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Review

# Preterm infant massage therapy research: A review

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ABSTRACT

In this paper, preterm infant massage therapy studies are reviewed. Massage therapy has led to weight gain in preterm infants when moderate pressure massage was provided. In studies on passive movement of the limbs, preterm infants also gained significantly more weight, and their bone density also increased. Research on ways of delivering the massage is also explored including using mothers versus therapists and the added effects of using oils. The use of mothers as therapists was effective in at least one study. The use of oils including coconut oil and safflower oil enhanced the average weight gain, and the transcutaneous absorption of oil also increased triglycerides. In addition, the use of synthetic oil increased vagal activity, which may indirectly contribute to weight gain. The weight gain was associated with shorter hospital stays and, thereby, significant hospital cost savings. Despite these benefits, preterm infant massage is only practiced in 38% of neonatal intensive care units. This may relate to the underlying mechanisms not being well understood. The increases noted in vagal activity, gastric motility, insulin and IGF-1 levels following moderate pressure massage are potential underlying mechanisms. However, those variables combined do not explain all of the variance in weight gain, highlighting the need for additional mechanism studies.

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**Table 1**
Mean weight gain for our massage therapy studies (S.D.s in parentheses).

| | Weight gain/day (g) | | | | |
|---|---|---|---|---|---|
| | #Days | Massage | Control | *p* | % Weight gain |
| Field et al. (1986) (*n* = 40) | 10 | 25.0 (6.0) | 17.0 (6.7) | .005 | 47 |
| Scafidi et al. (1990) (*n* = 40) | 10 | 33.6 (5.4) | 28.4 (11.1) | .003 | 21 |
| Wheeden et al. (1993) (*n* = 30) | 10 | 33.0 (7.3) | 25.7 (7.0) | .009 | 27 |
| Dieter et al., 2003 (*n* = 32) | 5 | 48.7 (36.9) | 32.7 (12.2) | .01 | 48 |
| Diego et al. (2005) (*n* = 32) | 5 | 19.6 (3.9) | 15.5 (3.7) | .01 | 25 |

Approximately 14% of infants in the United States are born prematurely (National Center for Health Statistics, 2007). Prematurity, in turn, is one of the leading causes of infant morbidity and mortality, and it results in approximately 15.5 billion dollars in hospital costs per year. Following intensive care treatment, weight gain becomes the main criterion for hospital discharge. Thus, several interventions have been designed to promote preterm infant weight gain including massage therapy.

## 1. Massage therapy studies

Randomized, controlled studies have documented greater weight gain in preterm newborns receiving moderate pressure massage therapy (see Field, Hernandez-Reif, & Freedman, 2004; Vickers, Ohlsson, Lacy, & Horsley, 2004 for reviews). These include our studies on preterm newborns who received 5–10 days of massage therapy and showed a 21–48% greater increase in weight gain and hospital stays of 3–6 days less than control infants (Diego, Field, & Hernandez-Reif, 2005; Dieter, Field, Hernandez-Reif, Emory, & Redzepi, 2003; Field et al., 1986; Scafidi, Field, Schanberg, Bauer, & Tucci, 1990; Wheeden et al., 1993) (see Table 1). These weight gain findings have been replicated by at least four independent groups (Cifra & Sancho, 2004; De-Roiste & Bushnell, 1996; Goldstein-Ferber et al., 2002; Mathai, Fernandez, Mondkar, & Kanbur, 2001).

The protocol in our randomized, controlled studies on the effects of massage therapy on NICU preterm infants involves moderate pressure stroking (tactile stimulation) and flexion and extension of the upper and lower extremities (kinesthetic stimulation) (see Field et al., 2004 for a review). These sessions have varied between 10 and 15 min and have been held two to three times a day for 5–10 days. All studies have reported greater weight gain for the massage therapy versus the standard care control group.

In our early studies (Field et al., 1986; Scafidi et al., 1990; Wheeden et al., 1993) a 15-min massage therapy protocol, three times per day, for 10 days resulted in 21–47% greater weight gain than standard care alone (see Table 1). Those infants were also discharged 6 days earlier on average than control infants, saving approximately 10,000 dollars in hospital costs per infant. Examination of the daily weight gain curves across the 10-day treatment period revealed that the massaged infants exhibited greater weight gain than the control infants as early as day 5 in the 10-day study, suggesting that 5 days of massage might be sufficient to increase weight gain at a reduced cost. In a study assessing the shorter time period, preterm infants receiving only 5 days of massage therapy gained 48% more weight than control infants (Dieter et al., 2003; Table 1).

In a recent study by a research group in India, the same protocol resulted in a weight gain of 4.24 g per day more than controls (Mathai et al., 2001). On the Brazelton Scale the massage group showed statistically higher scores on the orientation, range of state, regulation of state and autonomic stability subscales. In a meta-analysis of several studies using the same protocol, massage increased the daily weight gain by 5.1 g on average (Vickers et al., 2004) reduced the length of hospital stay by 4.5 days and had a positive effect on postnatal complications as well as weight gain at 4–6 months.

Other replications using this infant massage protocol were conducted in China. These studies also documented significant weight gain (Duan, Li, & Shi, 2002; Ke, Ling, & Li, 2001; Liu, 2005; Liu Chun Li, 2005; Lu Jiao, Li Ju Zhan, & Wu Li Fang, 2005; Na Zhuo Hua, Zie Hui Yun, & Huang Jian Hua, 2005; Shi Li & Xue Li Rong; Sun Hai Yun, Gao Xiang Yu, & Zhao Xue Mei, 2004; Zhai, Pan Xian, & Hua, 2001). Some of these studies also reported increased length and head circumference (Duan et al., 2002; Ke et al., 2001; Liu, 2005; Lu Jiao et al., 2005; Na et al., 2005).

## 2. Exercise studies

Greater weight gain has also been observed in preterm infants receiving passive limb movements. This exercise, which is a form of stimulation similar to the kinesthetic component of our massage protocol, involves flexing and extending the limbs (Eliakim, Nemet, Friedland, Dolfin, & Regev, 2002; Moyer-Mileur, Brunstetter, McNaught, Gill, & Chan, 2000; Nemet et al., 2002). The weight gain in these studies was less than in the massage therapy studies (0–38%). However, the exercise sessions in these studies were shorter than the typical 15 min massage sessions, and they were held only once per day. Nonetheless, the infants showed increased bone mineral density. Thus, exercise or the kinesthetic form of stimulation appears to lead to weight gain (see Table 2) as well as bone growth in preterm infants (Eliakim et al., 2002; Moyer-Mileur et al., 2000; Moyer-Mileur, Luetkemeier, Boomer, & Chan, 1995; Nemet et al., 2002).

Preterm infants are at risk for developing bone disease and bone fractures due to the limited formation of bone mass in utero and to limited activity (Backstrom, Kuusela, & Maki, 1996; Rigo et al., 2000). Inactivity has been associated with

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