

The Effect of Touch Care for Baby by Mother

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Abstract: As the subject of child-rearing support has become more a part of society in modern times, in order to stimulate the spread of mother/child attachment formation through baby touch-care, the effectiveness of touch-care was verified by physical data collected by non-linear analysis, obtained from hospitalized mothers shortly after childbirth, as well as with mothers at home. Comparison of values of LLE and Autonomic Nerve Balance by means of fingertip pulse readings were taken before and after touch-care. As a result, the touch-care for baby with mother was effective to both baby and mother. The research suggests that: 1) the touch-care was effective to both baby and mother, 2) avoidance of using touch-care during hospitalization, 3) both mother and father acquiring skill in touch-care prior to childbirth, 4) after hospital discharge, implementation of touch-care in the home at play times and after bath times, are factors that contribute to emotional well-being.

1 INTRODUCTION

1.1 Issue of Support in Child-rearing

In the year 2005, along with the decline in total population, Japan recorded its lowest birthrate in the nation's history. If the birthrate decline continued at the same rate, by the year 2055 the total population would decrease to 90,000,000, the average number of children born would be 1.26 children per woman, the elderly population would be 40%, and the annual birthrate would be 500,000. Such a reduction in birthrate and the resulting decrease in overall population would create a far-reaching negative influence on Japan's economy due to a reduced labor force, impacting the pension system, medical services, healthcare, national insurance, etc. Such a threat to Japan's future existence is a cause for deep concern.

In the background of this rapid decline in birthrate, there is a great disparity between the desire of communities regarding a healthy rate of marriages, births/child-rearing, and the actual reality

of the current situation. To eliminate this problem, it is important to create increased societal awareness from all viewpoints to effectively reconstruct solutions in institutions, government, etc., so that communities themselves can have hope in building a society where the citizens have peace of mind about marriage, bearing and raising children.

With the prevalence of the small family, a decrease in birthrate, a general breakdown of community, and a condition of parents feeling isolated and unable to properly raise children, parents need adequate knowledge, a positive attitude, and the support of an environment that assists them in the raising of children. However, this support must not come only from professionals in the infant-care and pre-school education sectors. In a broad sense, the care and support of parents and children is needed in all areas of society. For this reason, it is insufficient to delegate this task to "child-rearing support centers", but rather society as a whole must seek to provide support on a broad front. Therefore, the issue at hand is how to create an extensive network of individuals and locations

throughout the country that will provide support for parents and children.

The goal is to aim for a society in which individuals in the community mutually benefit by sticking close in support of parents and their children. The desired goal is for society as a whole to do away with the solitary mindset where individuals think “I will raise my own child myself”, and to have citizens in each community mutually give support to parents, bringing about the trend of a child-rearing culture where “we will all work together to raise our children”.

1.2 Formation of a Parent/Child “Attachment” Relationship

During the time of a child’s infancy and preschool years, the development and acquisition of a “basic feeling of trust” is very important. This involves creation of an “attachment” between a young child and a specific adult in whom the child learns to trust and go to for answers. This trusting relationship becomes the basis through which the child gains a sense of ease and trust toward others throughout life.

According to John Bowlby (1907 - 1990), this “attachment” begins to form between a child and their caregiver (primarily the child’s mother) within the first 2 to 3 months after birth. In this relationship, the child begins to show a selective desire to be with the person caring for them, and the caregiver also experiences a greater awareness of affection for, and an intensified desire to nurture the child. Through the repetition of this mutual relationship, a bond of attachment is created and strengthened between the caregiver and the child. Because of this, in the development of the young child, for the sake of the child’s expression and vocalization of their own feelings, it is extremely important that the caregiver show an abundant measure of responsive affection through smiles, physical contact, etc.

1.3 Regarding Effectiveness of Touch-Care upon Newborns

During the early stage of a newborn’s life, it is said that a large number of necessary nerves in the brain develop through a remaining process (“Nerve Darwinism”). Therefore it is believed that through positive implementation of touch-care from the time shortly after birth, a heightened sensitivity and formation of a strong parent/child attachment is encouraged.

