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Pediatrics 2000;105:84-

DOI: 10.1542/peds.105.6.e84

This information is current as of October 11, 2005

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://www.pediatrics.org/cgi/content/full/105/6/e84>

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Infant Massage Compared With Crib Vibrator in the Treatment of Colicky Infants

Virpi Huhtala, MD; Liisa Lehtonen, MD; Riitta Heinonen, RN; and Heikki Korvenranta, MD

ABSTRACT. *Objective.* To evaluate the effectiveness of infant massage compared with that of a crib vibrator in the treatment of infantile colic.

Methods. Infants <7 weeks of age and perceived as colicky by their parents were randomly assigned to an infant massage group ($n = 28$) or a crib vibrator group ($n = 30$). Three daily intervention periods were recommended in both groups. Parents recorded infant crying and given interventions in a structured cry diary that was kept for 1 week before (baseline) and for 3 weeks during the intervention. Parents were interviewed after the first and third weeks of intervention to obtain their evaluation of the effectiveness of the given massage or crib vibration.

Results. At baseline, the mean amount of total crying was 3.6 (standard deviation: 1.4) hours/day in the massage group infants and 4.2 (2.0) hours/day in the vibrator group infants. The mean amount of colicky crying was 2.1 (standard deviation: 1.1) hours/day and 2.9 (1.5) hours/day, respectively. The mean number of daily intervention periods was 2.2 in both groups. Over the 4-week study, the amount of total and colicky crying decreased significantly in both intervention groups. The reduction in crying was similar in the study groups: total crying decreased by a mean 48% in the massage group and by 47% in the vibrator group, and colicky crying decreased by 64% and 52%, respectively. The amount of other crying (total crying minus colicky crying) remained stable in both groups over the intervention. Ninety-three percent of the parents in both groups reported that colic symptoms decreased over the 3-week intervention, and 61% of the parents in the massage group and 63% of the parents in the crib vibrator group perceived the 3-week intervention as colic reducing.

Conclusions. Infant massage was comparable to the use of a crib vibrator in reducing crying in colicky infants. We suggest that the decrease of total and colicky crying in the present study reflects more the natural course of early infant crying and colic than a specific effect of the interventions. *Pediatrics* 2000;105(6). URL: <http://www.pediatrics.org/cgi/content/full/105/6/e84>; *infantile colic, massage, crib vibrator, treatment, sensory stimulation.*

ABBREVIATION. SD, standard deviation.

From the Department of Pediatrics, Turku University Hospital, Turku, Finland.

Received for publication Jul 26, 1999; accepted Jan 17, 2000.

Reprint requests to (V.H.) Department of Pediatrics, Turku University Hospital, Kiinamyllynkatu 4-6, 20520 Turku, Finland. E-mail: virpi.susanna.huhtala@utu.fi

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Excessive or qualitatively different, inconsolable crying is typical of infantile colic.¹⁻⁴ The phenomenon is associated with considerable parental distress^{5,6} and still lacks a safe and effective therapy. Dicyclomine was effective in the treatment of colicky infants^{7,8} but is now contraindicated because of the possible life-threatening side effects.⁹ Herbal tea¹⁰ and sucrose¹¹ may also be useful, but more evidence for their effectiveness is needed. The benefit of cow's milk elimination has been shown in several studies,^{12,13} and a 1-week trial with a hypoallergenic formula has been suggested for colicky infants.¹⁴ However, no consensus about the role of cow's milk allergy or intolerance in colic has so far been reached. Parental counseling is beneficial^{15,16} and is considered important in the current management of colic.

