2009

Effects of Infant Massage on HIV-Infected Mothers and Their Infants

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EFFECTS OF INFANT MASSAGE ON HIV-INFECTED MOTHERS AND THEIR INFANTS

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A DISSERTATION

Submitted to the graduate faculty of The University of Alabama at Birmingham,
in partial fulfillment of the requirements for the degree of Doctor of Philosophy

BIRMINGHAM, ALABAMA

2009

OUTCOMES OF MASSAGE INTERVENTIONS ON HIV-INFECTED MOTHERS AND THEIR INFANTS

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ABSTRACT

The current study aimed to determine whether HIV-infected mothers and their infants benefit from infant massage training. Because a number of risks, including maternal depression, high levels of maternal stress, decreased ability to perform parental tasks, involvement in risky behaviors such as drug use, inferior Brazelton Neonatal Behavioral Assessment Scale performance, and externalizing behavior problems in the children, have been associated with HIV-infected mothers and their children, this population was a sensible choice for intervention. A great deal of information related to the benefits of infant massage for a variety of at risk infants is available in the literature, however, only a few studies have focused on infants of HIV-infected mothers. This study looked at the effects of infant massage on HIV-infected mothers and their infants, particularly in the areas of parental stress, depression, maternal confidence, and feelings about physical contact.

Keywords: Depression, HIV, Maternal Stress

ACKNOWLEDGEMENTS

This dissertation is a result of a number of dedicated and helpful people who provided support and assistance throughout my graduate school career. I extend my deepest gratitude and heartfelt thanks to this wonderful group of individuals. Specifically, I thank my mentor, Dr. Fred Biasini who answered numerous questions, addressed every concern, and offered continuous support through this project. I would also like to thank Drs Daniel Marullo, Marsha Sturdevant, and Lynda Wilson for their infinite knowledge of the topic and guidance in the development of this study. I am grateful for the statistical and methodological wisdom of Dr. Sylvie Mrug.

I would like to thank the staff at the Family Clinic for their constant help in coordinating this study. I would like to acknowledge the families who participated in this study. Their dedication and patience made this project possible.

Finally, I would like to give an infinite amount of thanks to my family and friends. They have seen me through the good times and the hard times. I am especially grateful to my husband, Eric, who encouraged me to pursue my dream. His love and support have made all things possible. I am truly blessed both professionally and personally.

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LIST OF ABBREVIATIONS

ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
BDI-II	Beck Depression Inventory-II
EPDS	Edinburgh Postnatal Depression Scale
HIV	Human Immunodeficiency Virus
MCQ	Maternal Confidence Questionnaire
NICU	Newborn Intensive Care Unit
PSI-SF	Parenting Stress Inventory – Short Form

INTRODUCTION

According to the Centers for Disease Control and Prevention, the number of people with HIV infections in the United States remains stable yet unacceptably high. In 2005, women made up 27 percent of all adults and adolescents living with HIV. This amounts to 120,000 to 160,000 women who are infected with HIV in the United States (Centers for Disease Control and Prevention, 2007). Additionally, findings show that young people (ages 13 to 30) have more HIV infections (34%) than any other age group (Hall et al., 2008). This is particularly troubling because this group is of childbearing age and contracting this infection puts their children at increased risk as well. Approximately 6,000 to 7,000 women with HIV give birth each year (Centers for Disease Control and Prevention, 2007). Although mother-infant transmission of HIV infection has substantially dropped to less than two percent in the United States, studies have shown that even HIV-exposed infants are at risk for developmental problems due to factors commonly associated with HIV mothers (Cooper et al., 2002). These maternal risk factors include depression, high levels of stress, decreased ability to perform parental tasks, poor social support, and involvement in risky behaviors such as drug use (Agostoni et al., 1998; Ethier et al., 2002; Murphy, Marelich, Dello Stritto, Swendeman & Witkin, 2002). Schable et al. (1995) reported that nearly half of children of HIV-infected mothers are cared for by their HIV-infected mother alone. Therefore, it was hypothesized that these mothers would benefit from an intervention that might promote a more optimal mother-infant relationship and positive infant outcomes.

Characteristics of HIV-Infected and Depressed Mothers

Maternal and infant characteristics have the potential to affect the responses of the other partner. Research has shown that this is true in a negative way for depressed mothers. Depressed mothers and infants were rated as having poorer interaction scores than non-depressed mothers and their infants (Field et al., 2000). Infants of depressed mothers have also been found to have poorer cognitive performance later in childhood (Hay & Kumar, 1995).

HIV mothers, who are at increased risk for depression (Ethier et al., 2002; Jones, Beach, Forehand, & The Family Health Project Research Group, 2001; Murphy et al., 2002), are in particular need of an intervention aimed at strengthening the mother-infant relationship because of the combined risks associated with being a HIV-infected mother and at risk for depression. Bernatsky, Souza and DeJong (2007) found that HIV-infected mothers were found to have much poorer mental health than control mothers with 2/3 of the HIV-infected mothers reporting significant emotional distress. Research has also demonstrated that the infants of HIV-infected mothers may be adversely affected by their mothers' physical and mental conditions (Chase et al., 2000; Smith et al., 2006). Children's externalizing behavior problems have been linked to their parents' HIV status as well as drug usage (Knowlton, Buchanan, Wissow, Pilowsky & Latkin, 2007). Additionally, HIV-infected infants have been found to have substantially lower heights and weights than the norm (Agostoni et al., 1998). This is believed to be related to the harsh environment the infant may have been exposed to prenatally due to variables associated with HIV infection such as maternal malnutrition, drug use, smoking, and poor

social conditions (Agostoni et al., 1998). Although some researchers (Smith et al., 2006) have found that HIV-exposed infants fare better on developmental tests than HIV-infected infants, Gay et al. (1995) found that both groups performed worse on developmental tests compared to a normal sample over time.

Teaching Developmental Knowledge to Parents

Teaching developmental knowledge to parents has been associated with mothers who are less psychologically distressed, more focused on the infant's needs, and better able to engage in positive mother-infant interactions. They are also more successful at forming an attachment with the infant (Bialoskurski, Cox & Wiggins, 2002; Mazurek-Melnyk, Fischbeck-Feinstein & Fairbanks, 2002; Reichman, Miller, Gordon, & Hendricks-Munoz, 2000). These are all outcomes that HIV-infected mothers could benefit from. All of these positive outcomes result from simply sharing information, specifically teaching developmental knowledge. Therefore, it seems likely that increasing parental competence through teaching developmental knowledge would increase parental involvement and consequently help to facilitate positive mother-infant interactions. Positive mother-infant interactions and increased levels of nurturing touch are associated with less emotional and behavior problems at age 2 years (Weiss, Wilson, St. John-Seed, & Paul, 2001).

In a review of the literature on informational/behavioral interventions with parents of low birth weight premature infants, Mazurek-Melnyk et al. (2002) found similar needs expressed by families in the Newborn Intensive Care Unit (NICU) as the researchers mentioned above. There were three major and consistent results that were found across

the reviewed studies. First, it is important to provide parents with educational information/anticipatory guidance about their premature infants' development and behaviors. Second, providing informational/behavioral information about their premature infant improves parental responsiveness and maternal-infant interaction, which appears to positively impact the child's development. Finally, helping parents establish a specific and ongoing role in the care of their hospitalized infants facilitates stronger beliefs in their ability to care for their infants and increased involvement in their care. Although these studies refer to parents in a NICU, it is probable that this process of providing information that leads to more appropriate care and stimulation by the mothers, in turn, has a positive result on the child's development.

Sameroff's transactional model (Sameroff & Chandler, 1975) has been used to explain this effect that maternal characteristics play in shaping infant responses and vice versa (Van Doesum, Hosman, & Riksen-Walraven, 2005; Goodman, Hans, & Bernstein, 2005). In other words, the relationship between mother and infant is cyclical with behavior or characteristics of one individual influencing the behavior or characteristics of the other. Studies have shown that maternal characteristics and behavior affect various infant outcomes in areas such as temperament and cognitive development. For instance, depressed mothers affect the infant through the mother-infant relationship. Specifically, mothers' depression inhibits typical social interaction between mother and child that generally serves to facilitate infants' social, emotion, and cognitive abilities (Van Doesum et al., 2005). Therefore, in response to poor social and emotional experiences with their mothers, infants of depressed mothers seem to mimic these social behaviors, which results in impaired social-emotional as well as cognitive development (Murray &

Cooper, 1996). At the same time, however, infants' behaviors influence mothers' emotions and behaviors. Specifically, Secco and Moffatt (2003) found that difficult infant temperament was the strongest and only significant predictor of parent stress. Barr, Kramer, Pless, Boisjoly, and eLeduc (1989) also found that infant temperament may affect parenting competence via parent-infant interaction and resulting parental satisfaction.

