attachment regardless of the quality of interaction between infant and caretaker. Four different types of attachment have been identified and are known as (a) avoidant, (b) resistant-ambivalent or insecure-ambivalent, (c) disorganised-disoriented or insecure-disorganised and (d) secure. When an infant or child receives care that is chaotic, unpredictable, rejecting, inconsistent or neglectful, the first three attachment patterns evolve (Hardy, 2007; Pielage et al., 2005; Swain et al., 2007). According to Hennighausen and Lyons-Ruth (2005), the parent becomes both the source of the infant's stress and fear as well as the haven of safety. This creates a dilemma for the infant, making it difficult to decide whether the parent should be approached for comfort or not. Parenting styles promoting insecure attachment may act as a hindrance to the infant's development of inner resources needed to effectively cope with life stressors (Pielage et al., 2005).

• AVOIDANT ATTACHMENT

A child with a pattern of avoidant attachment is most likely to display behaviour resembling rejection. It will most probably be the child that experienced rough or aggressive parenting who will usually avoid close contact with people, ignore the departure and return of the parent as well as actively avoiding any efforts made by the parent to regain contact. When

confronted with a threat the child would rather linger near the parent than going directly to her for help (Pielage et al., 2005; Sroufe, 2005).

- **RESISTANT-AMBIVALENT**

The resistant-ambivalent child is one who would be preoccupied with the parent, alternately seeking comfort from or rejecting the parent. These children will not easily take part in exploratory play regardless whether a threat is present or not. This attachment pattern is the result of maltreatment by the parent. It is thought that the conflict between the knowledge that the parent is the source of both the distress and a potential source of comfort causes the infant to both reach out and reject the parent (Pielage et al., 2005; Swain et al., 2007).

- **INSECURE-DISORGANISED**

The insecure-disorganised attachment style is the pattern which surfaces when parents are emotionally absent. These parents mostly have an own history of abuse in their childhood. Children who are disorganised attached will usually react in very strange ways when facing a threat (Feldstein, 2002; Hardy, 2007; Sadock & Sadock, 2007). The infant will show a wide range of contradictory behaviour that can be viewed as the infant's inability to develop a consistent strategy in order to obtain comfort from the parent. Typical behaviour patterns of a disorganised attached infant will include the following:

1. Chronological demonstration of contradictory behaviour patterns seen when the infant first displays strong attachment behaviour and then avoidant behaviour;
2. Movements and expressions that can be described as "undirected, misdirected, incomplete and mistimed";
3. A display of nervousness and apprehension regarding the parent;
4. Manifestation of disorganisation in the presence of the parent (Hennighausen & Lyons-Ruth, 2005).

Mary Ainsworth describes disorganisation as a severe form of insecure attachment and that it can lay the foundation for the development of severe personality disorders and other psychopathology in adolescence and early adulthood (Hardy, 2007; Sadock & Sadock, 2007). There is one model that clarifies this phenomenon by explaining how insecure attachment can act as a vulnerability to appraise events as stressful. According to this model, persons with insecure attachment hold certain negative beliefs and expectations concerning the kindness, helpfulness and support of others as well as their own resourcefulness. They are prone to view and evaluate life events in such a way that it confirms the negative beliefs. After a while it starts to become a vicious cycle when the negative view of others and themselves makes them more prone to view and interpret events as stressful, which then increases their susceptibility to experience psychopathology (Pielage et al., 2000). It can, therefore, be concluded that disorganised attachment processes can be seen as early predictors of both internalizing and externalizing forms of psychopathology (Hennighausen & Lyons-Ruth, 2005).

- **SECURE ATTACHMENT**

The fourth attachment pattern, known as secure attachment, will develop when the infant forms a close, enduring and dependent bond to a primary caregiver. The caregiver is usually the parent who is affectionate and will promote attachment behaviour by being quick to respond, available when needed and also provide comfort when the infant is confronted with a stressor or threat. It can be expected that an infant who is securely attached will protest during a separation period and then attempt to regain proximity to the parent afterwards (Hardy, 2007; Willinger et al., 2005). Positive experiences, during which the infant learns that the parent is looking after the infant's needs, help to generate a basic trust in the world and the self. The ability to trust enables a person to have a positive attitude in life and serve as protection against psychological distress arising from difficult and stressful times. The internal working model that develops here provides the infant with a sense of social competence, hopefulness, a positive expectation concerning

others seeing them as trustworthy, feelings of self-worth and perceptions of the self as lovable, a perception that the world is a safe place and a better ability to cope with stress (Pielage et al., 2000; Shorey, 2005; Willinger et al., 2005).

The amount of time that parents and infants spend together can promote secure attachment. According to the economic theories, as described by Huston and Rosenkrantz Aronson (2005), time can be viewed as a resource or commodity invested in children by their parents. A consistent and available parent can provide a trustworthy social context and spend the time to provide intellectual stimulation (for example cognitive activities and language) through social interaction with the infant. The more time spent with the infant will provide the mother with opportunity to gain knowledge of her infant's signals and develop the appropriate reciprocal interactions. Failure to do so may result in the infant experiencing the mother's presence as irregular and unpredictable (Huston & Rosenkrantz Aronson, 2005; Stack, 2001).

Numerous research studies prove the importance of secure attachment. Secure attachment to a parent not only provides safety and protection, but also helps the infant to develop in all his aspects of functioning. The infant will be able to explore his/her environment, be sociable with others, learn basic trust and reciprocity, develop the ability of self-regulation of impulses and emotions and create a base for formation of identity. According to Willinger et al. (2005), children who are securely attached will be more sociable. Not only will they be spending more time with same-gender peers but will also be more effective in these relationships. The friendships will usually be reciprocal of nature. The children will be able to form both close friendships with other children and interact in larger peer groups. They will often include other children in their playful activities. This is also the group of children who will spend less time in therapy. Secure attachment provides a defence against stress and trauma (Fraley, 2004; Levy & Orlans, 2000). Longitudinal studies show that securely attached children have better relationships with their peer group, show more resilience during stressful periods, are more confident, are able to function independently and have the capacity for empathy. It can be

concluded that secure attachment contributes to broadening of the child's perspectives, capacities and skills (Fraley, 2004; Levy & Orlans, 2000; Mikulincer et al., 2003). According to Blackwell (2000), the infant's developing sense of intersubjectivity and attachment provides the infant with the motivation and secure platform from where the infant can explore the external world, communicate with others, develop understanding of the self as well as others and lastly, develop positive social relationships.

The literature explaining the development and features of attachment as well as the necessity of a good quality attachment forming between infant and mother leaves no uncertainty that it will be essential to identify the factors that have either a positive or negative impact on the formation of attachment.

3.4.3.4 FACTORS IMPACTING ATTACHMENT

Attachment seems to be influenced by various factors in both a positive and negative way.

3.4.3.4.1 POSITIVE FACTORS

From the extensive research conducted on attachment it seems that there are mainly two factors that have a big influence on the development of attachment. It is the availability of the attachment figure as well as the responsiveness of this attachment figure to the other individual in the dyad's proximity-seeking attempt.

- **AVAILABILITY OF ATTACHMENT FIGURE**

Mikulincer et al. (2003) suggest that the availability of the attachment figure activates a developmental sequence of security based strategies which consists of two stages. The first stage involves the consolidation of co-regulation and self-regulation, meaning that the primary attachment proximity seeking strategy is enhanced and expanded, which improves affect regulation. Regulation of affect is done with the assistance of available

attachment figures and is known as co-regulation. It is especially during the infant's first year of life that the success of primary attachment proximity-seeking strategies depends on the willingness and ability of the caregiver to co-regulate distress. During the second year of the infant's life the second stage begins, specifically the route from co-regulation to self-regulation, where the self is established as the chief decision-making agency of security-based strategies. It is proposed that three mechanisms facilitate the passage from co to self-regulation. It is known as the:

“...broadening of a person's perspective and capacities, expansion of the self, and internalization of functions that were originally accomplished by attachment figures” (Mikulincer et al., 2003, p. 92).

In order to develop self-regulation it is necessary to activate certain behavioural systems after the infant achieves a sense of attachment security. Bowlby introduced various behaviour systems of which the first one is known as the exploration system. It states that children and adolescents distance themselves from their parents to a certain extent. The distance presents them with the opportunity to explore their environment, providing them with the opportunity to learn more about their world and themselves in the process. This knowledge enriches their regulatory skills. They also discover their own capacity to be on their own in the world and doing new things without the help of others. The second system is called the “care giving system”. This provides the child and adolescent with the opportunity to learn how to help others with regulating their distress. The experience gained from this strengthens their sense of mastery and helps them to regulate their own distress. It can be concluded that activation of certain behavioural systems will not only broaden the individuals' regulatory skills but also enhances the feeling of confidence in the efficiency of their own resources for dealing with stress (Mikulincer et al., 2003).

• **RESPONSIVENESS OF ATTACHMENT FIGURE**

As the infant is dependent on the caregiver for survival, certain behaviour and inherent qualities of the infant are used to ensure that bonding takes place.

The infant will concentrate on human voices, recognize human faces and look intently into the parents' eyes when fed. The parent is used as guide or cue when faced with new stimuli and the infant actively attempts to maintain physical proximity as soon as the capacity for locomotion and intentional movement developed. Even when the infant is busy with an individual activity, he/she will repeatedly return to the parent for reassurance (Hardy, 2007). Bowlby made the observation that certain infants and small children exhibited specific behaviour after they were separated from their primary caregivers (Fraley, 2004; Levy & Orlans, 2000). Examples of this behaviour included excessive crying and clinging, all in an effort to maintain proximity with the caregiver. Bowlby (1969) came to the conclusion that this behaviour was used as a survival method to ensure that the infant's needs in terms of protection, care and support are met. As soon as the infant establishes that his/her needs are met, he/she feels safe enough to explore the surroundings and engage in social activities. However, if the infant realises that his/her needs are not met, heightened levels of stress occur. It causes the infant to exhibit a wide range of attachment behaviour to acquire the necessary level of closeness and caring (Fraley, 2004).

3.4.3.4.2 NEGATIVE FACTORS

Identified factors that can have a negative impact on the formation of attachment include the duration of separation periods as well as the lack of responsiveness from the attachment figure.

Focusing on the first factor, previous research revealed how both physiological and behavioural changes occur in the infant during a situation where separation takes place between parent and infant. During short separation periods an increase in autonomic and behavioural reactivity takes place. When this period is prolonged, the infant displays low activity levels (Feldman et al., 1999).

In the case where the parent is incapable of providing comfort for the distressed infant and, therefore, displays a lack of responsiveness to the

infant's needs, alternative coping skills develop in the form of avoidance. Since the infant does not receive any help with emotion regulation, he/she may try to suppress the emotions and switch off, usually with a lesser degree of success (Gerhardt, 2004). In a situation like this, the infant will show neither separation distress nor seek bodily proximity when he/she is upset (Crittenden & Claussen, 2003). The psychobiological attachment theory explains this type of behaviour by focusing mostly on the neurobiological basis of attachment. According to this theory, the infant's behaviour and physiology is regulated by the primary caregiver (Van den Boom, 2001). Hofer (2006) stated that different behavioural and/or physiological systems are independently regulated by different components of the interaction between infant and mother. Continuous and meaningful interaction in the dyad leads to the development of these regulators. During maternal separation, the loss of the regulators can cause behavioural and physiological changes in the infant. This can be seen during the "protest" and "despair" phases of separation (Van den Boom, 2001). Symptoms of attachment disorder can be observed, not only on an emotional level but also in behavioural, thoughts, relationships, moral/spiritual and physical aspects, thus causing impairment in many areas of a child's functioning (Crittenden & Claussen, 2003). Children with an attachment disorder could be impulsive, aggressive, irritated, less able to express empathy for others and incapable to give and receive love and affection. This type of behaviour can be seen as early as from the child's second year of life (Fraley, 2004; Levy & Orlans, 2000).

In conclusion, just as the availability and level of responsiveness of a parent can promote formation of quality attachment, the opposite can hinder the development of secure attachment. This is necessary information when considering various interventions to promote the quality of the relationship between parent and infant. The similarities between bonding and attachment, namely that both refer to the emotional bond between infant and parent/caretaker and the need of both parties to maintain proximity, become clear from the literature discussion. The correlation between attachment and bonding leads to the conclusion that by enhancing the one concept, the other

concept also improves. However, the main difference between bonding and attachment is that the term “bonding” refers to the relationship forming from the parent to the infant and the term “attachment” refers to the relationship forming from the infant to the attachment figure/ parent. Seeing as the parent is the first to initiate the behaviour that forms the parent-infant relationship, it would seem logical to enhance the bonding from parent to child.

It is now repeatedly emphasised that it is firstly necessary to ensure that optimal bonding and attachment patterns form. The discussions on both bonding and attachment reveal its impact on the individual's psychological functioning. Referring back to Insel's neurobiological model, it makes one aware of the importance to consider the impact in other areas of the individual's development.

3.5 EFFECT OF BONDING AND ATTACHMENT ON DEVELOPMENT

According to Balbernie (2001), it is the infant's emotional environment that will have an influence on the neurobiology that creates the basis of mind. The emotional connection between infant and parent is the most important part of an infant's surrounding world and the infant will automatically search for, register and respond to this connection. Therefore, an understanding of the neurobiology of attachment can be useful in the formulating and remodelling of persistent and complex social problems such as child abuse and neglect. This knowledge can help to develop and promote simple interventions that can change the infant's early environment (Swain et al., 2007).

3.5.1 BRAIN DEVELOPMENT

The attachment relationship between infant and caregiver serves as protection and ensures that the infant survives (Jernberg, 1979). However, that is not the only function. Healthy interaction between infant and caregiver provides early stimulation which is very important and necessary for normal development. One of these areas of development is specifically brain development.

There have been various studies focusing on the relationship between brain development and early psycho-social experience. It is proven that the attachment relationship ensures that certain brain structures involved in social cognition are appropriately organised and prepared in order to allow the individual to take part in an appropriate manner in social situations (Fonagy & Target, 2005; Berger, 1999). As the brain has the capacity to modify itself in order to adapt, enabling itself to become more highly complex and efficient, it is necessary to create the optimal conditions which will promote optimal development. With every experience, neural circuits are formed that mirror these experiences. Depending on how early in life it occurs and how long lasting and intense the effect of the experience is, the more difficult it will be to change the neural circuits. The whole process where the brain changes its structure according to environmental experiences is called “neuroplasticity”. The changes allow the brain to store information by neurons and neural systems (Balbernie 2001; Sadock & Sadock, 2007).

- **REINFORCEMENT AND ELIMINATION OF NEURAL CIRCUITS**

It is said that the primary task of brain development is to form connections and reinforce them to ensure that they become permanent. This is done by eliminating redundant synapses in a discriminatory way and reinforcing the ones used the most. It is determined by early experiences which circuits will be reinforced and retained (Berger, 1999). During the activation of a neural pathway by a stimulus the synapses involved store a chemical pattern and every time it is used, the neural pathway becomes strengthened. Through repeated use, the signal transmission reaches a certain threshold and this excludes the pathway from future elimination. It depends on the quality and content of the infant’s emotional environment which neural pathways are reinforced or lost (Balbernie, 2001).

- **DEVELOPMENT OF ORBITOFRONTAL CORTEX**

The process of reinforcement and exclusion is particularly visible in the orbitofrontal cortex, situated in the forebrain and especially active in the right cerebral hemisphere. This is the area of the brain where development depends on the experiences gained from relationships that becomes aggregated into the internal working model of attachment. According to Shore (2001a, p. 36), the orbitofrontal cortex "is known to play an essential role in the processing of interpersonal signals necessary for the initiation of social interactions between individuals". It is responsible for the generation of self-awareness and personal identity, episodic memory as well as the ability to picture oneself in the future and remember oneself in the past. It is also involved in the mediation of empathic and emotional relatedness. Other functions of the cortex involve the regulation of the sympathetic and parasympathetic nervous systems, monitoring the body's condition and evaluation of meaning and value of sensation, converting states of excitation into emotion. It is very sensitive for body language, eye contact, face-to-face communication and voice tone. The orbitofrontal cortex is a major cortical part of the limbic system. It is especially the right limbic system that is involved in attachment functions and interpersonal coping strategies. The temporal lobes, hippocampus, hypothalamus and amygdala are all part of the limbic system and play crucial roles in the functioning of the limbic system (Balbernie, 2001). The amygdala appears to play an important role in the integration of external and internal stimuli (Sadock & Sadock, 2007). Although the amygdala is not involved in the process of generation of emotional experience, it assists an individual to use both positive and negative emotions during a selection process to decide which situations and responses will maximise reward and minimize punishment (Beer & Lombardo, 2007). After the selection process where the emotional importance of the experience is determined, the amygdala activates the hippocampal activity level as required, either etching the experience in memory or disregarding it (Sadock & Sadock, 2007). The hypothalamus performs a regulatory function, controlling the pituitary gland and in doing so, converts neural activity into hormonal signals (Balbernie, 2001).

- **ORBITOFRONTAL CORTEX AND INTERNAL WORKING MODEL**

It is through the working of the orbitofrontal cortex and the right cerebral hemisphere that the internal working model comes into existence. As discussed earlier in this chapter, the term “internal working model” refers to the internalised expectations regarding the individual self as well as other (Adam, Gunnar & Tanaka, 2004). The orbitofrontal cortex is involved in procedural learning whilst the right cerebral hemisphere is involved in implicit learning. This refers to the generalized representations of repetitive experiences which constructs internal working models. The interactions between infant and caretaker, known as the attachment transactions, are imprinted into implicit-procedural memory as lasting internal working models. This occurs when the infant’s early sensory-motor and emotional memories are mediated through the amygdala, the thalamus, cerebellum and orbital medial prefrontal structures. It is through this system that early caretaking is remembered in the form of vestibular-sensory-emotional memories and in the end acts as an “emotional background” against which psychological development occurs (Cozolino, 2006). It determines the coping strategies needed to regulate affect in order to maintain fundamental regulation and positive affect when confronted with challenges (Balbernie, 2001).

- **EFFECT OF NEGLECT ON BRAIN DEVELOPMENT**

In the case where an infant is abused or neglected, the detrimental experience leads to neurobiological damage on two levels as the stress-induced neurochemicals can lead to cell death and neglect can cause unused regions of the brain to atrophy (Berger, 1999). Learning problems, language delay, lack of empathy, hyperactivity, hypervigilance and emotional problems due to poor impulse control are some of the problems listed by Balbernie (2001) which result due to abuse or neglect. This phenomenon can be clearly seen in children who are cared for residing in institutions. The lack of nurture, love and care leads to an emotional starvation where, during the first stage, psychological deterioration (intellectually and socially) is present; then to be

followed by physical deterioration and even death should the emotional starvation not cease (Sadock & Sadock, 2007).

3.5.2 DEVELOPMENT OF EMOTIONAL REGULATION

Emotional regulation can be described as the extrinsic and intrinsic processes involved in monitoring, facilitating and inhibiting heightened levels of positive and negative affect (Weller & Feldman, 2003). It can be conscious or unconscious, automatic or effortful (Calkins & Hill, 2007). It seems important for a person to develop emotional regulation. It is an important part of the person's abilities not only to handle stress and develop coping skills, mediate attention and encourage engagement with the external environment, but also to provide help with the construction of one's perceptions and thoughts and learning processes and thus function at optimal level.

• EMOTIONAL REGULATION AND BRAIN DEVELOPMENT

There is a definite link between the ability to regulate one's emotions and brain development. In order to regulate emotions, a connection is needed between the orbitofrontal cortex and limbic system. The connection is made up by three circuits: the first one developing during the first year of life as the axons projecting from a certain part of the limbic system, responsible for emotions, reaches the right orbitofrontal cortex. In the second year of life, the second cortico-limbic circuit comes into existence and regulates negative emotions. The third circuit is reinforced when the infant is older than 2 years of age and the circuit can be found between the left hemisphere of the prefrontal cortex and locus coeruleus. It is the function of the circuit to permit a greater awareness of emotions that can be named. In the end these circuits will allow for self-regulation of emotions or affect and supply the individual with the foundation on how future important emotions will be handled (Balbernie, 2001).

• PARENT-INFANT INTERACTION AND DEVELOPMENT OF EMOTIONAL REGULATION

The infant-parent relationship provides the conditions under which infant emotion regulation is developed through the type of interactions shared between parent and infant. The parent will both heighten emotions and help to regulate emotions in the infant (Berger, 1999; Bornstein & Tamis-LeMonda, 2001). It is through this kind of interaction that certain types of attachment are formed, fostering the formation of attachment used by the infant to form an explanatory style. The style is used to explain the causes of events and it can be an optimistic explanatory style, where the person expects that bad events will be infrequent, or a pessimistic one where the person expects the bad events to happen on a regular basis. The factors that can influence the individual's explanatory style are (a) the parents' modelling of their own explanatory style to the child, (b) the parents' interpretation of the child's behaviour and (c) the type of environment the child is exposed to. It is proven that children who have a safe, coherent, happy and warm environment are more likely to have a positive explanatory model. It is suggested that the explanatory style might influence emotion regulation (Peterson & Park, 2007).

It was proposed that the attachment theory is a theory of emotion regulation for the reason that, seeing as infants are initially not able to regulate their own emotions, they rely on the caregivers to assist them in this process. The way in which the caregivers regulate their own emotions directly influences the emotion regulation abilities of the infants. Consequently, attachment is seen as a form of dyadic emotion regulation (Goldberg, 2000; Sonkin, 2005). Emotions are seen "as the highest order direct expression of bio-regulation in complex organisms" (Shore, 2001b, p. 10).

According to Peterson and Park (2007, p. 159) emotion refers to

"... a constellation of psychological and biological characteristics that cohere around a particular affective state but also include signature thoughts, motives, response tendencies and physiological changes".

Power (2004) describes four types of maternal responses to the infant's emotions and the effect it has on the child's emotional regulation. In the case where a) the mother accepted the child's emotional expression, b) she helped the child to process the emotion and c) she soothed the distressed child, it was clear that the child exercised emotion regulation (as observed by the parents and teachers) and that the child was able to use verbal protestation to cope with anger amongst peers. The fourth response, which involves the questioning or punishing of the child's emotional expression, led to less effective emotion regulation (as observed by the parents and teachers), a lack of observable coping strategies for dealing with disappointment and fleeing in a peer anger situation (Power, 2004).

It can be argued that the reason for the different types of behaviour can be explained by research that discovered that, when an individual is securely attached, it is possible for the individual to reflect on his/her own internal emotional experience and understand it. The individual is also then capable of reflecting on the mind of the other person. The perception and interpretation of the emotions would be more realistic. An individual who is insecurely attached lacks the ability to reflect on both her/his own and other's emotional experience due to repressing or exacerbation of their own emotional responses (as in the case of dismissing or preoccupied attachment status). The individual will experience difficulty and confusion when trying to interpret and describe other's emotional expressions (Goldberg, 2000; Sonkin, 2005).

3.6 RELATIONSHIP BETWEEN BONDING, ATTACHMENT AND STRESS

It would seem that there is a correlation between bonding, attachment and stress. It is known that the psychological context has an important role in the modulation of the stress response as factors such as the novelty, predictability and control over life events influence the manner in which the individual reacts to the events. It is even possible for psychological stressors to initiate the stress response in absence of a physical or physiological stressor (Sapolsky, 2007).

