



Brief report

A longitudinal investigation of maternal touching across the first 6 months of life: Age and context effects

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ABSTRACT

The types of touch used by 12 mothers with their 1-, 3- and 5.5-month-old infants were examined longitudinally during two different interaction contexts lasting 5 min each. Changes in maternal touching as a function of infants' age and interaction context were revealed.

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During mother–infant interactions, touch has been shown to be an influential channel of communication for the mother–infant dyad (de Chateau, 1976; Kaitz, Lapidot, Bronner, & Eidelman, 1992), occurring 55% and 81% of the time during face-to-face interactions (Stack & Muir, 1990). Its presence impacts the quality of dyadic interactions and infants' behavior by, for example, reducing infant stress and increasing positive affect (Stack & Muir, 1992). However, it is not merely the presence or absence of maternal touch that communicates to the infant, but the quality of that touch. For example, it has been demonstrated that active, rather than passive touch, increases infants' smiling during a period of maternal unavailability (Stack & Muir, 1990, 1992). As contended by a number of researchers (Hertenstein, 2002; Stack, 2001, 2004; Tronick, 1995; Weiss, 1979), the specific examination of the type of touch used by mothers is integral to the investigation of the communicative functions of touch since it is believed that different types of touch can communicate different meanings.

To date, only a few studies have shown that mothers use different types of touch while interacting with their infants (Ferber, Feldman, & Makhoul, 2008; Harrison & Woods, 1991; Polan & Ward, 1994). Stack, LePage, Hains, and Muir (1996) found that across instructional conditions, mothers employed different types of touch. For example, when asked to maximize infants' smiling, mothers used high levels of tickling and lifting, and low levels of holding. Moreover, the findings indicate that mothers may use specific types of touch to elicit specific behaviors from their infants (Stack et al., 1996). These findings suggest that the type of touch used by mothers is communicative to the infant and that mother and infants may be sensitive to precise characteristics of their mother's touch, not only to its presence or absence (Stack & Muir, 1992).

In spite of the growing number of studies on tactile communication between mothers and infants, virtually nothing is known about how it develops. To better understand touch as a mode of communication it is imperative to assess its evolution during the first 6 months of life, a time when touch is crucial to the dynamics of the mother–infant interaction

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(Kaye & Fogel, 1980; Tronick, 1995) and to the infant's preverbal communicative skills (Lamb, Morrison, & Malkin, 1987; Stern, 1985). Furthermore, an examination of the change and stability of this communicative system is warranted not only across instructional context (Stack, 2001; Stack et al., 1996) but also across physical context. As underscored by Hertenstein (2002), the context in which the mother–infant interaction takes place influences the way infants perceive the communicative meaning of mothers' touch.

The objective of the present study was to conduct a longitudinal investigation of maternal touching during mother–infant interactions in two different contexts in order to obtain a clearer picture of the development of maternal touching. More specifically, the objectives were to observe the overall duration of maternal touch and the types of touch employed by mothers across age (1, 3, 5.5 months) and interaction context. Twelve mothers and their full-term infants (eight males and four females) were recruited to participate in a 2-year longitudinal study through birth announcements published in local newspapers in a Midwestern community in the US. All mothers were older than 21 years, had completed their high-school diplomas or beyond, and came from intact middle-class families. Eleven mothers were Caucasian, and one was African-American.

The dyads were videotaped weekly during the first year of the infants' lives (from 4 weeks to 52 weeks) and biweekly during their second year (53–103 weeks). Videotapes were made with three wall-mounted cameras, any two of which could be selected by the observers depending upon which had the best view of the dyad in one camera, and the infant's face and body in the other camera. Mothers and infants were videotaped under two interactive contexts. In the first (lap context), mothers sat on a straight chair with their infants on their laps and were asked to play with them as they would normally do at home. During the second (floor context), the dyad played on a blanket on the floor where age appropriate toys were available. All interactions lasted for 5 min.