Due to the influence that both maternal and infant behaviors and characteristics can have on each other, the use of a transactional model may be beneficial in creating an intervention aimed at optimizing the mother-infant relationship, particularly for HIV-infected mothers and their infants. Specifically, infant massage provides mothers with knowledge about infant cues. This knowledge may help mothers recognize and react more appropriately to their infants' needs, which in turn may result in maternal perceptions of more satisfied and content infants. Additionally, more content infants may promote increased maternal confidence, as well as decreased parenting stress and maternal depression because mothers perceive their actions and behaviors as resulting in positive infant responses and outcomes. Positive infant responses may then serve as reinforcers for mothers to utilize the knowledge that they gained through infant massage training.

Findings from a study of socioculturally diverse low birth weight infants whose mother-infant interactions were videotaped and coded by Weiss et al. (2001) indicated that providing knowledge about how to touch infants seems to be extremely important because touch plays an important role in the development of emotional and behavioral outcomes. Specifically, infants who received more nurturing touch had significantly

fewer emotional and behavioral problems at age two. However, for less responsive infants in particular, frequent and harsh touch was associated with increased aggressive and destructive behavior. It is possible that these results are related to the fact that this study did not teach parents about touching their infants and how to recognize stress cues. These findings therefore lend support to the argument of the importance of teaching parents about appropriate touching and the use of infant cues as a guide for amount and kind of touch. The findings by Appleton (1997) also suggest that adverse reactions to handling and touch are influenced to a greater extent by the failure of caregivers to provide stimulation dependent on the infant's developmental level and current behavioral state than by under-stimulation or over-stimulation. Although a majority of infant massage research focuses on the direct benefits of touch in terms of physical stimulation, another important component when teaching parents infant massage includes providing information about recognizing infant cues that help adults determine when stimulation, such as massage, is appropriate or should be stopped.

In conclusion, NICU mothers and perhaps all mothers, including those infected with HIV, desire knowledge about their infants. By providing parents with this knowledge, a positive mother-infant interaction along with appropriate mother-infant attachment may be facilitated (Bialoskurski et al., 2002; Mazurek-Melnyk et al., 2002; Pridham, Limbo, Schroeder, Thoyre, & Van Riper, 1998; Reichman et al., 2000). All of these relatively immediate outcomes are related to future outcomes. Therefore, these early experiences can positively or negatively impact the infants' development later in life (Weiss et al., 2001).

Parents' Impact on Infant Temperament

Optimal mother-infant interaction may also play a role in maternal perception of infant temperament. Leerkes and Crockenberg (2002) investigated the relationship between maternal self-efficacy, maternal sensitivity and infant characteristics. Infant soothability was associated with higher maternal self-efficacy. On the other hand, high infant distress was associated with lower maternal sensitivity, particularly when maternal self-efficacy was low and extremely high. These results indicate a relationship between infant temperament and maternal sensitivity behavior and point to the potential benefits of interventions, such as infant massage, aimed at increasing maternal sensitivity towards their infants.

Kivijarvi, Raiha, Kaljonen, Tamminen, and Piha (2005) found that infant temperament, maternal sensitivity, and the negative mother-infant interactions that accompany difficult temperament and low maternal sensitivity remain stable over time. At 1 year of age, infants of more sensitive mothers were described as less active by an observer than infants of less sensitive mothers. Sensitive mothers were defined as mothers who were aware of infant cues and appropriately responded to these cues, provided emotional support, anticipated infant behavior, and participated in infant-led interactions (Kivijarvi et al., 2005). Researchers suggested that these findings may be related to the ability of more sensitive mothers to structure the infant's environment. Results of this study also indicated that more positive temperaments were observed in infants of more sensitive mothers. The direction of the relationship between infant temperament and maternal sensitivity is debatable. In other words, infant behavior in response to maternal behavior may be predicted by infant temperament. Or, infant

behavior and temperament may be predicted by maternal behavior and sensitivity. The stability of infant temperament during the first year of life provides support for both genetic and environmental influences on temperament because both of these factors should remain constant during this time period. In this study, maternal sensitivity behavior influenced infant activity, positive mood, and sociability (Kivijarvi et al., 2005). These results suggest the importance of maternal sensitivity behavior on infant temperament, a factor that can positively or negatively affect mother-infant interaction. Since maternal sensitivity may be modified by training mothers to better interpret their infants' cues, an intervention aimed at improving maternal sensitivity could possibly be a successful approach to enhancing mother-infant interactions.

Background on Infant Massage

A mother's psychological state and consequently her interaction with her infant are positively influenced by knowledge about her infant (Bialoskurski et al., 2002; Mazurek-Melnyk et al., 2002; Pridham et al., 1998). One intervention aimed at increasing parents' knowledge and involvement with their infant is touch therapy. Massage therapy is an alternative therapy that has gained an increasing amount of interest over the last few decades. It dates back to the second century B.C. in China and shortly thereafter in India and Egypt where it was used as a medical treatment. Although massage therapy had been used previously in the United States, its use diminished with the advance of pharmaceuticals in the 1940s, but it has recently become popular again as interest in alternative medicine has increased. Although a number of methodological

problems, including a lack of random assignment, small sample sizes, use of inappropriate statistics, and limited follow-up studies, have been found in early massage studies, many benefits have been discovered in response to infant massage (Field, 1998).

Positive outcomes for children include decreasing discomfort and tension, facilitating weight gain for premature infants, and improving breathing function for asthmatic children (McClure, 2000). Study findings have suggested that massage is beneficial for cocaine-exposed infants as evidenced by enhanced weight gain and better motor behavior (Field, 1998). Studies with HIV-exposed infants demonstrated improved weight gain and reduced stress behaviors, and studies of massage with full-term infants demonstrated improvements in behavioral states, stress levels, and temperament (Field, 1998). Perhaps one of the greatest benefits of infant massage is that it can be provided by parents and loved ones. With a little training, this is something that any parent can do for his/her infant regardless of any financial, time, or educational constraints they may have (McClure, 2000).

Parent Outcomes of Touch Therapy

Although research on the benefits of touch interventions on parents has not been the primary focus of most infant massage studies, benefits have been found in the areas of parental depression, as well as, more appropriate caregiving behavior (Onozawa, Glover, Adams, Modi, & Kumar, 2001; Weiss, Wilson, Hertenstein, & Campos, 2000). Additionally, the positive behavioral outcomes elicited by parental touch are associated with more positive mother-infant interactions (Weiss et al., 2000). Consequently, one might expect that mothers trained in infant massage would feel increased maternal

confidence, higher self-esteem, and positive feelings toward their infants. However, research is required to support these hypotheses, particularly with HIV-infected mothers.

Perception of control may be an important mediating mechanism in the benefits of touch therapy. Lack of control has been found to be associated with increased distress and confrontive and escape-avoidant coping for mothers of NICU infants. On the other hand, accepting responsibility was predictive of decreased distress for these mothers (Reichman et al., 2000). These results seem to support the hypothesis mentioned above that providing mothers with information about infant behavior may increase her perception of control resulting in increased maternal confidence and a perception of a more adaptive infant temperament and might also generalize to other parents, including HIV-infected mothers. By encouraging mothers to accept responsibility and become involved in the care of their infant, it is anticipated that the mother's well-being will be positively influenced. Miller and Holditch-Davis (1992) also suggest that parental contact with preterm infants in the NICU has psychological benefits for parents. Therefore, positive infant behaviors that are elicited by infant massage, such as smiling, may promote parent-infant attachment in other populations.

Several studies demonstrated the effect of infant massage on maternal outcomes. For example, depressed mothers who attended a support group and an infant massage class improved more in their depression scores as compared to mothers who only attended a support group (Onozawa et al., 2001). At this point, it is unclear what aspects of the massage class were responsible for the benefits. In addition to teaching the mothers how to massage their infants, the class also taught mothers to recognize and respond

appropriately to their infants' cues. One would expect that this knowledge would influence mother-infant interactions and the mothers' care giving behaviors.

Weiss et al. (2000) explicitly assessed the relationship between maternal nurturing touch and maternal caregiving behaviors. For preterm infants who were responsive to nurturing touch, nurturing touch was associated with mother's warmth toward the infant. Those mothers who did not display nurturing touch also displayed less optimal caregiving behavior. These findings suggest that education about nurturing touch might lead to more appropriate care giving behaviors.

In conclusion, some initial support has been found to indicate that mothers also benefit from touching their infants. Currently, psychological benefits have been reported (Miller & Holditch-Davis, 1992; Reichman et al., 2000) along with appropriate caregiving (Weiss et al., 2000). Future research needs to examine the impact positive parental outcomes resulting from participation in infant massage have on long-term developmental outcomes for infants.