Research of touch-care for newborns was begun in the 1960’s, but these days is not limited to care of newborns only, but the practice of “Tactile Care ®” has also developed to involve people of every age, including the elderly, and is used as an effective means of aiding peace of mind as well as pain reduction. Also, touch-care is used to aid newborns (including premature newborns) in reduction of surplus levels of stress, and to stimulate proper child development. “Developmental Care” has been widely recognized as a means toward this goal, and through the specific means of “NIDCAP ® ” (Neonatal Individualized Developmental Care Program), the usefulness of touch-care has been demonstrated in promoting child development and formation of parent/child attachment.

1.4 Objective of Main Research

In sections I - III, the need in society for support of childcare, formation of parent/child attachment, and effectiveness of touch-care begun shortly after birth, were reported. In so doing, our research team verified the usefulness of childcare support in each locality, and the effectiveness of touch-care for infants as one means of attachment formation. From prior research regarding the fluctuation of fingertip pulse wave readings, in living creatures fingertip pulse wave readings showing “chaos” data from the brain were examined by means of non-linear analysis, and the effects of touch-care were investigated.

When a numerical value of mental activity can be derived by means of Largest Lyapunov Exponent (LLE) readings obtained through non-linear analysis of fluctuations in fingertip pulse wave data, verification is already obtained. It is our consideration that the practice of touch-care in some way or another affects the mental activity in mothers and infants, and that this can be known by fingertip pulse wave readings.

Also, from fingertip pulse wave fluctuation data, autonomic nerve balance (ANB) between sympathetic nerve priority vs. parasympathetic nerve priority can be understood. The autonomic nervous system is an accurate indicator of brain activity, and how autonomic nerve activity changes through touch-care can be obtained.

The aim of the main research is to verify, through this data, the effectiveness of touch-care for infants, and the means of application.

2 METHOD

2.1 Research Subject

The subjects for this research consisted of mothers hospitalized for childbirth, during the first 3-4 days after delivery, as well as mothers participating in childcare classes in various cities/towns, as well as mothers and young children during the childcare process in their locality. The target age for children in this study was under 1 year.

2.2 Research Period

December 2013 - February 2014

2.3 Research Location

“City A” General Hospital, childcare classes in “Town B” and, and the home of a participant in “City A”.

2.4 Research Method

First, explanation of the research was given to the participants, and a form with each participant’s consent for research was obtained. Next, pulse rates of the mother and child were measured for the first session. The mother’s pulse wave was monitored measuring the pulse at the tip of the second finger on the left hand using a finger cuff, and the pulse wave was measured for 3 minutes. The child’s pulse wave was obtained using a pediatric monitor attached to the child’s earlobe for 1 minute. Because of the challenge in getting a small child to sit still for long periods, measurement was set for a shorter time.

A birthing assistant (midwife) that helped with the research demonstrated the baby massage technique for the mother, using an infant size doll. Then the mother was asked to perform the same massage technique on her child. At the end of the massage period, the 2nd pulse wave reading was taken.

Also, a questionnaire for the participating mothers was utilized, which asked the mother two kinds of questions regarding 1) her impressions after having given the baby massage, and 2) how it affected her feeling of “attachment”. Questions regarding the mother’s impressions were as follows: “Did you experience any new realization of ‘touch-care’?” “Do you feel that you would like to continue this with your child? If so, what kind of ‘setting’ (location) would you prefer to use?” “What kind of feelings did you experience while doing the baby

massage?” “Did you notice any place on your child where they seemed to enjoy the massage?” There were 26 questions regarding “attachment”, and response to these questions was divided into 4 categories: (nearly always, often, sometimes, and rarely).

2.5 Method of Analysis

For analysis of the mother’s responses, “Lyspect” measurement analysis computer software was used. For the analysis of the child’s responses, “BACS” measurement analysis software was used.

Data that was gathered comparing fluctuations in pulse wave rates before and after the experiment was examined by non-linear analysis using the computer software. The numerical values of the Largest Lyapunov Exponent (LLE) and Autonomic Nerve Balance (ANB) were examined for comparative study. It was judged that participants whose final readings, when compared to initial readings, showed a rise in LLE values indicated a rise in their mind’s sense of well-being. Also, it was judged that participants whose final readings showed a comparative decrease in ANB due to higher parasympathetic nerve activity indicated a mental reaction of relaxation.

Answers to questions regarding “attachment” were assigned a point value ranging from 4 to 1 for analysis purposes.