Infant massage has been suggested for treatment of colic,¹⁷ and it may be widely used for this purpose; 50% of mothers were reported to use massage to soothe their excessively crying infants in a multicultural Dutch population.¹⁸ Infant massage provides a lot of sensory stimulation, which has been shown to have pacifying effects on infants generally.^{19,20} Massage therapy has been reported to promote growth and development in premature infants^{21,22} and to improve early mother-infant interaction.²³ Human immunodeficiency virus-exposed or cocaine-exposed infants and infants of depressed mothers have also been suggested to benefit from massage therapy.²⁴ However, increased sensory stimulation in the form of carrying or crib vibration^{25,26} has not been effective in the treatment of colicky infants. Instead, colicky infants may benefit from decreased stimulation.²⁷

To our knowledge, there was no controlled study of infant massage in the treatment of colic. Thus, we evaluated the effects of infant massage on crying in colicky infants in a randomized, controlled trial. Use of a crib vibrator was chosen for control intervention or placebo treatment, because it had been ineffective in a previous study.²⁶

METHODS

Subjects and Procedure

The colicky infants were enrolled in the study by giving information about the study to the mothers of newborn infants on the postpartum wards of the Turku University Hospital and at the well-infant clinics in the Turku town district. In the study information, colic was described as intensive infant crying of at least 3 hours a day on 3 or more days a week in an otherwise healthy infant. The mothers were asked to contact us if their infant had shown these symptoms of colic during the first month of the

infant's life, for at least 1 week. The inclusion criteria for study entry were <6 weeks of age, born at ≥ 37 weeks of gestation, not small for gestational age, Apgar scores ≥ 7 at 5 minutes and ≥ 8 at 15 minutes, healthy from birth on, and parental perception of the colic of the infant according to the description in the study information. If the parents were willing to participate, they received a 1-week diary for recording the crying, sleeping, and feedings of the infant and an informed consent form. At a visit to the researcher, the infant was then given a physical examination and an abdominal ultrasound. The families were randomly assigned to an infant massage or to a crib vibrator group. The use of a crib vibrator was considered a control intervention based on an earlier study in which a similar device was as effective as parental education or reassurance and support²⁶ and was chosen instead of nothing to improve parental compliance. Both of our interventions, however, were given equal value in discussions with the parents. After 1 week of diary recording (baseline), the families started a 3-week intervention according to the randomization and continued to keep the diary in which they also recorded the given intervention. After 1 and 3 weeks, the parents were interviewed to obtain their evaluation of the effectiveness of the given intervention. After the 3-week intervention, at a control visit, the infant was physically examined and the parents returned the completed diaries.

All participating families gave written informed consent. The study protocol was approved by the joint commission on ethics of the University of Turku and the Turku University Hospital.

Diary

The diary was based on that used in previous studies.^{28,29} Diaries have been validated as a method for measuring infant crying, using audiorecordings as a golden standard.^{30,31} In the diary, each page corresponded to 1 week and contained 7 rows. Each row corresponded to 1 day and was divided into 24 squares, each square corresponding to 1 hour. Parents recorded the colicky crying, other crying, and sleeping of the infant, to an accuracy of 15 minutes, and feedings as events in the lower half of the row by using specific symbols for each behavior. Colicky crying was defined as intensive crying with no identifiable cause and continuous despite efforts to console the infant. The given interventions were recorded by drawing a line in the upper half of the row, the length of the line corresponding to the duration of the intervention. Continuous intervention with no interruption of >15 minutes was interpreted as a single intervention period.

Interventions

At the beginning of the massage intervention, a trained nurse taught the massage technique²¹ to the parents (mothers) and gave them a brochure with written illustrated instructions. Massage included gentle stroking of the skin over the different parts of the head, body, and limbs. The palms of the hands or fingertips were used, according to the area that was massaged. Similarly, the pressure of the stroking/massage varied; for example, less pressure was applied on the face than on the soles of the feet. However, the parents were encouraged not to massage the areas where the infant did not like to be touched. Olive oil was used with the massage, and an attempt was made to maintain eye-to-eye contact and an uninterrupted touch between the infant and the masseuse during the procedure. At the end of the massage period, the infant was swaddled in a towel and was rocked gently a few times. Three daily massage periods were recommended: twice daily a whole body massage (estimated duration: 20–30 minutes) and once daily a belly massage (15 minutes). Parents were advised to give the massage when the infant was calm and satisfied, but the belly massage could also be tried during symptoms of colic.

The families in the crib vibrator group received the device with oral and written instructions at the beginning of the intervention period. The crib vibrator (EP 88, Enerpoint Oy, Rauma, Finland) consisted of a vibrating unit that also produced some white sound and a control unit for regulating the intensity and duration (5–25 minutes) of the vibration period. The vibrating unit was installed at the bottom of the infant's crib. The parents were advised to use the vibrator at least 3 times a day in 25-minute periods during spells of colic or in advance, during the usual daily colic period.