Infant Developmental Outcomes of Infant Massage

In one study, massage therapy was provided to hospitalized premature infants for three 15-minute sessions per day for 5 days to determine the effects of massage on weight gain and behavioral state (Dieter, Field, Hernandez-Reif, Emory, & Redzepi, 2003). On average, the massage group, which had a mean gestational age of 30.1 weeks, gained significantly more weight per day than the control group, which had a mean gestational age of 31.1 weeks. On the last day of massage, the massage group slept less than the control. The massage group also spent more time in the drowsy state than the control

group. These findings suggest that the massage may help to enhance the development of sleep/wake patterns in preterm infants. Additionally, it is of importance to mention that the weight gain in the massage group was rather rapid, only over a 5 day period, which is half of the previously investigated duration of massage. These results suggest that significant effects can be found with much less intervention time. On the other hand, researchers must consider the potential infant outcomes that may result from more long-term massage provided by parents.

Another aspect of infant response concerns stress. Because some critics of touch therapy for preterm infants have suggested that this intervention might induce stress, studies have been designed to test this speculation. For instance, salivary cortisol levels, a measure of stress, were analyzed in response to skin-to-skin contact and massage as a noninvasive measure of stress response (Gitau, Modi, Gianakoulopoulos, Bond, & Glover, 2002). Skin-to-skin contact significantly reduced salivary cortisol, while massage elicited both increased and decreased cortisol levels, which serve as an indicator of stress. However, it is important to note that the time of both interventions was not based on the infant's state and behavior cues. Also, different outcomes typically were invoked from the two different interventions. Although the skin-to-skin contact group usually went to sleep, some infants in the massage group had an increase in alert/wake state, perhaps related to stimulation from the massage. These babies may have benefited from this stimulation. Similar to the interpretation of the results of the previous study by Dieter et al. (2003), Gitau and colleagues suggest that perhaps the increase in salivary cortisol demonstrated increased development in sleep/wake patterns.

Field et al. (1986) found an increase in motor activity and more alertness for preterm infants who received tactile and kinesthetic stimulation for three 15-minute sessions per day for 10 days. These infants also gained more weight, scored higher on the Brazelton scale, a measure of babies' strengths, adaptive responses and possible vulnerabilities, and had shorter hospital stays than control infants. The stimulation and controls both entered the study with similar group mean gestational ages equal to 31 weeks and mean birth weights near 1300g. At 1 year of age, these massaged infants continued to weigh proportionately more than the control group infants and performed better on the Bayley Scales of Infant Development (Field, Scafidi, & Schanberg, 1987). These outcomes are believed to be attributed to increased stimulation by parents, which in turn encouraged gains in physical growth and development. These results suggest that parent behavior can be an important factor in determining infant outcomes. Specifically for infant massage, parents increased attention to infant needs seems to facilitate both physical and cognitive development.

Although the immediate short-term effects of massage, such as weight gain, increased alertness and motor activity, and shorter hospital stays are beneficial to preterm infants, researchers, medical staff, and parents are most interested in the long-term effects of touch and massage interventions (Dieter et al., 2003; Field et al., 1987; Gitau et al., 2002). Most touch intervention studies with preterm infants used medical or research staff to provide the intervention but the long-term outcomes mentioned above such as higher scores on the Bayley Scales of Infant Development suggest that greater long-term outcomes result from interventions by parents (Field et al., 1987). A study by Ferber et al. (2002) found similar weight gains for infants massaged for three 15-minutes sessions

per day for 10 days by medical staff and by the infants' parents. Despite these findings, it is important to consider the long term effects of such an intervention and the role parent-infant interaction plays in facilitating these long-term outcomes. In addition to the physical stimulation associated with infant massage, this intervention appears to benefit parents and infants through optimal parent-infant interactions, which are encouraged by teaching parents about infant cues and behaviors and the appropriate responses to these behaviors.

Massage Outcomes of HIV-infected Mothers

Very few infant massage studies have been conducted on populations other than preterm infants. Only one study was found that investigated the impact infant massage has on HIV-exposed infants; however, characteristics associated with HIV-infected mothers and their infants indicate that this intervention may be beneficial for this population. In this study by Scafidi and Field (1996), positive infant outcomes such as increased weight gain, more positive cognitive and developmental outcomes, and decreased infant stress were discovered after three 15-minute massage sessions by researchers for 10-days. Of particular interest was the finding that the massaged infants generally improved on cognitive and developmental tasks while control infants remained the same or performed worse. This suggests that without intervention, these HIV-exposed infants are not improving their performance as would be expected based on typical development (Scafidi & Field, 1996). This increases particular concern for HIV-exposed infants in terms of development.

Conclusion

Benefits of infant massage have been found to have positive short-term and long-term effects on the infants' development, positively influence mothers' depression, and facilitate mother-infant interactions. Teaching parents about their infants' development and behavioral cues helps these parents provide a nurturing and developmentally appropriate environment for their infants. This in turn helps ensure that these infants will have good developmental outcomes.

Because negative characteristics associated with depressed mothers and HIV-infected mothers have been identified in the literature, and these negative characteristics are also associated with poor infant outcomes, there is clearly a need for an intervention aimed at this population. Although the transactional model explains why negative maternal characteristics are associated with poor infant outcomes, the transactional model can also be used to explain why an intervention focused on improving maternal characteristics and behavior should result in positive infant behaviors and outcomes.

The Current Study

The current study aimed to determine whether HIV-infected mothers and their infants benefit from infant massage training. A study by Schable et al. (1995) found that more than half of women with HIV have children, and these HIV mothers are the most common caretakers. These mothers also often are dealing with a number of other factors that make parenting difficult such as maternal depression, high levels of maternal stress, decreased ability to perform parental tasks, and involvement in risky behaviors such as

drug use. Consequently, children of HIV-infected mothers have been show to display inferior development, and externalizing behavior problems. These risk factors indicated that this population was a sensible choice for intervention (Agostoni et al., 1998; Ethier et al., 2002; Knowlton et al., 2007; Murphy et al., 2002; Scafidi & Field, 1997). Previous research on the benefits of infant massage seems to address a number of the risks associated with this population of mother-infant pairs. A great deal of information related to the benefits of infant massage is available in the literature; however, only a few studies have focused on infants of HIV-infected mothers. This study looked at the effects of infant massage on HIV-infected mothers and their infants.

OBJECTIVES

The overall purpose of the current study was to expand the research in infant massage therapy to the HIV-infected mother population and use theory to develop, implement, and evaluate a massage intervention that would have direct and indirect benefits for both mother and infant related to infant's physical development, mother-infant relationship, mother's psychological well-being, and mother's social support.

Aim 1: There are several maternal characteristics and emotional reactions that are believed to impact the quality of infant care. These areas of interest include mood, maternal confidence, and parenting stress. The first aim of this study was to assess the impact of infant massage on the outcomes of the mothers. It was hypothesized that HIV-infected mothers who learned to massage their infants would have lower depression, higher maternal confidence, lower parenting stress, and more positive feelings about physical contact after 2 ½ months of massage intervention than mothers who did not learn to massage their infants (Hypothesis 1).

Aim 2: The second aim was to evaluate the impact of infant massage training on HIV-infected mothers' perceptions of infant temperament. Infant massage training involves teaching mothers massage strokes to use on their infants in addition to providing information about infant cues. Research has found that maternal perception of infant temperament can be influenced by maternal confidence and mother-infant relationships. Similar changes were expected for HIV-infected mothers' perception of infant temperament due to improved care provided by mothers who were taught about infant

cues during infant massage training and the association of adaptive infant behavior with appropriate care. In summary, it was hypothesized that infants who received infant massage from their mothers would be perceived by their mothers as having more adaptive temperaments at 2 ½ months after massage training than infants who did not receive infant massage (Hypothesis 2).

Aim 3: The third aim was to evaluate the impact of infant massage on the physical development of infants of HIV-infected mothers. Infant massage training involves teaching mothers massage strokes to use on their infants in addition to providing information about infant cues. Research on the use of infant massage with premature infants has found positive impacts on infant development such as state regulation, weight gain, and performance on developmental assessments. Similar results were expected for infants of HIV-infected mothers due to the physical stimulation of infant massage as well as the expected improved care provided by mothers who were taught about infant cues during infant massage training. It was hypothesized that infants who received infant massage would have better infant physical development outcomes at 4 months of age than infants who did not receive infant massage as measured by physical measures including weight, height, and head circumference (Hypothesis 3).

RESEARCH DESIGN AND METHODS

Design

The current study involved a 2 (Intervention) x 2 (Time) mixed factorial design. The within-subject factor was Time, which had two levels (baseline and post-intervention). The between-subject factor was Intervention, and it had two levels (control and massage intervention).

Participants

The participants included 17 HIV-infected mothers and their infants attending a pediatric clinic in Alabama. Infants ranged from 5 to 10 weeks of age when baseline measures were collected. Infants' birth weights ranged from 2.38 to 3.40 kg. Infants' birth heights were between 46 and 53.6 cm. The mothers in the sample ranged in age from 17 years to 34 years. A majority of the participants were African American (n=15). Mothers with a drug abuse history and those with premature infants were excluded from the study. Demographic information for the overall sample and each group is presented in Table 1.