To cope with everyday stressors in an effective way it is necessary for an individual have ownership of certain skills and strategies. Research found that the bond between infant and parent can provide the individual with the necessary coping resources. In the case of parental bonding it was found that it may help an individual to be more resilient and have more self-confidence in the presence of a stressor. Enhancing these two features can assist the individual's ability to take part in activities that will promote the development of effective coping skills. This includes enhanced problem solving, active distraction and seeking of social support (Matheson et al., 2005). According to Power (2004), parental warmth, support, acceptance as well as family cohesiveness is associated with active or problem-solving coping styles in children.

Research has shown that the type of attachment has an effect on the strategies individuals use to deal with negative affect and benefit from improved creativity made possible by positive affect (Willinger et al, 2004). According to Mikulincer et al. (2003), people who are securely attached show higher levels of creative problem solving and adopt more liberal and inclusive criteria during tasks requiring the categorizing of semantic stimuli during positive affect induction. It is said that positive affect induction communicates the message to the securely attached person that it is safe for the person to explore novel stimuli in a comfortable and playful manner. This means that the person will feel comfortable enough using innovative ways to deal with life events, deal with stress and enjoy task performance. Overall, securely attached individuals are more likely to show hopeful ways of thinking, a more truthful perception of reality, see themselves as valuable and effective and experience positive mental health and performance related results (Shorey, 2005). It has been observed that these individuals have security-based strategies of emotion regulation (Berger, 1999). The strategies are used to alleviate distress and to sustain supportive intimate relationships. It also increases adjustment to stressors through constructive and flexible coping efforts that are in line with reality. The strategies are recognisable through the identification of certain characteristics and behavioural patterns used by securely attached individuals to deal with stress.

Firstly, attachment security broadens the individual's perspectives and capacities and it also assists the incorporation of a mental representation of the security-enhancing attachment figures into the self. According to Shaver and Mikulincer (2007), the individual will be able to sustain an authentic sense of personal efficiency, resilience, as well as hopefulness and optimism even when lacking the presence of social support. Secondly, securely attached individuals will have enough trust in both their own capabilities and actions to reduce distress and also in the knowledge that asking for social support from others is an effective way of solving problems. It is through the positive interaction with the caregiver that the individual has learned that distress is manageable and that it will not overwhelm him/her, it is possible to exert control over events and that he/she is capable of solving problems and regulating emotions (Shaver & Mikulincer, 2007). In conclusion, when an individual is securely attached, he/she will possess all the necessary coping strategies since he/she acquired them during infancy and they will assist him/her in dealing effectively with everyday life stressors, lowering stress levels.

One can now come to the conclusion that the parent-child relationship has a significant impact on an individual's ability to cope with stress. It begins with the parent understanding and providing in the infant's needs. Since the parent is able to understand the infant and, therefore, display acceptance and empathy, it can enhance the parent's self-confidence regarding own parenting abilities and skill. It can be hypothesized that it can contribute to lower parental stress levels and, ultimately, make it easier for the parent to engage with the infant. Likewise, the infant will be aware of the parent's success in providing in the infant's needs. Through the process of development of secure attachment, development of emotion regulation and internalisation of the positive internal working models, the infant is able to use strategies such as resourcefulness, hopefulness and social support to cope when confronted with stressors.

3.7 MEASUREMENT OF BONDING AND ATTACHMENT

There are various methods in which bonding and attachment can be measured. As the focus of this study will only be on the measurement of bonding between mother and infant, the measures for attachment will not be discussed. The measures used to measure bonding in this study will be discussed.

- **MOTHER-TO-INFANT BONDING SCALE**

For the purpose of this study bonding will be measured using the Mother-to-Infant Bonding Scale, a straightforward self rating questionnaire designed to screen the general population to help with early identification of problems in the mother-infant dyad, especially focusing on the mother's feelings toward the infant. The scale consists of eight items, all words describing certain feelings such as "loving", "dislike" and "protective" that represent some of the feelings mothers feel towards their infants. The mother has to indicate the intensity of the feeling by using a four-point scale marked "very much"; "a lot"; "a little" and "not at all". Studies using this scale showed that the eight items on the scale have good internal reliability. The results also suggested that the questionnaire may be best for identifying abnormal responses and those subtle differences within the normal population might not be as easy detected (Taylor et al., 2005).

- **PARENTING STRESS INDEX**

The subscale "Attachment" of the Parenting Stress Index measures the parent's feelings towards the infant. There will be two possible reasons for high scores on this subscale. It can mean that the parent does not feel emotionally close to the infant. It could be expected that the parent-child relationship will be characterised by a cold, rather distant pattern of interaction. There is also a possibility that the parent has a real or perceived inability to detect and understand the infant's emotions and/or needs

accurately (Abidin, 2005). It must, however, be noted that the description of the subscale fits with the definition for bonding. The term “attachment” used for this subscale can, therefore, be misleading as one might be under the impression that it measures the quality of the emotional bond developing from the child to the mother, when in fact it measures the opposite. It would, therefore, be preferable if this subscale was named “Bonding”.

3.8 CONCLUSION

The quality and nature of the relationship between infant and caregiver is proven by numerous studies over several years to have a significant effect on the individual development throughout his/her development on both physiological and psychological level. The process starts with the parent's feelings and behaviour towards the infant and this is known as bonding. The quality of bonding creates a basis for the development of attachment from the infant to the parent. Depending on whether the infant is securely or insecurely attached, certain observable behaviour and developmental patterns (on both physical and psychological level) occur. The nature of the relationship and subsequently attachment style have a significant influence on the way the individual views the world, self and others. This view or internal working model influences how the individual acts in social situations, handles life stress and regulates emotions.

CHAPTER 4

MESSAGE AND INFANT MESSAGE

4.1 INTRODUCTION

Message is a form of therapy originating in the eighth century and still used to today as a form of complementary and alternative medicine (Hughes, Ladas, Rooney & Kelly, 2008). However, there is more to message than just being a form of therapy. When reading studies concerning message one comes under the impression that there are so many aspects concerning the mechanisms involved and effects on both psychological and physical level to consider. For these reasons it was decided that, for the purpose of the study, a variation of message focusing on infants would be chosen as an intervention. In order to comprehend the impact of message on the individual fully, it will be necessary to investigate the theory surrounding message.

4.2 DEFINITIONS OF MESSAGE AND INFANT MESSAGE

The definitions describing message and infant message would provide the beginning of a framework from which the underlying mechanisms can be explained.

4.2.1 MESSAGE

The term message is used to describe the act of rubbing or kneading the skin using the person's hands in order to stimulate or manipulate (Bond, 2002). McGrath, Thillet and Van Cleave (2007) are more specific when stating that message is the term used to refer to the systematically manipulation of tissues using hands to produce effects that will help to restore and improve the body's function and health.

It is agreed by Shor-Poshner, Hernandez-Reif, Miguez, Fletcher, Quintero, Baez et al. (2006), Lawler and Cameron (2006) and Hughes et al. (2008) that massage can be described as the manual manipulation of soft tissues in order to encourage health and well-being, consequently for therapeutic purposes.

There seems to be a general agreement amongst various researchers seeing that the definitions of massage tend to overlap. For the purpose of this study, the following definition of massage will be accepted:

Massage is the act of physical manipulation of bodily tissues and skin in a structured and systematically manner using one's hands for therapeutic purposes.

4.2.2 INFANT MASSAGE

It would seem that there are not specific definitions that describe infant massage. Most literature refers to the act of infant massage as a combination of Indian massage, Swedish massage and reflexology methods that have been adapted for infants. McGrath et al. (2007) are more specific in their description when stating that it is the type of massage that flows from infant's head to toes, using soft and tender touches.

For the purpose of this study the term "infant massage" will, therefore, be used when referring to the practice of the form of massage adapted for infants in the form of structured, systematically soft and tender strokes and is compiled from Indian, Swedish massage and reflexology methods.

Definitions of both massage and infant massage are the first step in understanding the concept of massage. A thorough understanding of the theory behind massage will further understanding of the underlying mechanisms as well as the impact of physical stimulation when either performing or receiving massage.

4.3 THEORY OF MASSAGE

Gaining a good knowledge regarding the development of massage and initial purposes as well as the role massage plays in the modern era will prove to be useful when considering massage as a form of intervention. Through the attainment of these facts, it will provide valuable information concerning the difference between massage and infant massage regarding application and impact on the individual's general functioning.

4.3.1 HISTORY AND CONTEMPORARY USE

Travelling back in history can reveal the origin of massage and infant massage as it is known today. It will then be possible to discover to what extent these two practices correlate and differ from each other.

4.3.1.1 MASSAGE

Studying the history of mankind, it is possible to see how the practice of massage was implemented as part of daily life. As quoted by various researchers, Hippocrates described the benefits of massage therapy and prescribed it as a treatment form for sprains and dislocations (Field et al., 2005; Hughes et al., 2008; McGrath et al., 2007). He specifically described it as medicine in the form of rubbing. The use of massage therapy gained and lost interest during the centuries, becoming less popular in the Middle Ages and then resurfacing in the 1800's under encouragement from the Swedish government (Hughes et al., 2008). Massage therapy, as part of touch therapy, was the main treatment until the pharmaceutical revolution occurred in the 1940's (Field, 1998). During that time biomedicine and technology arose and medical doctors would rather prefer that to massage. It would only be in the 1970's and 1980's that the value of massage was once again recognised and massage therapy seen as one of the three most used complementary therapies (Burns & Burns, 2000).

4.3.1.2 INFANT MASSAGE

Recordings of infant massage occurring during the height of the Egyptian empire as well as early China (2760 BC) proves that it is not just a modern day trend. Until recently it was usually the Far East countries which would implement infant massage as part of the mothering process. In other countries, including Nigeria, Uganda, Fiji and New Zealand, it is also common practice for infants to be massaged for the first months of their lives (Manious 2002; Moore, 2005). Manious (2002) speculates that the reason for the Western world's reluctance to incorporate infant massage could be related to the discomfort experienced with the human body as well as any possible sexual connotations regarding massage. Infant massage was introduced to America by Vimala Schneider McClure, who observed how it benefited infants in India and became the founder of the International Association of Infant Massage, an institute dedicated to teach parents the art of infant massage (Moore, 2005). Another massage therapist, Amelia Auckett, trained in India and published her knowledge in a book dedicated to infant massage (Mainous, 2002). Ever since, much research concerning the various effects of infant massage on especially pre-term infants was conducted and results included increased improved physical and psychological development (McGrath et al., 2007).

Studying the phenomenon of touch and tactile stimulation reveals the diverse views and attitudes different cultures hold about touch behaviour. It is especially the difference between the Western and non-Western cultures that is most significant. In Western culture it is most likely that an infant will experience less touch behaviour than in non-Western culture. It was found that Western infants would spend approximately a quarter of a 24 hour day (25%) in physical contact with the caregivers, whereas non-Western infants will experience physical contact with caregivers for more than 50% of the day (Blackwell, 2000). Seeing as Western culture encourages independence, infants are more likely to be placed in their own beds and weaned at an earlier age than non-Western infants (Blackwell, 2000; Klaus & Kennell, 1976). Teaching children to be more independent starts as early as the birth process,

which can be quite traumatic for the infant. The procedures and technology used do not promote a high level of touch, even though it is essential for infants to receive it after birth as it provides warmth, stimulation and stimulation to breathe as well as possibly reducing the risk of dehydration. It was only after the research by Klaus and Kennell (1976) regarding the relationship between the establishment of bonding and uninterrupted mother-infant contact during the perinatal period that Western medicine reviewed the existing practices and adjusted them in such a manner that the mothers were allowed to have the infants in their rooms at all times. It is, therefore, the opinion of the researcher that Western infants tend to miss out on opportunities to receive physical touch and the possible benefits it entails.

It will now be necessary to explore literature focusing on the impact of massage on an individual's functioning. Acquisition of this knowledge will prove to be beneficial when studying the effect of massage on an infant's functioning. It would seem that massage not only has an effect on physical but also psychological functioning.

4.4 EFFECT OF MASSAGE ON PHYSIOLOGICAL FUNCTIONING

From the literature it is possible to identify various areas where massage can have a significant impact. In the first place will it be necessary to explore a possible explanation regarding the physiological mechanism of infant massage to aid in the understanding of the changes taking place in the massaged individual.

4.4.1 PHYSIOLOGICAL MECHANISM OF INFANT MASSAGE

Of all of the five senses, it is the sense of touch that develops first when the skin develops *in utero* and is the largest sensory organ in the body. As soon as seven and a half weeks after conception touch emerges (Bond, 2002; Caulfield, 2000; McGrath et al., 2007; Stack, 2001). Touch is a somathetic sensation and is made up by two processes, the kinaesthetic and cutaneous processes. The kinaesthetic process is involved in the collection of

information concerning spatial position and movement while the cutaneous process refers to the skin's sensitivity to pressure, touch, temperature and pain (Stack, 2001). After birth it will be used by the infant to explore other people, objects and the external world (Caulfield, 2000; McGrath et al., 2007).

Studying the effect of massage on an individual's physiological functioning and development one comes under the impression that there are numerous systems and areas influenced by physical stimulation. Some of these include the immune system; the experience of pain, stress and anxiety levels as well as brain development. Examination of the aspect separately will reveal how massage can have an influence on the infant's functioning and development.

4.4.2 IMMUNE SYSTEM

It is suggested that a strong link exists between stress and the functioning of the immune system. In the case of HIV-positive individuals, where their immune systems have been compromised, therapy in the form of massage was found to be very beneficial to the individuals as the massage lowered their stress and anxiety levels. It lead to decreased cortisol levels and increased NK (natural killer) cells. More specifically, NK cell number, NK cell cytotoxicity and subsets of CD8 cells increased significantly (Field, 1998). The NK cells are the vital defence in the immune system and an increase in these would reduce the chance of the individual contracting infections such as pneumonia (Blackwell, 2000). Similar results were found when HIV positive children, ranging from the ages of two to eight years old, received massage therapy. Even though the children did not receive any antiretroviral medication, their immune functions seemed to improve significantly (Shor-Posner et al., 2006). Research by Scafidi and Field (1996) studying the effect of infant massage on HIV-exposed infants revealed that the infants had a higher weight gain and lower stress levels when compared to the control group. They also scored significantly better on the Brazelton scale cluster, which measures habituation, motor, range of state, autonomic stability, excitability and stress behaviour (Field, 1998; Mainous, 2002). It would,

therefore, seem that massage therapy is a good form of complementary treatment or intervention as it is both effective and a low cost method.

It is interesting to note that research studying the effect of infant massage on HIV-exposed infants revealed that it was not only beneficial for the infants but for the parents as well. The parental anxiety levels dropped, resulting from, according to Scafidi and Field (1996), the parents' belief that they were actively contributing to the infants' treatment. This means that massage is not just beneficial for those on the receiving end but also for the individuals delivering the massage.

It is not just individuals who are HIV-positive who benefited from massage. Similar studies on individuals with cancer showed results that proved that significant increases in NK and lymphocyte cell numbers as well as increases in dopamine and serotonin levels are part of the long term effects of massage therapy. It also proved to be beneficial for healthy adults who experienced acute stress. The higher glucocorticoid levels (which involve higher levels of cortisol) are associated with tumour growth and a decrease in NK cells. This implies that the individual would be more susceptible to infections. Just as in the cases of the HIV-positive and cancer patient participants, the healthy participants' results have revealed enhanced NK cell activity and higher white blood cell counts after receiving massage therapy due to reduced stress levels. As other studies observed that the sympathetic division of the hypothalamus and cerebral showed a reduced state of excitability after massage, it can be concluded that massage therapy functions as a stress reliever, enhancing the immune system by inhibiting the glucocorticoid levels (Hughes, 2008).

During stressful times the human body usually secretes cortisol which in turn suppresses physiological systems such as the immune system. Extended research on the institutionalized infants in Romania show these infants suffer from touch deprivation and how it affects their overall wellbeing. The high stress levels caused the infants to experience illness constantly due to impaired immune systems. After interventions in the form of touch or infant

massage were implemented, the infants' urine samples had lower cortisol levels, indicating lower stress levels (Blackwell, 2000). Based on these results the conclusion can be made that the infants' health improved significantly after receiving massage therapy.

4.4.3 PAIN

Several studies proved that massage had a positive effect on pain, acting as a form of pain reliever and making the experience of pain more bearable. Seeing as infants experience pain through conditions such as colic, teething and illness (Gerhardt, 2004; Kenny, 2000), it is important to know how massage can help to relieve pain. Field (1998) identified three different models that can be used to explain the mechanisms at work between touch and pain relief. It is known as (a) the Gate Theory, (b) serotonin levels and (c) quality of sleep.

(a) Gate theory

According to the gate theory, it is possible to relieve pain by applying pressure or cold temperature. The reason for this is the fact that pain fibres are shorter and less myelinated than the receptors for pressure and cold temperature. This means that pain stimuli would be transmitted at a slower rate than pressure or cold temperature stimuli. The theory proposes that these stimuli are processed first and close a gate in the process, preventing the pain stimulus to be processed (Field, 1998; Gildenberg, 2006).

(b) Serotonin levels

Research revealed that serotonin levels increased moderately after massage therapy. This leads to the conclusion that an increase in serotonin is involved in the relieving of pain (Field, 1998; Hernandez et al., 2005; Horowitz, 2007).

(c) Quality of sleep

The substance known as somatostatin is usually released during deep sleep and prevents the person from experiencing pain. Should it happen that a person does not reach the deep sleep stages, substance P is released. It is known that substance P can cause pain. In the event of a lack of deep sleep, a person not only has an increase in substance P, but also a lack of somatostatin (Field, 1998; Lawler & Cameron, 2006). As one of the benefits of massage includes improved sleep and rest quality, it can now be concluded that through massage, the person will sleep better and have higher levels of somatostatin.

4.4.4 STRESS AND ANXIETY

Some of the other benefits of massage include a decrease in anxiety, pain, stress and blood pressure (McRee, Pasvogel, Hallum, Behr, Garcia & Loeb, 2007). A study by Cambron, Dexheimer and Coe (2006) determined the change in blood pressure in adults after receiving a massage. Their studies showed that, depending on the type of massage, blood pressure would either increase or decrease. The type of massage that stimulates the carotid sinus, which involves linear stroking of the sternocleidomastoid muscles, is most likely the reason for blood pressure to decrease.

Studies done on the effect of touch on rat pups provided results demonstrating how tactile stimulation can promote developmental benefits associated with neurological and hormonal functions, which persist into adulthood. Looking specifically at the pups' ability to handle stress, it was clear from the results that the pups receiving a good quality of grooming in the early days of life responded more adaptively to stress compared to touch deprived pups (Blackwell, 2000). When comparing these results to studies investigating the effect of massage on 3 month-old infants, the results correlated with the previous mentioned findings by showing that they had lower stress levels after being massaged for several sessions over a six week period (Caulfield, 2000). Other studies done on rat pups provided results

suggesting that impact of handling or physical touch could be long term as it modulated cortisol production. Investigating long term effects, it was clear that the rat pups who received a great deal of handling showed lower corticosteroid production when they were older. The researchers also found that the same rats had more elaborate dendritic arborisation in the hippocampal region as well as improved memory function during maze performance. This correlates with research findings where magnetic resonance imaging (MRI) revealed that the hippocampal region in pre-term infants who received infant massage developed more rapidly. When these same infants were tested a year later, their memory performance was superior and it is suspected that the heightened development of the hippocampus is the reason (Field, 1998).

Diego, Field, Sanders and Hernandez-Reif (2004) mention three studies focusing on the effect of massage on electroencephalogram activity. EEG patterns are used as an indicator of the continuous electrical activity in the brain. The important brain waves identified in a healthy person can be classified as alpha, beta, theta and delta waves. Depending on the degree of activity of the cerebral cortex, the waves change noticeably between different stages of wakefulness, sleep or coma (Guyton & Hall, 2006). Focusing specifically on the alpha and beta power, which usually reflects attention and alertness, two studies discovered that the alpha and beta power decreased. One study also noticed an increase in delta power. Delta power represents slow wave EEG activity and will occur when an individual is in deep sleep or suffers from serious organic brain disease. It is also commonly seen in infancy (Guyton & Hall, 2006). The decrease in alpha and beta power and increase in delta power indicates an increase in relaxation and alertness. The third study found that right frontal EEG asymmetry decreased in depressed adolescents after massage therapy. It is known that there is a correlation between right frontal EEG asymmetry and negative mood and affect and could be used as a marker for depression. In the study by Diego et al. (2004) they found that moderate pressure massage was the most effective as it resulted in the biggest decline in self-reported stress and anxiety. The participants' self-report data correlated with the data retrieved from their EEG

results. It showed that the participants' frontal EEG delta power increased during the moderate massage and that their heart rates dropped. These findings indicate that the participants experienced lower arousal and more relaxation. It was interesting to note that the participants' results showed that a shift occurred to a greater left frontal EEG alpha asymmetry. This is usually associated with the expression of positive or approach emotions. The study by Diego et al. (2004) proved that moderate pressure massage therapy is enjoyable and relaxing.

4.4.5 ATTENTION AND CONCENTRATION

Research concerning the benefits of massage therapy also focuses on the effect of massage therapy on attention-deficit/hyperactivity disorder ADHD. It was found that the massaged teenagers with ADHD were happier, more able to focus on their tasks and less fidgety and hyperactive when compared to the ADHD teenagers in the relaxation therapy group (Field et al., 2005; Shor-Posner, 2006). Although it is not possible to identify the underlying mechanism with absolute certainty, it is suggested by various studies that the altering of brain waves (decrease in alpha and beta as well as the increase in delta power) and an increase in vagal tone, which are associated with heightened alertness, aid the person with ADHD to inhibit spontaneous activity and increase attentiveness (Shor-Posner, 2006). It can be debated that, if massage therapy can benefit those who struggle the most with attention and concentration, it will certainly help others as well to improve their attention and concentration. In fact, a study described by Field et al. (2005), focused specifically on the attention levels of infants after receiving a massage. The researchers found that the infants were able to perform better on tasks involving visual attentiveness.

4.4.6 PHYSICAL DEVELOPMENT IN GENERAL

The effect of tactile stimulation on preterm infants has been a popular topic for research. The results from the various studies showed that the infants required less oxygen and respiratory support as well as a shorter period of

tube feeding. The infants displayed better weight gain, improved neurobehavioral status and improved Bayley scores. Overall, it is suggested that tactile stimulation improves physical, emotional and psychological development (Liaw, 2000). However, seeing as the research was conducted on pre-term infants, it will be valuable to establish whether tactile stimulation will have the same benefits for full-term infants.

For various ethical and practical reasons, much research is conducted on animals to determine the effects of psychological interventions on the subject's physiological functioning. Therefore, it is not surprising to find several studies focusing on the developmental effects of touch on animals. One such a study was conducted on rat pups, investigating the physiological reaction to a lack of tactile stimulation. The results revealed how physiological alterations occurred, such as the suppression of prolactin and insulin. As both of these hormones promote growth, reduced growth and development occurred in the pups. More specifically, both Ornithine Decarboxylase (ODC), which serve as an indicator of tissue growth and development, and growth hormone were less in the touch-deprived rat pups (Blackwell, 2000).