Semistructured Interviews

The parents were interviewed after the first and third weeks of intervention. The first interview was conducted by phone and the second 1 at the control visit. Both interviews included an evaluation of the amount of colic symptoms (crying) compared with the amount at baseline and an evaluation of the perceived effect of the given intervention on these symptoms. The amount of colic symptoms was rated as: 1) decreased, 2) not changed, or 3) increased. The effect of the intervention was rated as: 1) colic decreasing, 2) no effect, 3) colic increasing, or 4) cannot say.

Data Analysis

Analysis of variance of repeated measures was used in the analysis of the percentage change in the amount of crying from the baseline level over the study weeks. In addition, 2-sample *t* test was applied in comparison of the study groups. Categorical data were analyzed using χ^2 statistics. SPSS for Windows, Release 6.1 (SPSS, Chicago, IL) was used for data analysis. The level of statistical significance was defined as $P < .05$.

RESULTS

Subjects

Between June 1995 and December 1997, 85 families with colicky infants were enrolled in the study. Of these, 25 (29%) did not eventually participate for various reasons: perceived improvement of colic (11), disease of the infant (3), or that of the mother (2), disapproval of the study protocol (5), and unknown (4). Of the 60 participating infants randomized to the intervention groups, 2 infants in the massage group were excluded, 1 because of maternal disapproval of the randomized intervention and 1 because of the infant's respiratory infection requiring hospitalization.

At baseline, 83% of the infants had 3 or more hours of total crying on 3 or more days (79% in the massage group and 87% in the vibrator group; $P = .41$) and 47% of the study infants had 3 or more hours of colicky crying on 3 or more days (43% in the massage group and 50% in the vibrator group; $P = .59$). Other characteristics of the 58 study infants and those of their parents are presented in Tables 1 and 2. Before intervention, the groups differed significantly from each other only in the amount of daily colicky crying, the infants in the vibrator group having more colicky crying than those in the massage group ($P = .021$). The age of the infants at the beginning of the intervention ranged from 23 to 48 days in both study groups. There was 1 single-parent family in the massage group and the father's employment data are missing for this family. All mothers were home full-time during the study weeks.

Complete diaries (minimum of 6 days per week) of the baseline week and parental evaluations were received from 28 families in the massage group and 30 families in the crib vibrator group. Complete diaries for all 4 study weeks were received from 26 families in the massage group and 28 families in the crib vibrator group and were included in the analysis of the diary data over the intervention. The 4 infants with incomplete diary data had more total ($P = .018$) and colicky ($P = .001$) crying at baseline than the other infants. They were also younger ($P = .040$) and all 4 were boys ($P = .062$). Otherwise, these infants and their parents did not differ from the rest of the infants and parents.

TABLE 1. Characteristics of the Study Infants

Characteristic	Infant Massage Group (<i>n</i> = 28) <i>n</i> (%)	Crib Vibrator Group (<i>n</i> = 30) <i>n</i> (%)
Gender		
Male	17 (61)	15 (50)
Female	11 (39)	15 (50)
Feeding type before intervention		
Exclusively breastfed	18 (64)	25 (83)
Mostly breastfed	7 (25)	3 (10)
Mostly formula fed	2 (7)	1 (3)
Exclusively formula fed	1 (4)	1 (3)
First born	16 (57)	20 (67)
Vaginal delivery	26 (93)	26 (87)
Birth weight (g)*	3681 (512)	3653 (390)
Gestational age (wk)*	40.1 (1.2)	40.0 (1.0)
Age (d)*		
At study entry	31.7 (7.4)	29.5 (8.0)
At the beginning of intervention	39.5 (7.2)	37.3 (7.7)
Crying at baseline (h/d)*		
Total crying	3.6 (1.4)	4.2 (2.0)
Colicky crying†	2.1 (1.1)†	2.9 (1.5)†
Other crying	1.6 (1.1)	1.3 (1.3)

* Data are presented as means (SD).