Table 1
Demographic Variables by Group

Variable	Mean (Standard Deviation)			*df*	*t*	*p*
	Total (N=17)	*Control (n=9)*	*Intervention (n=8)*			
Infant's Birth Weight (kg)	2.92 (0.36)	2.93 (0.38)	2.90 (0.37)	1,15	0.13	0.90
Infant's Birth Height (cm)	50.42 (1.99)	50.48 (2.34)	50.36 (2.07)	1,15	0.12	0.90
Infant's Age at Time 1 (wk)	6.65 (1.66)	7.22 (1.86)	6.00 (1.20)	1,15	1.59	0.13
Mother's Age (yr)	26.29 (5.82)	24.11 (6.31)	28.75 (4.33)	1,15	1.74	0.1
Number of Children	2.00 (0.79)	2.11 (0.78)	1.88 (0.84)	1,15	0.6	0.56
Number of Children Desired	2.35 (0.61)	2.33 (0.50)	2.38 (0.74)	1,15	0.14	0.89

Participants were recruited from a university clinic serving HIV infected women and their infants. With permission of the clinic director and Children's Hospital and after obtaining approval from the university's Institutional Review Board, the principal investigator attended the clinic on selected days, explaining the study requirements and procedures to potential participants whom clinic staff indicated were interested in participating in the study. Recruitment flyers were also posted in clinic treatment rooms. Although the clinic director gave permission to recruit for the study, clinic staff members were particularly protective of the HIV-infected mothers , and initially made few referrals to the investigator. However, the staff members were increasingly helpful in referring mothers to the investigator to discuss the study after initial project participants expressed satisfaction with their participation in the study.

Procedures

All procedures took place at the clinic. Baseline assessments were gathered when mothers and their infants attended their clinic appointments at approximately 6 weeks after delivery and included a demographic questionnaire, the Beck Depression Inventory-II (BDI-II), the Edinburgh Postnatal Depression Scale (EPDS), the Maternal Confidence Questionnaire (MCQ), the Parenting Stress Index-Short Form (PSI-SF), and the Questionnaire about Physical Contact. The participants were randomly assigned to the control or intervention group using a table of random numbers. Infant massage training took place after baseline measures were collected for those participants in the intervention group. Participants in the intervention group were provided with an instruction booklet and 3-ounce bottle of massage oil. These participants were asked to massage their infants each day for 2 ½ months. Weekly follow-up calls to answer questions, address concerns, and determine adherence to the intervention were attempted via the telephone after the massage training. It was not always possible to contact the mothers for the weekly follow-up phone calls if mothers did not answer the phone. Table 2 lists the number of weekly phone contacts made to each of the participants in the intervention group, and the mean number of massages reported across the 2 ½ month intervention period by each participant.

Table 2
Individual Adherence to Massage Intervention

	Intervention Participants							
Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
# weekly phone contacts	4	1	0	5	3	4	6	2
average number of massages per week								
Mean	4.00	4.00	-	3.80	5.00	4.75	4.67	3.50
Standard Deviation	1	0	-	1	1	1	1	1
Range	3-5	4	-	2-5		3-6	3-6	3-4

Follow-up assessments were completed at the clinic during the infants' 4 month appointments, which were approximately 2 ½ months after baseline measures were administered. The same measures were completed at follow-up except the demographic questionnaire. Participants in the control group were taught infant massage after completion of the measures if desired. The majority of control group participants (n=8) requested infant massage training at the end of the study.

Intervention Procedures

The investigator taught the massage intervention to participants in the intervention group using the Baby's First Massage curriculum created by Teresa Ramsey (www.babysfirstmassage.com). Each training session lasted approximately 15-20 minutes and took place at the clinic after baseline assessments were collected. Infants were approximately 6 weeks of age at baseline assessments. The massage training was conducted by the principal investigator who is a certified infant massage instructor in the Baby's First Massage program. Massage training began with a description and explanation of both welcoming and time-out infant behavioral cues. Specific facial

expressions, body movements, and physical characteristics are used to determine the infant's readiness for the stimulation of massage. Other information included interpretation of infant cries and the benefits of massage for both parent and infant. Although many strokes for various parts of the body are taught, a major emphasis of this curriculum is sensitivity to infant cues and responses. The massage strokes were demonstrated on a doll by the principal investigator while the participant mimicked the strokes on her infant. Mothers also received a booklet with all the information discussed as well as diagrams of the massage strokes.

Materials

Demographic Questionnaire

Demographic information for all groups was obtained using a self-report questionnaire. Information gathered included age, race, education, and number of children.

Parenting Stress Index – Short Form

The Parenting Stress Index Short Form (PSI-SF) (Abidin, 1995) was used to identify stress in parent-child dyads, which may put them at risk for future dysfunctional parenting behaviors or childhood emotional or behavior problems. It is a condensed version of the Parenting Stress Index full-length test that can be completed in 10 minutes and consists of 36 statements about parents' perceptions of child behavior and attitudes about parenting that are identical to those statements in the full-length version. Questions are rated on a 5-point Likert scale, ranging from *strongly agree* to *strongly disagree.*

Responses correspond to three 12 statement subscales (parental distress, parent-child dysfunctional interaction, and difficult child) that make up a Total Stress score. Total scores range from 36 to 180. Total stress scores and the three subscale scores were used in data analysis to examine parenting stress, mother-child interactions, and mother's perception of infant temperament. Statements such as, "I feel trapped by my responsibilities as a parent", and "There are quite a few things that bother me about my life" are used to examine parenting stress. Mother-child interactions were measured based on responses to statements such as, "Sometimes I feel my child doesn't like me and doesn't want to be close to me", and "I expected to have closer and warmer feelings for my child than I do and this bothers me." Perceptions of infant temperament are assessed using statements such as, "My child seems to cry or fuss more often than most children", and "My child gets upset easily over the smallest thing." Higher scores indicate higher parenting stress, less optimal mother-child interactions, and perceptions of less adaptive infant temperament.

Results of a study by Reitman, Currier and Stickle (2002) seem to support the use of the PSI-SF with lower socioeconomic, African American mothers. Construct validity was appropriate and reliability ratings ranged from .88 to .89 on the three scales, with a Cronbach's alpha of .95 for the Total Stress score. For the current study, the internal-consistency reliability was .90.

Maternal Confidence Questionnaire

The Maternal Confidence Questionnaire (MCQ) (Parker & Zahr, 1985) measures the degree of confidence in a parenting role. It is made up of 14 statements rated on a 5-

point Likert scale, ranging from never to always. Total scores range from 14 to70, with higher scores reflecting higher levels of maternal confidence. The MCQ is unidimensional with a higher score indicating a higher perceived confidence. Examples of items are "I know what makes my baby happy," and "I can feed my baby adequately."

Evidence of face and content validity for the MCQ has been established (Zahr, 1991, 1993). The alpha coefficients for the total items ranged between .86–.93. The internal-consistency reliability has been found to be .89 (Gibaud-Wallston & Wandersman, 1977). A positive correlation between the MCQ scores and the Parenting Sense of Competence Scale ($r = .53$, $p < .05$) was used to establish concurrent validity (Gibaud-Wallston & Wandersman, 1977). For the current study, the internal-consistency reliability was .58.

Beck Depression Inventory-II

The Beck Depression Inventory II (BDI-II) (Beck, Steer, & Brown, 1996) was used as a pre- and post-test measure to assess maternal depression. The BDI-II is a questionnaire consisting of 21 groups of statements, with each item scored on a 4-point scale indicating the presence and severity of depressed feelings/behaviors/symptoms. Items include topics such as sadness, self-dislike, and crying. Possible scores range from 0 to 63 with higher scores indicating greater levels of depression. For this study, scores were analyzed as both a continuous variable as well as a categorical variable with scores greater than or equal to12 indicating depression (Lasa, Ayuso-Mateos, Vazquez-Barquero, Diez-Manrique & Dowrick, 2000).

The internal-consistency reliability has been found to be .92 (Beck et al., 1996).

Evidence for convergent and discriminant validity has been reported in the BDI-II manual (Beck et al., 1996). For the current study, the internal-consistency reliability was .94.

Edinburgh Postpartum Depression Scale

The Edinburgh Postpartum Depression Scale (EPDS) is the most extensively studied measure related to postpartum depression and has been translated into many different languages (Boyd, Le, & Somberg, 2005; Cox, Holden, & Sagovsky, 1987). The EPDS is a ten-item, paper and pencil, self-report scale, which purports to measure symptoms of postpartum depression. It requires minimal training to administer and can be completed by most clients in less than 5 minutes. The EPDS is appropriate to use at 6-8 weeks postpartum. Each item is rated on a 4-point Likert scale, indicating depressive feelings and thoughts over the last 7 days. The items are rank ordered and weighted to reflect severity of symptoms. Possible scores range from 0 to 30. The threshold score is 12.5, with higher scores indicating a need for further assessment and possible intervention. The EPDS has reported levels of reliability ranging from .73 to .87. Previous studies reported that the concurrent validity with the BDI-II is .82 (Boyd et al., 2005). For the current study, the internal-consistency reliability was .69.

