

Effects of massage on behavior of full-term newborns

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Abstract

Background Baby massage is one of the touch stimulation that could be applied as soon as possible after birth. Giving massage regularly will affect the behavior of newborn.

Objectives This study explored the effects of ten-day massage on infant's behavior.

Methods A randomized control trial was done from December 2008 to March 2009. Full-term newborns were randomly assigned into massage group or control group. Babies in massage group were given massage by their mothers and supervised by midwives. All babies were evaluated twice, i.e., on day 1 and day 11, using Brazelton Scale (Neonatal Behavior Assessment Scale). The behavior was compared between the two groups.

Results A total of 72 full-term newborn infants appropriate for gestational age were included in this study. Infants in the massage group showed significant difference in adaptive behavior compared to control group. Those adaptive behavior consisted of habituation (WMD 1.08 CI 95% 0.67 to 1.49, $P < 0.0001$);, social interaction (WMD 1.54 CI 95% 1.23 to 1.84, $P < 0.0001$);, motor system (WMD 1.35 CI 95% 1.14 to 1.55, $P < 0.0001$);, organization state ($P < 0.0001$), range of state (WMD 1.35 CI 95% 0.95 to 1.55, $P < 0.0001$);, autonomic system (WMD 0.53 CI 95% 0.23 to 0.84, $p < 0.0001$);, and reflexes ($p < 0.0001$).

Conclusions Massage gives better adaptive behavior and reflexes of full-term newborns compared to those without massage. [Paediatr Indones. 2010;50:187-92].

Keywords: *massage, behavior, Brazelton scale.*

Massage is manual soft tissue manipulation, and includes holding, causing movement, and/or applying pressure to the body.¹ Massage can be applied for all ages, including newborn babies. It is safe and need no special trainers to do massage.²⁻⁴ In infants, massage is given as touch stimulation and is believed to affect the growth and development of the babies.⁵⁻⁷

How baby massage can affect the baby growth and development is not clear. The mechanism involves skin as the largest sensory organ of the body and the tactile system as the earliest sensory system to become functional.⁸ Early stimulation given to newborn will change the growth of the cells of the brain, improve adaptive behavior, and finally achieve the optimal development of their age.⁹⁻¹⁵ Adaptive behavior as infant's ability to involve with environmental stimulus is examined using *Neonatal Behavioral Assessment Scale* (NBAS) or Brazelton scale.¹⁶ This adaptation behavior is important to newborn because it shows states of consciousness involving the cortical function.^{14,17,18}

The first 10-day massage study by Fields and colleagues in 1986 suggested that the weight gain advantage for the massage group emerged after 5 days of treatment.⁵ The method is accepted and believed could improve weight gain for premature babies. Field

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also noted some adaptive behavior changes in that study and was supported by others few years later.^{9,20} Lack of evidence in blinding or controlling bias were the reason why massage was not yet recommended as routine procedure stimulus for newborn. This study was designed to find out the effects of ten-day massage on behavior change in full-term newborn.

Methods

This was a randomized controlled trial performed from December 2008 to March 2009. The study was performed at Budi Kemuliaan Hospital in Petojo, Petasan, and Pekojan Jakarta. Subjects were babies born with 37-41 week gestational age and birth weight of ≥ 2500 grams. We included 6-24 hour old infants who were non-asphyxiated, hemodynamically stable, and had no respiratory distress. We excluded babies with congenital anomaly or inherited diseases from their mothers, hyperbilirubinemia, experienced other stimulation than massage, and lived outside Jakarta. Subjects were recruited consecutively.

A randomization procedure was used to assign infants to either included in the massage therapy group ($n=36$) or the control group ($n=36$). All infants were medically stable and were not receiving IV fluids, oxygen, photo-therapy, antibiotics or gavage feeding at the start of the study.

This study used the massage therapy protocol according to Field et al.⁵ The massage sessions comprised three segments, which is five minutes of tactile stimulation, five minutes of kinesthetic stimulation, and another five minutes of tactile stimulation. During tactile stimulation, the infant was placed in prone position and was given moderate pressure with the flats of fingers of both hands. The massage was applied to the following body region: (a) from the top of the head, down to the back of the head, the neck, and back to the top of the neck; (b) from the back of the neck across the shoulders and back to the neck; (c) from the upper back, down to the buttocks and revert to the upper back (contact with the spine was avoided); (d) simultaneously on both legs from the hips to the feet and back to the hips; (e) both arms simultaneously from the shoulders to the wrists to the shoulders. For the kinesthetic phase, the infant was placed in a supine position. Each segment consisted

of six passive flexion/extension movements lasting approximately 10 seconds each. These “bicycling-like” movements of the limbs occurred in the following sequence: (a) right arm, (b) left arm, (c) right leg, (d) left leg, and (e) both legs simultaneously.