Keeping this information in mind, one can understand why it is said that tactile stimulation promotes physical development, especially weight gain. There are various possibilities which can serve as explanation for the relationship between tactile stimulation and weight gain. Field's (2001) research on the effect of massage therapy on rat pups showed that protein synthesis increased significantly. It is also known that physical stimulation promotes vagus activity and research shows that the vagus nerve applies stimulatory and inhibitory effects on secretion of gastrointestinal hormones and helps to regulate insulin. Stimulation of the vagus nerve promotes gastric movement, making absorption of food easier and more effective. Seeing as the vagus and gastrointestinal tract are connected through one of the vagus's branches, stimulation of vagal activity can stimulate gastric activity. (Field, 1998; Field et al., 2005; Holst, Lund, Peterson & Uvnäs-Moberg, 2005). Tactile stimulation plays a part in activating the endocrine system to promote optimal nutrient

assimilation, anabolic metabolism, digestive process and growth (Holst et al., 2005). In the end it is not only the heightened gastric hormone levels but also an increase in gastric activity that can be responsible for weight gain (Field, 2001). Long term results from research focusing on the effect of baby massage proved that the infants would generally gain more weight and slept for longer intervals when massaged regularly (Caulfield, 2000).

4.4.7 BRAIN DEVELOPMENT

Physical touch provides tactile stimulation which stimulates mechanoreceptors in the skin. It is also associated with the process of myelination of neurons and the proliferation of dendritic branching or synapses. It means that through repeated tactile stimulation new and more synapses form between neurons (Blackwell, 2000; Gerhardt, 2004). Neural pathways are formed which amplifies conduction of impulses especially between sensory and emotional areas. The new neural pathways contain neurons with long axons which are able to conduct impulses quicker between the brain and spinal cord, as well as between the various structures of the brain (Gerhardt, 2004; Widmaier et al., 2006). The process through which the pathways become specialised requires that different sizes of neurons and synaptic structures develop. This enables the neurons to react in a discriminatory way on tactile stimulation (Liaw, 2000).

Research investigating the extent to which differentiation of the cerebral cortex is formed into specialised areas by post-natal interactions delivers results supporting the importance of neural activity-dependent processes. The process of differentiation of the functional areas of the cortex, especially those involved in higher cognitive functions, is most likely to receive contributions from post natal activity-dependent processes (Johnson, 2001). Brain development is also enhanced or restrained by the type of environmental experiences the infant is exposed to. Shore (2001a) proposes that maturity of the right brain is dominant in the first three years and the maturation is experience dependent, found in the attachment relationship between infant and parent. It is important for optimal right brain development

as the right hemisphere's functions include processing social-emotional development, the regulation of bodily and affective states, facilitating attachment functions and controlling of functions responsible for passive and active coping with stress.

Massage's effects on an individual's physiological are evident from the results revealing both improved functioning of various areas and marked changes in brain functioning and structure. Its effect on an individual's psychological functioning proves to be just as extensive.

4.5 EFFECT OF MASSAGE ON PSYCHOLOGICAL FUNCTIONING

Studying the link between infant massage and mother-child relationship, it was found that, should extended bodily contact occur between a mother and her newborn directly after delivery, there would be an increase in the maternal contact behaviours such as rocking, touching and holding. After three months these same infants were the ones who smiled more and cried less at the age of three months (Stack, 2001). The first way in which the parent and infant can make positive contact is through the sense of touch. McGrath et al. (2007) describes parent-delivered infant massage as the practice in which the parent makes deep eye connections and vocalises with the infant while providing touch and massage strokes. The massage acts in a way in which loving touch is exchanged between parent and infant, fostering the parent's feelings of bonding as well as the aspiration to care and provide in the infant's needs. It also allows the parent to spend extra quiet time alone with the infant, promoting the attachment process. It was proven that long periods of separation could have a negative impact on this process as the mother misses out on opportunities to learn her infant's cues and thus misinterprets them. That may result in the infant experiencing the mother as unpredictable (Huston & Rosenkrantz Aronson, 2005; Stack, 2001).

Therefore, the process of infant massage acts as an educational process for the parents. Through touch the parent learns how to read the infant's nonverbal cues used to express emotions. This can be described as touch

communication where parent and infant use it as a special language to converse emotions and love (Lappin & Kretschmer, 2005; Moore, 2005). Parents are able to learn the infant's non-verbal cues and act accordingly, letting the infant develop a sense of "being heard". The parent starts to "listen with her hands" and also tell the infant through touch how much the infant is loved. As the parent "asks" the infant's permission to commence with the massage through different auditory and visual cues, the parent shows that she has respect for the infant's decision regarding the timing and duration of the massage. The infant is given choices and learns how to distinguish between appropriate and inappropriate touch (McGrath et al., 2007, p.43). It is important that both infant and parent develop sensitivity for each other's behaviour. It was found that, since the parent understands the infant's emotional cues better, the parent reports lower stress levels, enhanced feelings of confidence and in some cases, a decrease in maternal postpartum depression (McGrath et al., 2007; Moore, 2005).

4.5.1 SOSIO-EMOTIONAL DEVELOPMENT

Tactile stimulation offers a base for higher order processes necessary for the learning process. The developments of perceptions which provide meaning to the individual's life are influenced by the first exposure to tactile stimulation (Liaw, 2000). Part of this perception is of social nature. There are indications that a child's social intelligence is more sensitive to the type of interactions and experiences at the ages six to eighteen months. The formed neural pathways are used to organise the different types of social experiences and to predict interactions with other people (Gerhardt, 2004). Through social interaction a person receives feedback which the person will use to objectify himself in others. The person will search for social approval and in the process learn more about himself as a differentiated, unique entity. This way in which self and social knowledge are formed are the same in both adults and children. Research with infants has shown that infants learn about themselves by monitoring others and the response of others to the infants' behaviour from an early age (Johnson, 2001). Through these interactions, the infant will experience a variety of emotions ranging from positive to negative

emotions. The purpose of these emotions is to help the infant to deal with problems associated with interaction with others. Through this the infant will be able to organise intrapersonal and social processes (Witherington, Campos & Hertenstein, 2001).

Tactile stimulation can act as a form of communication (Lappin & Kretschmer, 2005; Moore, 2005). Liaw (2000) focused on a total of six factors that can be identified which form the tactile symbols defining the act of touch as a form of communication. The factors are duration, location, action, intensity, frequency and sensation. The factor "frequency" refers to the amount of touching in general experienced every day. It is thought that the frequency of touch has an impact on the individual's sense of closeness with others as well as cognitive and emotional abilities. It can even have an influence on the individual's biological development. The higher the frequency of touch, the better the individual's development will be. Sensation is a term used to describe the immediate reaction, either comfortable or uncomfortable, to touch. Through sensation the body determines whether the tactile stimulation is pleasurable or not. There are certain principles included in tactile stimulation and these are identified as gentleness, rhythm and equilibrium. Through organisation of these symbols, it is possible to develop a meaningful language that can support or inhibit a person's pleasure/pain balance and self esteem. There are also three types of touch, known as passive touch, active touch and social touch. Where passive touch refers to the excitation of skin and underlying tissue receptors, active touch occurs when the skin, joints and muscles work together in order to obtain information. It is through social touch that social bonds, attachment and emotional integrity are formed and promoted (Liaw, 2000). Long term results from research focusing on the effect of baby massage showed that the infants showed improved sociability and were also easier to sooth (Caulfield, 2000).

Stack (2001) is of opinion that it is through touch that emotions can be communicated in a direct manner. Through touch it is possible to convey feelings of sadness and anger as well as love, caring, happiness. In communicating the last mentioned emotions, it is possible to promote bonding

and attachment between mother and infant. The sensitivity and responsiveness to each other's behaviour can improve the relationship quality and future interactions. Field (2002) identifies negative touch which refers to harshness in the touch, such as poking and tickling. Negative touch would most likely occur during interactions between infants and stressed or depressed mothers. Long term studies revealed that it could be associated with later emotional behaviour problems. In the case of limited touch similar results were found. Children who received a limited amount of touch were more likely to have conduct disorder. Research on monkeys revealed that the monkeys who were touch deprived as result of separation from the mothers had lower levels of norepinephrine/noradrenalin and serotonin levels. This correlates with results from studies focusing on children with conduct disorder. According to the literature, norepinephrine and serotonin regulate dopamine and impulsive behaviour is usually associated with high levels of dopamine. It is believed that depletion of both norepinephrine and serotonin will result in high levels of dopamine and, therefore, high impulsivity levels. Field (2002) proposes a physiological mechanism that states that additional touch increases norepinephrine and serotonin levels, curbing secretion of excessive dopamine and impulsive behaviour.

It can now be concluded that the act of infant massage can be used as a form of communication when words are inadequate. Through this form of communication it is both the parent and infant that receives the opportunity to become acquainted with the other on different levels and in doing so, really understand each other. This leads to enrichment of the relationship, forming a closer bond between parent and infant. It is through this relationship that the infant develops social skills, especially emotion regulation skills. Overall, massage promotes wellbeing on both physiological and psychological level.

4.6 METHOD OF INFANT MASSAGE

For the purpose of this study, the curriculum as developed by the International Association of Infant Massage (IAIM) was used. It consists of a specific method that is an integration of Indian massage, Swedish massage,

reflexology techniques as well as stroke combinations and techniques, as developed by Vimala McClure. Each of these techniques serves a specific purpose. Swedish strokes are used to increase and improve circulation and tone muscles. The strokes move toward the heart from the extremities of the body. Indian strokes move from the trunk to the extremities, helping to relieve tension and stress. In order to stimulate the various nerve endings in the feet and remove toxins, techniques from reflexology are used to achieve optimal health (Lappin & Kretschmer, 2005; Moore, 2005). Simpson (2001) provides more clarity on the different types of techniques used in IAIM's curriculum. Some of the techniques include the "water wheel" where certain strokes are applied to the abdomen. This is a good technique to relieve constipation. The "Indian milking" technique involves the legs, specifically designed to increase blood flow to the feet. The same technique can be used on the infant's arms, which helps to relax the infant's arm. Reflexology techniques include applying pressure to the infant's foot soles on designated areas in order to relax the shoulders and chest area. The infant's face can be massaged with small circles around the jaw area to relieve tension, support chewing as well as speech and balance. The infant can also be turned on the stomach and the back massaged using back and forth stroking motions. This is used to stimulate body awareness.

It is the parent and infant's choice when to participate in the infant massage. The parent always starts by first asking the infant's permission to continue with the massage by rubbing her/his hands together in front of the infant's face. Based on the infant's verbal and non-verbal cues, the parent can then decide to continue with the massage or postpone until the infant allows it (McGrath et al., 2007; Simpson, 2001).

4.7 CONCLUSION

Massage can be defined as systematic stimulation and manipulation of bodily tissues and skin using hands as the tools. Massage has been proven by various studies to have diverse effects on an individual's physiological and psychological functioning, promoting physical health and development as well as enhancing social development. Massage seems to be an effective intervention as it can be time and cost effective. Regarding infant massage, it is an easy procedure that can be taught to the parents so that they can massage their infants. It provides the parent and infant with the opportunity to spend quality time together which will enhance the emotional bond between them. The improved contact provides both parties in the dyad with the opportunity to learn each other's cues and mood, helping them to understand each other better and using this understanding to provide in the other's needs. In the process, the infant learns more about relationships, both in the present and in the future. The knowledge gained from this first relationship is then carried into future relationships and is displayed through their type of social interactions. It is also through the touch that the infant is constantly assured of the parent's love and care, fostering secure attachment and improving the infant's chance of developing optimally on both physiological and psychological level.

CHAPTER 5

METHODOLOGY

5.1 INTRODUCTION

This chapter provides an outline of the aims, research design and procedures of this study as well as information regarding the participants, measures and statistical analysis of the quantitative data together with the gathering and analysis of the qualitative data.

5.2 AIMS OF THE STUDY

The study describes both a general aim as well as specific aims.

5.2.1 GENERAL AIM

The general aim of this study is to determine the effect of infant massage on the infants and mothers' stress levels, the infants' general development and the quality of bonding between the infants and the mothers.

5.2.2 SPECIFIC AIMS

The study aims to do the following:

1. Determine the effect of infant massage on infants' stress level;
2. Determine the effect of infant massage on mothers' stress level;
3. Determine the effect of infant massage on the relationship between mothers and infants;
4. Determine the effect of infant massage on general development of infants;

5. Determine the mothers' subjective experience of their infants, themselves and mother-infant interaction as reported through qualitative measures during post-testing.
6. Compare the mothers as participants' experience of their infants, themselves and mother-infant interaction as reported through quantitative measures and through qualitative measures.

5.3 RESEARCH DESIGN

The study employed the mixed-method by making use of both qualitative and quantitative methods. According to Stange, Crabtree and Miller (2006), it is possible through this method to generate new knowledge. It allows the strengths of both qualitative and quantitative methods to be utilized while their discrete limitations are minimized. It results in a greater and richer understanding of the phenomenon under study since results of the two methods can be used to verify, cross-validate or support findings within a single study (Schulenberg, 2007; Stange et al., 2006).

With regards to the quantitative methods, this study makes use of an experimental design by utilization of an experimental and control group. According to Key (1997), the experimental design enables the researcher to obtain justifiable conclusions on the relationship between the dependent and independent variables. The participants have been paired in order to ensure that the two groups are as similar as possible. A repeated measures design was used, meaning that the same participants are used in two conditions. The participants in both groups took part in the testing before the intervention (infant massage) commenced. The testing procedures were repeated after the programme concluded after four months in order to determine the effect of infant massage on the dependent variables.

With regards to the qualitative measures the study made use of structured interviews in order to collect the qualitative data. Each mother was interviewed after cessation of the four month programme and the qualitative data was analysed by making use of open coding as described by De Vos (2002). The description for open coding is given as "... the part of analysis

that pertains specifically to the naming and categorising of phenomena through close examination of data” (De Vos, 2002, p. 346). The data from the interviews were broken down and conceptualised. This allowed for certain phenomena to be identified and grouped into categories. The categories were named by choosing a name that is most logically related to the data.

5.4 PARTICIPANTS

The research population consists of eight infants between the ages of 3 to 9 months and their eight respective mothers from Potchefstroom, Klerksdorp, Lichtenburg, Fochville and Rustenburg. The participants were recruited by the means of newspaper advertisements, pamphlets, posters and advertisements at medical institutions. Participation in the study was voluntary. The main factor considered when the participants were recruited was the ages of the infants. The age of the selected infants was between the ages of three to nine months.

Table 1: Participants’ Biographical Detail

MOTHERS		n	%	Experimental group	Control group
Age	18-24 years	2	25	1	1
	28-36 years	6	75	3	3
Employed		7	87,5	4	3
Unemployed		1	12,5	0	1
Breastfeeding		8	100	4	4
INFANTS					
Age	3 months	1	12,5	0	1
	6 months	2	25	1	1
	7 months	2	25	1	1
	8 months	3	37,5	2	1
Female		5	62,5	3	2
Male		3	37,5	1	2
First born		6	75	3	3
Second born		2	25	1	1
Full term		6	75	3	3
Premature		2	25	1	1

- Pair One is a mother-daughter pair and the mother is 33 years old and full time employed. The daughter is 8 months old, second born and full term. They were in the experimental group.
- Pair Two is a mother-daughter pair and the mother is 24 years old and full time employed. The daughter is 8 months old, firstborn and full term. They were in the experimental group.
- Pair Three is a mother-daughter pair and the mother is 31 years old and full time employed. The daughter is 6 months old, firstborn and full term. They were in the experimental group.
- Pair Four is a mother-son pair and the mother is 30 years old and full time employed. The son is 7 months old, firstborn and born premature at 35 weeks due the mother's health status. They were in the experimental group.
- Pair Five is a mother-son pair and the mother is 36 years old and full time employed. The son is 7 months old, second born and full term. They were in the control group.
- Pair Six is a mother-daughter pair and the mother is 28 years old and currently unemployed. The daughter is 6 months old, firstborn and full term. They were in the control group.
- Pair Seven is a mother-son pair and the mother is 32 years old and full time employed. The son is 3 months old, firstborn and full term. They were in the control group.
- Pair Eight is a mother-daughter pair and the mother is 18 years old and full time employed. The daughter is 8 months old, firstborn and born 4 weeks premature. They were in the control group.

The mother-infant dyads were paired to ensure that the groups were as similar as possible. Criteria used for pairing were the following:

1. Infant is full-term or infant is born premature.
2. Infant is firstborn or infant is second born.
3. Infant's age.
4. Mother makes use of breastfeeding or bottle feeding.
5. Mothers are currently employed or unemployed.

5.5 RESEARCH PROCEDURE

The research procedure took place during five phases. The procedures took place at the North-West University in Potchefstroom.

- Phase One

The first phase consisted of the recruitment of the participants through the means of newspaper advertisements, pamphlets, posters and advertisements at medical institutions.

- Phase Two

The mothers who indicated willingness to participate in the research were contacted. The aims and procedures of the research was explained individually. Thereafter they received informed consent forms as well as biographical forms to complete. Based on the information obtained from the biographical information, the mothers were paired into the groups according to certain criteria (refer to Section 5.4). It was also required from them to complete the Parenting Stress Index and Mother-to-Infant Bonding Scale. They received training on the procedure to sample saliva samples from themselves as well as their infants. The Griffiths Mental Developmental Scales were administered by a registered Griffiths administrator to determine the infants' development prior to the onset of the programme.

- Phase Three

During this phase the experimental group took part in the Infant Massage course as presented by an instructor registered with the International Association of Infant Massage. The mothers in this group were requested to massage their infants at least four times per week. The mothers in the control group were asked to interact with their infants as normal, without performing infant massage. The phase continued for four months.

- Phase Four

In order to determine the cortisol levels of the infants and the mothers halfway through the four months a second round of sampling of maternal and infant saliva samples of both the experimental and control groups was required. These procedures took place as part of Phase Four.

- Phase Five

Phase Five involved the post-testing of both groups. The mothers were requested to complete the Parenting Stress Index, the Mother-to-Infant Bonding scale and collect saliva samples from themselves and their infants. The Griffiths Developmental Scales were administered to determine the infants' development. The qualitative data were collected by interviewing the mothers in both groups using a structured interview. The mothers from the control group were provided with the opportunity to participate in the infant massage course.

5.6 MEASURES USED

For the purpose of the study, measures were used in order to obtain quantitative data in the form of research questionnaires and biological measures as well as qualitative data in the form of structured interviews.

5.6.1 QUANTITATIVE DATA

In this study the following measures were used:

- Biographical questionnaire
- Mother-to-Infant Bonding Scale (Taylor et al., 2005)
- Parenting Stress Index (Abidin, 1995)
- Griffiths Mental Developmental Scales - Extended Revised (GMDS-ER) (Luiz et al., 2006)
- Saliva cortisol levels.

5.6.1.1 BIOGRAPHICAL QUESTIONNAIRE

The aim of the biographical questionnaire was to obtain more relevant personal information regarding the participants' medical history as well as current level of functioning. Through the acquisition of the information it was possible to pair the dyads in order to ensure that the groups were as similar as possible. The information required was the following: mother and infant's age; medical history of infant; infant's birth order; mother's medical history during and after pregnancy; occurrence and duration of breastfeeding; mother's current working status and perceived stress levels.

5.6.1.2 MOTHER-TO-INFANT BONDING SCALE

The scale, as described by Taylor et al. (2005), is used to study the relationship between a mother and her infant, especially the mother's early attitude towards the infant. It can be used from day one postpartum and is easy to use. It is a pen-and-paper test. The mother is provided with single-word description of selected emotions towards the infant and she must indicate to which degree she experiences the specific emotion. The adjectives in the scale are "Loving", "Resentful", "Neutral", "Joyful", "Dislike", "Protective", "Disappointed" and "Aggressive". The mother is required to rate her experience of this adjective as "Very much", "A lot", "A Little" or "Not at all". A score of 0 to 3 can be obtained with a 0 indicating a superior quality of bonding and 3 indicating a poor quality bonding. Overall high scores are associated with a poor quality of bonding. The scale has an internal validity of 0.71 (Taylor et al., 2005).

5.6.1.3 PARENTING STRESS INDEX

The Parenting Stress Index is a pen-and-paper measure and consists of 120 statements where the parent must indicate to which degree they agree with it on a scale that ranges from "Strongly agree", "Agree", "Not sure", "Disagree" and "Strongly Disagree". It investigates two domains of stressors, one known as the Child domain and the other known as the Parent domain, as well as a

Life Stress scale. The Child domain investigates six areas namely the child's adaptability; acceptability to parent; mood; distractibility/hyperactivity; demandingness and to which extent the child reinforces the parent. The descriptions of these areas are as follows:

- **Distractibility/Hyperactivity (DI)**

High scores can indicate that the child finds it difficult to adjust to changes in his/her physical or social environment, making the parenting task more difficult.

- **Adaptability (AD)**

High scores on this subscale indicate whether a child displays behaviour associated with Attention Deficit Disorder with Hyperactivity.

- **Reinforces Parent (RE)**

In the case where a parent does not experience the child as a source of positive reinforcement, it is usually found that the type of interaction between parent and child fails to produce good feelings for the parent, to such extent that the parent may feel rejected by the child.

- **Demandingness (DE)**

High scores in this subscale indicate that the parent experiences a large amount of demands from the child, ranging from physical to emotional demands.

- **Mood (MO)**

This subscale investigates the child's affective functioning. High scores indicate that the child is most likely to be unhappy and depressed.

- **Acceptability (AC)**

When a child possesses physical, intellectual and emotional characteristics which differ from the parent's expectations it is possible that poor attachment

and rejection from the parent's side occurs. High scores on this subscale can indicate problems in the parent's acceptance of her/his child.

High scores in the Child Domain lead to the conclusion that the child displays qualities that create difficulty for the parents in fulfilling their role.

The Parent domain includes measures of the parent's competence, isolation, attachment, health, role restriction, depression and the role of the spouse.

The descriptions of these areas are as follow:

- **Competence (CO)**

In the case where the parent feels overwhelmed by the demands of parenthood and does not feel competent enough to deal with it in an effective manner, this subscale produces high scores.

- **Isolation (IS)**

This subscale indicates whether a parent experiences social isolation from their partners, peers, relatives and other emotional support systems.

- **Attachment (AT)**

High scores on this subscale may indicate that the parent does not experience a sense of emotional closeness to the child. It may also indicate that the parent either feels unable or truly is unable to observe and understand the child's needs accurately.

- **Health (HE)**

High scores on this subscale indicate that the level of stress the parent experiences can either cause the parent's deterioration in health or act as additional stressor in the parent-child relationship.

- **Role Restriction (RO)**

This subscale indicates whether the parents feel restricted in their freedom and struggle to maintain their own identity. It may be that the parents see

themselves as being dominated and controlled by the children's needs and demands.

- **Depression (DP)**

High scores can suggest the presence of significant depression in the parent.

- **Spouse (SP)**

Parents who lack active, emotional support from the other parent regarding child management report high scores on this subscale.

Stressors measured in the Parent domain include objective life events, such as change in family structures, the mother's judgement of the child's activity level and to what extent the mother might feel ensnared by her responsibilities as mother. High scores in this domain suggest that the origin of stressors can be traced back to these dimensions of the parent's functioning. The third domain, the Life Stress scale, can give an indication of the amount of stress the parent may experience due to stressful situational circumstances over which they have little or no control. The index's validity is proven to be 0.84 and its reliability to be 0.73 (Abidin, 1995; Willinger, et al., 2005).