Questionnaire About Physical Contact

The Questionnaire about Physical Contact created by Sandra Weiss (personal communication, November 2005) consists of three sections with a total of 24 statements that address an individual's thoughts and feelings about physical contact with others

during three different time periods including one's ongoing life, childhood, and current relationships with family and friends. Each item is scored on a 4-point Likert scale. The sections related to one's ongoing life and current relationships were used in data analysis.

Responses from the ongoing life and current relationships sections were used to determine the effects of the infant massage intervention on feelings of physical contact. Statements such as "I appreciate a hug when I need comforting", and "I am comfortable putting my arm around a friend's shoulder" are used to assess comfort with touch as part of one's ongoing life. Questions that assess touch in current relationships include, "How often are you hugged, kissed or caressed by your friends and family", and "To what extent does the touch you receive from friends and family provide a supportive sense of security in your life?" The section, which is related to physical contact as part of one's ongoing life, measures attitudes towards touch and consists of 10 questions with possible scores ranging from 10 to 40. The section related to physical contact within current relationships measures an individual's feelings of security with touch provided by significant other and consists of 6 questions with possible scores ranging from 6 to 24. For both sections, higher scores indicate positive experiences and higher comfort with physical contact. Internal consistency reliability for this measure has been found to be 0.83 (Weiss et al., 2000). Predictive validity of the measure has been suggested by findings in a previous study that overall comfort with physical contact is correlated with a mother's satisfaction with the physical contact she is currently receiving (Weiss et al., 2000). For the current study, the internal-consistency reliability was .70 for the ongoing life subscale and .65 for the current relationships subscale.

DATA ANALYSIS

Analysis

Statistical analysis of the data consisted of descriptive statistics, bivariate correlations, an Analysis of Covariance (ANCOVA) for each continuous measure, and a Chi-Square test for categorical measures. Analysis of covariance was used to test for post-test differences in the scores on the BDI-II, EPDS, PSI-Short Form, Questionnaire about Physical Contact, and MCQ between mothers who received training in infant massage and those who did not after adjusting for the effects of pretest scores. Due to the categorization of BDI-II and EPDS scores into high ($\geq$12) and low ($\leq$11), differences between groups were explored using chi-square. The Statistical Package for Social Science (SPSS, version 12.0: Chicago, IL) was used to calculate the statistics. Descriptive statistics were generated to examine the distribution of scores and examined for kurtosis and skewness. In addition, Levine's method was used to test the homogeneity of variances assumption of ANCOVA. No significant differences in the variance were found between groups. These analyses indicated that the assumptions of ANCOVA were met, and the results are consequently valid.

Analysis of Covariance (Maxwell & Delaney, 1990; Rogosa, & Willett, 1983) was used to study the contributions of the intervention on measurement outcomes. The purpose of covariates in ANCOVA is to adjust for their relationship to the dependent variable in an attempt to control error variance. In this study, pre-test scores were used as covariates, while post-test scores served as the dependent variables. Correlations

between pre- and post-test scores were mostly positive, justifying the use of pre-test scores as covariates (see Table 3).

Table 3
Correlations between pre- and post-test scores

Construct	*Correlation Coefficient*	*p-value*
Depression (BDI-II)	0.36	0.16
Maternal Confidence	0.16	0.54
Depression (EPDS)	0.33	0.19
Total Parent Stress	0.76	0.00*
Parental Distress	0.80	0.00*
Parent-Child Dysfunctional Interaction	0.87	0.00*
Infant Temperament	0.17	0.51
Overal Feelings about Physical Contact	0.78	0.00*
Feelings about Physical Contact with Family and Friends	-0.09	0.74
Infant Weight	0.90	0.00*
Infant Height	0.90	0.00*
Infant Head Circumference	0.20	0.44

Note. * indicates $p<.05$.

RESULTS

Participant Descriptive Statistics

All continuous demographic variables were analyzed using an Analysis of Variance (ANOVA) and are displayed in Table 1. Groups did not significantly differ on any demographic variables. Baseline scores for all measures were analyzed using independent samples t-tests. Participants in the control group reported significantly more total parent stress and parent-child dysfunctional interaction along with significantly less comfortable feelings about physical contact with family and friends (see Table 4). The use of Analysis of Covariance to determine the impact of infant massage training on maternal and infant outcomes helps to account for these initial differences; however, results must be interpreted cautiously.

Table 4
Baseline Scores by Group

Construct	Mean (Standard Deviation) *Total (N=17)*	*Control (n=9)*	*Intervention (n=8)*	df	t	p-value
Depression (BDI-II)	8.00 (7.79)	7.67 (6.78)	8.38 (9.26)	1,15	-0.18	0.89
Maternal Confidence	60.71 (4.59)	60.00 (5.90)	61.50 (2.67)	1,15	-0.66	0.52
Depression (EPDS)	6.53 (4.20)	8.00 (2.65)	4.88 (5.14)	1,15	1.61	0.13
Total Parent Stress	65.06 (16.93)	73.78 (14.83)	55.25 (14.01)	1,15	2.63	0.02*
Parental Distress	25.06 (9.40)	28.44 (7.88)	21.25 (10.00)	1,15	1.66	0.12
Parent-Child Dysfunctional Interaction	18.65 (6.58)	22.78 (6.12)	14.00 (3.07)	1,15	3.66	0.00*
Infant Temperament	21.35 (4.44)	22.56 (3.24)	20.00 (5.40)	1,15	1.20	0.25
Overall Feelings about Physical Contact	29.82 (6.46)	26.56 (7.40)	33.50 (1.93)	1,15	-2.57	0.02*
Feelings about Physical Contact with Family & Friends	18.94 (1.39)	19.00 (0.50)	18.87 (2.03)	1,15	0.18	0.86
Infant Weight (kg)	4.66 (0.84)	4.96 (1.01)	4.31 (0.46)	1,15	1.67	0.11
Infant Height (cm)	55.54 (2.62)	56.41 (3.38)	54.56 (0.73)	1,15	1.51	0.15
Infant Head Circumference (cm)	37.74 (1.42)	38.17 (1.70)	37.25 (0.89)	1,15	1.37	0.19

Note. * indicates $p<0.05$.

Primary Analyses

Hypothesis 1

It was hypothesized that HIV-infected mothers who learned to massage their infants would have lower depression, higher maternal confidence, lower parenting stress, and more positive feelings about physical contact after 2 ½ months of massaging their infants than HIV-infected mothers who do not massage their infants (Hypothesis 1). To analyze the impact of infant massage training on maternal confidence, parenting stress, and feelings about physical contact, separate ANCOVAs were run for each measure. For

these analyses, the independent variable was the group (massage intervention or control). The dependent variables were the BDI-II, EPDS, MCQ, PSI parental distress, PSI parent-child dysfunctional interaction, PSI total stress, Questionnaire about Physical Contact (ongoing and current) post-test scores, and the covariates were the pre-test scores for each corresponding measure. Using the pre-test scores as covariates allowed an adjustment for any difference between the groups prior to intervention. In order to determine whether significant changes occurred within groups, paired-samples t-tests were run for each continuous measure. The McNemar test was run on each categorical measure to assess whether significant changes occurred within groups.

The first set of analyses compared the change in maternal depression, maternal confidence, parental distress, parent-child dysfunctional interactions, and feelings about physical contact (ongoing and current) for the HIV-infected mothers who received infant massage training with that of the HIV-infected mothers who did not receive the training. There was a significant difference in maternal depression. Mothers in the control group reported higher levels of depression on both the BDI-II and EPDS than mother in the intervention group (see Table 5). When depression scores were analyzed as high (> 12) or low (≤ 12) scores, the chi-squared test also revealed that the groups differed on depression scores as indicated by both the BDI-II and the EPDS (see Table 7). There were fewer depressed HIV-infected mothers who were trained in infant massage than depressed HIV-infected mothers without massage training. There were no significantly depressed mothers at follow-up who were trained in infant massage. Twenty-two percent of mothers who did not receive infant massage training indicated significant depression at follow-up on both depression measures. However, there were no significant differences

in depression rates between baseline and follow-up scores for the control or intervention group on either the BDI-II (p = 1.00 and p = .25, respectively) or the EPDS (p = 1.00 and p = .50, respectively).

A significant difference was found in amount of total parent stress between groups. Mothers who were trained in infant massage indicated lower total parent stress than those who were not trained in infant massage. However, these results must be interpreted cautiously because mothers in the control group reported significantly higher total parent stress at baseline than mothers in the intervention group (see Table 4). Paired-samples t-tests revealed a significant decrease in total parent stress for the control group (see Table 6). Total parent stress was not significantly different from baseline to follow-up for mothers in the intervention group. There was a significant difference in parental distress between mothers in the control group and intervention group at follow-up. HIV-infected mothers in the control group indicated higher parental distress than those in the intervention group. A significant difference was also found in parent-child dysfunctional interaction. HIV-infected mothers in the control group reported more parent-child dysfunctional interactions than mothers in the intervention group. Significantly more parent-child dysfunctional interactions were reported for the control group at baseline than for the intervention group (see Table 4). Therefore, these results must be carefully interpreted. A significant decrease in parent-child dysfunctional interaction was discovered for the control group (see Table 6).