† *P* = .021, 2-sample *t* test for independent samples.

TABLE 2. Characteristics of Study Parents

Characteristic	Infant Massage Group (<i>n</i> = 28) <i>n</i> (%)	Crib Vibrator Group (<i>n</i> = 30) <i>n</i> (%)
Couples	27 (96)	30 (100)
Married	17 (63)	21 (70)
Father's employment*		
Employed	24 (89)	21 (70)
Unemployed	3 (11)	5 (17)
Student	0 (0)	4 (13)
Age at child's birth (y)†		
Mother	30.0 (4.2)	28.6 (4.4)
Father	31.0 (4.0)	29.6 (4.2)

* *n* = 27 in the massage group.

† Data are presented as means (SD).

Crying and Given Interventions Over the Study Weeks (Diaries)

The amount of intervention given during the intervention weeks is presented in Table 3. Massage was performed a mean 2.2 (standard deviation [SD]: .5) times a day and the crib vibrator was used 2.2 (1.1) times a day during the 3-week intervention. The mean duration of the intervention was .9 (SD: .3) hours/day in the massage group and 1.2 (.7) hours/day in the vibrator group.

The mean amount of total crying at baseline was 3.5 (SD: 1.4) hours/day in the massage group infants and 4.0 (1.9) hours/day in the vibrator group infants (*P* = .25). Over the 4-week study, the

amount of total daily crying decreased significantly (*P* < .001) but similarly (*P* = .27) in the study groups (Fig 1), the mean decrease being 48% (SD: 30) in the massage group and 47% (27) in the crib vibrator group (*P* = .87). The amount of colicky crying tended to be lower in the massage group than in the vibrator group during all 4 study weeks. The difference between the groups was significant at baseline (mean: 1.9; SD: .9 hours/day of colicky crying in the massage group vs 2.7 [1.4] hours/day in the vibrator group; *P* = .017). Colicky crying decreased significantly from the baseline level (*P* < .001) but not differently (*P* = .53) in the intervention groups over the course of the study. The mean decrease of colicky crying by the third intervention week was 64% (SD: 37) in the massage group and 52% (40) in the crib vibrator group (*P* = .24). This decrease in colicky crying contributed to most of the decrease in total crying, because other crying did not change significantly (*P* = .17). Other crying decreased by a mean 17% (SD: 63) in the massage group and by 15% (115) in the vibrator group (*P* = .93).

Thirty-three infants (33/54; 15 infants in the massage group and 18 infants in the vibrator group; *P* = .62) were <6 weeks of age at the beginning of the intervention. In these infants, as well as in those who were older, total and colicky crying decreased significantly from the baseline

TABLE 3. Number and Duration of Daily Interventions

Interventions	Infant Massage Group (<i>n</i> = 26) Mean (SD)	Crib Vibrator Group (<i>n</i> = 28) Mean (SD)
Number of intervention periods/d		
First wk	2.2 (.5)	2.5 (1.0)
Second wk	2.2 (.6)	2.1 (1.3)
Third wk	2.0 (.6)	1.9 (1.3)
Duration of intervention (h/d)		
First wk	.9 (.3)	1.3 (.6)
Second wk	.9 (.4)	1.2 (.8)
Third wk	.8 (.3)	1.0 (.8)