The focus of the present study was on the interactions of mother–infant dyads when their infants were 1, 3, and 5.5 months of age. Data were available at these three time points for all dyads except for two; one began the study when the infant was 1.5-month-old and the other terminated the study before the infant was 5.5 months of age. For the selected sessions, face-to-face interactions were coded by an undergraduate student using the Caregiver Infant Touch Scale (CITS) developed by Stack et al. (1996) which classifies maternal touching into eight possible types of touch: (1) static touch, (2) stroke/rub/caress/massage, (3) pat/tap, (4) grab/squeeze/pinch, (5) tickle/finger-walk/prod/poke/push, (6) shake/wiggle, (7) pull/lift/flexion/clap, and (8) other types of touch (kiss, posture change, adjusting clothing, rocking, bouncing, touching with toys). For each 1-s interval of the 5-min interactions, the type of touch utilized by mothers was coded. In order to avoid coding touching behaviors that were accidental, mothers' touch had to last a minimum of 0.5 s per 1-s interval in order to be coded as one of the eight types of touch. A second-coder, blind to the research hypotheses, re-coded 15% of all interactions in order to establish inter-rater reliability. Using a kappa coefficient (Cohen, 1968), inter-rater reliability was found to be 90.07% for the types of touch in the lap context and 87.67% for the floor context.

Descriptive statistics were conducted to assess for the presence of outliers, and to verify the normality of the distribution (Table 1). When significant skewness or kurtosis was found, outliers were brought in according to the method described by Tabachnick and Fidell (1996), where the score is brought in to the next acceptable level and 1 is added to the score. As a result of bringing in outliers, there was no skewness or kurtosis in the data hence no transformations were required. Repeated measures analysis of variance (ANOVAs) were conducted. For all the analyses, when ANOVAs revealed significant interactions, Šidák pair wise comparisons were used to isolate the source of the significance (Šidák, 1967). Furthermore, for all the significant ANOVAs, partial eta-squared (η_p^2) are reported as a measure of effect size (Olejnik & Algina, 2003).

A 3×2 (age \times context) repeated measures ANOVA, using the total duration of touch in each observation session as the dependent variable, revealed that collapsed across age and context, mothers touched their infants for an average of 66.26% of the time ($SE = 2.57$). Specifically, mothers touched their infants more during the lap context ($M = 99.53\%$, $SE = 0.16$) than during the floor context ($M = 32.99\%$, $SE = 5.17$), $F(1, 11) = 165.55$, $\eta_p^2 = .94$, $p < .0001$. Furthermore, they touched their infants more when they were 1-month-old ($M = 72.32\%$, $SE = 5.08$) compared to 3-month-old ($M = 60.86\%$, $SE = 1.80$), $F(2, 22) = 3.60$, $\eta_p^2 = .25$, $p < .05$. No significant differences were found in the amount of touching provided to infants at these ages and at 5.5 months ($M = 65.61\%$, $SE = 3.04$).

Table 1

Means and standard deviations for the percent duration of each type of maternal touch and overall touch across age and context.

Type of maternal touch	Lap			Floor		
	1 month	3 months	5.5 months	1 month	3 months	5.5 months
Static	37.33 (17.64)	37.82 (19.34)	48.27 (11.33)	8.94 (9.31)	3.83 (3.73)	11.56 (14.82)
Stroking	8.545 (7.43)	5.58 (7.47)	2.82 (2.48)	3.11 (2.72)	1.06 (1.21)	1.58 (1.29)
Patting/tapping	11.42 (13.41)	5.64 (9.02)	0.82 (1.21)	228 (3.47)	0.44 (0.83)	0.55 (0.52)
Squeezing	3.54 (3.19)	4.32 (2.31)	4.66 (1.33)	2.1 (2.45)	1.44 (1.26)	0.98 (1.01)
Tickling	0.33 (0.45)	1.22 (1.91)	3.21 (3.45)	3.18 (4.01)	2.96 (3.17)	1.52 (1.97)
Shaking	1.88 (2.26)	2.43 (3.05)	0.84 (1.04)	2.84 (4.04)	1.25 (1.66)	0.61 (0.85)
Lifting	17.58 (15.31)	16.47 (16.26)	26.03 (10.52)	13.36 (18.29)	4.83 (3.44)	1.52 (1.60)
Other	17.48 (11.89)	20.57 (20.30)	10.91 (3.05)	6.59 (9.88)	6.36 (4.66)	10.15 (5.71)
Total touch	99.90 (0.28)	99.30 (1.11)	99.38 (1.06)	44.73 (35.18)	22.41 (12.14)	31.85 (21.78)

A $3 \times 2 \times 8$ (age \times context \times types of touch) repeated measures ANOVA was used to analyze the effect of age and context on the percent duration of each type of touch mothers were using on their infants. A main effect of type of touch was found, $F(7, 77) = 45.09$, $\eta_p^2 = .80$, $p < .001$ indicating that across age and context mothers spent more time using static touch ($M = 24.63\%$, $SE = 1.43$) than any other type of touch. Furthermore, the “other” category of types of touch ($M = 12.01\%$, $SE = 1.48$) was significantly different from stroking ($M = 3.78$, $SE = 0.69$), patting and tapping ($M = 3.52$, $SE = 0.96$), squeezing ($M = 2.84$, $SE = 0.32$), tickling ($M = 1.92$, $SE = 0.43$), and shaking ($M = 1.64$, $SE = 0.35$). Mothers used more lifting ($M = 13.30\%$, $SE = 2.24$) compared to squeezing, tickling, and shaking. Stroking, patting and tapping, grabbing, tickling, and shaking did not significantly differ from one another.

