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Temperature Increases in Preterm Infants During Massage Therapy

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Abstract

Temperature was assessed in 72 preterm infants randomly assigned to a control or a massage therapy group. A greater increase in temperature was noted for preterm infants receiving massage therapy versus a control group, even though the incubator portholes remained open during the 15-minute massage therapy session but not for the control group over an equivalent time period.

Temperature Increases in Preterm Infants During Massage Therapy

In studies conducted over the past 20 years, preterm newborns receiving massage therapy gained 21-47% more weight and were hospitalized 3-6 days less than control infants (see Field, Hernandez-Reif & Diego, 2006). Given these findings, it is not surprising that massage therapy is currently practiced in as many as 38% of Neonatal Intensive Care Units in the United States (Field, Hernandez-Reif, Feijo & Friedman, 2006).

The preterm infant massage therapy protocol used in many of these studies as well as this one, involves three 15-minute sessions per day of moderate pressure stroking of the head, back, arms and legs, and flexion and extension of the extremities (Field et al., 2006). For smaller infants residing in isolettes, the therapist massages the infant through the isolette portholes. Because opening the isolette portholes lower the temperature of the isolette, it is of concern that massaged infants could experience heat loss. This heat loss is a potential problem inasmuch as preterm infants have poor insulation and heat production due to their decreased fat content, poor vascular control and inability to shiver (McCall, Alderdice, Halliday, Jenkins & Vohra, 2005; Sherman, Greenspan, St Clair, Touch & Shaffer, 2006).

In the present study, we monitored temperature of preterm infants receiving massage therapy in their isolettes. Given the positive outcomes reported for preterm infants receiving massage therapy, we expected that heat loss would not occur during massage therapy.

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Methods

Participants

Medically stable preterm infants recruited from a Neonatal Intensive Care Unit were randomly assigned to a massage therapy or a standard care control group as part of a larger study designed to assess the mechanisms underlying weight gain in preterm infants following massage therapy. The sample was comprised of 48 Infants distributed 54% male and 58% Hispanic, 40% African American and 2% Caucasian. Their mean birthweight was 1206 grams, and their mean gestational age at birth was 29.4 weeks. The groups did not differ on these and other background variables. A sample size of 48 infants was chosen based on effect sizes observed for preterm infant temperature regulation in a previous Kangaroo Care study (Ludington-Hoe et al., 2000).

Procedure

Following informed consent from their parents, the infants were randomly stratified to a massage therapy or a standard care control group based on two separate computer-generated random number tables for infants <1250g and infants > 1250g to ensure equal birth weight distribution across groups. All infants were assessed during the mid-morning, approximately one hour after feeding. Prior to the temperature recording, the isolette portholes were open for approximately 2 minutes in order to undress the infant and attach a temperature probe (UFI, Morro Bay, CA) to the infant's right outer calf using a 1.27cm by 6cm strip of surgical tape (3M, Transpore). Infants in both the control and massage groups remained undressed during the 45-minute observation period. All infants resided in isolletes using air servo control mode set at 35°C. Immediately after attaching the temperature probe, the isolette's portholes were closed and temperature was continuously recorded using a UFI Model SRS2004/d-SP Electrophysiology Acquisition System (UFI, Morro Bay, CA) at 10 samples per second. Temperature data was then used to derive mean temperature in degrees centigrade, for the 15-minute baseline, 15-minute treatment (massage/ control) and 15-minute post-treatment periods for each infant using Acq Knowledge software (v3.5. Biopac Systems, Goleta, CA). The infants assigned to the control group rested in a supine position for 45-minutes. The isolette portholes for control group infants remained during the 45-minute observation period. Infants assigned to the massage therapy group, rested in a supine position, with the isolette portholes closed during the 15-minute baseline period. During the 15-minute treatment period, the isolette's portholes were opened to allow a trained therapist to administer the 15-minute preterm neonate massage therapy protocol. At the end of the 15-minute massage therapy period, the infant was placed in a supine position and the isolette portholes were closed. The temperature recording procedure was identical for both groups with the exception that the isolette's portholes for the massage therapy group were opened during the 15-minute massage therapy period.

The massage therapy protocol consisted of 3 standardized 5-minute phases, with tactile stimulation during the first and third phases and kinesthetic stimulation during the middle phase. For the tactile stimulation phase, the neonate was placed in a prone position and stroked with moderate pressure: 1) from the top of the head to the neck and back to the top of the head, and back to the neck; 2) from the neck across the shoulders; 3) from the upper back to the waist and back to the upper back; 4) from the thigh to the foot to the thigh on both legs; and 5) from the shoulder to the hand to the shoulder on both arms. During the 5-minute kinesthetic stimulation phase, the neonate was placed in a supine position and each arm, then each leg, and finally both legs together were flexed and extended (as in a bicycling motion).

Results

A group (massage/ control) by treatment period (15 minute baseline period/ 15 minute massage or control period/ 15 minute post-massage or post-control period) repeated measures analysis of variance conducted on preterm infant temperature (Figure 1) yielded a significant group by period interaction effect, $F(2, 92) = 15.09$, $p < .001$, $Eta^2 = .25$. Subsequent post hoc Bonferroni corrected t-tests revealed that: 1) the temperature for infants in the control group significantly increased over the 45- minute observation period (baseline to control period increase $t(23) = 11.48$, $p<.001$, control to post-control period increase $t(23) = 5.50$, $p <.001$); and 2) the temperature for infants in the massage therapy group peaked during the 15-minute massage period (baseline to massage period increase $t(23) = 9.11$, $p <.001$) and remained elevated during the post-massage period (baseline to post-massage period increase $t(23) = 7.05$, $p <.001$; massage vs post-massage period change $t(23) = 2.16$, not significant). Analyses of Variance conducted on temperature change scores further revealed that preterm infants in the massage therapy group exhibited a significantly greater increase in temperature during the treatment period $F(1, 46) = 26.97$, $p < .001$ and post treatment periods $F(1, 46) = 4.79$, $p < .05$) than infants in the control group (Table 1).