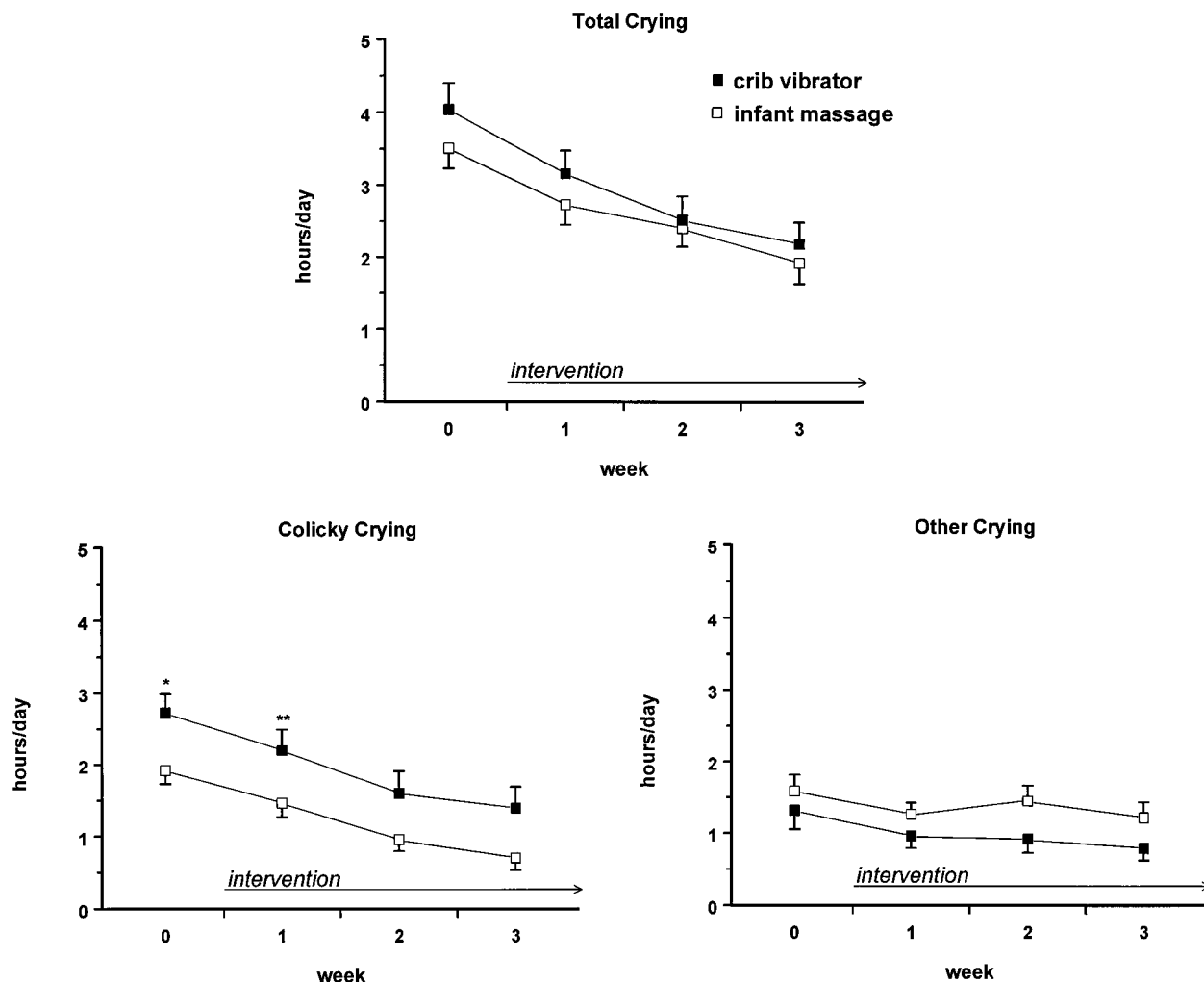


Fig 1. Mean (standard error) daily duration of the total, colicky, and other crying at baseline (0) and during the 3 intervention weeks (1–3). Total and colicky crying decreased significantly but similarly in the study groups over the intervention. At the beginning of the study, the infants in the crib vibrator group had significantly more colicky crying than the infants in the massage group (* $P = .017$; ** $P = .045$). The amount of other crying remained comparable in the study groups.

level over the intervention (both $P < .001$), whereas the amount of other crying remained stable ($P = .27$). The percentage changes in total, colicky, and other crying over the intervention weeks were similar in these 2 age groups (all $P > .42$).

Twenty-four infants (92%) in the massage group and 26 infants (93%) in the vibrator group had less total crying in the third intervention week than at baseline. The amount of colicky crying decreased in 92% of the infants (24/26) and in 89% of the infants (25/28; $P = .70$), respectively. During the third intervention week, 19% of the infants (5/26) in the massage group and 25% of the infants (7/28) in the crib vibrator group ($P = .61$) had no colicky crying. These infants (12/54) did not differ significantly from the rest of the infants as to age at the beginning of the intervention ($P = .19$) or as to amount of total, colicky, or other crying at baseline (all $P > .31$). Seven of these infants with no colicky crying in the last intervention week (7/12) had reached the 8 weeks of age by the beginning of the third intervention week.