Additionally, there was a significant difference in ongoing feelings about physical contact. HIV-infected mothers in the intervention group indicated a more positive and comfortable attitude about physical contact than those in the control group. A paired-

sample t-test indicated that the control group had significantly more positive attitudes about physical contact at follow-up than baseline (see Table 4). However, there was no significant difference between control and massage intervention groups in maternal confidence, or current feelings of physical contact (see Table 5).

Table 5
Analysis of Covariance for Post-test Differences between Groups

Construct	*Adjusted Post-test means*		*df*	*F*	*p*
	Control	*Intervention*			
Depression (BDI-II)	8.61 (1.00)	5.31 (1.06)	1,16	3.96	0.04*
Maternal Confidence	61.29 (1.13)	61.79 (1.20)	1,16	0.23	0.80
Depression (EPDS)	7.28 (1.18)	2.68 (1.26)	1,16	4.56	0.03*
Total Parent Stress	59.53 (3.64)	60.40 (3.90)	1,16	9.56	0.00*
Parental Distress	25.00 (1.06)	20.75 (1.12)	1,16	21.64	0.00*
Parent-Child Dysfunctional Interaction	14.32 (0.36)	12.89 (0.39)	1,16	33.46	0.00*
Infant Temperament	19.60 (1.83)	23.20 (1.94)	1,16	1.1	0.36
Overall Feelings about Physical Contact	31.85 (0.90)	33.42 (0.96)	1,16	12.59	0.00*
Feelings about Physical Contact with Family & Friends	20.11 (0.29)	20.62 (0.31)	1,16	0.77	0.48

Note. * indicates $p < .05$.

Table 6

Paired-Samples T-tests for each Group

Construct	Mean (Standard Deviation)					
	Control (n=9)			*Intervention (n=8)*		
	Pre-Test	*Unadjusted Post-Test*	*t*	*Pre-Test*	*Unadjusted Post-Test*	*t*
Depression (BDI-II)	7.67 (6.78)	8.56 (4.28)	-0.58	8.38 (9.26)	5.37 (1.06)	0.90
Maternal Confidence	60.00 (5.90)	61.22 (4.06)	-0.56	61.50 (2.67)	61.88 (2.100	-0.32
Depression (EPDS)	8.00 (2.65)	7.44 (4.50)	0.39	4.88 (5.14)	2.50 (0.76)	1.24
Total Parent Stress	73.78 (14.83)	65.22 (17.96)	2.52*	55.25 (14.01)	54.00 (4.14)	0.31
Parental Distress	28.44 (7.88)	26.33 (5.57)	1.23	21.25 (10.00)	19.25 (3.11)	0.79
Parent-Child Dysfunctional Interaction	22.78 (6.12)	15.11 (1.76)	4.80*	14.00 (3.07)	12.00 (0.00)	1.84
Infant Temperament	22.56 (3.24)	20.00 (7.30)	1.25	20.00 (5.40)	22.75 (1.04)	-1.35
Overall Feelings about Physical Contact	26.56 (7.40)	30.56 (3.71)	-2.37*	33.50 (1.93)	34.87 (2.59)	-1.49
Feelings about Physical Contact with Family & Friends	19.00 (0.50)	20.11 (1.05)	-2.86*	18.87 (2.03)	20.63 (0.52)	-2.26
Infant Weight (kg)	4.96 (1.01)	6.38 (1.29)	-8.95*	4.31 (0.46)	5.95 (0.67)	-10.72*
Infant Height (cm)	56.41 (3.38)	60.92 (3.00)	-10.35*	54.56 (0.73)	59.61 (1.18)	-15.13*
Infant Head Circumference (cm)	38.17 (1.70)	41.06 (1.61)	-3.74*	37.89 (0.89)	40.44 (1.15)	-8.73*

Note. * indicates p<.05.

Table 7

Pearson Chi-Square (X^2) Comparisons of Categorical Measures

Construct	*N*	*df*	X^2	*p*
Depression (BDI-II)	17	1	9.94	0.00*
Depression (EPDS)	17	1	9.94	0.00*

Note. * indicates $p < .01$.

Hypothesis 2

The second hypothesis was that infants who received infant massage from their mothers would be perceived by their mothers as having more adaptive temperaments at 4 months of age than infants who do not receive infant massage from their mothers. Mother's perception of child temperament was measured by the PSI difficult child subsection. These results were used to indicate the impact massage had on infant behavior. To analyze the impact infant massage had on infant behavior, an ANCOVA was run for PSI difficult child scores by group (control and massage intervention). The PSI difficult child pre-test score was used as the covariate and the PSI difficult child post-test scores as the dependent variable. The independent variable was the group (control and massage intervention). In order to determine whether significant changes occurred within groups on perceived child temperament, paired-samples t-tests were run. There were no significant differences in perceived child temperament between or within groups (see Table 5).

Hypothesis 3

The third hypothesis was that infants who received infant massage from their mothers would have more optimal physical development, as assessed by weight and height gain, at 4 months of age than infants who did not receive infant massage. In order to assess the influence that infant massage had on the infants' physical development, ANCOVAs were used to compare weight, height, and head circumference at follow-up. The baseline physical assessments were used as the covariates and the follow-up physical assessments as the dependent variable. The independent variable was the group (control

and massage intervention). Infants whose mothers were trained in infant massage were significantly heavier and longer at Time 2 than infants whose mothers were not trained in infant massage (see Table 8).

Table 8
Analysis of Covariance for Infant Physical Development Variables

Construct	*Adjusted Mean (Standard Deviation)*		*df*	*F*	*p*
	Control	*Intervention*			
Infant's Weight at Time 2 (kg)	6.02 (0.16)	6.36 (0.17)	1,15	36.38	0.00*
Infant's Height at Time 2 (cm)	60.20 (0.38)	60.42 (0.41)	1,15	29.62	0.00*
Infant's Head Circumference at Time 2 (cm)	40.99 (0.50)	40.51 (0.53)	1,15	0.52	0.60

The results of these analyses suggest that the massage intervention had a positive impact on mothers' overall level of comfort with physical contact, maternal depression, total parent stress, parental distress, and parent-child interaction. However, significant group differences were not found in other measures. Although these analyses failed to show significant group differences on a number of measures, these findings may not be truly indicative of the effects of an infant massage intervention on HIV-infected mothers and their infants in this study because of the very small sample size.

Due to small sample size and large within group variability, effect sizes for each measure were calculated in order to determine the degree of impact the massage intervention had on each variable compared to controls. Cohen's *d* was calculated by subtracting the corrected intervention post-test mean from the corrected control post-test mean for each measure and dividing this result by the pooled standard deviation for each

measure ($d = (M_1 - M_2)/\sigma_{pooled}$). According to Cohen (1988), effect sizes can be defined as small (*d*=.2), medium (*d*=.5) or large (*d*=.8). Using these guidelines, a large effect of massage intervention was found for maternal depression, total parental stress, parental distress, current feelings of physical contact and parent-child interaction. These results indicate that infant massage could potentially decrease depression, decrease parent stress and distress, increase comfort with physical contact, and decrease parent-child dysfunctional interactions. Also, a medium effect of massage intervention was found for both ongoing feelings of physical contact and mother's perception of infant temperament. This indicates that infant massage training may serve to increase positive attitudes about physical contact and improve mothers' perceptions of their infants' temperaments. Effect sizes are displayed in Table 9.

Table 9
Effect Sizes for Massage Intervention vs. Control

Construct	*effect size*	*d*
Parent-Child Dysfucntional Interaction	large	2.42
Parental Distress	large	1.54
Depression (EPDS)	large	1.48
Feelings about Physical Contact with Family & Friends	large	-1.33
Depression (BDI-II)	large	1.00
Toal Parent Stress	large	0.84
Overall Feelings about Physical Contact	medium	-0.61
Infant Temperament	medium	-0.51
Maternal Confidence	small	-0.2

Supplemental Qualitative Information

Weekly phone calls to mothers in the massage intervention group were attempted. Each participant in this group was contacted approximately three times between baseline and follow-up assessments (see Table 2). All of these mothers reported that they performed infant massage in the evening. No negative infant reactions were reported in response to the infant massage. Instead, mothers reported that infants seemed to enjoy the massage based on behaviors such as smiling and looking at the mother.