5.6.1.4 GRIFFITHS MENTAL DEVELOPMENT SCALES (BIRTH TO 2 YEARS)

The Griffiths Scales are used to provide a general developmental quotient (GQ) as well as the measurement of six domains of functioning (Luiz, Foxcroft, Povey, 2006; Luiz, Foxcroft & Steward, 2001). The six sub-scales are known as (a) Subscale A – Locomotor; (b) Subscale B – Personal / Social; (c) Subscale C – Hearing and speech; (d) Subscale D – Eye and Hand Co-ordination; (e) Subscale E – Performance; (f) Subscale F – Practical reasoning. The explanation for the subscales is as follows:

- **Subscale A: Locomotor**

This subscale assesses the child's gross motor skills. This includes age-appropriate activities such as general body movements, kicking in the bath, ability to balance as well as the ability to co-ordinate and control movements.

- **Subscale B: Personal - Social**

The child's ability to take part in everyday activities and to interact with other children in addition to his/her level of independence is measured through this scale. These include activities such as holding a spoon or displaying interest in other children and adults.

- **Subscale C: Language**

The child's use of expressive and receptive language as well as an overall understanding of language is measured through this scale. In the case of infants the items for this subscale include the listening to sounds, familiar with the infant's own name, interest in pictures and making use of sounds and words.

- **Subscale D: Eye and Hand Coordination**

This subscale assesses the child's visual perception skills, physical dexterity and fine motor skills. To measure the infant's abilities on this scale some of the following items are used: infant follows bell with eyes, reaches for object and searches for fallen object.

- **Subscale E: Performance**

This subscale assesses the child's visuo-spatial awareness, speed of performance and precision. Items incorporated on this subscale for infants include shaking a box, picking up a toy and clapping hands.

For the purpose of this study the scale designed for children aged 0 to 2,0 years were used. This scale differs from the scales designed for children aged 2,1 to 8,0 months as only Subscale A to E is administered for children below the age of 2. Every subscale is formulated in such a way that it can be

used as separate and complete scale in itself (Luiz et al., 2001). The items in each scale are diverse and gradually increase in difficulty level. Bondurant-Utz and Luciano (1994) point out that the objective in assessment is to gather data that are representative of the child's typical functioning. The items of the Griffiths Scales meet this criterion as it is compiled from natural activities that can be seen in any culture. It includes activities such as walking, playing, responding to own name and identifying objects. Such an assessment requires the employment of a comprehensive measure, which encourages the child to demonstrate his or her abilities. The reliability for the Griffiths Mental Development Scales is determined as 0.70 and validity as 0.83 (Luiz et al., 2006).

5.6.1.5 SALIVA CORTISOL LEVELS

Saliva samples were collected from both the mothers and infants in the experimental and control group using Sarstedt Salivette®. The Salivette® makes it possible to collect saliva through an easy, safe and standardized method. A study by De Weerth and Van Geert (2002) assessed the variability of the basal cortisol levels in five to eight month-old infants and their mothers. Mothers and infants are exposed to similar environmental stressors in the family and are genetically related. These conditions provide the researchers with satisfactorily matched pairs in which adult-infant differences, in terms of variability of basal cortisol, can be studied (De Weerth & Van Geert, 2002; Goldberg et al., 2003).

Saliva samples were collected on three separate occasions. The mothers were requested to chew on a cotton wool swab and to place a swab in the infant's mouth until it saturated with saliva and then to return it to the Salivette tube. The first samples were retrieved before implementation of the intervention, the second round of samples collected two months after implementation of the intervention and the last round of samples collected as part of the post-testing procedures. The mothers were given instructions on the correct procedures and conditions in order to ensure validity of the saliva samples. The mothers were asked to collect the saliva samples from their

infants in an attempt to reduce the risk of increased infantile cortisol levels due to a fear of strangers. The following instructions were provided:

1. Sampling must occur between 9am and 11am;
2. Participants must be careful when brushing their and the infants' teeth the night and morning before sampling to ensure that the gums are not hurt. This is to guarantee that there is no blood present in the samples.
3. The participants must avoid brushing their own and the infants' teeth for at least two hours before sampling to ensure that there is no toothpaste residue present in the samples.
4. The participants must refrain from eating, drinking and smoking for at least two hours prior to sampling to prevent contamination.

The mothers were requested to place the saliva samples in ice directly after sampling for transportation purposes and note the time and conditions. Upon arrival at the Physiology Laboratory of the University the samples were placed in a bio-freezer and stored at -80°C. The participants' cortisol levels were measured by making use of R&D Systems' Cortisol Immunoassay. The measure, as described by ParameterTM manual, is a 2,5 hour competitive enzyme immunoassay designed to measure cortisol in saliva, serum, urine and cell culture supernates. This assay makes use of the competitive binding technique where the cortisol present in a sample has to compete against a fixed amount of HRP (horseradish peroxidase) labelled cortisol to bind with sites on a mouse monoclonal antibody. During incubation the monoclonal antibody will bind to the goat anti-mouse antibody coated onto the micro plate. It is washed to remove excess conjugate and unbound sample. A substrate solution is added to the wells to determine bound enzyme activity. The colour development is stopped and absorbance read as 450 nm. The intensity of the colour is inversely proportional to the concentration of cortisol in the sample. The intra-assay precision of the procedure is determined to be CV (%) = 5.4% – 9.2%. The inter-assay precision of the procedure is determined to be CV (%) = 9.3% -21.1%. The sensitivity of the procedure is determined by evaluating 31 assays and it resulted in the minimum detectable dose of cortisol ranged from 0.030 – 0.111 ng/mL and the mean minimum detectable

dose was 0.071 ng/mL. One experimental group's mother-infant dyad cortisol results could not be used and the statistical analysis was performed on three mother-infant dyads in the experimental group and on four mother-infant dyads in the control group.

5.6.2 QUALITATIVE DATA

The qualitative data were collected by making use of a structured interview with every mother after cessation of the intervention. Although the mothers in the control group were asked to interact with their infants as normal, without performing infant massage, the following questions were presented to the mothers in the experimental as well as the mothers in the control group in order to ensure consistency.

1. How many times per week did you massage your infant?
2. (a) What did you enjoy the most?
(b) What did your infant enjoy the most?
3. How did you experience the infant massage procedure?
4. To what extent did the process influence your relationship with your infant?
5. Did any changes occur in your relationship with your infant?
6. (a) What changes can you identify in yourself?
(b) What changes can you identify in your infant?
7. (a) In which ways were you affected by infant massage?
(b) In which ways were your infant affected by infant massage?

The qualitative data were analysed by making use of open coding as described by De Vos (2002). The data were broken down to discrete parts and compared for similarities and differences. It was possible to identify certain themes and categories.

5.7 ETHICAL PROCEDURES

Ethical approval for this study was retrieved from the Ethics Committee of the North-West University at Potchefstroom with the reference number of NWU-00043-07S3. Written informed consent to participate in the research was retrieved from all the mothers. Participation was voluntary and the participants could withdraw any time. The pre and post-testing was conducted under supervision of a registered psychologist. The Griffiths Mental Developmental Scales were administered by a trained Griffiths user. The data were reported anonymous as to ensure the participants' privacy. The results were made available to the participants. For the duration of the research no harmful risks were present. The participants of the control group were allowed the opportunity to participate in the infant massage training after the research has been completed. The mothers also gave permission for photos to be taken during the infant massage course to be used in Appendix A.

5.8 STATISTICAL ANALYSIS

The statistical analysis was done by the Statistical Consultation Service of the North-West University in Potchefstroom by making use of STATISTICA 7 (Statsoft Inc., 2007).

5.8.1 DIFFERENCES BETWEEN GROUPS: PRE-TESTS

In order to determine to any practical and statistical significant differences between the experimental and control group before implementation of the intervention, the non-parametric test, Mann-Whitney U Test was used to determine to what extent the groups were parallel.

5.8.2 DIFFERENCES WITHIN GROUPS

In order to determine the differences that took place within each group, therefore measuring each participant's performance against her-/himself, the non-parametric test, Wilcoxon Matched-Pairs Signed Rank T-Test, was used

for both the experimental and control group. In order to determine the changes that took place within the groups regarding the cortisol levels, the comparisons were done with Friedman's ANOVA as there were more than 2 measurements per each infant and mother.

5.8.3 DIFFERENCES BETWEEN GROUPS: POST-TESTS

In order to determine any practical and statistical significant differences between the experimental and control group after termination of the four month programme, the non-parametric test, Mann-Whitney U Test was used to determine the effect of the infant massage on the dependent variables.

5.8.4 EFFECT SIZES AND PRACTICAL SIGNIFICANCE

Sani and Todman (2006, p. 200) define effect size as follows:

"The size of an effect as distinct from its statistical significance. One measure of effect size is the difference between means in units of standard deviation."

Effect size can be viewed as the extent to which a sample differs from the null hypothesis expectation (Thompson, 2007) and it measures the strength of the relationship between the dependent and independent variables (Trusty, Thompson & Petrocelli, 2004). It is important to consider effect sizes seeing as sample size can have a significant effect on statistical measures (Thompson, 2002). Due to the fact that the sample size for this study is small and the possibility of determining statistical significance is slight, the effect sizes will be considered for this study. However, all results of statistical analysis must be regarded with great caution due to the small number of participants in both groups. This implied that no statistical significant results could be obtained as there was not enough power to observe differences. In order to interpret results, effect sizes are used as indications of the practical significance of observed trends. Rosenthal et al. (2000) indicated that when one is confronted with a "non-significant" p and a "large" effect size, one might be making a serious mistake to conclude on the basis of the significance level

that no changes occurred. The effect size to determine whether a practical significant difference is present is $r = \sqrt{\frac{X^2}{n}}$, with X^2 being the Friedman ANOVA Chi-square statistic. The guidelines for interpretation in the current study are: small effect: $r \geq 0.1$, (b) medium effect: $r \geq 0.3$, (c) large effect: $r \geq 0.5$.

5.9 HYPOTHESES

The hypotheses that formed the basis of the aims of the study are as follows:

HO1: Tactile stimulation, in the form of physical touch through the act of infant massage, does not decrease secretion of steroid hormones such as cortisol in the infants, therefore does not lower stress levels.

Ha1: Tactile stimulation, in the form of physical touch through the act of infant massage, decreases secretion of steroid hormones such as cortisol in the infants, therefore lowering stress levels.

HO2: The process of infant massage does not lead to a decrease in the mothers' stress levels as reported through quantitative measures.

Ha2: The process of infant massage leads to a decrease in the mothers' stress levels as reported through quantitative measures.

HO3: The process of infant massage will not enhance the relationship between mothers and infants and will, therefore, not improve the quality of bond forming from mothers to infants.

Ha3: The process of infant massage will enhance the relationship between mothers and infants, therefore, improve the quality of bond forming from mothers to infants.

H04: Tactile stimulation, in the form of physical touch through the act of infant massage, will not improve the infants' general development.

Ha4: Tactile stimulation, in the form of physical touch through the act of infant massage, improves the infants' general development.

H05 and Ha5 can, due to the exploratory nature of the study, not be stated.

H06 and Ha6 can, due to the exploratory nature of the study, not be stated.

5.10 SUMMARY

In Chapter 5 the aims of the study, information regarding the participants, ethical aspects and different phases of the research programme are explained. It also provides a demonstration of the research design, measurements used to collect quantitative and qualitative data as well as statistical procedures used to analyse the data.

CHAPTER 6

RESULTS AND DISCUSSION

6.1 INTRODUCTION

The results from the study will be interpreted and discussed. The results of the statistical analysis compare intra-group results as well as inter-group results before and after implementation of infant massage for the period of 4 months. In this chapter the quantitative data will be discussed first and secondly the results of the qualitative results will be reported in the form of themes. Comparison of the quantitative and qualitative data for each group will be discussed by integrating the two different sets of data.

6.2 RESULTS AND DISCUSSION

The aims of the study will be discussed individually by reporting and discussing the relevant data to the specific aim.

6.2.1 AIM 1: THE EFFECT OF INFANT MASSAGE ON INFANTS' STRESS LEVEL

In order to determine the effect of infant massage on the infants' stress levels, the study used cortisol levels of bio-marker as it can be performed on any individual in any age group (Neu et al., 2007) and is viewed as a reliable measurement (Garde & Hansen, 2005). This method makes it ideal to measure the infant's stress levels and the results can, therefore, be viewed as a valid description of the infant's level of stress. Cortisol is a steroid hormone that assists the body to cope during stressful times (Nash & Theborge, 2006). It is the understanding that low cortisol levels are preferable as high levels of cortisol indicate high stress levels. It should be noted that one infant in the experimental group's results could not be used and the results reported in the tables consist of three infants of the experimental and four infants of the control groups' measurements.

6.2.1.1 CORTISOL LEVELS OF INFANTS: COMPARISON BETWEEN EXPERIMENTAL AND CONTROL GROUPS REGARDING FIRST AND THIRD MEASUREMENT

Table 2 illustrates how the experimental and control groups' results compare with each other with respect to the first and third cortisol level measurement.

Table 2: Non-Parametric Mann-Whitney U Test: Comparison For Experimental and Control Groups

Measure	Rank Sum E	Rank Sum C	U	Z	p-level	r
1B	12,0	16,0	6,0	0.00	1,0000	0.00
3B	13,0	15,0	5,0	0.35	0.723	*0.13

* Practical significance (r ≥ 0.1 small effect size)
 ** Practical significance (r ≥ 0.3 medium effect size)
 *** Practical significance (r ≥ 0.5 large effect size)

Where:

Rank Sum E = Sum of non-parametric ranks in Experimental group
 Rank Sum C = Sum of non-parametric ranks in Control group
 Measure 1B = First / Base Line measurement
 Measure 3B = Third measurement
 p = Statistical significance
 r = Effect size

According to Table 2 neither statistical nor practical significant differences existed between the experimental and the control groups' results regarding the first/basal line measurement. The third measurement indicates that, although no statistical significant changes occurred, a small (r = 0.13) practical significant difference can be identified between the groups, which can lead to the understanding that changes took place during the four month period. More information regarding the comparison between the control and the experimental group will be provided by the descriptive statistics.

6.2.1.2 DESCRIPTIVE STATISTICS

Table 3 provides the descriptive statistics as illustration of how the infants in the two groups' cortisol levels changed during the four month period of the intervention.

Table 3: Descriptive Statistics of Infants' Cortisol Levels

	Measure 1	Measure 2	Measure 3
	Median	Median	Median
Experimental Group	1,060	0.760	1,250
Control Group	0.875	0.400	1,025

Measure 1 = First / Base Line measurement
Measure 2 = Second measurement
Measure 3 = Third measurement

It is clear from the results of Table 3 that the experimental groups' cortisol levels were elevated compared to the control group's results throughout the four month duration of the intervention, indicating higher stress levels. From these results it would seem that the experimental and control groups' results followed a similar pattern, starting with high cortisol levels, decreasing during the second measurement and then reaching a peak during the third measurement. The increase in the experimental group's results as seen during the third measurement caused the small practical significant difference between the groups seen in Table 2. One can come to the conclusion that the infants in the experimental group experienced higher levels of stress than the control group's infants during the last measurement. Due to the fact that only three infants in the experimental group's cortisol measurements could be obtained, various factors could have a significant effect on the results.

The second and third measurements are compared against the first measurement that serves as the base line measurement. In both groups the second measurement indicates the lowest levels. This measurement was taken two months into the intervention and performed by the mothers in their own homes, therefore eliminating factors such as stranger anxiety or unfamiliarity with the environment as possible factors that may have an effect on the infants' cortisol levels (Papalia, Olds & Feldman, 2008). The conditions for the third measurement might not have been as favourable and may, therefore, account for the rise in cortisol levels. Phase Five of the research procedure, which includes the post-testing of the participants, required the mothers to travel to the North-West University in Potchefstroom. Seeing as the collection of the last saliva samples occurred on the same day the mothers were asked to go to the university, it is possible that the mothers did

not comply entirely with the instructions. Some of the mothers in both the experimental and control groups travelled a far distance and might have only sampled the saliva at the place of accommodation in Potchefstroom or upon arrival at the university. This might have caused the infant to experience distress due to unfamiliarity with the environment or increased excitement levels that could influence the cortisol levels.

6.2.1.3 CORTISOL LEVELS OF INFANTS: COMPARISON WITHIN EXPERIMENTAL AND CONTROL GROUPS REGARDING FIRST AND THIRD MEASUREMENT

Friedman's ANOVA was used to do the comparisons within the groups due to the fact that there were more than 2 measurements per infant.

Table 4: Friedman ANOVA and Kendall Coefficient of Concordance: Experimental and Control Groups

	Experimental Group				Control Group			
Variable	Average Rank	Sum of Ranks	Mean	Std. Dev.	Average Rank	Sum of Ranks	Mean	Std. Dev.
Measure 1	1.66	5.0	1.010	0.516	2.00	8.0	0.990	0.6482
Measure 2	1.66	5.0	1.236	1.198	1.50	6.0	1.270	1.8565
Measure 3	2.66	8.0	11.073	17.589	2.50	10.0	1.305	1.0715
ANOVA Chi Sqr = 2.00, p = 0.368, r = ***0.67					ANOVA Chi Sq r = 2.00, p = 0.368 r = ***0.57			

Where:
Measure 1 = First / Base Line measurement
Measure 2 = Second measurement
Measure 3 = Third measurement

The results in Table 4 provide a description of the changes that occurred within each group throughout the duration of the four month intervention. According to the results no statistical significant changes could be detected due to the small sample size. Nonetheless, practical significant effects are visible in both groups. The experimental group showed a large ($r = 0.67$) practical significant increase in cortisol levels when the last measurement are compared with the first and the second. Similar results are seen with the control group, with the third measurement showing a large ($r = 0.57$) practical significant difference to the first and second measurement. According to

studies by Field et al. (2005), it would be expected that the cortisol levels on the third measurement should be lower for the experimental group. The opposite end result reported in Table 4 could lead to the assumption that the process of infant massage was not effective in lowering an infant's stress levels as reported through biological markers. However, seeing as the results from the control group are similar to the experimental group's results, it would be necessary to consider other reasons that could be responsible for the rise during the third measurement. Individual characteristics as well as the time and location during which sampling took place are factors that must be considered as possibly interfering with the results.

6.2.2 AIM 2: THE EFFECT OF INFANT MASSAGE ON MOTHERS' STRESS LEVELS

The effect of infant massage on the mothers' stress levels was determined through the use of the Parenting Stress Index and measurement of cortisol levels. By studying each measurement's results on its own and then comparing the data sets with each other, it will be possible to gain a better understanding of the effect on a mother's stress levels as reported through a physiological measure and a psychological measure.

6.2.2.1 PARENTING STRESS INDEX

In order to determine the effect of infant massage on the mothers in the experimental group's stress levels, it will be necessary to become familiar with each group's results before implementation of infant massage and then to what extent the groups differ after cessation of the four month intervention. The differences that took place within each group during the four months will also be investigated.

6.2.2.1.1 PARENTING STRESS INDEX: PRE-TEST COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS

Table 5 illustrates how the experimental and control groups compare with regards to reported stress levels on the Parenting Stress Index with respect to pre-testing.

Table 5: Non-Parametric Mann-Whitney U Test: Comparison For Experimental and Control Groups

Subscales	Rank Sum E	Rank Sum C	U	Z	p-level	r
Total	18.0	18.0	8.0	0.00	1.0000	0.00
DI	16.5	11.5	1.5	1.59	0.1116	***0.56
AD	10.0	18.0	4.0	-0.71	0.4795	*-0.25
RE	18.0	10.0	0.0	2.12	0.0339	***0.75
DE	13.5	14.5	4.5	0.53	0.5959	*0.19
MO	14.0	14.0	4.0	0.71	0.4795	*0.25
AC	13.0	15.0	5.0	0.35	0.7237	*0.13
CO	7.5	20.5	1.5	-1.59	0.1116	***-0.56
IS	10.0	18.0	4.0	-0.71	0.4795	*-0.25
AT	13.0	15.0	5.0	0.35	0.7237	*0.13
HE	10.5	17.5	4.5	-0.53	0.5959	*-0.19
RO	8.5	19.5	2.5	-1.24	0.2159	**0.44
DP	12.0	16.0	6.0	0.00	1.0000	0.00
SP	18.0	10.0	0.0	2.12	0.0339	***0.75
CD	16.0	12.0	2.0	1.41	0.1573	***0.50
PD	9.0	19.0	3.0	-1.06	0.2888	**0.38
TS	15.0	13.0	3.0	1.06	0.2888	**0.38
LS	12.5	15.5	5.5	0.18	0.8597	0.06

Where:

Rank Sum E	=	Sum of non-parametric ranks in Experimental group
Rank Sum C	=	Sum of non-parametric ranks in Control group
AD	=	Adaptability
AC	=	Acceptability
DE	=	Demandingness
MO	=	Mood
DI	=	Distractibility / Hyperactivity
RE	=	Reinforces Parent
DP	=	Depression
AT	=	Attachment
RO	=	Role Restriction
CO	=	Competence
IS	=	Isolation
SP	=	Spouse
HE	=	Health
CD	=	Child Domain
PD	=	Parent Domain
TS	=	Total Stress
LS	=	Life Stress
p	=	Statistical significance
r	=	Effect size

The results from Table 5 provide an overview of the differences between the experimental and control group with regards to the pre-testing. There were no differences on the Total Score and the results in general did not deliver any statistical significant differences between the groups, but there were certain subscales where practical significant changes could be detected. More information regarding the comparison of the control and the experimental groups will be provided by the descriptive statistics.

6.2.2.1.2 DESCRIPTIVE STATISTICS

Table 6 provides the descriptive statistics as illustration of how the mothers in both groups' reported stress levels changed during the four month period of the intervention.

Table 6: Parenting Stress Index: Experimental and Control Groups with Respect to Pre and post-testing

	Experimental Group		Control Group	
	Pre-test	Post-test	Pre-test	Post-test
Subscales	Median	Median	Median	Median
AD	40.0	40.0	60.0	80.0
DI	90.0	72.5	62.5	72.5
RE	85.0	47.5	45.0	45.0
DE	55.0	35.0	37.5	60.0
MO	50.0	42.5	42.5	60.0
AC	70.0	75.0	50.0	50.0
CO	30.0	32.5	77.5	72.5
IS	90.0	87.5	85.0	92.5
AT	35.0	45.0	30.0	25.0
HE	65.0	90.0	74.5	72.5
RO	40.0	57.5	75.0	87.5
DP	70.0	50.0	62.5	75.0
SP	95.0	90.0	60.0	72.5
CD	75.0	45.0	42.5	65.0
PD	70.0	77.5	75.0	82.5
TS	75.0	65.0	60.0	75.0
LS	50.0	17.5	57.5	35.0
Total	2.0	1.0	1.5	1.5

Where:		
AD	=	Adaptability
AC	=	Acceptability
DE	=	Demandingness
MO	=	Mood
DI	=	Distractibility / Hyperactivity
RE	=	Reinforces Parent
DP	=	Depression
AT	=	Attachment
RO	=	Role Restriction
CO	=	Competence
IS	=	Isolation
SP	=	Spouse
HE	=	Health
CD	=	Child Domain
PD	=	Parent Domain
TS	=	Total Stress
LS	=	Life Stress
p	=	Statistical significance
r	=	Effect size

- **Difference in Distractibility/Hyperactivity (DI)**

High scores on this subscale indicate whether a child displays behaviour associated with Attention Deficit Disorder with Hyperactivity (Abidin, 1995). The large ($r = 0.56$) practical significant difference seen on Table 5 for the pre-test is a result of the experimental group reporting the higher scores of Distractibility/Hyperactivity (Table 6). Observations during the Griffiths Mental Development Scales and the one mother in the experimental group's report of her infant's high activity level could have influenced the scores.