A type of touch by context interaction, $F(7, 77) = 30.17$, $\eta_p^2 = .73$, $p < .001$, revealed that there was more static touch, stroking, patting and tapping, squeezing, lifting, and other types of touch in the lap ($M = 41.14\%$, $SE = 2.74$; $M = 5.65\%$, $SE = 1.38$; $M = 5.95\%$, $SE = 1.92$; $M = 4.17\%$, $SE = 0.43$; $M = 20.03\%$, $SE = 3.02$; $M = 16.32\%$, $SE = 2.26$) than in the floor context ($M = 8.11\%$, $SE = 2.00$; $M = 1.91\%$, $SE = 0.35$; $M = 1.09\%$, $SE = 0.38$; $M = 1.50\%$, $SE = 0.29$; $M = 6.57\%$, $SE = 1.86$; $M = 7.70\%$, $SE = 1.07$). No significant differences across context were observed for tickling ($M = 1.59$, $SE = 0.35$; $M = 2.25$, $SE = 0.65$) and shaking ($M = 1.72$, $SE = 0.48$; $M = 1.57$, $SE = 0.48$).

As shown in Fig. 1, a significant interaction was found between type of touch and age, $F(14, 182) = 2.45$, $\eta_p^2 = .18$, $p < .005$. Across both contexts, mothers used more static touch at 5.5 months than at 3 months. Mothers used more stroking at 1 month ($M = 5.82\%$, $SE = 1.07$) than at 3 ($M = 3.32\%$, $SE = 1.13$) and 5.5 months ($M = 2.19\%$, $SE = 0.35$). Significant differences were also found in the duration of patting and tapping between 1 ($M = 6.85\%$, $SE = 2.02$) and 5.5 months ($M = 0.68\%$, $SE = 0.23$).

As depicted in Fig. 2, a significant interaction between types of touch, age, and context ($F(14, 154) = 2.15$, $\eta_p^2 = .16$, $p < .01$) revealed that in the lap context mothers used more patting and tapping when their infants were 1-month-old compared to when they were 5.5-month-old. Furthermore, mothers tended to stroke their infants more at 1 month than at 3 months of age. In contrast, mothers used more tickling with their 5.5-month-olds compared to their 1-month-olds. In the floor context, mothers used more lifting with their 1-month-olds relative to their older infants.

Evidence that touch is an important component of mother–infant interaction was reflected in the duration of touch collapsed across context and across age ($M = 66.26\%$) and by the diversity of tactile behaviors used by the mothers. In general, mothers provided diverse tactile stimulation to their infants, varying from passive touch (e.g., static) to active and stimulating behaviors (e.g., lifting and shaking). As well, findings from the current study suggest that the amount and types of touch provided by mothers changed with infants' age and the interaction context; this implies that mothers adjust their tactile