3 RESULT

3.1 Attributes of the Participants

In all, 25 mothers took part in the research. Among these, 15 were women tested during hospitalization, and the remaining 10 were women who were tested either at childcare classes or in their homes. The average age of the mothers was 28.8 ± 4.5 years. 7 mothers were tested 3 days after childbirth, 8 mothers were tested 4 days after childbirth, and 1 mother was tested 5 days after giving birth. 15 women were first-time mothers (primipara), and 10 women had previous births (multipara). All of the mothers had normal pregnancies lasting from 37 - 41 weeks, and none of the babies tested were underweight. Of the babies who were tested at home, ages were from 2 – 8 months old. In all, 10 babies were boys, and 15 were girls.

3.2 Regarding Results of Touch Care

Results in measurement of the mothers' fingertip pulse wave can be seen in the table 1.

After completion of the touch-care procedure, 16 of the 25 mothers showed a rise in Largest Lyapunov Exponent (LLE) and a drop in Autonomic Nerve Balance (hereafter referred to as ANB). In contrast, 9 mothers showed a drop in LLE and a rise in ANB. Within the model of increased LLE readings indicating a mental sense of well-being, and decreased ANB readings indicating a relaxed state, 64% of the mothers showed results suggesting that touch-care is effective.

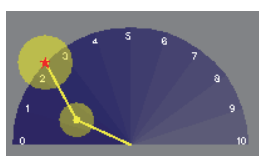


Figure 1: Case3's LLE.

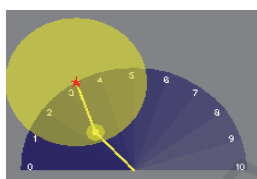


Figure 2: Case23's LLE.

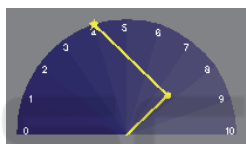


Figure 3: Case6's ANB.



Figure 4: Case20's ANB.

Figure 1, 2, 3, 4: Cases where touch-care was effective.

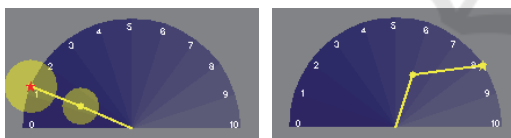


Figure 5: Case7's LLE and ANB.

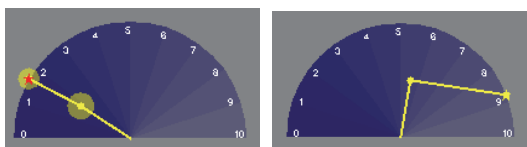


Figure 6: Case21's LLE and ANB.

Figure 5, 6: Cases effectiveness of touch-care could not be recognized.

Among mothers tested during hospitalization, 7 out of 15 women (46.7%) had results showing touch-care as "effective", and among mothers at home, 9 out of 10 women (90%) showed the same "effective" results.

Table 1: Data of all case (LLE and ANB).

