Japanese Journal of Applied Psychology
2012, Vol. 38 (special edition), 83–91

Minor Study

Differences in Japanese Mothers' Touch of Their Four-Month-Old Infants Based on Results Gleaned from a Survey of Nurturing Scenes:

Focusing on scenes of playing, crying, feeding, and putting infants to sleep

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The purposes of this study are: (1) to examine the differences in maternal touch between different nurturing scenes, (2) to examine the meaning of maternal touch to infants, and (3) to examine the role of maternal touch in mother–infant interactions.

A total of 603 mothers of four-month-old infants completed a questionnaire that used a touch-rating scale. Friedman's test was conducted with 19 touch categories as dependent variables and four nurturing scenes as independent variables. The Wilcoxon test was used for multiple comparisons.

The major results indicated that maternal touch differed among the four nurturing scenes. In playing scenes, mothers administered various types of touch to their infants as a means of eliciting infant smiling. In crying scenes, the mothers tended to use a type of touch that provided quiet vibration at a constant rate as a means of soothing their crying infant.

Hence, these results suggest that a mother's touch can be functionally useful, depending on nurturing scene.

Key words: touch, nurturing scene, infant, mother, touch-rating scale

INTRODUCTION

In recent years, child-rearing problems such as child abuse and anxiety over child-rearing have been on the rise in Japan. Following the 2004 amendment of the Child Abuse Prevention Law, the Japanese government introduced a project to encourage professionals (e.g., nurses and midwives) to visit each individual family unit within four months of delivery for a health check.

The quality and frequency of mother-infant interactions are believed to be vital to the formation of attachment between mothers and their infants, and to help to reduce mothers' child-rearing anxiety. Some local governments even incorporate touch-care classes into public services for new mothers.

Definition of touch

Touch has interactive and emotional properties, so it is an important index for reflecting the relationship between people (Cohn and Tronick, 1989). A multimodal sensation is defined as a sensation that causes tactile, baresthesic, thermesthetic, or nociceptive responses (or a combination of any or all four) when the skin comes contacts an object (Iwamura, 2001). Thus, the sensation of touch is multimodal as well as complex in its si-

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multaneous aspects of physical contact that can be objectively observed and sensation that can be subjectively described.

Literature review

As we review the history of research on touch, we find two trends, clinical research and basic research. First, clinical research has examined the effects of massage therapy and kangaroo care on premature infants. Reports have addressed the effects on weight gain (Field, Hernandez-Reif, Diego, Feijo, Vera, and Gil, 2004) and the adjustment of circadian rhythm in preterm newborns (Feber, Laudon, Kuint, Weller, and Zisapel, 2002). There are indications that massage therapy is effective in preterm newborns but harmful in full-term newborns (Koniak-Griffin and Ludington-Hoe, 1987).

Basic research has adopted naturalistic observation (Tronick, Morelli, and Ivey, 1992) and experimental observation such as the still-face procedure (Stack and Muir, 1992). However, many previous studies did not sufficiently examine the constituents of touch because they often aimed to study the presence or absence of touch (Stack and Muir, 1992) or the duration of physical contact (Tronick et al., 1992).

Only recently has research begun to focus on the constituents of touch. Hertenstein (2002) separates the concept of touch into quality of touch (action, intensity, velocity, abruptness, and temperature) and parameters of touch (location, frequency, duration, and extent of surface area touched). Tronick (1995) focused on the meanings of different types of maternal touch. For example, holding communicates safety to infants, while poking is perceived as a threat. Malphurs, Raag, Field, Pickens, and Peláez-Nogueras (1996) define stroking and rubbing as positive touch, and poking and tickling as negative touch for infants.

Moreover, the meaning of touch is influenced by context. Hertenstein (2002) suggests that the context in which mothers administer touch to their infants can profoundly influence the communicative functions of touch. Furthermore, Aso and Iwatate (2006) found that the characteristics of touch varied by nurturing scene.

The primary issue in the study of touch thus far is to clarify variations in maternal touch. It is necessary to determine the differences in maternal touch (which differs from massage) in natural nurturing scenes. The second issue is to clarify the connection between different kinds of maternal touch and nurturing scenes by determining how the meaning of such touch changes depending on the scene. The third issue is to develop a touch scale to assess maternal touch. No effective touch rating scale has been developed because the properties of touch are complicated and because previous studies have adopted experimental observation as the research method. Drawbacks of brief experimental observation are that only a small sample can be observed, the measures used tend to be limited, and there is a possibility of bringing about the experimental effect. Therefore, this study uses a questionnaire in an effort to develop an effective touch-rating scale.