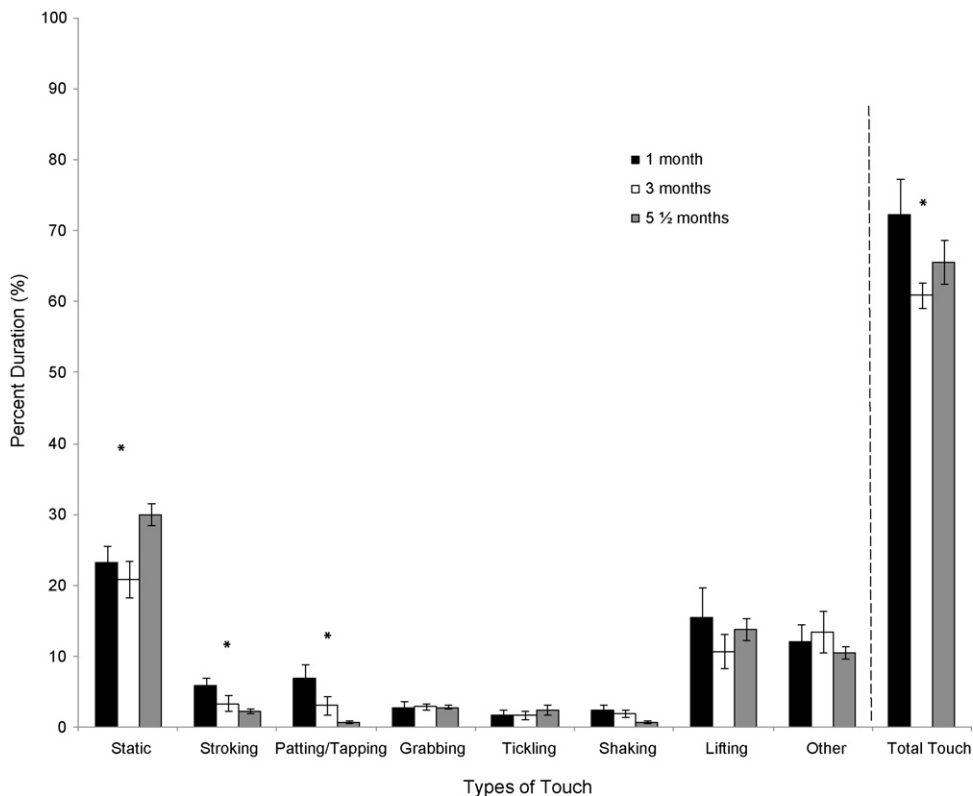


Fig. 1. Percent duration of types of touch across age.