Parental Evaluation of the Effectiveness of Intervention (Interviews)

The parents rated the amount of colic symptoms and the effect of the interventions similarly in the study groups at both interviews (all $P > .38$; Table 4). Ninety-three percent of the parents in both groups reported that colic symptoms decreased over the 3-week intervention. Sixty-one percent of the families in the massage group and 63% of the families in the crib vibrator group perceived the 3-week intervention as colic decreasing. However, 21% of the parents in the massage group and 30% of the parents in the crib vibrator group considered that the given intervention had no effect on colic symptoms. No families in either group reported that the intervention increased colic symptoms, neither after 1 week nor after 3 weeks of intervention.

Sample Size

This study had a power of 94% (at a significance level of .05) to detect an intergroup difference of 30% in the reduction of daily total crying. The power was

TABLE 4. Parental Evaluation of Colic Symptoms and the Effect of Intervention

Parental Evaluation	Infant Massage Group (n = 28) n (%)	Crib Vibrator Group (n = 30) n (%)
Colic symptoms		
After first wk of intervention		
Decreased	15 (54)	18 (60)
Not changed	11 (39)	11 (37)
Increased	2 (7)	1 (3)
After third wk of intervention		
Decreased	26 (93)	28 (93)
Not changed	1 (4)	1 (3)
Increased	1 (4)	1 (3)
Effect of intervention		
After first wk of intervention		
Colic decreasing	13 (46)	15 (50)
No effect	10 (36)	11 (37)
Colic increasing	0 (0)	0 (0)
Cannot say	5 (18)	4 (13)
After third wk of intervention		
Colic decreasing	17 (61)	19 (63)
No effect	6 (21)	9 (30)
Colic increasing	0 (0)	0 (0)
Cannot say	5 (18)	2 (7)

77% to detect a similar difference in the reduction of daily colicky crying.

DISCUSSION

Crying and colic decreased similarly over the 3-week intervention in colicky infants receiving either massage or crib vibration. The 2 ways to evaluate the effectiveness of the interventions were in concordance: parental diaries and interviews showed no difference between the study groups. The reduction of crying in our study infants is comparable to that in earlier studies in which a crib vibrator²⁶ or supplemental carrying²⁵ was used. In both of those studies, the interventions were as effective as parental counseling. Taken together, the reports of normal crying and the natural course of colic^{1,2,28,32} and our present findings suggest that neither infant massage nor the use of a crib vibrator modifies the natural course of crying in infantile colic.

Infant crying has been reported to peak during the first 6 weeks of life,^{2,33} and more than half of the colicky infants are free from colic by the end of the second month.^{1,34} Parkin et al²⁶ also reported a significant decrease in crying only in colicky infants who were older than 6 weeks, not in younger ones, when all their intervention groups, including the group using a crib vibrator, were evaluated together. In our study, the age of the infant did not influence the course of crying or the disappearance of colic symptoms.

The total amount of crying decreased in nearly all infants over the intervention weeks. The evaluation of 2 separate types of crying showed that the decrease in colicky crying contributed most to the reduction in total crying, whereas the amount of other crying remained stable. These findings are in accordance with those reported earlier as a natural course of crying in colicky infants over the first 2 or 3

months of life.²⁸ It may be difficult to distinguish a colic cry from a hunger cry on an audible basis only,³⁵ but our definitions take into consideration both the audible quality and the context of crying. We defined colicky crying as intensive, unsoothable crying with no identifiable cause. Thus, other crying represented soothable crying related to hunger, need for company, or diaper change, etc. Because crying is suggested to have a function in securing the fulfillment of basic needs until other means of communication appear, it is reasonable that the amount of other crying remains stable in the early weeks of life. The fact that parents recorded a stable amount of other crying also suggests that they were able to recognize functionally relevant and excessive crying.