Framework of the study

The framework of this study is depicted in Fig. 1. Here, we define maternal touch as physical contact from mother to infant. We focus on maternal touch in four different nurturing scenes where we speculate that touch is particularly interactive: playing, crying, feeding, and putting infants to sleep. We focus on quality and frequency of touch as parameters of touch behavior. We define types of touch as various movements through which the mother touches the infant's skin. This study focuses on the fourth month of an infant`s life because it is considered to be a crucial time for developing attachment and socialization (Ainsworth, 1973) and because this period has drawn the special attention of professionals for its effect on preventing abusive treatment from early infancy (Yamada, Morioka, and Yanagawa, 2009).

Objectives of this study

The objectives of this study are threefold. First, we sought to determine differences in maternal touch in different nurturing scenes, predicting that maternal touch administered to infants can be differentiated by nurturing scene. Second, we aimed to determine the meaning of maternal

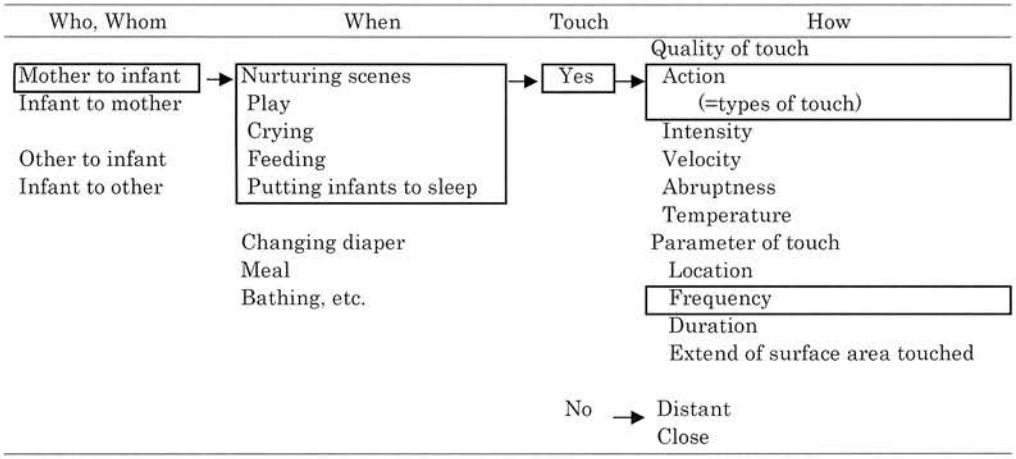

Fig. 1. Dimension of touch.
Note. Parts of this table are taken from Hertenstein (2002). This framework of this study is indicated in the boxed areas.

touch employed with infants, looking to clarify what meaning maternal touch would have for infants, depending on the context in which touch is administered, and whether infants would perceive it as positive or negative touch. Third, we sought to clarify the role of maternal touch in mother-infant interactions, hypothesizing that if there are indeed differences in maternal touch by nurturing scene, then maternal touch would play a functional role in satisfying the infant's needs in mother-infant interactions.

METHODS

Participants

The participants were 603 mothers (mean age 30.9 years, range 16 to 42 years; primipara 336, multipara 234; male infants 297, female infants 273) residing in medium-sized City A, with a population of 200,000 people, in the suburbs of Tokyo. The participants were among 901 mothers who attended their infants' four-month health check and who completed a self-reporting questionnaire (collection rate 67%). The profile of the participants is presented in Table 1. The characteristics of our sample population indicated the same tendencies as published for the representative sample (National Institute of Population and Social Security Research, 2005).

Table 1. Sample characteristic.

		Number of case (%)
Mother's age (years old)	16–24	35 (6.1)
	25–34	410 (71.9)
	35–42	125 (21.9)
Birth experience	Primiparas	336 (58.9)
	Multiparas	234 (41.1)
Feeding method	Breast feeding	242 (42.4)
	Mixed feeding	146 (25.6)
	Bottle feeding	121 (21.2)
Mother's occupation	Housewife	474 (83.1)
	Company worker	55 (9.6)
	Self-employed	12 (2.1)
	Part-time worker	10 (1.8)
	others	19 (3.3)
Sex of infant	Males	297 (52.1)
	Females	273 (47.8)

Research period

This research was conducted from November 2004 to September 2005.