- **Difference in Adaptability (AD)**

High scores can indicate that the child finds it difficult to adjust to changes in his/her physical or social environment, making the parenting task more difficult (Abidin, 1995). There is a small to medium ($r = 0.25$) practical significant difference (Table 5) between the experimental and control group with the control group reporting a higher score on Adaptability in the pre-test (Table 6). This can lead to the understanding that the mothers in the control group experience their infants to have greater difficulty adapting to their environment.

- **Difference in Reinforces Parent (RE)**

In the case where a parent does not experience the child as a source of positive reinforcement, it is usually found that the type of interaction between parent and child fails to produce good feelings for the parent, to such an extent that the parent may feel rejected by the child (Abidin, 1995). A large (r

= 0.75) effect (Table 5) showed that the experimental group reported practical significant higher scores (Table 6) than the control group during the pre-test. It would seem that the mothers in the experimental group do not experience their infants to be as reinforcing as the mothers in the control group experience their infants.

- **Difference in Demandingness (DE)**

High scores in this subscale indicate that the parent experiences a large amount of demands from the child, ranging from physical to emotional demands (Abidin, 1995). A small ($r = 0.19$) practical significant difference is seen between the experimental and control group (Table 5) with the control group reporting higher scores (Table 6). The outcome can lead to the understanding that the control group experiences their infants to be more demanding.

- **Difference in Mood (MO)**

This subscale investigates the child's affective functioning. High scores indicate that the child is most likely to be unhappy and depressed (Abidin, 1995). The pre-test scores indicated a small to medium ($r = 0.25$) effect (Table 5) between the groups and the experiment group reported higher scores than the control group (Table 6). In comparison with the control group, it would seem that the experimental group believe their infants to experience higher levels of unhappiness.

- **Difference in Acceptability (AC)**

When a child possesses physical, intellectual and emotional characteristics which differ from the parent's expectations it is possible that poor attachment and rejection from the parent's side occur. High scores on this subscale can indicate problems in the parent's acceptance of her/his child (Abidin, 1995). A higher score as reported by the experimental group (Table 6) during the pre-test results in a small ($r = 0.13$) practical significant difference between the groups (Table 5). The mothers in the experimental group reportedly view their

infants to possess different characteristics than expected to a higher extent than the control group.

- **Difference in Competence (CO)**

In the case where the parent feels overwhelmed by the demands of parenthood and does not feel competent enough to deal with it in an effective manner, this subscale produces high scores (Abidin, 1995). According to the test results, it seems that a large ($r = 0.56$) effect is evident between the experimental and control group (Table 5) with the control group reporting the high scores in the pre-test (Table 6). In comparison, the control group feels more overwhelmed by demands posed to them as parents than the experimental group.

- **Difference in Isolation (IS)**

This subscale indicates whether a parent experiences social isolation from their partners, peers, relatives and other emotional support systems (Abidin, 1995). The pre-test showed a small to medium ($r = 0.25$) effect (Table 5) with the experimental and control group with the control group reporting the higher scores (Table 6), indicating that they experience higher levels of isolation from their support systems.

- **Difference in Attachment (AT)**

High scores on this subscale may indicate that the parent does not experience a sense of emotional closeness to the child. It may also indicate that the parent either feels unable or truly is unable to observe and understand the child's needs accurately (Abidin, 1995). The pre-test results showed a small ($r = 0.13$) practical significant difference (Table 5) between the experimental and control group with the control group reporting higher scores (Table 6), which could lead to the understanding that the control group does not experience the same high quality bonding with their infants as in the case of the experimental group.

- **Difference in Health (HE)**

High scores on this subscale indicate that the level of stress the parent experiences can either cause the parent's deterioration in health or act as additional stressor in the parent-child relationship (Abidin, 1995). This subscale's pre-test results show a small ($r = 0.19$) effect between the experimental and control group with the control group reporting a higher score (Table 6). In comparison, the control group experiences more health-related stress than the mothers in the experimental group.

- **Difference in Role Restriction (RO)**

This subscale indicates whether the parents feel restricted in their freedom and struggle to maintain their own identity. It may be that the parents see themselves as being dominated and controlled by the children's needs and demands (Abidin, 1995). There is a medium ($r = 0.44$) practical significant difference (Table 5) between the experimental and control group with the control group reporting higher scores (Table 6). It can lead to the understanding that the control group felt more restricted in their parental roles than the experimental group.

- **Difference in Depression (DP)**

High scores can suggest the presence of significant depression in the parent (Abidin, 1995). There are no practical significant differences between the experimental and control groups (Table 5), indicating that either the groups experience similar levels of depression or both groups do not display symptoms associated with depression.

- **Difference in Spouse (SP)**

Parents who lack active, emotional support from the other parent regarding child management report high scores on this subscale (Abidin, 1995). There was a large ($r = 0.75$) practical significant difference (Table 5) between the experimental and control group during the pre-test results (Table 6) with the experimental group reported the highest scores. It can lead to the

understanding that the experimental group experienced a lack of emotional support from their partners to a larger extent than the control group.

- **Difference in Child Domain (CD)**

This scale measures the extent to which the child displays qualities that make it difficult for the parent to fulfil the parenting role (Abidin, 1995). There is a large ($r = 0.50$) practical significant difference (Table 5) between the experimental and control group (Table 6). The experimental group reported the higher scores. This can lead to the understanding that, in comparison with the control group, the mothers in the experimental group view their infants to possess more qualities that can make it difficult for them to fulfil their roles as mother.

- **Difference in Parent Domain (PD)**

Dimensions of the parent's functioning may be related to problems in the parent-child relationship and the source of stress. A high score in this subscale indicates that certain aspects of the parent's functioning may contribute to the level of stress experienced (Abidin, 1995). The pre-test results showed there is a medium ($r = 0.38$) practical significant difference (Table 5) between the experimental and control group with the control group reporting the higher score (Table 6). It would seem that it is the control group that views certain aspects in their own functioning to be the contributing factor that may lead to problems in their relationship with their infants.

- **Difference in Total Stress (TS)**

This score is compiled from the scores of the Child Domain, the Parent Domain and the Life Stress. The score can be used to determine whether the parent-child relationship is under stress and whether there is a risk for the occurrence of dysfunctional behaviour in either the child or the parent (Abidin, 1995). There is a medium ($r = 0.38$) practical significant difference between the experimental and control group (Table 5) with the control group reporting the higher score (Table 6). The outcome in this domain can lead to the

understanding that it is the mothers in the control group that experience higher levels of stress in total.

- **Difference in Life Stress (LS)**

High scores on this subscale indicate that the parents find themselves in stressful situational circumstances. These circumstances are often beyond their control (Abidin, 1995). There are no practical significant differences between the experimental and control groups for the pre-test. It can be assumed that both groups experienced similar stressful situational conditions.

6.2.2.1.3 PARENTING STRESS INDEX: POST-TEST COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS

Table 7 illustrates how the experimental and control groups compare with regards to reported stress levels on the Parenting Stress Index with respect to post-testing.

Table 7: Non-Parametric Mann-Whitney U Test: Comparison of Experimental and Control Groups

Subscales	Rank Sum E	Rank Sum C	U	Z	p-level	r
Total	15.0	21.0	5.0	-0.87	0.3865	**0.31
DI	18.5	17.5	7.5	0.14	0.8852	0.05
AD	14.0	22.0	4.0	-1.15	0.2482	**0.41
RE	18.5	17.5	7.5	0.14	0.8852	0.05
DE	15.0	21.0	5.0	-0.87	0.3865	**0.31
MO	14.5	21.5	4.5	-1.01	0.3123	**0.36
AC	20.5	15.5	5.5	0.72	0.4705	*0.26
CO	16.0	20.0	6.0	-0.58	0.5637	*0.20
IS	10.0	26.0	0.0	-2.31	0.0209	***0.82
AT	17.0	19.0	7.0	-0.29	0.7728	*0.10
HE	22.0	14.0	4.0	1.15	0.2482	**0.41
RO	19.0	17.0	7.0	0.29	0.7728	*0.10
DP	14.5	21.5	4.5	-1.01	0.3123	**0.36
SP	14.0	22.0	4.0	-1.15	0.2482	**0.41
CD	21.0	15.0	5.0	0.87	0.3865	**0.31
PD	16.0	20.0	6.0	-0.58	0.5637	*0.20
TS	18.0	18.0	8.0	0.00	1.0000	0.00
LS	16.5	19.5	6.5	-0.43	0.6650	*0.15

Where:		
Rank Sum E	=	Sum of non-parametric ranks in Experimental group
Rank Sum C	=	Sum of non-parametric ranks in Control group
AD	=	Adaptability
AC	=	Acceptability
DE	=	Demandingness
MO	=	Mood
DI	=	Distractibility / Hyperactivity
RE	=	Reinforces Parent
DP	=	Depression
AT	=	Attachment
RO	=	Role Restriction
CO	=	Competence
IS	=	Isolation
SP	=	Spouse
HE	=	Health
CD	=	Child Domain
PD	=	Parent Domain
TS	=	Total Stress
LS	=	Life Stress
p	=	Statistical significance
r	=	Effect size

The results in Table 7 indicate that, although no statistical significant changes took place, practical significant differences between the groups can be detected after cessation of the intervention. The Total Score of the subscales shows a medium ($r = 0.31$) practical significant difference between the groups with the experimental group reporting lower scores on the subscales (Table 6), indicating that they experience lower stress levels in general. The largest practical significant difference with respect to the post-test results is seen in the Isolation subscale (IS) with a large ($r = 0.82$) effect (Table 7). According to Table 6, it is the control group that reported the highest score and this can lead to the understanding that the mothers in this group experienced isolation from emotional support systems to a larger extent than the mothers in the experimental group.

The post-test results reveal medium to large practical significant effects on seven subscales.

- The Adaptability subscale (AD) show a medium to large ($r = 0.41$) practical significant difference with the control group reporting the higher test scores (Table 6), which can indicate that the mothers in the control group feel that their infants find it more difficult to adapt to their environment.
- A medium ($r = 0.31$) effect on the Demandingness subscale (DE) reveals the control group's post-test results to be practical significant higher (Table 6 and 7), implicating that the mothers in this group experience their infants to be more demanding on a physical and emotional level.

- The post-test results show a medium ($r = 0.36$) practical significant difference on the Mood subscale (MO) (Table 7) between the experimental and control groups with the control group reporting the higher test score (Table 6). In comparison with the experimental group, it would seem that the control group feel that their infants experience higher levels of unhappiness.
- The Health subscale (HE) post-test results reveal a medium to large ($r = 0.41$) practical significant difference (Table 7) between the scores of the experimental and control group with the experimental group reporting the higher score (Table 6). It would seem that the mothers in the experimental group experiences more health-related stress than the mothers in the control group.
- According to Table 7, a medium ($r = 0.36$) practical significant difference on the Depression subscale (DP) is present between the experimental and control group with the latter reporting the higher scores (Table 6). This implicates that the mothers in the control group experience higher levels of depression than the mothers in the experimental group.
- The post-test shows a medium ($r = 0.31$) practical significant difference (Table 7) between the experimental and control group for the Child Domain (CD) with the control group reporting the higher score (Table 6). This can lead to the understanding that, in comparison with the experimental group, the mothers in the control group view their infants to possess more qualities that can make it difficult for them to fulfil their maternal role.

The comparison of the experimental and control group revealed that it was the mothers in the experimental group who reported the lower stress levels. In the next section each group's post-test results will be compared with its own pre-test results in order to determine what changes occurred within the groups during the four month period.

6.2.2.1.4 PARENTING STRESS INDEX: PRE AND POST-TEST COMPARISON WITHIN EXPERIMENTAL AND CONTROL GROUPS

The changes that occurred within the experimental group during the four month period as determined through the non-parametric Wilcoxon Rank Test are conveyed in Table 8 and the changes that occurred within the control group are conveyed in Table 9.

Table 8: Non-Parametric Wilcoxon Rank Test: Experimental Group Pre and Post-test Results

Pre and post-test	T	Z	p-level	r
Total	0.0	1.60	0.1088	***0.80
DI	0.0			
AD	0.0			
RE	0.0			
DE	2.0	0.53	0.5930	**0.31
MO	2.5	0.27	0.7893	*0.15
AC	0.0			
CO	3.0	0.00	1.0000	0.00
IS	0.0	1.60	0.1088	*** 0.93
AT	0.0			
HE	0.0	1.60	0.1088	*** 0.93
RO	1.0	1.07	0.2851	*** 0.62
DP	1.5	0.80	0.4227	**0.46
SP	3.0	0.00	1.0000	0.00
CD	1.0	1.07	0.2851	*** 0.62
PD	0.0	1.60	0.1088	*** 0.93
TS	3.0	0.00	1.0000	0.00
LS	1.0	1.07	0.2851	*** 0.62

Where:

AD	=	Adaptability
AC	=	Acceptability
DE	=	Demandingness
MO	=	Mood
DI	=	Distractibility / Hyperactivity
RE	=	Reinforces Parent
DP	=	Depression
AT	=	Attachment
RO	=	Role Restriction
CO	=	Competence
IS	=	Isolation
SP	=	Spouse
HE	=	Health
CD	=	Child Domain
PD	=	Parent Domain
TS	=	Total Stress
LS	=	Life Stress

p	=	Statistical significance
r	=	Effect size
T	=	Test statistic
Z	=	Approximate Z-statistic

The results reported in Table 8 display the differences that occurred within the experimental group during the four month period. There were no statistical significant differences, but various practical significant differences can be determined and can it be concluded that noteworthy changes took place. According to Table 6, large practical significant decreases can be identified on the Isolation subscale (IS) ($r = 0.93$), the Child Domain (CD) ($r = 0.62$) and Life Stress ($r = 0.62$) together with the medium practical significant decreases identified on the Demandingness (DE) ($r = 0.31$) and Depression subscale (DP) ($r = 0.46$). According to Table 6, the large practical significant effects identified on the Health subscale (HE) ($r = 0.93$), the Role Restriction subscale (RO) ($r = 0.62$) and Parenting Domain ($r = 0.93$) indicate an increase in these subscales. In total, the results show that the mothers in the experimental group reported lower scores on five subscales of which two falls in the Parenting Domain, two in the Child Domain as well as an overall lower Child Domain Score. This can lead to the understanding that the mothers experience possible stress factors concerning their infants to be a lesser contributing part to their general experience of stress.

Table 9: Non-Parametric Wilcoxon Rank Test: Control Group Pre and Post-test Results

Pre and post-test	T	Z	p-level	r
DI	1.0	1.07	0.2851	*** 0.53
AD	0.0	1.60	0.1088	*** 0.80
RE	0.0			
DE	1.0	1.07	0.2851	*** 0.53
MO	0.0			
AC	3.0	0.00	1.0000	0.00
CO	0.0			
IS	0.0			
AT	2.0	0.53	0.5930	*0.27
HE	2.0	0.53	0.5930	*0.27
RO	1.0	1.07	0.2851	*** 0.53
DP	2.0	0.53	0.5930	*0.27

Table 9: Non-Parametric Wilcoxon Rank Test: Control Group Pre and Post-test Results (Continued)

SP	0.0			
CD	0.0			
PD	1.0	1.07	0.2851	*** 0.53
TS	1.0	1.07	0.2851	*** 0.53
LS	0.0			

Where:

AD	=	Adaptability
AC	=	Acceptability
DE	=	Demandingness
MO	=	Mood
DI	=	Distractibility / Hyperactivity
RE	=	Reinforces Parent
DP	=	Depression
AT	=	Attachment
RO	=	Role Restriction
CO	=	Competence
IS	=	Isolation
SP	=	Spouse
HE	=	Health
CD	=	Child Domain
PD	=	Parent Domain
TS	=	Total Stress
LS	=	Life Stress
p	=	Statistical significance
r	=	Effect size

The results from Table 9 indicate that, although no statistical significant effects were present, practical significant effects could be identified in six subscales. Large practical significant increases on the Distractibility/Hyperactivity (DI) subscale ($r = 0.53$), Adaptability (AD) subscale ($r = 0.80$), Demandingness (DE) subscale ($r = 0.53$), Role Restriction (RO) subscale ($r = 0.53$), Parent Domain (PD) ($r = 0.53$) and Total Stress Score ($r = 0.53$). This means the mothers reported higher scores on three subscales that lie within the Child Domain, two in the Parent Domain as well as an overall higher Parent Domain Score and an increased Total Stress score, indicating that they experience that these factors contribute to their stress levels to a greater extent than during the pre-testing round. In comparison to the results from the experimental group, where the latter group found factors related to their infants to be a lesser contributing factor to their overall stress levels, the opposite is true for the control group. From these results it would seem that infant massage did have a detectable effect on the experimental group's reported stress levels as the results decreased from the pre-test to the post-test and are lower than the control group's post-test results. This correlates with research by Field et al. (2005) and McGrath et al. (2007) where they

found the mothers to relax and experience lower stress levels after performing infant massage.

6.2.2.2 CORTISOL

The second measure used to determine the effect of infant massage on the mothers in the experimental group's stress levels is the biological measure in the form of cortisol levels as measured in saliva. By performing inter and intra-group comparison with regards to the first (basal line) and third measurement, it will be possible to determine the effect of infant massage on the mothers' cortisol levels.

6.2.2.2.1 CORTISOL LEVELS OF MOTHERS: COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS REGARDING FIRST AND THIRD MEASUREMENT

Table 10 illustrates how the experimental and control groups compare during the first and third cortisol level measurement.

Table 10: Non-Parametric Mann-Whitney U Test: Comparison Of Experimental and Control Groups

Measure	Rank Sum E	Rank Sum C	U	Z	p-level	r
1M	16,0	12,0	2,0	1,41	0.1570	***0.53
3M	12,5	15,5	5,5	0.85	0.859	0.07

Where:

Rank Sum E = Sum of non-parametric ranks in Experimental group
 Rank Sum C = Sum of non-parametric ranks in Control group
 Measure 1 = First / Base Line measurement
 Measure 3 = Third measurement

According to Table 10, it was not possible to identify statistical significant differences on any of the measurements, but it was possible to detect practical significant differences between the results of the experimental and the control group for the base line measurement. The first measurement indicates that a large ($r = 0.53$) practical significant difference can be identified between the groups with the experimental group's mothers registering the

higher cortisol levels. The third measurement did not deliver either statistical or practical significant differences between the groups. More information regarding the comparison between the control and the experimental group will be provided by the descriptive statistics.

6.2.2.2.2 DESCRIPTIVE STATISTICS

Table 11 provides the descriptive statistics as illustration of how the mothers in the two groups' cortisol levels changed during the four month period of the intervention.

Table 11: Descriptive Statistics of Mothers' Results

	Measurement 1M	Measurement 2M	Measurement 3M
	Median	Median	Median
Experimental Group	0.960	0.770	1,130
Control Group	0.420	0.425	0.575

Measure 1 = First / Base Line measurement
 Measure 2 = Second measurement
 Measure 3 = Third measurement

The practical significant difference between the groups for the base line measurement as reported on Table 10 is due to high cortisol levels measured in the experimental group's saliva samples. The results from the control group reveal a steady increase in cortisol levels. The mothers in the experimental group's results show a similar pattern than the infants in the experimental groups' results by starting with a high basal line measurement, a lower second measurement and ending with a third measurement indicating higher cortisol levels than the basal line. This can lead to the understanding that these mothers' stress levels were higher than during the first measurement. The second measurement is expected according to McGrath et al. (2007), whose study revealed how parental cortisol levels drop when the parents massage their infants.

However, the third measurement's results are opposite to what is expected according to literature. There are several identifiable factors that could cause

the cortisol levels to rise. Due to the fact that one mother in the experimental group's saliva samples could not be used, the sample size decreased to only three participants, which can cause the data to be more vulnerable to fluctuation due to individual factors. Although the mothers received training in sampling the saliva, it is possible that the mothers did not follow the procedures according to instructions. As already stated it must be considered that the third measurements were scheduled to take place on the same morning that the mothers had to travel to the University for the post-tests and personal interviews. It is possible that the mothers experienced some level of anxiety or stress in anticipation of the interviews or rushed in order to be at the university at the scheduled time and, therefore, experienced higher stress levels.

6.2.2.2.3 CORTISOL LEVELS OF MOTHERS: COMPARISON WITHIN EXPERIMENTAL AND CONTROL GROUPS REGARDING FIRST AND THIRD MEASUREMENT

Friedman's ANOVA were used to do the comparisons within the groups due to the fact that there were more than 2 measurements per mother.

Table 12: Friedman ANOVA and Kendall Coefficient of Concordance: Mothers of Experimental and Control Groups

Variable	Experimental Group				Control Group			
	Average Rank	Sum of Ranks	Mean	Std. Dev.	Average Rank	Sum of Ranks	Mean	Std. Dev.
Measure 1	2.33	7.0	2.440	2.676	1.75	7.0	0.987	1.3450
Measure 2	1.66	5.0	0.866	0.463	2.12	8.5	0.457	0.2565
Measure 3	2.00	6.0	0.9466	0.703	2.12	8.5	0.975	1.1115
ANOVA Chi Sqr=0.67, p=0.7165, r = *0.22					ANOVA Chi Sqr=0.40. p=0.8187, r = *0.12			

Where:
Measure 1 = First / Base Line measurement
Measure 2 = Second measurement
Measure 3 = Third measurement

The results in Table 12 provide a description of the changes that occurred within each group throughout the duration of the four month intervention.

According to the results no statistical significant changes could be detected. This could be due to the small sample size. Nonetheless, practical significant effects are visible in both groups. The experimental group showed a small to medium ($r = 0.22$) practical significant increase in cortisol levels when comparing the last measurement with the basal and second measurement. Similar results are seen with the control group, with the third measurement showing a small ($r = 0.12$) practical significant difference to the first and second measurement. According to research reported by Field et al. (2005), IMIS (2006) and Horowitz (2007), it is expected that the cortisol levels on the third measurement should be lower for the experimental group. The opposite end result reported in Table 12 could lead to the assumption that the process of infant massage was not effective in lowering the mother's stress levels as reported through biological markers. However, seeing as the results from the mothers in the experimental group are similar to those of the infants in the experimental group (Table 4), it would be necessary to consider other reasons that could be responsible for the rise during the third measurement. Individual characteristics as well as the time and location during which sampling took place are factors that must be considered as possibly interfering with the results. From the results reported on Table 10, 11 and 12 it would seem that infant massage did not have the expected effect (lowering cortisol levels) on the mothers in the experimental group's stress levels.