Massage therapy was begun on the day following Brazelton examination and it was continued for 10 consecutive days. Infants were tested mid-day between feeds in a quiet, semi-darkened room with an ambient temperature of 32-34°C. For the purpose of analysis the items scored were grouped included ‘habituation’, ‘orientation’, ‘motor’, ‘range of state’, ‘regulation of state’, ‘autonomic stability’, ‘reflexes’ and ‘interactive behavior’. All values were tabulated as averages (means) with standard deviations (SD). Comparisons were done using t- test for parametric data and Mann-Whitney test for non-parametric data.

Results

During the study there were 98 babies of massage group and control group. At the age 11 day old there were 18 babies (16 babies of control group and 2 babies of massage group) who didn’t come because of bad weather. Three other babies of control group moved to other area at the age 11 day old. Two babies of control group and 1 baby at the massage group dropped out from study because they had bilirubin level of > 17 mg/dL at the age of 5 day. One baby of control group also out of study because he had auditory stimulation.

During the study period, 36 subjects were eligible for each group. There were no differences in sex, gestational age, birth weight, birth height, head circumferential and weight at 11 day old between the two groups (Table 1).

All subjects in this study were examined in six cluster of functioning neonatal behavior which consists of 28 behavioral items and 18 reflexes. The six cluster of functioning neonatal behavior are habituation, social interactive, motor system, state organization, state regulation, and autonomic system. The supplementary items that arrange to evaluate the preterm baby were not done in this study because all subjects were full-term babies. Reflexes also evaluated in this study to see the neurological aspect of the newborn.

Table 2. Behavior score using Brazelton scale at 1 day old and the difference behavior score on Brazelton scale at 1 day old and 11 days old between massage group and control group.

	1 day old		P	score difference (Δ)		Effect size	P
	massage	control		massage	control		
Habituation [¶]	4.8 (SD 0.9)	5.0 (SD 0.8)	0.38*	1.8 (SD 1.0)	0.7 (SD 0.7)	1.08 CI 95% 0.67 to 1.49	<0.0001*
Social Interactive [¶]	2.8 (SD 0.5)	2.9 (SD 0.6)	0.59**	2.0 (SD 0.8)	0.5 (SD 0.5)	1.54 CI 95% 1.23 to 1.84	<0.0001*
Motor system [¶]	3.6 (SD 0.4)	3.4 (SD 0.3)	0.07**	1.5 (SD 0.6)	0.2 (SD 0.2)	1.35 CI 95% 1.14 to 1.55	<0.0001**
State organization [#]	3.8 (SD 0.5)	3.8 (SD 0.4)	0.72**	1.0 (SD 0.7)	0.2 (SD 0.2)	-	<0.0001**
State Regulation [¶]	3.6 (SD 0.8)	3.9 (SD 1.0)	0.22*	1.6 (SD 0.8)	0.4 (SD 0.4)	1.25 CI 95% 0.95 to 1.55	<0.0001*
Autonomic system [¶]	4.0 (SD 0.6)	3.9 (SD 0.5)	0.73**	1.0 (SD 0.7)	0.6 (SD 0.5)	0.53 CI 95% 0.23 to 0.84	0.01*
Reflexes [#]	1.7 (SD 0.2)	1.7 (SD 0.1)	0.12**	0.4 (SD 0.2)	0.2 (SD 0.1)	-	<0.0001**

*unpaired t test ** Mann-Whitney test [¶]mean [#]media

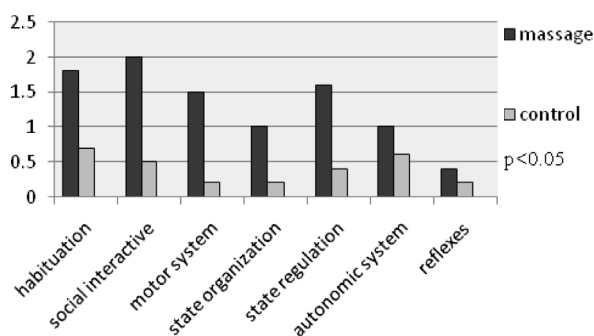


Figure 1. Difference behavior score in the age 11 days old between massage group and control.

The habituation scoring presents babies abilities to decrease responses to repeated disturbing stimulus (light, rattle, bell and tactile stimulation of the foot). Social interactive evaluates the ability to attend to animate or inanimate visual or and auditory stimuli and the quality of overall alertness. Motor system asses general tone, motor maturity, pull-to-sit, defensive and activity level. State organization shows peak of excitement, rapidity of build-up, irritability and lability of states. State regulation consists 4 items: cuddliness, consolability, self-quieting and hand-to mouth. Scoring autonomic system we evaluate tremulousness, startles and lability of skin color.