| | place | LLE ① | LLE ② | | AN B① | AN B② | | |
|----|-------|-------|-------|---|-------|-------|---|---|
| 1 | HP | 1.47 | 1.64 | ↑ | 4.4 | 5.6 | ↑ | ○ |
| 2 | HP | 1.35 | 2.47 | ↑ | 5.73 | 6.4 | ↑ | ○ |
| 3 | home | 2.13 | 2.62 | ↑ | 7.21 | 7.4 | ↑ | ○ |
| 4 | home | 2.4 | 4.69 | ↑ | 7.9 | 7 | ↑ | ○ |
| 5 | home | 2.37 | 2.2 | ↓ | 5.25 | 3.33 | ↓ | ○ |
| 6 | HP | 1.28 | 1.25 | → | 6.04 | 8.1 | ↑ | × |
| 7 | HP | 1.86 | 1.92 | ↑ | 3.78 | 4.67 | ↑ | ○ |
| 8 | HP | 2.05 | 1.09 | ↓ | 5.95 | 6.64 | ↑ | × |
| 9 | HP | 3.8 | 3.63 | ↓ | 7.43 | 7.83 | ↑ | × |
| 10 | HP | 1.55 | 1.77 | ↑ | 2.54 | 8.91 | ↑ | ○ |
| 11 | HP | 2.98 | 2.48 | ↓ | 4.34 | 6.3 | ↑ | × |
| 12 | HP | 2.44 | 2.31 | ↓ | 9.49 | 9.39 | → | × |
| 13 | HP | 0.91 | 0.63 | ↓ | 4.01 | 5.7 | ↑ | × |
| 14 | HP | 1.85 | 1.76 | ↓ | 6.3 | 5.59 | ↓ | ○ |
| 15 | HP | 2.37 | 3.17 | ↑ | 2.71 | 6.65 | ↑ | ○ |
| 16 | HP | 3.84 | 2.46 | ↓ | 6.96 | 7.68 | ↑ | × |
| 17 | home | 4.85 | 2.36 | ↓ | 3.6 | 6.46 | ↑ | × |
| 18 | home | 4.55 | 1.49 | ↓ | 3.6 | 1.97 | ↓ | ○ |
| 19 | home | 2.34 | 3.36 | ↑ | 5.79 | 6.41 | ↑ | ○ |
| 20 | HP | 2.46 | 1.88 | ↓ | 7.7 | 4.04 | ↓ | ○ |
| 21 | HP | 1.84 | 1.69 | ↓ | 5.6 | 8.8 | ↑ | × |
| 22 | home | 2.55 | 1.82 | ↓ | 5.57 | 4.81 | ↓ | ○ |
| 23 | home | 2.65 | 3.3 | ↑ | 5.35 | 7.4 | ↑ | ○ |
| 24 | home | 2.1 | 2.79 | ↑ | 5.35 | 7.04 | ↑ | ○ |
| 25 | home | 2.42 | 3.74 | ↑ | 9.49 | 8.82 | ↓ | ○ |

3.3 Regarding LLE and ANB Levels

In the 50 times that levels were measured, the average LLE level was a 2.38 reading. When looking at data from only mothers during hospitalization, the average LLE level was a 2.07 reading. Among mothers living at home, the average LLE level was a 2.84 reading.

In our previous research, 17 female students between the ages of 20 - 22 years old were tested, and when measurements were taken before and after food intake, the average LLE level was a 3.71 reading. Even when factoring in a decrease in levels immediately following food intake, these individuals had an LLE reading that was significantly higher than the average 2.07 LLE reading of mothers during hospitalization.

In all cases a trend was observed that immediately following the baby massage, ANB showed a gain in sympathetic nerve activity.

3.4 Attributes of Participants during Hospitalization Vs. at Home

Compared to participants during hospitalization,

participants at home showed a significantly higher percentage of effectiveness regarding touch-care. ($p = 0.045$)

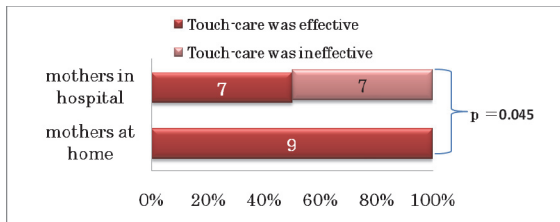


Figure 7: Comparisons between hospitalized mothers vs. mothers at home, regarding effectiveness of touch-care.

Compared to hospitalized participants, mothers at home showed a significantly higher percentage of awareness to where on the body their child enjoyed the baby massage. ($p = 0.027$).

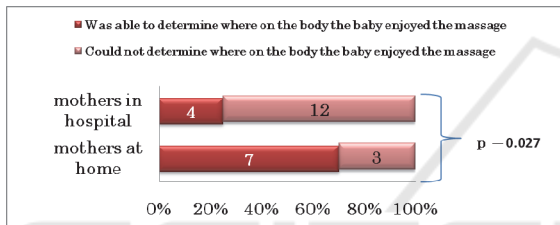


Figure 8: Comparisons between hospitalized mothers vs. mothers at home, regarding the response: “I could tell where on its body my baby enjoyed the massage”.

Compared to hospitalized participants, mothers at home showed a much higher percentage of response that “I could understand the personality of my child”, when answering the questionnaire. ($p = 0.042$).

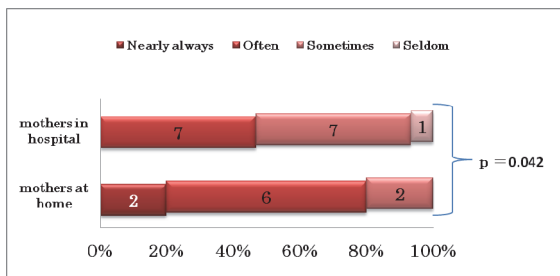


Figure 9: Comparisons between hospitalized mothers vs. mothers at home, regarding the response: “I understand the personality of my child”.