Preliminary studies

In order to develop the Japanese Touch-Rating Scale (JTRS), a new instrument to assess maternal touch, in the first preliminary study we videotaped and observed the behavior of 17 infants and their parents during the first year of life. From the recorded data, we extracted categories of touch that parents administered to their infants, and arranged these categories referring to previous stud-

ies (Peláez-Nogueras, Field, Gewiritz, Cigales, Gonzale, Sanchez, and Richardson, 1997; Tronick, 1995). As a result, we extracted 13 touch categories (Table 2, touch categories 1 through 8, 13, and 16 through 19).

In the second preliminary study, we interviewed 21 mothers to identify what type of touch they administered to their children. As a result, six touch categories were added, and a total of 19 touch categories were set (Table 2, touch categories 9 through 12, 14, and 15).

To determine the nurturing scenes to be assessed, in the third preliminary study we surveyed nine mothers of infants, allowing free description of the type of scenes in which they would touch their children. From seven scenes identified (Aso and Iwatate, 2006), we adopted the four most frequently reported scenes: playing, crying, feeding, and putting an infant to sleep. Based on the three preliminary studies, we then drafted the JTRS, which has 19 touch categories to be rated in each of the four nurturing scenes.

Procedures and measures

During the infants' four-month health check (city hall), we explained the purpose of this research and handed the questionnaire to all those who agreed to complete it and return it. The questionnaire was anonymous and was returned by mail in the stamped envelope provided. Mothers for whom individual guidance was recommended after medical examination were excluded from the research target.

The JTRS was used to assess maternal touch. Participants rated each of the 19 touch categories in four nurturing scenes using a 5-point scale (5 for always do, 4 for mostly do, 3 for sometimes do, 2 for mostly don't do, 1 for never do).

In addition, 20 items of the Self-Rating Depression Scale (SDS), Japanese version (Fukuda and Kobayashi, 1973), and 21 items of a Child-Rearing Stress Scale (Sato, Sugawara, Toda, Shima, and Kitamura, 1994) were completed by the participants as a measure of maternal mental health. However, the present study adopted only the SDS.

Participants scored each item of the SDS on a 4-point Likert scale (4 for almost all of the time, 3 for a good part of the time, 2 for some of the time, 1 for little of the time). A higher total score indicated higher severity of depression. Thus, participants who had a total score exceeding 50 points (number=61) were eliminated from analysis, in order to limit the analysis to mothers without depression.

Data analysis

The mean score for each of the 19 touch categories for each of the four nurturing scenes was calculated. Friedman's test was conducted with the 19 touch categories as dependent variables and the four nurturing scenes as independent variables to determine the main effect of the nurturing scene. The Wilcoxon test was used for multiple comparisons.

RESULTS

Main effect of nurturing scenes

The results of the study are presented in Table 3. A significant main effect of nurturing scene was found for all 19 touch categories ($p<0.001$). The main results of multiple comparisons among the nurturing scene factors were as follows.

Thirteen touch categories (Touching (1), Stroking (2), Rubbing (3), Holding up infant's hands and feet (4), Waving infant's hands and feet (5), Poking (7), Tickling (8), Holding infant's hands and feet affectionately (9), Massaging (10), Pinching (11), Kissing (12), Supporting infant's body (14), and Shaking (19)) were all used by mothers significantly more frequently in the playing scene than in the other three nurturing scenes ($p<0.001$).

Four categories (Patting (6), Holding (13), Picking infants up (16), and Quietly swaying (18)) were used more frequently in the crying scene than in the other three nurturing scenes ($p<0.001$).

In the feeding scene, eleven categories (Touching (1), Stroking (2), Rubbing (3), Patting (6), Massaging (10), Kissing (12), Hugging (15), Picking infants up (16), Changing position (17), Quietly swaying (18), and Shaking (19)) were employed by mothers significantly less frequently than in the other three nurturing scenes ($p<$

Table 2. Touch category.