6.2.3 AIM 3: THE EFFECT OF INFANT MASSAGE ON THE MOTHER-INFANT RELATIONSHIP

In order to determine the effect of infant massage on the quality of the relationship between the mother and her infant, this study made use of the Mother-to-Infant Bonding Scale as well as the Attachment Subscale from the Parenting Stress Index. By first examining the results from each instrument individually and then in combination, the effect of infant massage can be determined.

6.2.3.1 MOTHER-TO-INFANT BONDING SCALE

Table 13 illustrates how frequently the mothers in the experimental and control groups chose a certain category (superior quality bonding, good quality bonding, poor quality bonding) with respect to every concept described in the scale during the pre and post-testing (refer to Section 5.6.1.2 for a detailed description of the scale).

Table 13: Frequency Table: Comparison of Experimental and Control Groups with Respect to Pre and Post-testing

		Experimental Group		Control Group	
CONCEPT	Category	Pre-test	Post-test	Pre-test	Post-test
LOVING	0	4	4	3	3
	1	0	0	1	1
	Missing	0	0	0	0
HAPPY	0	4	4	2	1
	1	0	0	1	3
	2	0	0	1	0
	Missing	0	0	0	0
PROTECTIVE	0	2	3	2	3
	1	2	1	2	1
	Missing	0	0	0	0
NEUTRAL	0	3	3	3	4
	1	1	1	1	0
	Missing	0	0	0	0
DISLIKE	0	4	4	4	4
	1	0	0	0	0
	Missing	0	0	0	0
RESENTMENT	0	3	3	4	4
	1	1	1	0	0
	Missing	0	0	0	0
DISAPPOINTED	0	4	4	3	4
	1	0	0	1	0
	Missing	0	0	0	0
AGGRESSIVE	0	3	4	4	4
	1	1	0	0	0
	Missing	0	0	0	0
TOTAL	0	1	1	2	1
	1	2	3	1	1
	2	1	0	1	2
	Missing	0	0	0	0

Where
0 = Indication of superior quality bonding
1 = Indication of good quality bonding
2 = Indication of poor quality bonding

- **Difference in Loving**

The four mothers in the experimental group indicated during the pre and post-test that they experience a superior feeling of love for their infants. During the pre-test three mothers in the control group indicated that they experience a superior feeling of love for their infant and one mother indicated that she experiences a good feeling of love for her infant. During the post-test three mothers indicated that they experience a superior feeling of love for their infant and one mother indicated that she experiences a good feeling of love for her infant. It appears that the results for “Loving” remained unchanged for both groups.

- **Difference in Happy**

The four mothers in the experimental group indicated during the pre and post-test that they experience a superior feeling of happiness. During the pre-test two mothers of the control group indicated that they experience a superior feeling of happiness, one mother indicated that she experiences a good feeling of happiness and one mother indicated that she experiences a poor feeling of happiness. During the post-test one mother of the control group indicated that she experiences a superior feeling of happiness and three mothers indicated that they experience a good feeling of happiness. The result for “Happy” indicates that the experimental group’s results remained the same and that the control group’s results improved, implicating that they feel happier about their infants and motherhood.

- **Difference in Protection**

During the pre-test two mothers in the experimental group indicated that they experience superior feelings and two mothers indicated that they experience good feelings of protectiveness towards their infants. During the post-test three mothers indicated that they experience superior feelings of protectiveness towards their infants and one mother indicated that she experiences a good feeling of protectiveness toward her infant. Two mothers in the control group indicated during the pre-test that they experience superior feelings and two mothers indicated that they experience good feelings of

protectiveness towards their infants. During the post-test three mothers indicated that they experience superior feelings of protectiveness towards their infants and one mother indicated that she experience a good feeling of protectiveness toward her infant. Both groups reported an improved score for “Protective” during the post-test, implicating that they feel more protective towards their infants.

- **Difference in Neutral**

During both the pre – and post-test three mothers in the experimental group indicated that they do not experience feelings of neutrality towards their infants and one mother indicated that she experiences feelings of neutrality towards her infant. Three mothers in the control group indicated during the pre-test that they do not experience feelings of neutrality towards their infants and one mother indicated that she experiences feelings of neutrality towards her infant. During the post-test four mothers in the control group indicated that they do not experience feelings of neutrality towards their infants. It appears that the results for “Neutral” remained unchanged for both groups.

- **Difference in Dislike**

During both the pre and post-test all the mothers in both the experimental and control groups indicated that they do not experience any feelings of dislike for their infants. The results for “Dislike” remained unchanged for both groups.

- **Difference in Resentment**

During both the pre – and post-test three mothers in the experimental group indicated during the pre-test that they do not experience feelings of resentment towards their infants and one mother indicated that she experiences feelings of resentment towards her infant. The pre and post-test results reveal that four mothers in the control group indicated that they do not experience any feelings of resentment towards their infants. It appears that the results for “Resentment” remained unchanged for both groups.

- **Difference in Disappointment**

During both the pre and post-test four mothers in the group indicated that they do not experience any feelings of disappointment towards their infants. Three mothers in the control group indicated during the pre-test that they do not experience feelings of disappointment towards their infant and one mother indicated that she experiences feelings of disappointment towards her infant. During the post-test four mothers in the control group indicated that they do not experience feelings of disappointment towards their infants. The result for “Disappointment” indicates that the experimental group’s results remained the same and that the control group’s results improved, implicating less feelings of disappointment towards their infants.

- **Difference in Aggressive**

During the pre-test three mothers in the experimental group indicated that they do not experience feelings of aggression towards their infants and one mother indicated that she experiences feelings of aggression towards her infant. During the post-test four mothers in the experimental group indicated that they do not experience feelings of aggression towards their infants. During both the pre and post-test four mothers in the control group indicated that they do not experience any feelings of aggression towards their infants. The result for “Aggressive” indicates that the experimental group’s results improved, implicating that they experience less levels of aggressiveness towards their infants, and that the control group’s results remained the same.

- **Difference in Total Score**

During the pre-test one mother in the experimental group indicated that she experiences a superior quality bonding with her infant, two mothers indicated that they experience a good quality bonding with their infants and one mother indicated that she experiences a poor quality bonding with her infant. Results of the post-test reveal that one mother in the experimental group indicated that she experiences a superior quality bonding with her infant and three mothers indicated that they experience a good quality bonding with their infants. During the pre-test two mothers of the control group indicated that

they experience a superior quality bonding with their infants, one mother indicated that she experiences a good quality bonding with her infant and one mother indicated that she experiences a poor quality bonding with her infant. During the post-test one mother in the control group indicated that she experiences a superior quality bonding with her infant, one mother indicated that she experiences a good quality bonding with her infant and two mothers indicated that they experience a poor quality bonding with their infants.

From these results the statement can be made that the quality of bonding between the mothers and infants of the control group seemed to decline whereas the quality of bonding between the mothers and infants of the experimental group improved. The higher scores reported by the experimental group's mothers on the Total Score, indicate a better quality bonding with their infants in general than the control group, as well as an improved quality of bonding with their infants from the pre to the post-test results. These outcomes can lead to the understanding that infant massage promoted the quality of the emotional bond between mother and infant. This outcome correlates with results from studies conducted and reported by Field (2005), Horowitz (2007), IMIS (2006), McGrath et al. (2007) and Moore (2005).

6.2.3.2 ATTACHMENT SUBSCALE (PARENTING STRESS INDEX)

The scores of this subscale can be used as an indication of the parent's sense of emotional closeness to the child. A high score may be indicative of problems in the parent-child emotional bond or that the parent either is or feels unable to address the child's needs accurately (Abidin, 1995). However, it must be noted that according to the definitions accepted for bonding and attachment for this study, the Attachment Scale could be misleading as it, in fact, provides an indication of bonding. For this reason the Attachment Subscale's results will be used to refer to bonding from the mother to the infant.

6.2.3.2.1 ATTACHMENT: PRE AND POST-TEST COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS

Table 14 illustrates how the experimental and control groups compare during the pre and post-testing. This enables one to determine to what extent the groups differed before and after implementation of infant massage as well as the effect of it on the scores reported on the Attachment subscale.

Table 14: Non-parametric Mann-Whitney U test: Experimental and Control Groups Pre and Post-test

	Subscales	Rank Sum E	Rank Sum C	U	Z	p-level	r
Pre-test	AT	13.0	15.0	5.0	0.35	0.7237	*0.13
Post-test	AT	17.0	19.0	7.0	-0.29	0.7728	*-0.10

Where:
 Rank Sum E = Sum of non-parametric ranks in Experimental group
 Rank Sum C = Sum of non-parametric ranks in Control group
 Measure 1 = First / Base Line measurement
 Measure 3 = Third measurement
 AT = Attachment

According to Table 14 there were no statistical significant differences between the experimental and control group during either the pre or post-tests. However, it is possible to identify practical significant effects. The experimental and control group showed a small ($r = 0.13$) practical significant difference during the pre-test as well as during the post-test ($r = 0.1$). More information regarding the comparison between the control and the experimental group will be provided by the descriptive statistics.

6.2.3.2.2 DESCRIPTIVE STATISTICS

Table 15 provides the descriptive statistics as illustration of how the mothers in the two groups' scores on the Attachment (AT) subscale changed during the four month period of the intervention.

Table 15: Descriptive Statistics: Attachment Subscale

	Experimental Group		Control Group	
	Pre-test	Post-test	Pre-test	Post-test
	Median	Median	Median	Median
AT	35.0	45.0	30.0	25.0

AT = Attachment

The results from Table 15 show that the small practical significant difference between the experimental and control group as seen in Table 14 is due to the experimental group reporting higher scores on the Attachment subscale. Referring back to the discussion of this subscale in the section regarding the Parenting Stress Index, **high scores** can indicate that the parent does not experience a sense of emotional closeness to the child or experiences herself as unable to understand the child's needs accurately. The small practical significant difference between the two groups for the post-test as seen in Table 14 can be ascribed to the experimental group reporting the higher scores. The experimental group's post-test results are not just higher than the pre-test scores, but also higher than the control group's results. This can lead to the understanding that it is the mothers in the control group that experience a closer emotional bond with their infants than the mothers in the experimental group as measured by the Mother-to-Infant Bonding Scale.

6.2.3.2.3 ATTACHMENT: PRE AND POST-TEST COMPARISON WITHIN EXPERIMENTAL AND CONTROL GROUPS

The changes that occurred within the experimental group and within the control group during the four month period as determined through the non-parametric Wilcoxon Rank Test are conveyed in Table 16.

Table 16: Non-Parametric Wilcoxon Rank Test: Differences within Experimental and Control Groups

	T	Z	p-level	r
Experimental group	0.0			
Control group	2.0	0.53	0.5930	*0.27

Where:		
p	=	Statistical significance
r	=	Effect size
T	=	Test statistic
Z	=	Approximate Z-statistic

The results from Table 16 show that, although the experimental group reported higher scores during the post-test as seen on Table 15, it can not be viewed as either statistical or practical significant. The control group reported lower scores during the post-test and although it is not a statistically significant decrease, it can be viewed as a small to medium ($r = 0.27$) practical significant decrease. This can lead to the understanding that the control group reportedly experienced their relationship with their infants to be of better quality during the post-test than during the pre-test. From these results it is not possible to determine whether infant massage promoted an improved relationship between the mothers and infants of the experimental group. A possible reason for this phenomenon can be found in the qualitative data as gathered through the interviews (see Section 6.3). Two mothers in the control group recalled how their experience of the pre-tests made them more aware of their own feelings, attitudes and actions towards their infants as well as their infants' abilities. The increased awareness helped them to bring along the necessary changes in order to promote bonding.

The results of the Mother-to-Infant Bonding Scale and the Attachment subscale of the Parenting Stress Index seem to contradict each other. It is possible that the Mother-to-Infant Bonding Scale is more vulnerable to be influenced than the Attachment Subscale. It is possible that the mothers in the experimental group were more inclined to indicate a higher quality of bonding on the Mother-to-Infant Bonding Scale as they were aware that infant massage was the intervention and that they might have felt obliged to report an improved bond with their infants. The questions used in the Attachment subscale are possibly more objective and not as vulnerable to influence from the mothers' subjective views.

6.2.4 AIM 4: THE EFFECT OF INFANT MASSAGE ON INFANTS' GENERAL DEVELOPMENT

The Griffiths Mental Development Scales was used to determine the effect of infant massage on the infants' development on five areas. Through the tests it was possible to determine the infants' level of functioning before and after implementation of the infant massage as well as how each group's development changed over the four month period.

6.2.4.1 GRIFFITHS MENTAL DEVELOPMENT SCALES: PRE-TEST COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS

Table 17 illustrates how the infants in the experimental and control groups' development compare with respect to the pre-testing.

Table 17: Non-Parametric Mann-Whitney U Test: Comparison of Experimental and Control Group

Subscales	Rank Sum E	Rank Sum C	U	Z	p-level	r
Chronologic Age	23.0	13.0	3.0	1.44	0.1489	***0.51
General Quotients	16.0	20.0	6.0	-0.58	0.5637	*-0.20
Subscale A	21.0	15.0	5.0	0.87	0.3865	**0.31
Subscale B	21.0	15.0	5.0	0.87	0.3865	**0.31
Subscale C	19.5	16.5	6.5	0.43	0.6650	*0.15
Subscale D	23.0	13.0	3.0	1.44	0.1489	***0.51
Subscale E	20.5	15.5	5.5	0.72	0.4705	*0.26

Where:

Rank Sum E	=	Sum of non-parametric ranks in Experimental group
Rank Sum C	=	Sum of non-parametric ranks in Control group
Subscale A	=	Locomotor
Subscale B	=	Personal – Social
Subscale C	=	Hearing and Language
Subscale D	=	Eye-Hand Coordination
Subscale E	=	Performance
p	=	Statistical significance
r	=	Effect size

According to the results on Table 17, there were no statistical significant differences between the experimental and control group but practical significant differences could be identified. The biggest differences were visible on the chronologic age with a large ($r = 0.51$) effect size as well as

Subscale D: Eye-Hand Coordination's large ($r = 0.51$) effect size and the medium practical significant differences between the groups on Subscale A: Locomotor ($r = 0.31$) and Subscale B: Personal – Social ($r = 0.31$). Subscale C ($r = 0.15$), Subscale E ($r = 0.26$) and the General Quotient ($r = 0.2$) all showed a small practical significant difference between the groups. Due to the fact that the sample size is small and any factor can have a significant effect on the results, it is possible the differences can be explained by the fact that the experimental group's infants' ages range from 6 to 9 months and the control group's infants' ages range from one infant of 3 months of age and the others' ages ranging from 6 to 9 months. The large effect ($r = 0.51$) regarding the two groups' chronological age show that the experimental group is practical significant older than the control group. As the 3 month old infant is not capable of performing the same tasks as the 6 month old infants, the 3 month old infant's level of functioning may lower the overall scores of the control group. This should, therefore, be taken into account when interpreting the difference between the groups. More information regarding the comparison between the control and the experimental group will be provided by the descriptive statistics.

6.2.4.2 DESCRIPTIVE STATISTICS

Table 18 provides the descriptive statistics as illustration of how the infants in the two groups' development changed during the four month period of the intervention.

Table 18: Descriptive Statistics of Infants' General Development

	Experimental Group		Control Group	
	Pre-test	Post-test	Pre-test	Post-test
	Median	Median	Median	Median
Chronologic Age	7.7	12.8	7.0	12.1
General Quotients	106.1	100.0	111.2	101.2
Subscale A	8.9	15.5	7.5	11.3
Subscale B	9.1	13.8	7.4	12.5
Subscale C	7.5	12.6	7.7	12.5
Subscale D	8.2	11.5	7.5	11.9
Subscale E	6.5	11.0	6.2	10.5

Where:		
Subscale A	=	Locomotor
Subscale B	=	Personal – Social
Subscale C	=	Hearing and Language
Subscale D	=	Eye-Hand Coordination
Subscale E	=	Performance

- **Difference in Subscale A: Locomotor**

This subscale assesses the child's gross motor skills. This includes age-appropriate activities such as general movements, kicking in the bath, and ability to balance as well as the ability to co-ordinate and control movements. The medium ($r = 0.31$) practical significant difference between the two groups as seen in Table 17 for the pre-test is a result of the infants in the experimental group performing on a higher level of functioning.

- **Difference in Subscale B: Personal - Social**

The child's ability to take part in everyday activities and to interact with other children in addition to his/her level of independence is measured through this scale. This includes activities such as holding a spoon or displaying interest in other children and adults. The pre-test results show a medium ($r = 0.31$) practical significant difference between the two groups and the experimental group performed on a higher level of functioning.

- **Difference in Subscale C: Language**

The child's use of expressive and receptive language as well as an overall understanding of language is measured through this scale. In the case of infants the items for this subscale include the listening to sounds, familiar with the infant's own name, interest in pictures and making use of sounds and words. There is a small ($r = 0.15$) practical significant difference (Table 17) between the groups during the pre-test with the control group performing on the higher level of functioning.

- **Difference in Subscale D: Eye and Hand Coordination**

This subscale assesses the child's visual perception skills, physical dexterity and fine motor skills. To measure the infant's abilities on this scale some of the following items are used: infant follows bell with eyes, reach for object and search for fallen object. There is a large ($r = 0.51$) practical significant (Table

17) difference between the experimental and control group in the pre-test results and it was the infants in the experimental group that performed on a higher level of functioning.

- **Difference in Subscale E: Performance**

This subscale assesses the child's visuo-spatial awareness, speed of performance and precision. Items incorporated on this subscale for infants include shaking a box, picking up a toy and clapping hands. There is a small to medium ($r = 0.26$) practical significant difference (Table 17) between the experimental and control group in the pre-test results with the experimental group delivering the higher scores.

- **Difference in General Quotients**

The General Quotient is calculated by taking the average of the raw scores and converts the score using the appropriate norms. There is a small ($r = 0.2$) practical significant difference (Table 17) between the experimental and control group. The control group's infants performed better in general compared to the experimental group.

6.2.4.3 GRIFFITHS MENTAL DEVELOPMENT SCALES: POST-TEST COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS

Table 19 illustrates how the experimental and control group compares with each other during the post-testing. This enables one to determine to what extent the groups differed before and after implementation of infant massage as well as the effect of it on the infants' development.

Table 19: Non-Parametric Mann-Whitney U Test: Comparison for Experimental and Control Groups

	Rank Sum E	Rank Sum C	U	Z	p-level	r
Chronologic Age	22.5	13.5	3.5	1.30	0.1939	**0.46
General Quotients	19.0	17.0	7.0	0.29	0.7728	*0.10
Subscale A	24.0	12.0	2.0	1.73	0.0833	***0.61
Subscale B	20.0	16.0	6.0	0.58	0.5637	*0.20
Subscale C	19.0	17.0	7.0	0.29	0.7728	*0.10
Subscale D	18.0	18.0	8.0	0.00	1.0000	0.00
Subscale E	18.0	18.0	8.0	0.00	1.0000	0.00

Where:

Rank Sum E	=	Sum of non-parametric ranks in Experimental group
Rank Sum C	=	Sum of non-parametric ranks in Control group
Subscale A	=	Locomotor
Subscale B	=	Personal – Social
Subscale C	=	Hearing and Language
Subscale D	=	Eye-Hand Coordination
Subscale E	=	Performance
p	=	Statistical significance
r	=	Effect size

According to Table 19 there were no statistical significant differences between the groups during the post-testing, but medium to large practical significant effects are visible in two instances.

- There is a medium to large ($r = 0.46$) difference between the experimental and control group's chronologic age with the experimental group being the older group (Table 18).
- According to Table 19 a large effect ($r = 0.61$) on Subscale A: Locomotor indicate a practical significant difference between the two groups. The experimental group performed on a higher level of functioning than the control group (Table 18).

From these results it would seem that the two groups do not differ from each other during the post-test to the same extent as the pre-test. It is only the scores on Subscale A that indicate a noteworthy difference and this can lead to the understanding that infant massage could have had a detectable effect on the infants' locomotor abilities, meaning gross motor skills. This finding correlates with research conducted and reported by Field et al. (1998), Manious (2002) and Papalia et al. (2008) that found that, especially in the case with premature born infants, the massaged infants performed better on

the motor scales of the Bayley Scales of Infant Development and showed improved motor activity. It will be necessary to investigate the changes that occurred within each group during the four month period in order to gain a better understanding of the results provided in Table 19.

6.2.4.4 GRIFFITHS MENTAL DEVELOPMENT SCALES: PRE AND POST-TEST COMPARISON WITHIN EXPERIMENTAL AND CONTROL GROUPS

The changes that occurred within the experimental group during the four month period as determined through the non-parametric Wilcoxon Rank Test are conveyed in Table 20 and the changes that occurred within the control group are conveyed in Table 21.

Table 20: Non-Parametric Wilcoxon Rank Test: Experimental Group Pre and Post-tests

	T	Z	p-level	r
Chronologic age	0.0	1.83	0.0679	***0.91
General Quotients	2.0	1.10	0.2733	***0.55
Subscale A	0.0	1.83	0.0679	*** 0.91
Subscale B	0.0	1.83	0.0679	*** 0.91
Subscale C	0.0	1.83	0.0679	*** 0.91
Subscale D	0.0	1.83	0.0679	*** 0.91
Subscale E	0.0	1.83	0.0679	*** 0.91

Where:
 Subscale A = Locomotor
 Subscale B = Personal – Social
 Subscale C = Hearing and Language
 Subscale D = Eye-Hand Coordination
 Subscale E = Performance
 p = Statistical significance
 r = Effect size

It is evident from the results in Table 20 that, even though it was not possible to identify any statistical practical significant differences, large practical significant differences are seen on all the aspects measured through the Griffiths Mental Development Scales. Subscales A to E showed large ($r = 0.91$) practical significant increases from the pre-test to the post-test results (Table 18). The General Quotients also revealed a large ($r = 0.55$) effect but

according to Table 18 the post-test results decreased from the pre-test results.

Table 21: Non-Parametric Wilcoxon Rank Test: Control Group Pre and Post-tests

	T	Z	p-level	r
Chronologic age	0.0	1.83	0.0679	*** 0.91
General Quotients	1.0	1.46	0.1441	*** 0.73
Subscale A	0.0	1.83	0.0679	*** 0.91
Subscale B	0.0	1.83	0.0679	*** 0.91
Subscale C	0.0	1.83	0.0679	*** 0.91
Subscale D	0.0	1.83	0.0679	*** 0.91
Subscale E	0.0	1.83	0.0679	*** 0.91

Where:

Subscale A = Locomotor
 Subscale B = Personal – Social
 Subscale C = Hearing and Language
 Subscale D = Eye-Hand Coordination
 Subscale E = Performance
 p = Statistical significance
 r = Effect size

There are no statistical significant differences between the control group's pre and post-test results, but practical significant differences are evident on every aspect measured through the Griffiths Mental Development Scales. According to Table 18 the large ($r = 0.91$) effects seen in Subscale A to E are a result of the increase from the pre to the post-test results. The General Quotients decreased (Table 18) with a large ($r = 0.73$) practical significant effect from the pre to the post-test results. The results from the control group are similar to the experimental group's results. Although both groups improved on a practically significant level, the General Quotients that represent the average total of the five subscales and converted according to the appropriate norms, indicate a decrease in scores.