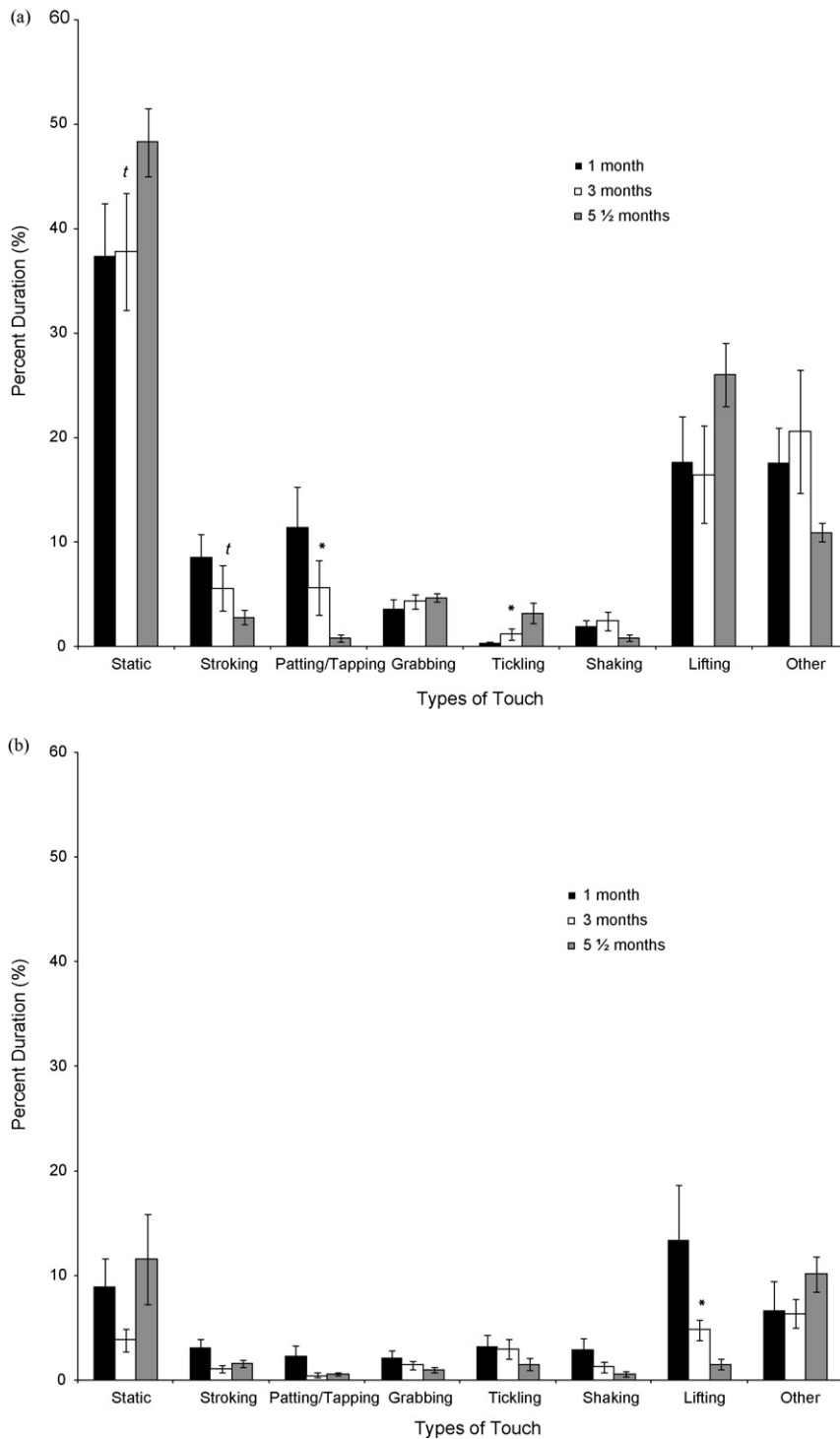


Fig. 2. Percent duration of types of touch across age in the lap context (a) and floor context (b).

behavior based on their infant's development and that within mother–infant interactions, touch may serve different functions (e.g., nurturing, holding and support, stimulating).

Infant age was found to influence both the duration of touch as well as the types of touch utilized by mothers. These changes suggest the evolving nature of the mother–infant interaction over time. As infants develop, they become more sophisticated and independent partners in social interchange (Cohn & Tronick, 1988; Kaye & Fogel, 1980). In response,

mothers adapt their tactile behavior to the developing abilities of their infants. In addition, as proposed by Harrison and Woods (1991), parents may change their tactile behavior according to the physical state and limits of their infants' bodies. Across age, a decrease in the duration of nurturing touch, such as stroking and patting was observed. This decrease in stroking and patting as infants aged might reflect infants' emerging regulatory abilities (Ferber et al., 2008). As well, mothers may have used more nurturing and less physically stimulating types of touch with their 1-month-olds because they are smaller and more delicate. In contrast, as infant aged an increase in tickling and static touch was observed, while a slight decrease in the overall amount of touch was found from 1 to 3 months of age. One explanation for these results is that at around 3 months of age mothers may be using others forms of communication to interact with their infants as they become more socially and physically competent. This hypothesis is consistent with the emergence of the social smile (Spitz, 1965; Wolff, 1987) and its associated increase in mutual gaze occurring at around 2–3 months of age which gives rise to the beginning of reciprocal interactions (Lavelli & Fogel, 2005). The increased static touch at 5.5 months suggests that although infants continue to require constant support, and touching remains an important modality, with time the dyad might rely more on multi-modal forms of communication involving more distal behaviors such as vocalizations, facial expressions, and gazing accompanied by touching (Ferber et al., 2008). It is important to note that the decrease in the overall amount of touch was not significant at 5.5 months.

The context in which the mother–infant interchanges occurred was also found to influence mothers' tactile behaviors. Mothers were found to touch their infants more in the lap than in the floor context but this result seems due simply to the fact that in the lap context, the infants were seated on their mothers' laps, thus mothers had to provide them with constant support. In the floor context, mothers did not have to support the infants and may have used toys, as opposed to touch, to stimulate their infants. This contention is supported by the results demonstrating that compared to the floor context, in the lap context mothers used more static touch which is typically used to provide support. In addition, no differences in the levels of tickling and shaking, both highly stimulating types of touch, were observed across contexts, suggesting that although mothers are not using high amounts of touch during the floor context ($M = 32.99\%$), they are proportionally using more tickling and shaking than in the lap context. Taken together, results indicate that the duration of mothers' touch is likely influenced by the quality of the physical and social environment.

Taken together, findings indicate that touch is an integral part of the mother–infant relationship and demonstrate that mothers adjust their tactile behavior to the age of the infant and to the context of the interaction. Moreover, a first step was taken toward establishing a portrait of the development of maternal touch across age. Results add to a growing body of literature emphasizing the role of touch in early development, and provide further support for the contention that different forms of touch may communicate different meanings and serve different functions (Hertenstein, 2002; Jean & Stack, 2009; Stack, 2001; Tronick, 1995). Nevertheless, given the sample size ($n = 12$) and the fact that we examined mother–infant interactions across two contexts and for a 5-min period, the generalizability of the findings is limited. Replication with a larger sample size, longer observational time, and with more than two contexts is warranted. Furthermore, future research should include an expanded age range across the first year of infants' lives. Moreover, consistent with a dynamic systems perspective (Fogel & Garvey, 2007), examining maternal touch in conjunction with other maternal behaviors and infants' emotional displays during tactile stimulation, and investigating how the dynamics of this special communication develop and are co-created, would enhance our understanding of mother–infant communication.

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