3.5 Differences between First-time Mothers (Primipara) and Those with Prior Births (Multipara)

Primipara mothers, compared to multipara mothers,

showed a much higher percentage of awareness that “I could tell where on its body my baby enjoyed the massage.” ($p = 0.014$).

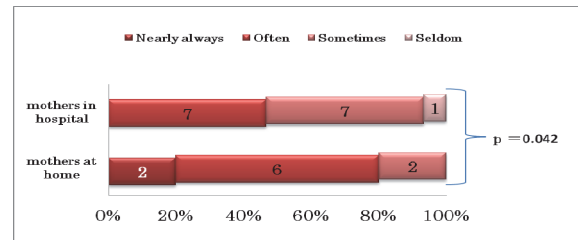


Figure 10: Differences between primipara mothers vs. multipara mothers regarding detection of where on the body the baby enjoyed massage.

Primipara mothers, compared to multipara mothers, showed a much higher percentage of response of “almost always”, when asked how much time they would like to spend with just their baby. ($p = 0.043$).

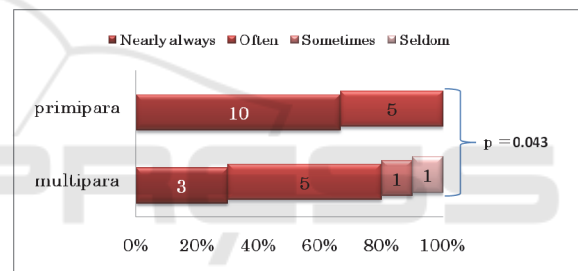


Figure 11: Comparisons between primipara mothers vs. multipara mothers regarding the response: “I want to spend time alone with my baby.”

Primipara mothers, compared to multipara mothers, showed a much higher percentage of response saying, “I like to look into my child’s eyes”, when answering the questionnaire. ($p = 0.027$).

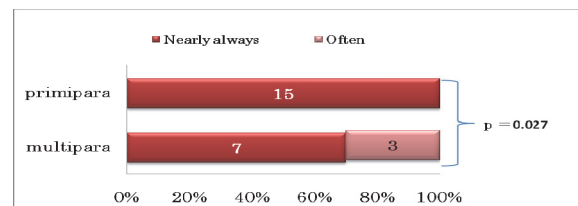


Figure 12: Comparisons between primipara mothers vs. multipara mothers regarding the response: “I enjoy looking into my baby’s eyes.”

3.6 Characteristics of the “Attachment” Measurement

The “Attachment” measurement had an average

reading of 96.6 ± 5.8 points. We calculated all answer of each case to the points as “nearly always”=4 points, “often”=3 points, “sometimes”=2 points, “rarely”=1 point.

3.7 Impressions following Touch Care

Approximately 70% of the participants responded that they “mostly understood” regarding touch-care.

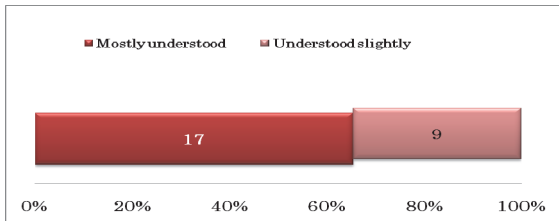


Figure 13: Level of comprehension with touch-care.

Approximately 70% of the participants responded that they “absolutely want to continue” touch-care.

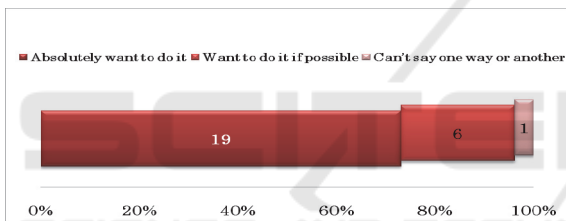


Figure 14: Desire to continue touch-care.

During the touch-care sessions, many mothers expressed feelings like “cute”, and when touching the baby made comments like “it’s a pleasant feeling”, “the baby is soft”, “the baby is warm”, etc. Negative comments such as “it’s scary”, “it makes me nervous”, “it’s a bother”, or “it’s tiring” were not expressed.