This can lead to the understanding that, with the exception of the experimental group's improved performance on Subscale A: Locomotor, infant massage did not have a detectable effect on the infants' general development. However, the literature regarding the effect of massage on infants' development indicates primarily an improvement in motor skills, weight gains and reduced stress (Field, 1998, 2001; Mainous, 2002). The duration of these studies were similar to the duration of the present study and

one can come to the understanding that it is on physical and motor level that results can most probably be expected. It can, therefore, be expected that the infants in the present study would perform better on Subscale A: Locomotor in comparison to the other subscales. Even so, should the duration of the present study be prolonged, it could be expected that improvements on the other subscales might be more prominent. A study as reported by Caulfield (2000) assessed infants' development one year after implementation of infant massage. In comparison with the control group, the infants in the experimental group performed better on both the motor and the mental scales of the NeoNatal Behaviour Assessment Scales.

The data from the quantitative data illustrates the changes that occurred in both the experimental and control group with regard to the mothers and the infants' (a) stress levels as measured through the Parenting Stress Index and cortisol levels, (b) relationship between the mother and infant as determined through the Mother-to-Infant Bonding Scale and (c) the infants' development as determined through the Griffiths Mental Development Scales.

The following section reports the qualitative data as obtained through the personal interviews.

6.2.5 AIM 5: DETERMINE THE MOTHERS' SUBJECTIVE EXPERIENCE OF THEIR INFANTS, THEMSELVES AND MOTHER-INFANT INTERACTION AS REPORTED THROUGH QUALITATIVE MEASURES DURING POST-TESTING

From the qualitative data, it is possible to identify the following themes in both the experimental and control group. Further illustrations of the themes will be provided in the form of quotes from the interviews. It will be translated from Afrikaans to English.

6.2.5.1 EXPERIMENTAL GROUP

The questions discussed during the personal interviews focused on the mothers' experience as well as the infants' experience as perceived by the mothers.

6.2.5.1.1 MOTHERS' EXPERIENCES

From the data gathered during the personal interviews with the mothers after termination of the intervention, it was possible to identify the following themes.

- **Different types of touch**

Two mothers noticed a difference in the type of touch they use to interact with their infants. Before implementation of the infant massage routine, the bulk of touching the infants would be to dress or to feed them, whereas after implementation the mothers are now frequently touching their infants in order to cuddle and play. Thus, instead of just handling the infant, the mother is now touching the infant with the sole purpose to interact with the infant in a more intimate manner. The one mother specifically mentioned that she makes use of this special touch as a form of communication to communicate her love to her infant.

"I made time to spend more time with him, it is not just a case of putting on a nappy or putting on a vest and then we go. It became playtime, it is fun."

"Where you usually would change the nappy or put on clothes, you would now touch her more often. There is a difference between touch and handle. Handle is when you clothe or bath her and touch is just to touch her."

- **Quality of time spend with infant**

The four mothers agree that they are now able to share a specific special time with their infant where they enjoy each other's company without any external

disturbance. They have adjusted their daily routine to ensure that they spend an extra amount of time focusing only on their infants.

"It is our special time together, no one bothers us and it is my-and-her time together."

"I want to spend more time with her, play with her."

- **Bonding**

Three mothers are of the opinion that they share a better bond with their infants. One mother experiences a need to spend more time and touch her infant. The second mother feels that, even though she previously shared a good relationship with her infant, the process of infant massage brought them closer by providing them with the opportunity to spend quality time with each other. The third mother mentioned that infant massage gave her and her infant time to cuddle which strengthened their bond.

"I have a need to touch her, not just to handle, but to touch."

"It really helped to have the special time in the evening; it brought us closer to each other."

"It was nice to have an extra opportunity to cuddle. If he liked it could I give an extra hug and kiss. It builds a good bond."

- **Self-confidence**

One mother reported that she gained more confidence in her own abilities as a mother. The fact that her infant can be described as happier helps her to feel more confident and less anxious.

"It (infant massage) gave me more self-confidence. The happier your infant, the more self-confidence you have."

- **Patience with infant**

Two mothers discovered that they are more patient with their infants.

"I am much more patient. I would usually become very angry if he fussed, but now I am much calmer."

- **Relaxation**

All four mothers are of the opinion that performing infant massage helped to make them feel more relaxed. According to the mothers, it is due to the fact that it was required of them to spend at least five minutes of quiet time with their infants.

"The more I do it (perform infant massage) the more she becomes relaxed, just lies and relax. It makes her and me calm, we both relax more."

"It is enjoyable, it makes us more calm. So calm that I fell asleep alongside her. I usually ly with her on the bed and perform the infant massage. The relaxation is due to us being together and her, at long last, being more relaxed."

6.2.5.1.2 INFANTS' EXPERIENCES AS PERCIEVED BY MOTHERS IN EXPERIMENTAL GROUP

The following themes became evident from the mothers' recollection of their infants' experience of infant massage.

- **Enjoyment of infant massage**

All four of the mothers reported that it is clear that, ever since the infants became more familiar with infant massage, they are enjoying the procedures. Two mothers explained how the massage takes on a form of play and evokes laughter and smiles from both themselves and the infants.

"It makes her more relaxed and she enjoys it. It is just giggles and laughter and she really enjoys it a lot."

"It became playtime, it is fun."

- **Relaxation**

All four mothers observed that their infants became more relaxed when receiving infant massage.

"The more I do it (perform infant massage) the more she becomes relaxed, just lies and relax. It makes her and me calm, we both relax more."

"He is much more relaxed, massage has a relaxing effect on him."

- **Attention and affection**

Four mothers noticed that their infants are actively seeking them out for attention and affection. Three mothers became aware that their infants would approach them more frequently in order to receive the attention they want.

"She is much more attached to me. She always was crazy about me but now she is very crazy about me."

"It is wonderful when you discover that she starts to know that you are her mother, because that happened since we did the (infant massage) course. You discover that she recognizes you as her parent. She will seek more attention, for example when I do my make-up she will crawl to me and stand up against my leg. You can see that she wants to be picked up. It is wonderful to see that she seeks your attention and only wants to be picked up and be held."

6.2.5.2 CONTROL GROUP

The questions discussed during the personal interviews focused on both the mothers' and infants' experiences as perceived by the mothers.

6.2.5.2.1 MOTHERS' EXPERIENCE

From the data gathered during the personal interviews with the mothers after four months (in which they did not participate in the intervention programme) it was possible to identify the following themes:

- **Unchanged relationships**

Two mothers in this group reported that they cannot identify any significant changes in their relationships with their infants. Any changes in the infants' behaviour towards the mothers are recognized as part of the infants' natural development.

- **Increased awareness**

The two remaining mothers of the control group experienced a difference in their relationships with their infants after completion of the first round of tests. The one mother reports that the results from the Griffiths Mental Developmental Scales made her aware of her infant's abilities, making it easier for her to interact with her infant. She gained both more trust in her infant and confidence in her own abilities as a mother. This contributed to an improved mother-infant relationship.

"When I discovered that she wasn't as far behind (regarding developmental level according to the Griffiths), I played with her more often to help her as she was so little. This improved our relationship so much."

"I trust her more, I know now that she is capable of doing things, for example, playing with the blocks. It makes me feel good to know that my child can

perform, I did nothing wrong; I know that everything that I do is right. It makes one feel better about yourself."

The second mother became more aware of her own feelings and attitude towards her infant after completing the research questionnaires. The increased awareness enabled her to bring along change in the negative feelings and frustration she frequently experienced toward her infant. The adjustment helped her to view her infant in a different light. This contributed to a positive change in their relationship, strengthening the bond between them.

"I can still remember how I felt when I completed the first forms. With the year that passed I feel much closer to her. I don't feel "Grrrr...." anymore. I feel much closer to her; we are more dependent on each other. It is because I became more aware of how I felt and I said to myself to become more relaxed."

6.2.5.2.2 INFANTS' EXPERIENCE AS PERCEIVED BY MOTHERS IN CONTROL GROUP

Two themes became apparent during the interviews with the mothers in the control group.

- **Unchanged relationships**

Two mothers reported that they do not detect any significant changes in their infants' reactions towards them.

- **Improved relationship**

The two mothers who became more aware of their own reactions toward the infants noticed a change in the infants' reactions towards them. The one infant would specifically seek her mother's attention opposed to her previously seeking attention primarily from her father. The other mother is of the opinion that she and her infant are more dependent on each other and that this contributes to the improvement in their relationship.

"If she didn't feel good she always just wanted to be with her father. Now she will only come to me if she feels ill.... Yes, she is very much closer to me. I think she gets the feeling that we trust her more when she plays with something."

6.2.5.3 DISCUSSION: THE MOTHERS' SUBJECTIVE EXPERIENCE OF THEIR INFANTS, THEMSELVES AND MOTHER-INFANT INTERACTION AS REPORTED THROUGH QUALITATIVE MEASURES DURING POST-TESTING.

The literature study places emphasis on certain factors that can improve the relationship between mother and infant. The quality and amount of touch (Kennel & McGrath, 2005; Klaus & Kennel, 1976), spending time alone with each other without external intruders (Jernberg, 1979) and time as a resource invested in the child by the parent (Huston & Rosenkrantz Aronson, 2005) are some of the factors recognised to enhance bonding. An investigation into the mothers in the experimental group's experience of infant massage reveals to which degree the factors addressed by the literature study feature in their experience. The main changes noticed by two mothers seem to concern the quality and amount of time spent with their infants. These mothers felt an increased need to spend time with their infants and from their observations it seems that the infants experience the same need. The mothers reorganised their schedules in order to ensure that they spend more time with their infants than before and the infants are found to approach their mothers more often in order to receive attention. It can be concluded that both parties experience a need to maintain proximity. Referring back to the definitions regarding bonding and attachment accepted for this study, it becomes clear that some of the mothers' experiences fit in with the definition.

The other factors mentioned by some of the mothers in the experimental group regarding improved maternal self-confidence and patience can be seen as a sign of an improved relationship. According to McGrath et al. (2005) and Moore (2005), the enhanced self-confidence can be the product of the mother gaining a better understanding of her infant. By having a better

understanding, the mothers may be more willing to be patient with the infant. The Oxford English Dictionary Online (2008) defines the term "patient" as the ability to wait calmly or to be understanding of other people's faults or limitations. It would seem that patience can be linked with empathy. Empathy implicates a more accurate understanding and appropriate reaction of the other person's feelings and experiences. It is aspects such as parental empathy, emotional intimacy in the relationship and feelings of competence in the parental role that can reduce parental stress (Willinger et al., 2005). This may account for the reasons why the mothers feel that they are more relaxed. They experience an improvement in their relationships with their infants, a fact proven to contribute to lower parental stress levels. Through the improved relationships they feel more competent as parents because of the positive reactions from their infants towards them. The infant's positive response to the infant massage by expressing joy and becoming more relaxed enforces maternal confidence and provides the foundation for sensitive parenting, which in turn promotes a better understanding of the infant. The act of infant massage can help them to communicate the understanding to the infant as touch is seen as a form of emotional communication (Stack, 2001). Previously, the main way of communicating their love for their infants would be through verbal and non-verbal communication, which could be difficult for the infant to understand, especially when the infant is still very small. The touch communication can, therefore, serve to bridge the communication gap. The message of love is communicated in a direct way which is more understandable for the infant.

The theme of infant relaxation is prominent in the data gathered from the interviews. Although the underlying mechanism for this phenomenon cannot be identified with certainty, a possible explanation based on the literature regarding massage and relaxation can be proposed. From the literature and studies as described by Kennell and McGrath (2005) and Sadock and Sadock (2007), reassurance of the mother's love and comforting presence enables the infant to relax. On a physical level it is proved through previous research how massage can help a person to relax by lowering blood pressure, lowering stress and anxiety levels, improving concentration and relieving pain. Overall,

this can account for the improved relaxation in the infants as perceived by the mothers in the experimental group. This acts as a positive feedback system. As the infant becomes visibly more relaxed, it is easier to predict his/her reactions and to soothe the infant when distressed. It results in the infant showing less negative affect. This contributes to the parent's experience of competence (Prudhomme White et al., 2000) and, therefore, lowers stress levels.

Qualitative data gathered from two of the four mothers in the control group leads to the assumption that any intervention, even in the form of questionnaires and psychometric scales, may have a noteworthy impact on the mother-infant relationship. The one mother gained awareness of her own reactions to her infant and decided to change for the better. Her resolution to be more patient with her infant helped them to grow closer as the mother's level of frustration lessened. The second mother found that gaining knowledge of her infant's abilities helped her to develop a better bond with her infant. The negative view she held about the infant's physical development was replaced with a positive view after becoming aware of her infant's actual level of development. This enabled her to trust her infant more as well as increasing her self-confidence in her own abilities as a mother. The enhanced self-confidence and levels of trust are factors proven to be beneficial for the development of a high quality bonding. This is confirmed by the mother when she explains how their relationship improved remarkably. The other two mothers reported no significant change in their relationships with their infants and it can, therefore, be assumed that it might require more specified interventions to have a noticeable change.

6.2.6 AIM 6: COMPARE THE MOTHERS AS PARTICIPANTS' EXPERIENCE OF THEIR INFANTS, THEMSELVES AND MOTHER-INFANT INTERACTION AS REPORTED THROUGH QUANTITATIVE MEASURES AND THROUGH QUALITATIVE MEASURES.

The quantitative and qualitative data for the experimental and control groups will be integrated in order to determine to what extent the data sets support or differ from each other. It will be discussed according to the variables investigated in this study, namely stress, bonding and development.

6.2.6.1 EXPERIMENTAL GROUP

The mothers' experience of infant massage with regards to the three variables will be discussed in the next section.

- **STRESS**

The experimental group's stress levels as reported through the Parenting Stress Index and data from the interviews were lower after cessation of the infant massage intervention. The mothers related how they felt more relaxed during the infant massage because it forced them to calm down and spend quiet time with their infants while both take part in a pleasurable activity. The results from the saliva cortisol levels do not correlate with the previous mentioned results. According to the cortisol levels measured during the third measurement, the mothers experienced higher levels of stress. Possible reasons for this phenomenon are explored in the section regarding Aim 6 (Section 6.4.3.1). The cortisol results from the infants in this group follow a similar pattern to the mothers' results. A possible explanation for this phenomenon may be the fact that the mother-infant pairs are not just genetically linked but also share the same environment. According to De Weerth and Van Geert (2002) and Goldberg et al. (2003), these are the two conditions that provide satisfactory matched pairs to study adult-infant differences. As the infant massage is an intervention that involves both the mother and the infant it also implies similar changes for the both of them. It

can, therefore, be expected that the infants' cortisol levels will vary in similar ways than their mothers' results. Even though the infants' cortisol values were not lower after cessation of the four month intervention, every mother in the experimental group experiences her infant to be more relaxed while being massaged. It correlates with the various research studies done by Field and Diego et al. (2004) who found infants to be more relaxed after receiving infant massage.

According to the results from the Parenting Stress Index, the mothers in the experimental group reported lower stress levels, specifically in the Child Domain. It would seem that they experience the child's characteristics to be a lesser contributory factor to their stress levels than before implementation of the infant massage. Their collective scores on the Parenting Domain and Life Stress seem to indicate that characteristics in themselves and stressors in their daily lives may now be the main contributing factors to their stress levels. It is interesting to note that the lower stress levels as reported through the Parenting Stress Index results and during the interviews are not reflected in the cortisol measurements. Instead of the expected lower cortisol levels during the third measurement, the results report cortisol values higher than the basal values recorded during the first measurement indicating more stress experiencing (Nash & Thebarge, 2006). The reason for this phenomenon is not clear and a few factors must be considered. Due to the small sample size, it is possible that any factor can have a significant influence on the results.

- (a) According to Power (2004) and Sparrow (2007), the parent-child relationship has a significant big influence on the individual's stress levels. The mothers reported that they found the infants to be more relaxed during the infant massage, that the infants enjoys the interaction and actively seek the mothers' attention and affection. The positive reaction to the mother's actions can improve bonding by helping the mother to experience more positive feelings towards her infant. According to the results of the Mother-to-Infant Bonding Scale the mothers experience an enhanced quality of bonding with their infants. This is confirmed through the data collected from the interviews where

three mothers specifically stated that they shared an improved bond with their infants. The improved bond can, therefore, serve to lower perceived stress levels in the mothers, although not visible through the cortisol measurements.

- (b) The results on the Parenting Stress Index illustrate that the reported scores on the Parenting Domain (PD) and Life Stress (LS) increased. It is possible that it is these sources of stress that are reflected in the increased cortisol values.
- (c) The mothers' individual characteristics and circumstances may have a significant influence on the cortisol values.

- **BONDING**

In general the mothers found the infants to respond positively to both the practice of infant massage as well as to them as mothers in the form of exhibiting an increased need to be with their mothers. It can be debated that the positive reactions from and changes within the infants are the factors that promoted the enhanced emotional bond as reported through the Mother-to-Infant Bonding Scale and during the interviews. One might even reason that the lower stress levels on the Child Domain reported during the post-test can be linked to the enhanced bonding. According to Levy and Orlans (2000) and Swain et al. (2007), the three groups of factors that can impair bonding are the parental factors, child factors and environmental factors. It is the same categories investigated by the Parenting Stress Index (Abidin, 1995). According to Table 6 the experimental group reported lower scores on the Life Stress Scale and more specifically, lower scores on the Child Domain. Pearce and Ayers (2005) report that a mother's expectations and evaluation of the infant's characteristics can influence the mother-infant bond. The mothers' positive evaluations of their infants may, therefore, enhance positive feelings towards the infants, promoting a high quality of bonding. Other than the above mentioned factors, other aspects must also be considered to contribute to the enhanced bonding. Prominent themes arising from the interviews were the difference in the type of touch, touch as a form of communication and spending quality time with each other. These are the same themes that,

according to the literature (Lappin & Kretschmer, 2005; McGrath et al., 2007; Moore, 2005), promote bonding. The results from the Mother-to-Infant Bonding Scale, the personal interviews and Parenting Stress Index lead to the conclusion that the practice of infant massage promotes bonding and, therefore, facilitates an improved relationship between the mother and infant.

- **DEVELOPMENT**

According to the literature study, it is expected that the infant massage will promote the infant's general development. According to the results (Table 7), the infants' performance on the Griffiths Mental Development Scales revealed that there was a large practical significant increase from the pre-test to the post-test. However, when their results are compared to the results of the infants in the control group, it becomes clear that the latter's performance are similar to the experimental group's results. The only difference between the groups seems to be on Subscale A: Locomotor. As discussed in section 6.2.4.4 it was found with most studies that the infants' performance on motor activity improved the most when they were massaged. From this study it is not possible to determine with certainty whether infant massage promoted general development in the infants in the experimental group. It is possible that the duration of the intervention was too short and comparison of the groups after a period of a year might result in different outcomes, as seen in the study described by Caulfield (2000).

6.2.6.2 CONTROL GROUP

The mothers' experience with regards to the three variables will be discussed in the next section.

- **STRESS**

The control group's stress levels as reported through the Parenting Stress Index, cortisol levels and data from the interviews were higher after four months during which normal interaction (no infant massage) took place. It

was expected that the stress levels would be similar or higher when compared to the pre-test results. However, it is interesting to note that the infants' second saliva sample revealed cortisol levels lower than the base line measurement although the third measurement increased to such an extent that it was higher than the base line measurement (Table 3). The mothers' cortisol levels increased gradually from the base line measurement to the third measurement.

The mothers in the control group reported higher stress levels on the Parenting Stress Index during the post-test in comparison with the pre-test results. Just as with the experimental group, the mothers in the control group reported an increase on the Parenting Domain subscale, indicating that factors in this domain may be the main contributing factors to the mothers' stress levels. The cortisol values of the mothers correlate with the Parenting Stress Index results revealing a gradual increase in cortisol values, associated with an increase in stress levels (McEwen, 2005). The theme of relaxation and lower stress levels did not feature during the interviews with the mothers in the control group.

• BONDING

With regards to bonding, an important theme that featured during the interviews is an increased awareness within two of the mothers. They are of the opinion that, just by answering the questionnaires and gaining knowledge regarding their infants' level of functioning, as well as becoming aware of their infants' abilities, enabled them to have a better relationship with their infants. In turn, positive feedback from their infants enforced the mothers' positive behaviour, feelings and attitudes towards the infants. This could explain the reason why the Attachment (AT) subscale's scores for the control group decreased for the post-tests, indicating an improvement in the mother's ability to form an emotional close bond with her infant. According to the results of the Mother-to-Infant Bonding Scale, there was some improvement on the Disappointment, Protective and Neutral concepts although the Total Score still indicates a lower quality of bonding than the experimental group.

- **DEVELOPMENT**

The infants' performances on the Griffiths Mental Development Scales reveal that the infants performed practical significantly better during the post-test than during the pre-test. Compared to the experimental group's results it is not possible to identify any specific difference between the two groups after cessation of the four month intervention.

6.3 EVALUATION OF AIMS AND HYPOTHESES

This section presents a short evaluation of the aims and hypotheses of the research.

6.3.1 AIM 1: THE EFFECT OF INFANT MASSAGE ON INFANTS' STRESS LEVELS

Ha1 state: Tactile stimulation, in the form of physical touch through the act of infant massage, decreases secretion of steroid hormones such as cortisol in the infant, therefore lowering stress levels.

The effect of infant massage on the infant's stress levels was determined through the use of saliva cortisol levels measured on three occasions. High levels of cortisol are indicative of high stress levels. Each groups' results were compared against themselves and the other group. Both groups' third measure revealed higher cortisol levels compared to the base line measurement, indicating that both groups experienced higher levels of stress during the third measurement. The experimental group's high cortisol levels compared to the control group lead to the understanding that the former group experienced higher levels of stress. From the results gathered in this study Ha1 cannot be accepted.

6.3.2 AIM 2: THE EFFECT OF INFANT MASSAGE ON THE MOTHERS' STRESS LEVELS

Ha2 states: *The process of infant massage leads to a decrease in the mother's stress levels as reported through quantitative measures.*

The effect of infant massage on the mother's stress levels was determined through the use of saliva cortisol levels measured on three occasions. Each groups' results were compared against themselves and the other group. Both groups' third measure revealed higher cortisol levels compared to the base line measurement, indicating that both groups experienced higher levels of stress during the third measurement. The experimental group's higher cortisol levels compared to the control group during the third measurement indicates higher levels of stress in the experimental group. From the results gathered in this study Ha2 cannot be accepted.

The study made use of the Parenting Stress Index which is used to identify the major sources or domains of parenting stressors. Both groups' mothers were requested to complete the Parenting Stress Index during the pre and post-tests. Intra and inter-group comparisons were made and they revealed the experimental group's results to decrease from the pre-test to the post-test and to be lower than the control group's post-test results, meaning that the experimental group experienced lower stress levels.

From these results it is not possible to state with certainty whether infant massage lowered the mothers' stress levels or not. In terms of biological measures, Ha2 cannot be accepted, but in terms of psychological measures, Ha2 can be accepted.