Touch category	Operational definition
Partial touch category	
1. Touching	Parts of the caregiver's body (especially fingers, hands or palms) touch a part of the infant's body. While touching, the point of contact does not move; e.g. touches forehead or cheek.
2. Stroking	Parts of the caregiver's body (especially fingers, hand or palm) touch a part of the infant's body. The point of contact moves slowly and gently at a rate of 1–5 times per 5 seconds, and the speed is slower than rubbing; e.g. strokes infant's head or eyebrow.
3. Rubbing	Parts of caregiver's body (especially fingers, hands or palms) touch a part of the infant's body, and the point of contact moves quickly at the rate of 10–15 times per 5 seconds. The speed is faster than stroking; e.g. rub infant's back or hand.
4. Keeping up infant's hands and feet	Parts of the caregiver's body (especially fingers, hands or palms) touch a part of the infant's body. By doing so, the caregier bears the infant's weight. The point of holding does not move; e.g. holds infant hands or legs or head.
5. Waving infant's hands and feet	Caregiver holds parts of the infant's body with parts of his or her body (especially fingers, hands or palms) and moves the infant little by little in a circular motion at a rate of 2–3 times per second; e.g. waves bye-bye.
6. Patting	Caregiver touches a part of infant's body with parts of his or her body (especially fingers, hands or palms). Then, the caregiver pats the part continually. The speed is regular and at a rate of 1–5 times per 5 seconds; e.g. pats infant's back or hip.
7. Poking	Caregiver touches a part of the infant's body with a part of his or her body (especially fingers). The area of skin touched with a light pressure is small; e.g. pokes infant's cheek or belly.
8. Tickling	Parts of the caregiver's body (especially fingers, hands, palms, legs or mouth) touch a part of the infant's body. Caregiver stimulates the part of the infant's body, such as sides, neck, and soles of the feet, and makes the infant want to laugh; e.g. tickles infant's armpit or neck.
9. Holding infant's hand and feet affectionately	With his/her fingers, caregiver holds parts of the infant's body, expecially fingers and hands. Caregiver does not bear the infant's weight by holding; e.g. holds infant's fingers and hands.
10. Massaging	To improve blood circulation, caregiver exerts pressure or friction to parts of the infant's body with his or her fingers and hands; e.g. massages infant's sole.
11. Pinching	Caregiver hold parts of the infant' body harder than usual such as the cheek, nose and arms with parts of his/her own body, especially hands and fingers; e.g. pinches infant's cheek or nose.
12. Kissing	Caregiver's lips touch part of the infant's body; e.g. kisses infant's cheek
Holding category	
13. Holding	Caregiver holds the infant around his or her abdominal area and wraps up the infant's hands, feet and arms. The parent-infant contact is continuous; e.g. vertical holding, horizontal holding.
14. Supporting infant's body	Caregiver supports the infant's body with parts of his/her body (hand or legs). The parent–infant contact is continuous; e.g. holds infant in the inner thighs, hold infant's side.
15. Hugging	Caregiver holds the infant around his or her abdominal area and wraps up the infant's hands, feet and arms. When hugging, caregiver puts some kind of feeling into it. The parent–infant contact is continous; e.g. hugs the infant's body.
16. Picking up infant	Caregiver picks up the infant for the purpose of moving, carrying or soothing the infant. The duration of holding is short at less than 10 seconds; e.g. picks up a crying infant.
17. Changing position	Caregiver holds the infant and changes the position of holding. After the change, the position does not revert back to the previous position after 1 second; e.g. changes position from vertical level to horizontal level.
18. Quietly swaying	Caregiver holds the infant and sways him/her rhythmically from right to left, up and down or back and forth. When swaying from right to left, the angle should be less than 90 degrees laterally; e.g. rocks the infant as if in a cradle.
19. Shaking	Caregiver holds the infant and shakes him/her from right to left, up and down or back and forth. When shaking from right to left, angle degree should be more than 90 degrees laterally; e.g. throws infant up in air, moves the infant like an airplane.

Table 3. Mean (standard deviation) values for each nurturing scene, main effect of nurturing scene factor , and multiple comparison test among all 4nurturing scenes.