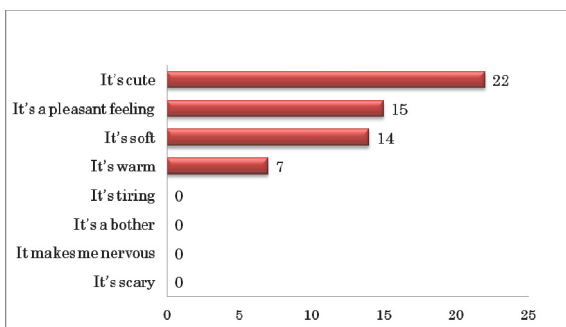


Figure 15: Impressions following touch-care.

3.8 Regarding Results Taken from Baby Measurements

In 2 studies, baby fingertip pulse readings were taken before, immediately after, and 10 minutes after performing touch-care. Because nursing babies fingers are thin and because babies move around erratically, for pulse measurement a pediatric size cuff was attached to the baby’s earlobe. From previous research it was understood that the babies’ LLE readings were high. LLE readings just before and 10 minutes after touch-care were very high, but LLE levels were very low immediately following touch-care. In 2 studies, the obtained measurement results closely resembled this pattern both times. (Table2, Figure16, 17)

Because available time for set-up of equipment was limited, measurement of autonomic nerve balance (ANB) was not possible.

Table 2: Babies’ value of LLE.

| Measurement time | Baby A (boy, 5months) | Baby B (girl, 2months) |
|-------------------|-----------------------|------------------------|
| before | 9.256 | 7.978 |
| immediately after | 2.625 | 2.433 |
| 10 minutes after | 8.295 | 8.849 |

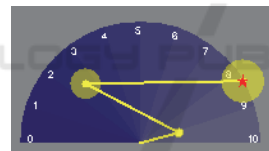


Figure 16: Baby A’s LLE.



Figure 17: Baby B’s LLE.

4 CONSIDERATION

4.1 A Difference in Effectiveness of Touch Care during Hospitalization Vs. at Home

From measurements with this research, results showed that touch-care was effective in 64% of all the participant mothers. The heart of the mothers, who performed the massage, showed a lively attitude toward their children, and this was verified by fluctuations in the fingertip pulse wave measurements, as indicated by the LLE numerical values. However, a great discrepancy was noted among mothers tested 3 - 5 days after giving birth who showed an effectiveness of only 46.7% (less

than half) vs. mothers at home, who showed an effectiveness of 90%.

When considering the cause of low effectiveness of touch-care among hospitalized mothers, postpartum depression that affects many women, also known as “baby blues”, could possibly be a factor. Due to drastic changes in hormone balance after giving birth, crying easily, irritability, anxiety about what childcare will involve, and other such symptoms are common. But even though the mother experiences the positive effect of giving baby massage and has pleasant feelings (“my baby is cute”) toward her child, the fact remains that the condition of her mind and body goes through a great deal of instability at this time. A mother usually recovers from this within 1 - 2 weeks after giving birth, but because our testing was done from the 3rd to 5th day after childbirth, it appeared that there were many mothers whose emotional state of mind was at a low point. The average level of LLE among these women was 2.07, an extremely low reading.

When considering these kinds of results, one other potential cause was the problem of the surroundings. The hospital rooms where mothers stayed had 6 women in a room, which made for a very tight space, and when baby bassinets were placed next to the mothers’ beds to allow the mothers and babies to be together in the same room, this made for an extremely cramped environment. In addition, due to the influence of an increasing societal trend toward more personal privacy, mothers completely closed the curtains around their beds, creating a lifestyle of isolation during hospitalization. Room lighting was rather dim, and the cramped space became a “boxed-in” environment. It is believed that these factors very possibly exerted an influence on the LLE readings of the mothers.

Also, it seems that the tendency of sympathetic nerve priority following the massage session was due to the mental concentration and nervousness of mothers who were practicing the massage for the first time. Since fatigue and hormonal changes after childbirth put an increased load upon a mother’s mind and body, it is thought that it would be better to avoid situations where the degree of nervousness is elevated.

With the passage of time after childbirth, the mother/child attachment increases, and a bond of trust is established. These factors likely explain the reason for the high level of effectiveness of touch-care with mothers at home. Another influence for consideration is that included in this group were mothers who had participated in childcare classes

numerous times, and had already used baby massage repeatedly. Also, the mothers’ recognition of what part of the body their babies enjoyed being massaged, as well as comprehension of their babies’ personalities were linked to repeated usage of baby massage and observation of their babies over an extended period of time.