The amount of colicky crying in our study infants is similar to that reported in our previous study,²⁸ but it is greater than the amount reported in another study of excessive criers.³⁶ Therefore, it is possible that the infants in this study had more severe colic than the infants in some other studies. At baseline, the crib vibrator group infants had significantly more colicky crying than the massage group infants. This difference, however, is unlikely to bias the evaluation of the interventions, because we used the percentage change in crying in the analysis.

Parental compliance in carrying out the interventions was good. Infants received interventions approximately twice a day in both groups during the 3-week period. The mean duration per day of the massage was 54 minutes (.9 hours) and of crib vibration 72 minutes (1.2 hours). Rice²¹ included four 15-minute massage periods per day in her original instructions for infant massage, but even a shorter daily duration of massage has been reported to be effective.²⁴ It is unlikely that increasing the duration of daily massage could increase its benefit in the treatment of colicky infants. It would even be difficult to increase the amount because, in our experience, mothers perceived even the performed intervention as strenuous, and some mothers also reported that their infant did not like the massage. It may be speculated whether the massage would have been more effective if performed by someone else, not by the tired³⁷ and distressed^{5,6} mother trying to cope with her colicky infant. In contrast, because massage therapy has been shown to increase maternal sensitivity to infant cues,²³ a better response to massage, especially when performed by the mother, could have been expected.

Parents of colicky infants desperately search for something that would ameliorate the colic symptoms. Massage is often tried as a method of soothing¹⁸ and has even been recommended for treatment of colicky infants.¹⁷ We did not find any difference in the reduction of colicky crying between infants receiving massage and those with a crib vibrator over a 3-week intervention. We consider that the decrease of crying in our study reflects more the natural course of early infant crying and colic^{1,2,28,32} than a specific effect of the interventions. Thus, infant massage cannot be recommended for treatment of infantile colic.

ACKNOWLEDGMENTS

This study was financially supported by grants from the Turku University Hospital and the Pediatric Research Foundation.

We thank Turku Private Pediatric Practice for providing us with space and equipment, and Hans Helenius, MSc, for statistical help.

We thank the parents and infants who participated in this study.