Touch category	Nurturing Scenes P[a] M	P[a] SD	C[b] M	C[b] SD	F[c] M	F[c] SD	S[d] M	S[d] SD	Main effect	Multiple comparison test
Partial touch category										
1. Touching	4.87	0.39	4.10	1.13	3.87	1.30	4.06	1.23	**	P>C/S/F**e, C>F**, S>F**
2. Stroking	4.69	0.62	4.13	1.07	3.87	1.26	4.21	1.09	**	P>S/C/F**, C>F**, S>F**
3. Rubbing	4.36	0.93	4.16	1.10	3.27	1.38	3.84	1.30	**	P>C/S/F**, C>S/F**, S>F**
4. Keeping up infant's hands and feet	4.65	0.67	3.33	1.33	3.48	1.39	3.04	1.48	**	P>F/C/S**, F>S**, C>S**
5. Waving infant's hands and feet	4.29	0.92	2.89	1.36	1.86	1.03	1.77	1.06	**	P>C/F/S**, C>F/S**
6. Patting	4.00	1.21	4.16	1.18	2.59	1.46	3.94	1.35	**	C>P/S/F**, P>F**, S>F**
7. Poking	3.82	1.08	2.16	1.20	1.95	1.15	1.48	0.83	**	P>C/F/S**, C>F/S**, F>S**
8. Tickling	3.72	1.14	2.19	1.23	1.37	0.73	1.29	0.66	**	P>C/F/S**, C>F/S**, F>S**
9. Holding infant's hand and feet affectionately	4.55	0.74	3.62	1.27	3.75	1.29	3.60	1.41	**	P>/F/C/S**
10. Massaging	2.99	1.19	2.05	1.11	1.60	0.93	1.88	1.21	**	P>C/S/F**, C>S/F**, S>F**
11. Pinching	2.33	1.23	1.58	0.86	1.33	0.67	1.26	0.62	**	P>C/F/S**, C>F/S**, F>S**
12. Kissing	4.28	1.07	3.27	1.45	1.92	1.28	3.05	1.57	**	P>C/S/F**, C>S/F**, S>F**
Holding category										
13. Holding	4.81	0.55	4.90	0.35	4.59	0.99	4.37	1.07	**	C>P/F/S**, P>F/S**, F>S**
14. Supporting infant's body	4.32	1.06	3.94	1.31	2.78	1.68	2.75	1.57	**	P>C/F/S**, C>F/S**
15. Hugging	4.46	0.83	4.50	0.91	2.87	1.53	3.58	1.45	**	P>S/F**, C>S/F**, S>F**
16. Picking infants up	4.76	0.61	4.88	0.41	2.74	1.62	3.32	1.56	**	C>P/S/F**, P>S/F**, S>F**
17. Changing position	4.57	0.81	4.53	0.91	3.28	1.67	3.56	1.44	**	P>S/F**, C>S/F**, S>F**
18. Quietly swaying	4.48	0.86	4.67	0.68	2.33	1.45	4.41	0.97	**	C>P/S/F**, P>F**, S>F**
19. Shaking	2.77	1.32	2.46	1.40	1.24	0.56	1.46	0.95	**	P>C/S/F**, C>S/F**, S>F**

Note. ** $p<.01$.

The level of significance for multiple conparison test in all touch categories is $p<.01$. to adopt Bonferroni's inequality.

[a] P: Playing scenes, [b] C: Crying scenes, [c] F: Feeding scenes, [d] S: Putting infants to sleep scenes. [e] P>C/S/F showed that 1. touching in the playing scenes was significantly higher than in the crying scenes and putting infant to sleep scenes, and feeding scenes.

0.001).

In the putting infants to sleep scene, five categories (Holding up infant's hands and feet (4), Poking (7), Tickling (8), Pinching (11), and Holding (13)) were used by mothers significantly less frequently than in the other three nurturing scenes ($p<0.001$).

DISCUSSION

Differences in nurturing scenes by types of maternal touch

The purpose of this study was to examine the differences in maternal touch administered to infants in four common and natural nurturing scenes. We hypothesized that maternal touch administered to infants would differ according to nurturing scene. The results suggest that maternal touch is indeed different in all four nurturing scenes. The results of the study also supported Hertenstein's (2002) theory that the communicative effects of touch administered to infants occur through different forms of touch and vary according to context.

Relationship between types of maternal touch and nurturing scene

Previous studies considered stroking, rubbing, and holding as positive touch administered to in-

fants, and poking and tickling as negative touch administered to them (Malphurs et al., 1996; Tronick, 1995). The results of the present study indicated, first, that the mean values of three of the touch categories (Stroking (2), Rubbing (3), and Holding (13)) were high in all four nurturing scenes. In addition, the mean value of Touching (1) was high in all four nurturing scenes, although previous studies did not include this category in positive touch. Thus, mothers frequently employ these four categories of touch in the four nurturing scenes they can therefore be considered positive touch that communicates positive meanings to infants.