DISCUSSION

Numerous studies have found that HIV-infected mothers are at risk for depression (Ethier et al., 2002; Knowlton et al., 2007; Murphy et al., 2002) and high levels of stress (Ethier et al., 2002), both of which may interfere with parenting (Knowlton et al., 2007). In a study by Dutra et al. (2000), a positive parent-child relationship served as a protective factor for children of HIV-infected mothers. Previous massage studies have identified positive impacts on mother-infant interactions as well as infant development and mother's psychological well-being in relation to infant massage (Field et al., 1986; Onozawa et al, 2001). Therefore, it seems plausible that infant massage may increase resiliency in children of HIV-infected mothers by facilitating successful mother-infant interactions. The purpose of this study was to examine the effects of an infant massage intervention for HIV-infected mothers and their infants. The results of this study provide some support for the usefulness of teaching infant massage to HIV-infected mothers as a way of enhancing maternal-infant interactions, decreasing parental stress, and lowering depression.

First, although mothers in the control group reported significantly higher parent-child dysfunctional interactions than mother in the massage intervention group, a large effect size for parent-child dysfunctional interaction suggests that infant massage training may have a positive influence on mother-infant interactions for HIV-infected mothers. Significant differences in parent-child interaction scores between mothers who were trained in massage and those who were not, along with the large effect size for this

measure, indicate the benefits of infant massage on this relationship. A possible explanation for this finding is that when mothers are knowledgeable and confident in their parenting abilities, infants' needs are quickly and appropriately met. Consequently, a trusting relationship between mother and infant is formed, and the infant has a healthy platform to begin his/her development. The transactional model serves as a basis for this explanation, suggesting that optimal care by the mother results in a happier infant and the perception of a more pleasant mother-infant interaction by the mother. This lends support to the interpretation of the importance of infant behavioral cue knowledge in the establishment of a healthy mother-infant relationship. This result is particularly significant due to previous findings indicating the important role of the parent-child relationship in facilitating positive outcomes for children of HIV-infected mothers amidst a difficult environment. Additionally, significantly lower levels of total parent stress and parental distress reported by mothers who massaged their infants than mother who did not massage their infants may also provide evidence that massage training may be related to the mother's ability to successfully interpret their infant's needs and consequently meet those needs efficiently and effectively. The large effect size for total parent stress and parental distress also support this interpretation despite significantly elevated baseline reports of total parent stress and parental distress by mothers in the control group compared to those in the intervention group. Because stress and distress have been identified as common issues facing HIV-infected mothers, a reduction in these emotional reactions would probably be beneficial to the women as a mother and in their life in general.

Second, significant differences were found between the control and intervention

groups in the area of depression when analyzed as both a continuous and categorical variable. Along with the large effect size associated with post-intervention depression scores, these findings indicate that the massage intervention was associated with lower depression in HIV-infected mothers. Although both groups showed some improvement in depression scores from baseline on the EPDS, HIV-infected mothers in the massage intervention group had much larger improvements in depression scores than their controls. These results replicate the findings of Onozawa et al. (2001), who also found improvement in depression scores among mothers who were trained in infant massage. Although the aspects of this relationship are still unclear, these findings suggest that increased knowledge of infant cues along with skills in nurturing touch may facilitate positive mother-infant interaction, which in turn may benefit the mother's depression.

Third, HIV-infected mothers who were trained in infant massage reported significantly more positive attitudes towards physical contact in general than those who were not trained in infant massage. Although HIV-mothers who were not trained in infant massage had significant increases in comfort and a positive attitude toward physical contact at follow-up compared to baseline reports, HIV-mothers in the infant massage training group maintained more positive attitudes about physical contact than this group. These results may have effects on mother-infant interactions because of the benefits of physical touch on attachment. In addition, enhanced comfort with and recognition of the importance of physical contact may serve as a protector against depression due to increased social support, which is another area that HIV-infected mothers may be lacking. However, significant differences between groups in individuals' feelings about physical contact with family and friends were not found.

Finally, mothers in the massage intervention group indicated satisfaction with the intervention. The amount of data collected from weekly phone calls was extremely limited due to difficulty reaching the mothers. However, the information that was gathered was consistent across individuals. Mothers in the massage intervention group indicated that they tended to massage their infants in the evening. This was the suggestion by the investigator at the time of infant massage training because of the calming effects that massage can have on infants and the positive impact that it can have on sleep patterns. HIV-infected mothers who were trained in infant massage reported no negative responses to the massage. This outcome is probably due to the information on infant cues included in the infant massage training that helps mothers recognize when infants are indicating that they are in an optimal behavioral state for stimulation and interaction. This explanation is further supported by reports from mothers in the massage intervention group that their infants frequently expressed behaviors that indicated they enjoyed the massage. Some of these behaviors included smiling, eye contact, and drowsiness.

This study integrates a number of separate areas of research. Previous research has emphasized the benefits of providing information about infants to their mothers (Bialoskurski et al., 2002; Mazurek-Melnyk et al., 2002; Pridham et al., 1998) and interventions that facilitate nurturing touch (Field et al, 1987). Because infant massage combines both of these variables, it is possible that both information sharing and physical touch are responsible for the benefits associated with infant massage. The population in this study was particularly appropriate for training in both of these areas.

Implications

The purpose of this study was to examine the effects of an infant massage training intervention on HIV-infected mothers' knowledge and attitudes about parenting and their infants' behavior. The results of this study provide some support for the teaching of infant massage to this population. The desire for most control participants to be trained in infant massage after completion of the study suggests that this form of intervention may be accepted and perhaps even enjoyed by HIV-infected mothers. Because this intervention can be provided in a rather short amount of time and inexpensively, it may be appealing to clinics serving this population.

Limitations

The attempt to extend infant massage research to a HIV-infected population did not come without limitations. Due to the small sample size, statistically significant effects were difficult to identify. Although large effect sizes suggest that a number of outcomes may be significantly influenced by infant massage training, additional studies with larger samples remain necessary in order to confirm these hypotheses.

A few limitations in study design are also important to highlight. All measures were self-report. Therefore, it is subject to intentional and unintentional provisions of misinformation. Additionally, only physical infant development outcomes such as weight and height were assessed. A longitudinal study that could evaluate infant developmental outcomes across a longer time period is important in confirming this study's findings.

Finally, the inability to monitor compliance with the massage intervention was

another limitation of this study. The mothers in the intervention group were asked to massage their infants daily for 2 ½ months. The principal investigator attempted to contact mothers in the intervention group on a weekly basis to assess compliance; however, the participants were very difficult to contact due to disconnected phone lines and inability to reach them. At follow-up, a majority of mothers in the intervention group reported massaging their infant several times a week. However, it is still somewhat unclear whether the findings are related to actually massaging their infants or simply being provided with the knowledge about infant behavior. It is also not clear how length of treatment is related to the effectiveness of the massage intervention. This study implemented the massage intervention for 2 ½ months; however, a shorter duration may have been just as beneficial. These limitations indicate a need to replicate these findings with a larger sample, using more objective measures, and across varying time spans.

Future Research

Despite some significant findings of this study, answers to a number of questions continue to remain unclear. In order to determine the individual role that different components of infant massage play in both mother and infant outcomes, knowledge about infant cues and physical stimulation through massage need to be compared as separate and distinct interventions. Although prior research has shown the benefit of sharing information with parents, research about the impact of knowledge on the topic of infant behavior is lacking (Bialoskurski et al., 2002; Mazurek-Melnyk et al., 2002; Reichman et al., 2000). Future studies should also assess the particular elements of infant massage training that mothers found most helpful and enjoyed the most.

The results of the current study gave some support for the notion that infant development can be influenced either positively or negatively by the mother. Due to the relatively short interval between baseline and follow-up data collection, this relationship is still unclear. Future studies should utilize a longitudinal design with multiple data collection points to determine the persistence of group differences over time. Additionally, infant development outcomes may be more easily evaluated with older infants, making inferences about developmental outcomes more valid.

Summary

In summary, this study investigated the effects of an infant massage intervention on the outcomes of HIV-infected mothers and their infants. Although further investigations are necessary, the current study provides preliminary insight into the feasibility and effectiveness of teaching infant massage to HIV-infected mothers. Infant massage is well-researched, inexpensive, and innovative technique that provides both hands-on experience and intellectual enhancement. This study indicates the potential benefits of a massage intervention to both mother and infant as a supplement to follow-up medical care.

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APPENDIX A

ETHICAL APPROVAL

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Institutional Review Board for Human Use

Form 4: IRB Approval Form
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56 and ICH GCP Guidelines. The Assurance became effective on November 24, 2003 and expires on September 19, 2010. The Assurance number is FWA00005960.

Principal Investigator: OSWALT, KRISTA L

Co-Investigator(s):

Protocol Number: **F051212008**

Protocol Title: *Outcomes of Massage Interventions on Teen Mothers and Their Infants*

The IRB reviewed and approved the above named project on 10/24/2007. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received FULL COMMITTEE review.