REFERENCES

1. Wessel MA, Cobb JC, Jackson EB, Harris GS, Detwiler AC. Paroxysmal fussing in infancy, sometimes called "colic." *Pediatrics*. 1954;14:421-434
2. Brazelton TB. Crying in infancy. *Pediatrics*. 1962;29:579-588
3. Lester BM, Boukydis CFZ, Garcia-Coll CT, Hole WT. Colic for developmentalists. *Infant Ment Health J*. 1990;11:321-333
4. Zeskind PS, Barr RG. Acoustic characteristics of naturally occurring cries of infants with "colic." *Child Dev*. 1997;68:394-403
5. Beebe SA, Casey R, Pinto-Martin J. Association of reported infant crying and maternal parenting stress. *Clin Pediatr (Phila)*. 1993;32:15-19
6. Miller AR, Barr RG, Eaton WO. Crying and motor behavior of six-week-old infants and postpartum maternal mood. *Pediatrics*. 1993;92:551-558
7. Illingworth RS. Evening colic in infants: a double-blind trial of dicyclomine hydrochloride. *Lancet*. 1959;2:1119-1120
8. Weissbluth M, Christoffel KK, Davis AT. Treatment of infantile colic with dicyclomine hydrochloride. *J Pediatr*. 1984;104:951-955
9. Williams J, Watkin-Jones R. Dicyclomine: worrying symptoms associated with its use in some small babies. *Br Med J*. 1984;288:901
10. Weizman Z, Alkrinawi S, Goldfarb D, Bitran C. Efficacy of herbal tea preparation in infantile colic. *J Pediatr*. 1993;122:650-652
11. Markestad T. Use of sucrose as a treatment for infant colic. *Arch Dis Child*. 1997;76:356-358
12. Jakobsson I, Lindberg T. Cow's milk as a cause of infantile colic in breast-fed infants. *Lancet*. 1978;2:437-439
13. Hill DJ, Hudson IL, Sheffield LJ, Shelton MJ, Menahem S, Hosking CS. A low allergen diet is a significant intervention in infantile colic: Results of a community-based study. *J Allergy Clin Immunol*. 1995;96:886-892
14. Lucassen PLBJ, Assendelft WJJ, Gubbels JW, van Eijk JTM, van Geldrop WJ, Knuistingh Neven A. Effectiveness of treatments for infantile colic: systematic review. *Br Med J*. 1998;316:1563-1569
15. Taubman B. Clinical trial of the treatment of colic by modification of parent-infant interaction. *Pediatrics*. 1984;74:998-1003
16. Wolke D, Gray P, Meyer R. Excessive infant crying: a controlled study of mothers helping mothers. *Pediatrics*. 1994;94:322-332
17. Larsen J-H. Infants' colic and belly massage. *Practitioner*. 1990;234:396-397
18. Van der Wal MF, van den Boom DC, Pauw-Plomp H, de Jonge GA. Mothers' reports of infant crying and soothing in a multicultural population. *Arch Dis Child*. 1998;79:312-317
19. Brackbill Y. Cumulative effects of continuous stimulation on arousal level in infants. *Child Dev*. 1971;42:17-26
20. Brackbill Y. Continuous stimulation reduces arousal level: stability of the effect over time. *Child Dev*. 1973;44:43-46
21. Rice RD. Neurophysiological development in premature infants following stimulation. *Dev Psychol*. 1977;13:69-76
22. Field TM, Schanberg SM, Scafidi F, et al. Tactile/kinesesthetic stimulation effects on preterm neonates. *Pediatrics*. 1986;77:654-658
23. White-Traut RC, Nelson MN. Maternally administered tactile, auditory, visual, and vestibular stimulation: relationship to later interactions between mothers and premature infants. *Res Nurs Health*. 1988;11:31-39
24. Field T. Massage therapy for infants and children. *J Dev Behav Pediatr*. 1995;16:105-111. Review
25. Barr RG, McMullan SJ, Spiess H, et al. Carrying as colic "therapy": a randomized controlled trial. *Pediatrics*. 1991;87:623-630
26. Parkin PC, Schwartz CJ, Manuel BA. Randomized controlled trial of three interventions in the management of persistent crying of infancy. *Pediatrics*. 1993;92:197-201
27. McKenzie S. Troublesome crying in infants: effect of advice to reduce stimulation. *Arch Dis Child*. 1991;66:1416-1420
28. Lehtonen L, Korvenranta H. Infantile colic. Seasonal incidence and crying profiles. *Arch Pediatr Adolesc Med*. 1995;149:533-536
29. Riih a H, Lehtonen L, Korhonen T, Korvenranta H. Family life 1 year after infantile colic. *Arch Pediatr Adolesc Med*. 1996;150:1032-1036
30. Barr RG, Kramer MS, Boisjoly C, McVey-White L, Pless IB. Parental diary of infant cry and fuss behaviour. *Arch Dis Child*. 1988;63:380-387
31. St. James-Roberts I, Hurry J, Bowyer J. Objective confirmation of crying durations in infants referred for excessive crying. *Arch Dis Child*. 1993;68:82-84
32. Barr RG. The normal crying curve: what do we really know? *Dev Med Child Neurol*. 1990;32:356-362
33. Hunziker UA, Barr RG. Increased carrying reduces infant crying: a randomized controlled trial. *Pediatrics*. 1986;77:641-648
34. Illingworth RS. "Three months' colic." *Arch Dis Child*. 1954;29:165-174
35. St. James-Roberts I. What is distinct about infants' "colic" cries? *Arch Dis Child*. 1999;80:56-62
36. St James-Roberts I, Conroy S, Wilsher K. Bases for maternal perceptions of infant crying and colic behaviour. *Arch Dis Child*. 1996;75:375-384
37. Riih a H, Lehtonen L, Korvenranta H. Family context of infantile colic. *Infant Ment Health J*. 1995;16:206-217

Infant Massage Compared With Crib Vibrator in the Treatment of Colicky Infants

Virpi Huhtala, Liisa Lehtonen, Riitta Heinonen and Heikki Korvenranta

Pediatrics 2000;105:84-

DOI: 10.1542/peds.105.6.e84

This information is current as of October 11, 2005

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