Discussion

Control infants' temperature gradually increased across the 45-minute observation period. This is not surprising inasmuch as opening the isolette's portholes for two minutes to undress the infant and attach the temperature electrode likely resulted in a slight decrease in preterm infant temperature, which then gradually increased over the 45- minute observation period after the portholes were closed, and the isolette resumed regulating the infants' temperature.

The significant increase in preterm infants temperature during the massage therapy period is consistent with findings on kangaroo care (Ludington-Hoe, Nguyen, Swinth & Satyshur, 2000). This increase may have resulted from the therapist hands transferring heat to the infant thereby decreasing heat loss. In addition the containment provided by touch therapy (including kangaroo care and massage therapy) may have facilitated preterm infant neurological regulation of temperature. Both kangaroo care and massage therapy have been noted to promote neurological regulation in neonates including motor and state self-regulation (Ferber & Makhoul; Field et al., 2007). The increase in preterm infant temperature may have also resulted from increased circulation, as massage therapy has been noted to increase blood flow (Tochikubo, Ri & Kura, 2006). Surprisingly, even though the isolette portholes remained open during the 15-minute stimulation period, the increase in temperature noted for preterm infants during that massage therapy period was significantly greater than the increase noted for the control group (Mean increase from baseline = .75°C for the massage therapy group vs .30°C for the control group). Further, the preterm infants' temperature following the massage procedure was higher than that of the infants in the control group following the corresponding time period (Mean increase from baseline = .62°C for the massage therapy group vs .42°C for the control group).

Taken together, these findings indicate that heat loss does not occur in preterm infants receiving massage therapy in isolettes, suggesting that this procedure is safe to use in preterm infants residing in isolettes. These findings also highlight the contribution of human touch for promoting temperature regulation in neonates.

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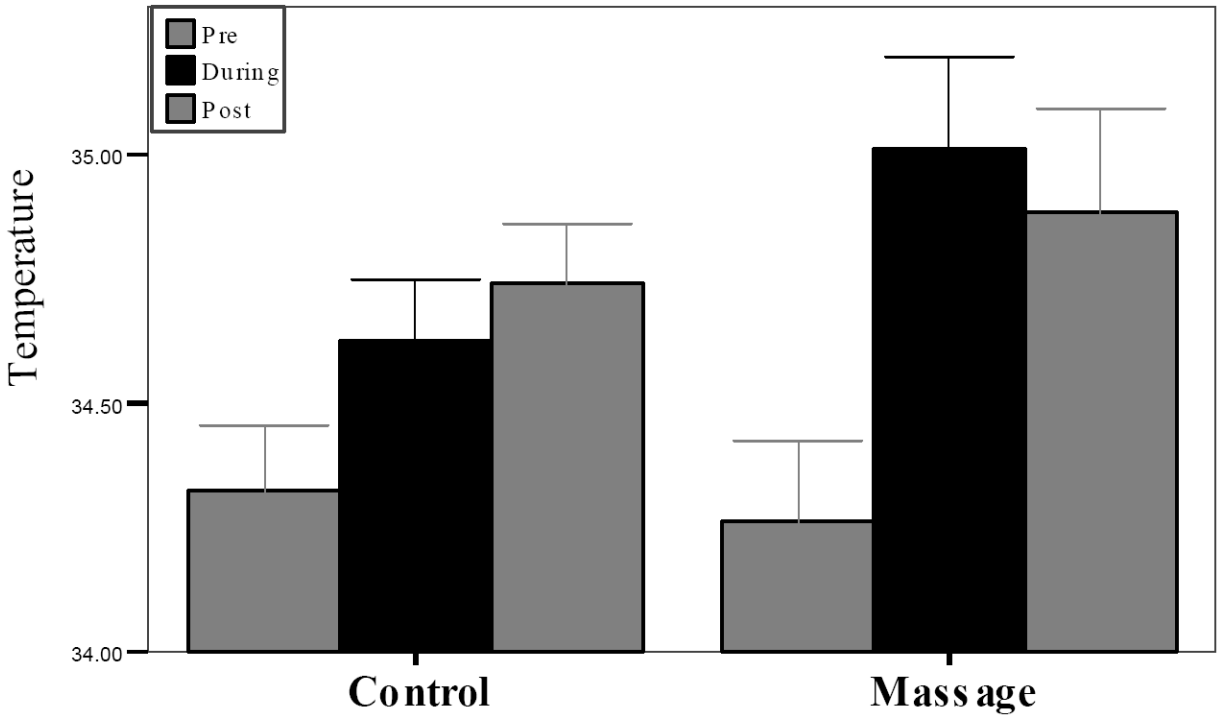

Figure 1.
Mean temperature 15 minutes pre, 15-minutes during the massage or control period, and 15-minutes post the intervention period (Mean ± 2 SEM).

Table 1

Mean temperature increase for preterm infants in degrees centigrade.

	Massage	Control
Pre-During Increase	0.76 $_{a}$ (0.41)	0.30 $_{b}$ (0.12)
Pre- Post Increase	0.62 $_{a}$ (0.43)	0.42 $_{b}$ (0.13)

Different subscripts denote significant differences between means.