6.3.3 AIM 3: THE EFFECT OF INFANT MASSAGE ON THE MOTHER-INFANT RELATIONSHIP

Ha3: *The process of infant massage will enhance the relationship between mother and infant; therefore improve the quality of bond forming from mother to infant.*

In order to determine the effect of infant massage on the quality of the mother-infant relationship, this study made use of the Mother-to-Infant Bonding Scale and the Attachment Subscale from the Parenting Stress Index. The Mother-to-Infant Bonding Scale results showed that the experimental group's mothers experienced both an enhanced quality of bonding after termination of the intervention and an improved bond with their infants compared to the control group's mothers. It correlates with the experimental group's mothers' experience of an improved bond with their infants. However, the results of the Attachment subscale indicate that the control group experiences a better bond with their infants. In conclusion, based on the results from the Mother-to-Infant Bonding Scale Ha3 can be accepted as true.

6.3.4 AIM 4: THE EFFECT OF INFANT MASSAGE ON INFANTS' GENERAL DEVELOPMENT

Ha4 states: *Tactile stimulation, in the form of physical touch through the act of infant massage, improves the infant's general development.*

The Griffiths Mental Development Scales was used to determine the effect of infant massage on the infants' development on five areas. Intra and inter-group comparison showed how each group changed over time. The results showed that the infants in the experimental group improved on Subscale A: Locomotor but no further improvements of practical significance could be detected as infants in both the experimental and control group improved on a practical significant level during the four months. Ha4 can, therefore, be partially accepted as true.

6.3.5 AIM 5: DETERMINE THE MOTHERS' SUBJECTIVE EXPERIENCE OF THEIR INFANTS, THEMSELVES AND MOTHER-INFANT INTERACTION AS REPORTED THROUGH QUALITATIVE MEASURES DURING POST-TESTING.

The data retrieved from the personal interviews indicate that the mothers found infant massage to be beneficial in the sense that they experienced both themselves and their infants to be more relaxed and that their relationships with their infants improved. Other factors such as improved self-confidence, patience and an increased need to maintain proximity mentioned by the mothers in the experimental group and an increased awareness on some of the mothers in the control group's behalf became evident. In total the mothers in the experimental group found infant massage as an enriching experience.

6.3.6 AIM 6: COMPARE THE MOTHERS AS PARTICIPANTS' EXPERIENCE OF THEIR INFANTS, THEMSELVES AND MOTHER-INFANT INTERACTION AS REPORTED THROUGH QUANTITATIVE MEASURES AND THROUGH QUALITATIVE MEASURES.

An evaluation of all of the results regarding the mothers' stress levels in the experimental group reveals correlations between the data gathered from the Parenting Stress Index and the personal interviews. However, it is not the case when these results are compared to the biological measures. It would seem that the mothers' subjective recalling of their stress levels does not correlate with the objective measurements. It could be debated that the mothers in the experimental group still experience similar levels of stress as before implementation of the practice of infant massage, but that by implementing certain changes in their daily routine, their attitudes, feelings and actions it altered their experience of the stressors. Therefore, on a subjective level they may experience their stress levels to be reduced, but the biological measure as a form of objective perspective indicates that it is not the case. In conclusion, if a person reports lower stress levels either through interviews or through psychological questionnaires, it might not be true on a biological level. The mothers in the control group's results on the Parenting

Stress Index and cortisol levels correlated as both sets of post-test results were higher.

With regards to bonding the mothers in the experimental group reported improved emotional bonds through the Mother-to-Infant Bonding Scale and during the interviews, but not through the Attachment subscale of the Parenting Stress Index. The results from the interviews and the Mother-to-Infant Bonding scale lead to the conclusion that the practice of infant massage promotes bonding and, therefore, facilitate an improved relationship between the mother and infant. Two mothers in the control group reported during the interviews that their relationship with their infants improved due to improved awareness of their own feelings and the infants' abilities, which correlates with the improved score on the Attachment subscale. This indicates that any form of intervention can create awareness and allow for changes to occur in the mother-infant relationship.

6.4 SUMMARY

Chapter 6 reported the results as obtained through the quantitative and qualitative measures used during the pre and post-tests. The statistical analysis showed that no statistical significance could be found on any of the measures but practical significant effects could be detected in most instances. According to the results, infant massage did have an effect on (a) stress by decreasing the mothers' stress levels as reported through the Parenting Stress Index and the interviews, and (b) bonding by improving the emotional tie between mother and infant as reported through the Mother-to-Infant Bonding Scale and interviews. It appears that infant massage did not have an effect on the infants or mothers' stress levels as measured through the saliva cortisol levels. The results obtained from the Griffiths Mental Development Scales showed that infant massage had an effect on the infants' motor abilities but did not have a detectable effect on the other aspects of development as measured through the Griffiths.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

7.1 INTRODUCTION

This chapter will provide a summary of the aims and conclusions from the literature review and study. It includes the strengths and limitations of the study as well as recommendations for future studies.

7.2 SUMMARY OF LITERATURE AND OBJECTIVES

A summary of the literature, conclusions obtained and aims for this study will be provided in the following sections.

7.2.1 CONCLUSIONS FROM LITERATURE REVIEW

The literature review focused on three concepts namely stress, bonding and development and from this review certain conclusions could be reached.

7.2.1.1 STRESS

For the purpose of this study stress can be viewed as the individual's response on a biological, emotional, cognitive and behavioural level when confronted with a perceived physical or psychological stressor that threatens the body's homeostatic systems. From the definition it is evident that stress should ideally be approached from physiological, psychological and environmental viewpoints. The literature makes it clear that stress levels should ideally be low as chronic high stress levels, thus high cortisol levels, can be detrimental to an individual's physical and mental health. The majority of studies make use of cortisol as biomarker for stress. It is proven to be a reliable and uncomplicated way to measure stress levels as it is minimally intrusive and can be performed by the participants. From the literature

several factors were identified to have an effect on an individual's stress levels. In general, stressors in the form of physical illness, relationship problems and stressful life events were proven to elevate stress. Factors applicable to infants include physical conditions such as teething and colic or psychological factors such as the parent-child relationship. The three main factors impacting this relationship are identified as the child's characteristics, parental characteristics and demographic factors. According to the literature, infant massage can have a significant effect on the first two factors. Changes within the child and the child's functioning are shown to include decreased infantile stress and anxiety levels, improved concentration, weight gain and socio-emotional development. Changes in the parents include enhanced self-confidence and feelings of competence. It can be concluded from the literature that infant massage would help to alleviate factors in both the child and the parent that can make it difficult for a parent to fulfil his/her parenting role. It can also be concluded that infant massage can alleviate the parents' stress level as it promotes a better bond between the infant and the parent, making it easier for the parent to understand her/his infant's needs and characteristics. From the literature study it is, therefore, possible to reach the conclusion that infant massage will lower the infants and the mothers' stress levels. The following section focuses on the parent-child bond and how infant massage influences this bond.

7.2.1.2 BONDING

For the purpose of this study the term "bonding" can be defined as the emotional tie that develops from the primary caregiver, in most cases the mother, to the infant and that it is characterised by a need for both to maintain physical and psychological proximity to each other in the dyad. This definition is similar to the definition for attachment which defines attachment as the development of the relationship from the infant to the attachment figure and that there is an expectation that the attachment figure will care for the child in the dyad. The two concepts differ in the way that, with bonding, the emotional tie develops from the caregiver to the child and, with attachment; the emotional tie develops from the child to the attachment figure. The literature

reveals several factors that have a positive influence on bonding. Some of these include eye-to-eye contact, the quality and amount of skin to skin contact as well as the caregiver's own perception of bonding.

As indicated in the discussion of stress, there are three categories of factors that can have a negative impact on the development of bonding, namely parental contributions, child contributions as well as socio-economic and environmental contributions. From the literature it can be concluded that, if it is possible to address and eliminate the problems in these areas as much as possible, the process of bonding will be encouraged. It is important that a good quality of bonding exists between the parent and child as the literature review explains how bonding can influence the infant's development with regards to brain development and emotion regulation. It can be concluded from the literature that there is a relationship between bonding and stress. The parent-child relationship has a significant impact on an individual's ability to cope with stress. The parent is able to understand the infant, display acceptance and empathy and provide accurately in the infant's needs. This can enhance the parent's self-confidence regarding own parenting abilities and skill. As both parties are reinforced in a positive manner, stress levels can be expected to decrease. Through the process of infant massage it is possible to encourage a good quality of bonding. Infant massage has been described as a form of emotional communication and can be used to relate the mother's love to her infant without having to use words. The practice also requires the mother-infant dyad to spend more time with each other while only focusing on each other. This provides the mother with the opportunity to learn and understand her infant's cues, enabling her to interpret them correctly and act accordingly. The infant experiences her/his needs to be understood and fulfilled and the mother gains more self-confidence in the knowledge that she is able to fulfil her maternal role. It is, therefore, possible to reach the conclusion that, according to the literature review, infant massage helps to strengthen the emotional bond between parent and the child.

The following section provides a summary of the literature review with regards to the effect of infant massage on an infant's development.

7.2.1.3 DEVELOPMENT

The literature review makes it clear that, when exploring the concept of development, it is necessary to focus on both physiological and psychological development, as it would seem that a relationship exists between these two areas. Focusing on stress, the literature explains how cortisol is secreted by the body during stressful times. Should it be the case that an individual experiences chronic high levels of stress, the constant secretion of cortisol can be detrimental to the individual's health and development as high cortisol levels are proven to have a harmful effect on various body functions and systems. It can be concluded that, if stress levels are not kept at bay it may have dire consequences for a person's development.

According to the literature review, bonding has an effect on development. Through the healthy interactions within the parent-child relationship the infant receives necessary and important stimulation. Development of emotion regulation and the brain can be influenced by the quality of the emotional bond. It can, therefore, be concluded that it is beneficial for an infant to experience controlled levels of stress together with a bond of high quality with his/her caregiver/parent as these conditions contribute to the opportunity for optimal physical and mental development. The infant's socio-emotional development benefits from infant massage as tactile stimulation offers a base for higher order processes necessary for the learning process. Tactile stimulation can also act as a form of communication that allows both the parent and infant to become acquainted with the other on different levels and in doing so, really understand each other. This leads to enrichment of the relationship, forming a closer bond between parent and infant. As infant massage is said to promote bonding, it can be concluded that infant massage has an impact on development through the promotion of bonding.

A clear explanation of the concepts explored in this study made it possible to formulate a four month programme incorporating infant massage in order to investigate its effect on the concepts of stress, bonding and development.

7.2.2 IMPLEMENTATION OF INFANT MASSAGE AS INTERVENTION AND THE EMPIRICAL RESEARCH

This section provides a summary of the research project with regards to research design, programme, participants and analysis of data.

7.2.2.1 SUMMARY OF THE RESEARCH PROJECT

This research utilizes an experimental design and made use of a repeated measures design. The participants in both groups took part in the testing before commencement of the intervention (infant massage). The testing procedures were repeated after the programme concluded after four months in order to determine the effect of infant massage on the dependent variables. The research employed the mixed-method (also known as multi method) by making use of both qualitative and quantitative methods. The measures used in this study include a biographical questionnaire, the Mother-to-Infant Bonding Scale, the Parenting Stress Index, the Griffiths Mental Development Scales, saliva cortisol levels and personal interviews with each mother.

The study described six aims. The first aim was to determine the effect of infant massage on an infant's stress level; the second aim was to determine the effect of infant massage on the mother's stress level; the third aim was to determine the effect of infant massage on the relationship between mother and infant and the fourth aim was to determine the effect of infant massage on general development of the infant. The fifth aim was to determine the mothers' subjective experience of their infants, themselves and mother-infant interaction as reported through qualitative measures during post-testing and aim six compared the mothers as participants' experience of their infants, themselves and mother-infant interaction as reported through quantitative measures and through qualitative measures.

The non-parametric test, Mann-Whitney U Test, was used to determine any statistical and practical significant differences between the groups before implementation of the intervention. The non-parametric test, Wilcoxon

Matched-Pairs Signed Rank T-Test, was used for both groups in order to determine the differences that occurred within each group during the four months. Friedman's ANOVA was used to determine the changes that took place within the groups regarding the cortisol levels. No statistical significance could be found but practical significance could be found in certain instances. The qualitative data was analysed by making use of open coding in order to identify themes.

7.2.3 CONCLUSION OF THE EMPIRICAL STUDY

The results and discussion of the results were provided in Chapter 6. The most important results will be summarized.

According to literature it is expected that an infant's stress levels as measured through cortisol levels will be lower after receiving infant massage. The experimental group's cortisol levels during the third measurement was higher than the base line measurement as well as the control group's cortisol level, which leads to the understanding that the experimental group experienced higher levels of stress than the control group.

The effect of infant massage on the mother's stress levels was determined through the use of saliva cortisol levels measured on three occasions. The experimental group's cortisol levels during the third measurement was higher than the base line measurement as well as the control group's cortisol level, which leads to the understanding that the experimental group experienced higher levels of stress than the control group. The second part of the aim involved making use of the Parenting Stress Index to identify the major sources or domains of parenting stressors. The experimental group's results decreased from the pre-test to the post-test and were lower than the control group's post-test results, indicating that they experienced lower stress levels after termination of the intervention and they experienced lower stress levels than the control group. Together with the results from the Parenting Stress Index the results from the interviews indicated that the mothers felt more relaxed than before implementation of infant massage.

This study made use of the Mother-to-Infant Bonding Scale, the Attachment Subscale from the Parenting Stress Index and personal interviews to determine the effect of infant massage on the mother-infant relationship. The results from the Mother-to-Infant Bonding Scale and data retrieved from the interviews showed that the mothers in the experimental group experienced an improved quality of bonding after termination of the intervention than the mothers in the control group. The results of the Attachment subscale indicate that the control group experienced a better bond with their infants.

The Griffiths Mental Development Scales was used to determine the effect of infant massage on the infants' development on five areas. The results showed the experimental group's infants improved on Subscale A: Locomotor, but no further improvements of practical significance could be detected as infants in both the experimental and control group improved on a practical significant level during the four months.

The mothers in the experimental group's subjective experience of infant massage are positive as they reportedly experienced lower levels of stress and improved mother-infant relationships. Two mothers in the control group reported that, due to the pre-testing, they gained awareness regarding their own feelings and attitude towards their infants as well as the infants' abilities, which enabled them to make the necessary changes, improving the mother-infant relationship in the end.

Comparison of the mothers as participants' experience of infant massage as reported through quantitative measures and through qualitative measures reveals that the mothers' subjective recalling of their stress levels do not correlate with the objective measurements. It can be concluded that a person's subjective experience of his/her stress levels may not necessarily correlate with the results revealed on a biological level. The improved bonding reported during the interviews by the mothers in the experimental group correlated with the results from the Mother-to-Infant Bonding Scale.

The strengths and limitations of the study will be discussed in the next section.

7.3 STRENGTHS OF THE STUDY

The strengths of the study can be summarised as follow:

- The study made use of three different types of measures to determine the effect of infant massage on the mother's stress levels by making use of a questionnaire, an interview as well as a biological measure in the form of cortisol. It provides the study with the opportunity to discover to what extent the mother's subjective perspective of her stress levels match the objective perspective.
- The mixed-method approach provides the opportunity to compare the data retrieved from the quantitative and qualitative measures in order to determine to what extent the data differ or agree.

7.4 LIMITATIONS OF THE STUDY

The following limitations can be identified:

- The study group is too small to determine statistical significance. It would be preferable if the group consisted of 30 mother-infant pairs in order to secure statistical significance.
- The results of this study cannot be generalized as the participants come from a restricted background regarding racial background, socio-economic status and language. Therefore, the results of the study could be indicative of the type of experience mothers and infants of white, middle to high socio-economic status, suburban and Afrikaans speaking background, would have.
- Certain precautions were taken to ensure that the data were gathered in the specified, scientific manner to ensure validity and reliability, especially in the case of collection of the saliva samples. The mothers received the

necessary training and written instructions. However, the researcher had to rely on the mothers' commitment and dependability to follow the instructions in the correct manner.

- The Parenting Stress Index's Attachment subscale is misleading as it measures the phenomenon that is known to be bonding instead of attachment.

7.5 RECOMMENDATIONS FOR FUTURE RESEARCH

The following recommendations can be made based on the experience gained from the research programme and the results from this study:

- It is recommended that the research study be repeated with a larger sample size in order to establish statistical significance. The practical significant changes detected in the results makes the researcher confident that infant massage did have a positive effect on the infants and mothers' functioning as expected and that a larger sample size will prove it to be statistically significant.
- It would be preferable that the programme's duration is prolonged so that more developmental changes can be detected.
- A longitudinal study will provide information regarding the long-term effects of infant massage on individuals from infancy to adulthood.
- During the interviews the theme of "patience" became apparent. The researcher was unable to find literature in the databases available that explored the concept of patience. It is, therefore, recommended that further research is undertaken to investigate this concept and how it relates to infant massage.
- It would be preferable to use other measurements for bonding instead of the Attachment subscale of the Parenting Stress Index as its name is misleading. It is suggested that the Behaviour Q-test be used in future studies as it is a standardized method of observation of the parent and child in a natural environment. This is applicable to children from 10 months to 6 years (Waters & Deane, 1984).

7.6 CONCLUSION

The practice of infant massage promises to have a variety of effects on an individual's functioning. The study provided the researcher with the opportunity to investigate a select few of these effects and in the process, to the researcher's knowledge, contribute to the existing knowledge surrounding infant massage and South African infants and their mothers. It is the view of the researcher that the mothers and infants that participated in this study benefited from infant massage as the results from the study indicate that infant massage does have a positive effect on the different areas of functioning as investigated by the study, whether it was reported through the quantitative or qualitative measures.

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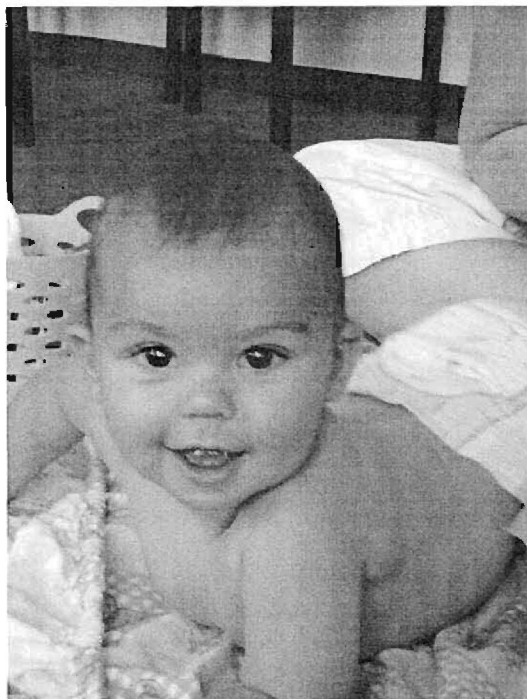
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Appendix A

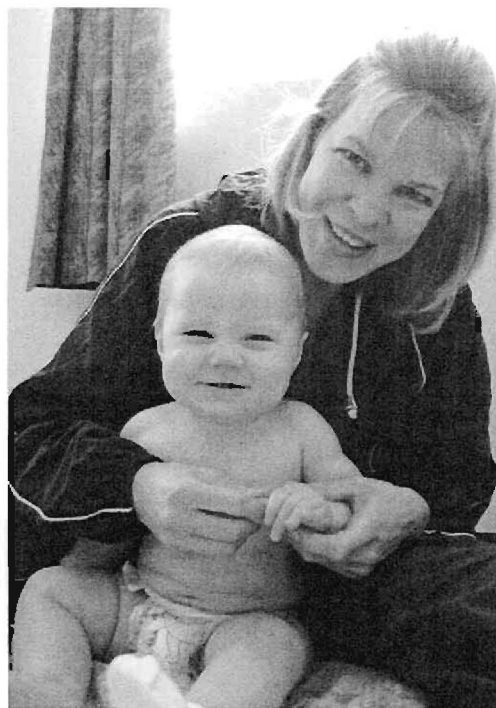
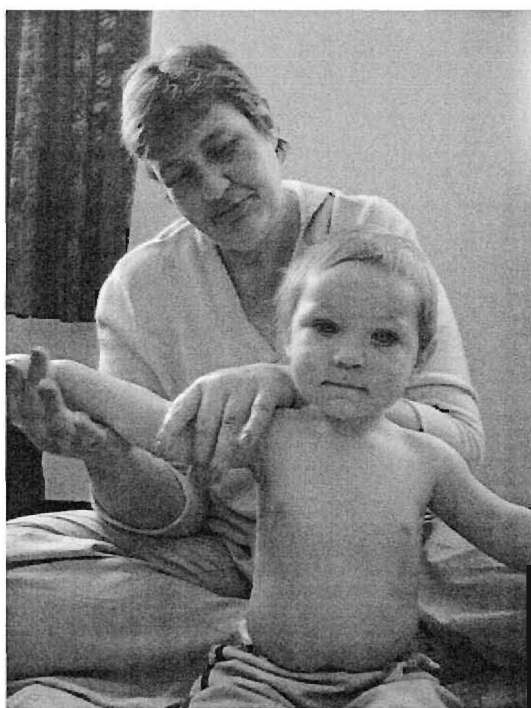
Infant Massage Photos



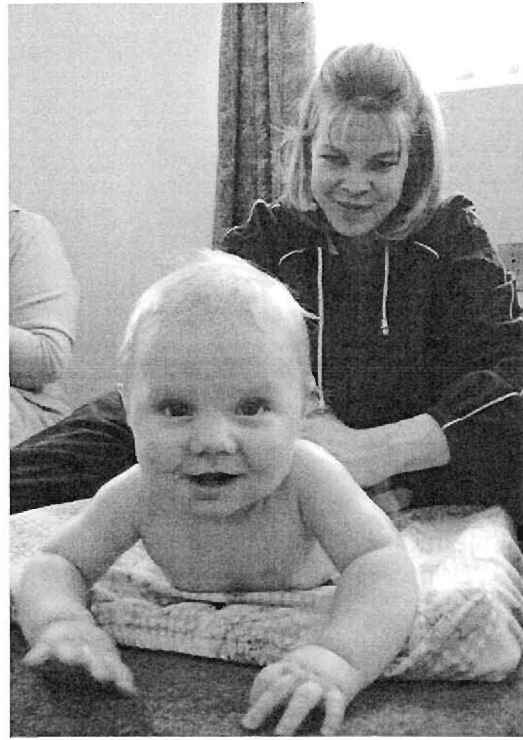
Hello Baby! Are you ready to begin?



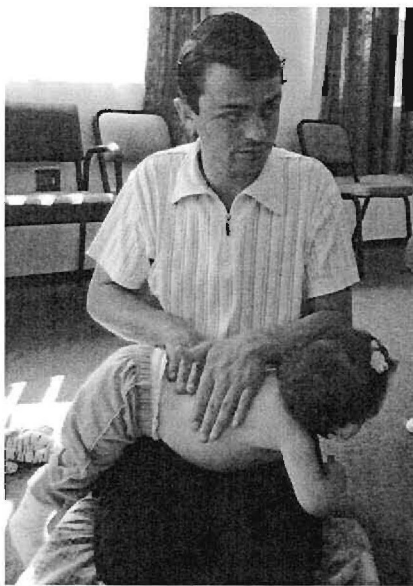
Let's get ready to massage!



First, we start with the arms and hands, making sure they are relaxed...



Next, we move to the legs... That feels great Mom!



Ooh, my favourite! A nice relaxing back massage...



Wow, this feels so good! Thank you Mom!