4.2 Differences between Primipara Vs. Multipara Mothers

Among primipara (first-time) mothers, numerous women responded by saying that they could determine what part of the body their child enjoyed being massaged, they enjoyed spending time alone with their child, and enjoyed looking into the eyes of their child. Results of this research showed that primipara mothers, compared to multipara mothers, took a longer amount of time in physical contact with their child, and had an environment where they focused a large amount of attention on their child.

4.3 Regarding Attachment

The emotional well-being of mothers during hospitalization was rather poor, nevertheless their response to questions regarding attachment averaged an extremely high reading of 96.6 points on a scale with a maximum 104 points possible. The following responses were especially prevalent: “I can sense the love of my child”, “I think my child is cute”, “I feel that I want to have a close relationship with my child”, “I like watching the gestures my child makes”, etc. Even though this research immediately followed childbirth, it was clear that there existed a strong level of mother/child attachment.

However, although a deep and healthy attachment of mothers toward their newborn babies was clearly visible, there were instances where the physical data taken from the fingertip pulse wave fluctuations did not correspond. Researchers grasped the fact that at times the actual participants themselves had a conscious awareness of the effects of touch-care, and at other times only had a mere outward observance without understanding parts of it. It was determined that by using fingertip pulse wave data objectively, aid in the care of emotional and physical health after childbirth is possible.

4.4 Impressions after Application of Touch Care

70% of the participants felt they understood touch-care well, and responded that they very much wanted

to use it, experienced “cute”... “soft”... “feels good”... “warm” and other such pleasant feelings toward their child, and that they were conscious of the positive effect touch-care had on them.

When asked in what setting they would like to use touch-care, in addition to “play time”, many women responded that they would use it after bath time. Recently, it is reported that in many families the father has assumed the role of caring for the baby’s bath. Consequently, it is desirable that fathers also acquire ability to practice touch-care and form a bond with their child.

4.5 Effectiveness of Touch Care for Baby

It is known that shortly after birth there are large fluctuations in babies’ fingertip pulse wave readings. It is said that this condition is a baby’s adaptation to the outside world in the growth process. At 3 years of age LLE levels drop precisely, and because of this clear one-time drop the “3 year-old myth” is corroborated. However, it is considered that because the subjects of this research were children at the ages of 5 months and 2 months after birth, this period reflected very high LLE levels.

It is thought that the reason infant LLE levels drop sharply immediately following touch-care is due to the infant’s “internal concentration” focus resulting from the touch-care session. This drop could be due to the condition of the infant’s concentration regarding the sensations it experiences and the interaction with its mother, thus causing an “internal concentration” leading to the sharp drop in LLE levels.

10 minutes after touch-care, infant LLE levels returned to the initial high reading, but this type of fluctuation is thought to be a condition of the infant’s growth development and enjoyment of the touch-care stimuli.

Although the infants spoke nothing, the physical data gave evidence that baby massage is effective. But because the subjects were limited to only 2 studies, it is needful for further testing to be done in order to more fully verify the findings.

It was determined that touch-care was effective for both mothers and their babies.

5 CONCLUSIONS

It was verified that baby touch-care is effective in aiding the mind/body health of mothers. Though examples are few, when making an objective

observation from physical data taken from the babies, it was clear that baby touch-care is effective. Because of drastic hormonal changes after childbirth and the cramped environment with inadequate space in hospital settings, touch-care during hospitalization is best avoided. Rather, childcare classes prior to childbirth where both father and mother together practice touch-care, as well as learning touch-care in the home after childbirth when life has returned to normal, is to be desired. However, the most effective use of touch-care for newborns would be if both the mother and her husband could take their time and learn touch-care during the pregnancy, then after the birth, while preparing for discharge from the hospital, encourage a resumption of touch-care so that all aspects of touch-care can be implemented as the mother and child go home. The cooperation with both midwives and local health care nurses is important. In these days when the importance of child-rearing support is being spoken of in communities, it is the conclusion of our research that in order for mothers and their babies to experience a lifestyle where they enjoy health of mind and body in the area where they live, it is needful for baby touch-care to be more greatly popularized.

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