IRB Approval Date: 10/24/2007

Date IRB Approval Issued: 11.26.07

Identification Number: IRB00000196

Ferdinand Urthaler M.D. /afp

Ferdinand Urthaler, M.D.
Chairman of the Institutional Review
Board for Human Use (IRB)

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.

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APPENDIX B

MASSAGE MATERIALS

This booklet is for people who have just given birth to a baby, or for those who are caring for a newborn. It is a little book about something very important. It describes "how to" touch your newborn baby in a nurturing, gentle way that not only satisfies your baby's need for touch, but also helps you begin to communicate.

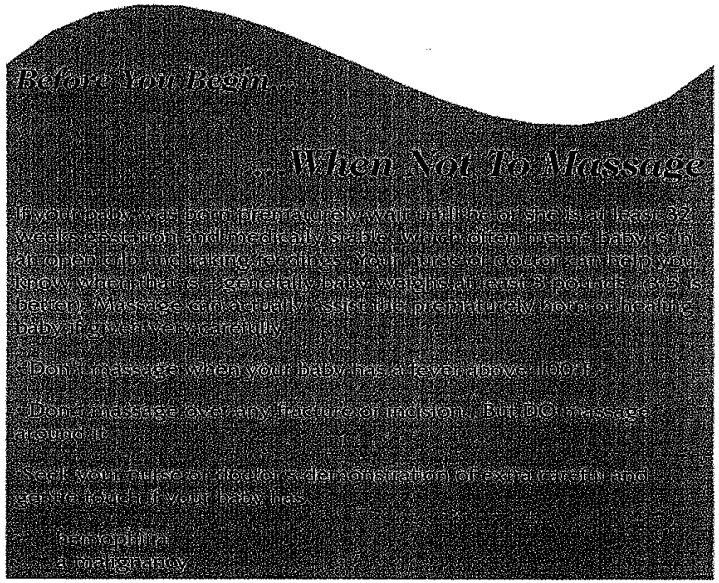
Understanding early cues your baby gives you will help build a foundation for a lifetime of positive communication. Communication is a vital element in parent-child relationships; the need for "hearing" and being "heard" is as lasting as families. Stroking your baby is one of the most natural things to do as a parent, and is the first form of communication a baby experiences... as an embryo developing inside the uterus. The skin is the first organ to develop, and touch is the first sense to develop. You will come to understand that massage feels good to the hands (and heart) of the person doing the strokes. When we touch, we are touched; and when we pay attention in a soft and easy way, we begin to make little miracles happen... we learn to love.

The strokes you will learn are so simple that a young child could learn them, and any member of the family can share in this experience. If you are gentle, and go slowly through these instructions, you will do these strokes perfectly the first time.

Teresa Kirkpatrick Ramsey

Benefits of Massage For Your Newborn

- Feedings are digested better, which may help the baby gain weight easier and grow at a faster pace.
- Stimulating the nervous system through the skin may help build muscle tone, coordination and brain functioning.
- The baby receives special attention from you, which helps you grow closer to each other.
- Circulation is improved, which may speed healing of birth-related trauma.
- Massage has a calming effect which leads to deeper, more restful sleep.
- The immune system is stimulated through the skin by at least five minutes of rubbing daily.



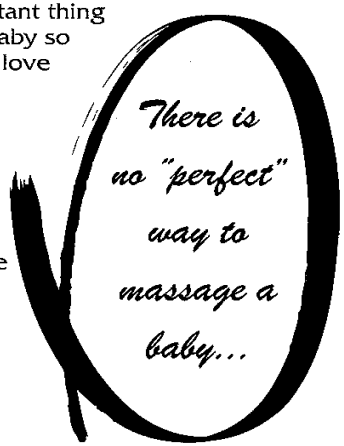
Getting Started...

Newborns have special needs while healing from the birth experience and settling into life outside the uterus. For the first time, they are using energy to breathe, to keep warm, and digest food. They are coping with enormous changes! Help them by protecting their available energy. Keep them warm, not hot.

If your baby is working hard to keep warm, then do the strokes over top of clothing. (No need for lubricant!) Keep them comfortable (learn the "time-out" cues in the next section; stop the stroking if they begin to "talk" to you in this way). Keep the cord clean and free of oil or cornstarch. Newborns are unusually sleepy the first few days, but may be massaged even if asleep.

- These strokes help "turn on" the digestive system. If you do these simple strokes before feeding, digestion will be improved. If you are breast feeding, you can stroke the baby right after feeding. If you are feeding the baby formula, either stroke before the feedings, or wait 30 minutes afterwards.
- Take your time; this is pleasurable for you and the baby. Let this be a restful experience for you while you are healing, too. After you gather the necessary items and have washed your hands, find a comfortable place to sit down.

- You will need a cold-pressed vegetable, nut oil, baby lotion or corn-starch as a lubricant. Some light oils that feel nice on the skin are almond, sunflower, sesame, pecan , hazelnut and safflower. Do not use any perfumes on your infant's skin until your baby is at least 3 months old.
- Remember: if your baby is cold (some newborns take a little time to be able to keep themselves warm) do the strokes over the top of clothing~ without any lubricant.
- You will need a pillow or thick blanket to support the baby - soft enough to be comforting but NOT smothering. Keep your baby wrapped in a lightweight blanket during the massage for warmth and a sense of security. If necessary, change the baby's diaper before you begin.
- Repeat a stroke several times in each area. Apply gentle pressure, using the pads of your fingers, gliding over the baby's skin without pulling on it.
- Stroke more slowly/gently in any tender areas, but do so as this may speed the healing process
- Always keep one hand on the baby's body while you do the strokes. Your baby will feel more secure and will accept the stroking much more readily.
- Remember: there is no "perfect" way to massage a baby. The important thing is to touch and stroke the baby so that he or she can feel your love and calming influence.
- If the baby starts crying or fussing, stop stroking and use the calming techniques that are described to you in the next pages. When the baby is calm again, continue the strokes.



A few words about crying...

Maybe you feel like crying! Go ahead, you'll feel better! Crying is one of your infant's most powerful ways to let you know he or she needs your help. One thing we don't know how to teach are the specifics about each and every cry. Your baby is an individual and will teach you what each of her/his cries mean.

In three or four weeks, you will be an expert with this, so relax. You might want to go to a library and ask about books on crying, or talk to someone you respect in how they have parented their children.

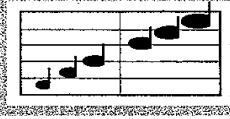
As a newborn care teacher for several years, I noticed these things regarding crying:

There are basically two kinds of cries: *Help me, someone!* and *Please listen to me!* If your baby wants you to *listen*, you listen. Your baby will be able to look you in the eyes, so look back and make nice little reassuring sounds back to him or her; when the baby is "talked out," they'll go to sleep, and sleep very well knowing they have been heard. You WILL NOT spoil your child.

The *I need help* cry is very easy to spot. All you have to do is figure out what your baby needs help with! It could be hunger, needing to burp, or a diaper change; too tight clothing, thirst, being overly tired or sleepy; gas (See page 12), and whatever else you can think of... Then, as soon as you can (and without a lot of tension), give the help your baby needs. Here is what these cries are like:

A *talking* cry sounds like this: wah-wah-wah-wah/breath/wah-wah etc. Each cry is like the one before it.

An *I need help* cry becomes higher and higher in pitch, usually; there is a lot more "feeling" in it.



Very soon, you become the expert with your infant. You begin to notice what is normal and not normal, and will be able to respond correctly to your baby's cries... and both of you will be very pleased!

Ways to calm your baby...

It is very interesting how babies begin to cry after you leave the hospital. Most babies are too tired at first, and sleep most of the time. But, your baby will wake up, and will probably be fussy at times. Very sensitive babies often are very fussy babies, and will need lots of your time and attention. Ask for help if you are feeling overwhelmed. Your baby seems to know when you feel upset, and will actually become more upset! So begin with yourself... Take a few slow, deep breaths like you did during labor.

Learn baby's early cues of distress:

- Arching the back
- Spitting up or hiccuping (not related to eating)
- Avoiding looking into your eyes
- Spreading his or her fingers as if to say "STOP"
- Crying the I Need Help cry

Explore some causes for your baby's fussiness, such as:

- Hunger, needing to burp
- Gassiness (see Step 3, 4, 5 & 6 for "gas relief")
- Needing a diaper change
- Over stimulation
- Overly tired

These are some simple things to try which may calm your baby:

- Place the baby in the fetal position with head down, arms tucked in, knees tucked up.
- Rest your hands on baby for a few seconds without moving them. Breathe deeply and relax.
- Wrap the baby snugly except where you are stroking, especially arms and hands.
- If baby wants to suck, use a pacifier, bring the baby's fingers to the mouth for sucking, or if breastfeeding, put baby to the breast.
- Stop talking or playing music.
- One person take the baby to a darkened room.
- Wrap your baby snugly and cradle, rock or walk your baby.
- Place your baby on your chest up by your left shoulder; stroke from the head down to the diaper, over the clothing and blanket.