Second, regarding negative touch, the present results revealed that the mean values for Poking (7) and Tickling (8) were low in the crying, feeding, and putting infant to sleep scenes, but were high in the playing scene. These results therefore differ from those of previous studies that defined poking and tickling as negative touch (Malphurs et al., 1996; Tronick, 1995). The reason for such discrepancy in the results is that the meaning of touch communicated to infants varies depending on the nurturing scene in which touch is administered, which was not examined in detail in those studies. The data from the present study suggest that mothers tend to employ poking and tickling with infants in the playing scene; therefore, they may not in fact communicate negative meaning to infants. Indeed, this could be supported by the fact that mother's tickling is said to generate conflicts of pleasant and unpleasant feelings in infants; this conflict of feeling is eventually integrated as the emotion "titillation" and then becomes playful (Negayama, 2002). Harsher forms of touch (e.g., tickling and poking) used with infants in the playing scene can be considered positive engagement in play, whereas such harsh touch used in the crying, feeding, or putting infants to sleep scenes would worsen the situation by arousing the infants, as well as communicate negative meaning to them.

The results of the present study therefore suggest that the effects of the different types of touch on infants are strongly influenced by the nurturing scenes in which they occur.

Role of maternal touch in mother-infant interactions during infancy

Thirteen touch categories (e.g., Stroking (2), Patting (6), and Shaking (19)) were observed significantly more frequently in playing scenes than in the other three scenes. In categories that indicated a significant difference, various types of touch were observed, ranging from gentle touch (e.g., touching and stroking) to sudden and abrupt touching (e.g., shaking). These types of touch were intended to attract the infant's attention and to communicate affection. The relationship between infant smiling and the presence of touch has been studied (Stack and Lepage, 1996); in the playing scene, mothers use various types of touch with their infants as a means of eliciting infant smiling.

In crying scenes, four touch categories (e.g., Patting (6) and Quietly swaying (18)) were observed significantly more frequently than in the other three scenes. These rhythmic types of touch were used to quieten the infant. Indeed, the effect of vestibular proprioceptive stimulation that soothes crying infants has been verified (Korner and Thoman, 1972). In crying scenes, the mothers tended to use types of touch that provide a quiet vibration at a constant rate as a means of soothing the crying infant.

In feeding scenes, 11 touch categories (e.g., Massaging (10) and Shaking (19)) were observed significantly less frequently than in the other three scenes. Unlike the other three scenes, the feeding scene is one in which it is difficult for a mother to use touch with her infant, although the four touch categories of Touching (1), Stroking (2), Holding the infant's hands and feet affectionately (9), and Holding (13) were frequently used. Relations of mutual contingency and turn-taking were observed in the mother's jiggling and the infant's sucking (Kaye and Wells, 1980). The types of touch that scored high in the feeding scenes (e.g., Holding (13), Stroking (2), and Touching (1)) were used to jiggle the infants when they paused sucking. The frequency of the other touch categories was low because the infant needed to maintain sucking; thus, unnecessary touch was avoided. The mother employed close holding and

stroking as a means of stabilizing the act of sucking.

In putting the infant to sleep scenes, five touch categories (e.g., Poking (7) and Tickling (8)) were observed significantly less frequently than in the other three scenes. Three of these categories, (Poking (7), Tickling (8), and Pinching (11)) involve touch that provides a physical stimulus and evokes sensation. In putting the infant to sleep scenes, mothers tended to avoid touch that would evoke sensation, in order to quieten the child.

The results confirm that mothers employ different types of touch with their infants, depending on the infants' needs in each nurturing scene; thus, touch is used functionally. These findings suggest that the transmutation of maternal touch is indeed an important foundation for mother-infant interactions.

Limitations and future research

The touch-rating scale used in this study, the JTRS, was developed with the main focus on the types of touch used from among the various touch parameters. In addition, the participants were mothers with four-month-old infants who were not deemed to be potentially abusive.

In the future, research targeting potentially abusive mothers is warranted. Furthermore, by including additional measures of specific parameters of touch (e.g., strength, speed of touch, and parts of the infant's body touched), we intend to develop a touch-rating scale that enables the detection of potential problems in early child-rearing. In the future, we need to observe rearing activities and infant responses continuously and compare the findings with those of the present study.

AN ADDITIONAL NOTE

This study is a reanalysis of Aso and Iwatate's data (2011) (*The Journal of Child Health*, **67**, 506–514.) from another viewpoint.