Table 1. Characteristic of the subjects

Characteristic	Massage group (n=36)	Control group (n=36)
Baby		
Sex		
Female	20	17
Male	16	19
Gestational age, mean (SD) wk	39.1 (0.9)	38.9 (0.9)
Birth weight, mean (SD) g	2963.2 (285.1)	2929.2 (334.5)
Birth height, mean (SD) g	48.0 (1.6)	48.2 (1.5)
Head circumferential (cm)	33.1 (1.1)	33.1 (1.1)
Weight at 11 day, mean (SD) yr	3118.1 (235)	3067 (312)
Mother		
Age, mean (SD) yr	28 (4.9)	26 (5.3)
Education background		
Low	4	2
Middle	27	30
High	1	4
Occupation		
Housewives	29	31
Private employee	6	5
Teacher	1	0
No of children, mean (SD)	2.2 (1.1)	1.9 (1.0)

The behavior evaluation on the first day (6-24 hours) in this study found no differences among both groups. Both groups had similar behavior according to Brazelton scale. After 10 days we found different results between the 2 groups. Babies with massage had better improved their capacity than control group to decrease responses to bell's ringing in habituation cluster (mean 2.2 [SD 1.7] compare vs. 0.6 [SD 0.8]; $P < 0.0001$). They also had better ability to follow and keep their interested to red ball in animate and inanimate visual (mean 2.2 [SD 1.3] vs. 0.4 [SD 0.7]; $P=0.00$) and to rattle in animate auditory (2.2 SD 1.1 vs. to 0.6 SD 0.7). State organization, state regulation autonomic system and reflexes showed slightly improved compare to control group although they statistically difference.

Discussion

The concepts of critical and plastic periods are based on the assumption that neurological development depends on the exposure of the brain to a predictable timetable of developmental experience.^{13,14} The infant's first experiences play a major role in brain development. Neural connections are created or strengthened depending on the type and quality of experience. Likewise, a lack of stimulation may lead to a slowing down or termination of synaptic growth. At the time when there are negative experiences or the absence of appropriate stimulation, disorganization of brain growth is much more likely.^{14,18}

This study has shown the positive effect of massage in the early extra uterine life. Giving massage as early stimulation to newborns has accelerated the adaptive behavior to new environment. Their abilities to organize five different behavioral states (two kinds of sleep states, two kinds of awake-alert states, and one kind of distress state) present their organization in physiologic system and activity of the nervous system to change the nature of the input-output relations between newborn to different stimuli.^{19,20}

Examining behavior using Brazelton scale in this study was done at the age of 1 day in order to give the midwives plenty of time to teach and supervised the mother while massaging their babies. Compared with previous studies, our results seem to have lower scores.²⁴⁻⁶ This difference might be due to different

age of the baby to do the first examination. Study by Boatelle-Costa, et al²⁴ was done at 48-80 hour old infants, while Canals et al²⁵ was done at 3-4 days old. Although the optimal time to do the the first test of Brazelton scale is 48-72 hours old (third day), but Brazelton also states that the examination still can be possible at the age of 1 years old as long as the infants in stable conditions. Behavior examination using Brazelton prefers to individual evaluation and to be used in larger community, researcher must do some application before use it in community.²³

In her study, Field found progressing adaptive behavior in habituation, social interactive, motoric system and range of state, while Mathai found organization state and autonomic system score better in massage group.^{5,28} This study not only found statistical differences between two groups, but also ours proved the clinical difference among two groups. The Brazelton scores between and after massage in the massage group were higher than one scoring scale, while in Mathai and Field studies, the differences score were less than one scoring scale. This might happen because our study used full-term newborns, while the previous studies were done in preterm babies. Subjects in previous studies might have asphyxiate, infection intrauterine history or isolated in intensive care that affected their adaptive behavior abilities.

This study aimed to evaluate the baby's behavior changes after 10 days of massage and it was proven that massage give better adaptive behavior that needed for newborns to develop their interaction with their environment. Massage improved the newborn performances. They had better ability to decrease their responses to disturbing stimuli to maintain their sleeping state than baby without massage. They also had better coordination between eye movement and neck to process all information from surrounding when they see a red ball, hear a rattle in social interactive score. Their ability to control the head was performed in better pull-sit-down score in motor system cluster and signed the readiness to sit, stand and walk later. Finally babies with massage in this study could organize their autonomic system and regulate their state responding to stimulation.

We hope this result can be special consider to determine the role of giving massage for newborn babies. Although there were significant progress behavior of massage group, the conclusion of the

effect of long-term massage was not established yet. There should be another study to evaluate the effectiveness of giving massage longer than 10 days or the effect of massage applied to infants older than 2 weeks. Another important issue is about high risk baby. It was also accepted that indication of baby massage as earlier stimulation is to prevent delayed development of high-risk baby. The term high risk baby is not only for small gestational age or every conditions happen during intrauterine, but also refers to neglect, child abuse infants or born from cocaine addicted mothers.

We conclude that massage gives better behavior and reflexes in full-term newborn compared to children without massage stimulation. Based on the result of our study, we suggest giving massage for all infants with normal birth-weight especially those who need special consideration.

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