ACKNOWLEDGMENT

This study was supported by a grant funding from the project of Miraiokizuku-Kosodate by Sumitomo Life Insurance Company and a kakenhi grant for Scientific Research (c) (Grant number #22530761 senior researcher Shizuo Iwatate).

REFERENCES

Ainsworth, M. D. 1973 The development of infant–mother attachment. In B. M. Caldwell., & H. N. Ricciuti (Eds.), *Review of development research. Vol. 211.* Chicago: The University of Chicago Press.

Aso, N. & Iwatate, S. 2006 Differences in mother's touching their infants who were 0–1 years old among the seven scenes of nurturing: Using the retrospective method. *The Journal of Child health*, **67**, 488–497.

Cohn, J. F. & Tronick, E. Z. 1989 Specificity of infants' reponse to mothers' affective behavior. *Journal of American Child Adolescent Psychiatry*, **28**, 242–248.

Feber, S. G., Laudon, M., Kuint, J., Weller, A., & Zisapel, N. 2002 Massage therapy by mothers enhances the adjustment of circadian rhythms to the nocturnal period in full-term infants. *Developmental and Behavioral Pediatrics*, **23**, 410–415.

Field, T., Hernandez-Reif, M., Diego, M., Feijo, L., Vera, Y., & Gil, K. 2004 Massage therapy by parents improves early growth and development. *Infant Behavior and Development*, **27**, 435–442.

Fukuda, K. & Kobayashi, S. 1973 A study on a self-rating depression scale. *Psychiatria et Neurologio Japonica*, **75**, 673–679.

Hertenstein, M. J. 2002 Touch: Its communicative functions in infancy. *Human Development*, **45**, 70–94.

Iwamura, Y. 2001 Touch. Tokyo: Igakushoin, pp. 1–22.

Kaye, K. & Wells, A. J. 1980 Mothers' jiggling and the burst-pause pattern in neonatal feeding. *Infant Behavior and Development*, **3**, 29–46.

Koniak-Griffin, D. & Ludington-Hoe, S. M. 1987 Paradoxical effects of stimulation on normal neonates. *Infant Behavior and Development*, **10**, 261–277.

Korner, A. F. & Thoman, E. B. 1972 The relative efficacy of contact and vestibular-proprioceptive stimulation in soothing neonates. *Child Development*, **43**, 443–453.

Malphurs, J. E., Raag, T., Field, T., Pickens, J., & Peláez-Nogueras. 1996 Touch by intrusive and withdrawn mother with depressive symptoms. *Early Development and Parenting*, **5**, 111–115.

National Institute of Population and Social Security Research 2005 Japanese national fertility survey: couples survey. (htt://www.ipss.go.jp/ps-doukou/j/doukou13/doukou13.asp)

Negayama, K. 2002 Aspects of early development in

independence. Viewpoint of development ethology. Tokyo: Kanekoshobo, pp. 15–59.

Peláez-Nogueras, M., Field, T. M., Gewiritz, J. L., Cigales, M., Gonzalez. A., Sanchez, A., & Richardson, S. C. 1997 The effects of systematic stroking versus tickling and poking on infant behavior. *Journal of Applied Developmental Psychology*, **18**, 169–178.

Sato, T., Sugawara, M., Toda, M., Shima, S., & Kitamura, T. 1994 Rearing related stress and depressive severity. *The Japanese Journal of Psychology*, **64**, 409–416.

Stack, D. K. & Lepage, D. E. 1996 Infants' sensitivity to manipulations of maternal touch during face-to-face interactions. *Social Development*, **5**, 41–55.

Stack, D. K. & Muir, D. W. 1992 Adult tactile stimulation during face-to-face interactions modulates 5-month-old's affect and attention. *Child Development*, **63**, 1509–1525.

Tronick, E. Z. 1995 Touch in Mother-infant interaction. InT. Field (Ed.), *Touch in early Development*. New Jersey: Laurence Erlbaum, pp. 53–63.

Tronick, E. Z., Morelli, G. A., & Ivey, P. K. 1992 The Efe forager in infant and toddler's pattern of social relationships: Multiple and simulataneous. *Developmental Psychology*, **28**, 568–577.

Yamada, K., Morioka, I., & Yanagawa, T. 2009 Two surveys (2004 and 2005) of families with nurturing problems or child abuse that required ongoing support. *Japanese Journal of Child Abuse and Neglect*, **11**, 357–365.