

REGULAR ARTICLE

## Massage decreases aggression in preschool children: a long-term study

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### Abstract

**Aim:** To evaluate the effects of massage in 4- to 5-year-old children with aggression and deviant behaviour at day-care centres.

**Method:** The children received daily massage in preschool at the midday rest ( $n = 60$ ). The controls were listening to a story ( $n = 50$ ). The Child Behaviour Checklist (CBCL) was used to rate the children's behaviour by parents and staff before the treatment started, and after 3 and 6 months. A long-term evaluation was also carried out. It included all massaged children still in daycare after 12 months ( $n = 34$ ).

**Results:** Children with high scores of behaviour problems, receiving massage and/or extra attention showed significant decrease in aggression scores after 3 months, but after 6 months significantly lowered scores were only found in massage-treated deviant children. Parents of the children receiving massage rated a significant decrease of somatic problems of their children. Staff rated that the massaged children's social problems decreased, compared to the control children. Attention problems tended to decrease, especially at home. A continuous decrease in aggressive behaviour and somatic problems over a 12-month period was observed in the children receiving massage.

**Conclusion:** Daily touching by massage lasting for 5–10 min could be an easy and inexpensive way to decrease aggression among preschool children.

### INTRODUCTION

Aggressive behaviour in young people seems to be an increasing problem in the western society. In Sweden, child abuse and violence among young people has increased during the last decades (1). Probably, changes in family structure, exposure to violence in the media and drug abuse including alcohol are involved. Aggressive behaviour in an individual child is quite stable from toddlerhood into adolescence (2,3). In Sweden, most women are part of the labour market and their small children are taken care of in day-care centres by professional staff, usually preschool teachers. A serious problem, reported by the staff, is aggressive behaviour, in particular among boys. The aggressive problems may be treated with behaviour techniques. However, this treatment is difficult to adopt in a day-care setting.

Massage and the mechanisms of touching have been studied in animals. In response to various kinds of non-noxious sensory stimulation, the peptide oxytocin is released into the blood circulation and into the cerebrospinal fluid (4,5). The effects caused by oxytocin are strikingly similar to the ones seen in response to massage and facilitates social interaction and cognition (6,7). Oxytocin administered to humans has a calming effect (8). It is possible that the beneficial effects can be induced by the treatment with massage – like touching. Thus, it is important to evaluate whether massage, an easy and inexpensive method, is effective, in children at day-care centres.

This study sought to examine, in a controlled way, the long-term effects of massage. The setting was nonclinical. The study was focused on problematic behaviour in preschool children. The hypothesis was that massage should decrease aggression, deviant behaviour and social problems.

### METHODS

One hundred and ten, 4- to 5-year-old children, at day-care centres in Stockholm and Uppsala participated in the study. In Sweden, a day-care centre normally cares for 12–15 children. One department cares for these children between the ages from 1 to 5 years. The children stay at the same department until the age of 6, when they continue to school. Each department has 3–4 staff members, educated as preschool teachers.

### Massage

Nine day-care centres were chosen for the study. The staff had been trained in massage therapy. The method is described by Axelsson and Hedberg (9). The massage consists of slow stroking and nonpainful kneading at least 3–4 times of the parts the child points out. Mostly soft tissue is massaged. Hands, arms, back and neck are the parts most commonly treated. The massage usually lasts for 5–10 min and all children at the department receive the same treatment. Massage starts on the back and is spread to other parts of

the body if the child so wishes. It is very important that the child finds it comfortable and therefore the treatment was individualized.

There is a routine to have a period of rest at noon in Swedish day-care centres. This time was chosen for the treatment. The children who accepted massage were given daily massage (the massage group). None of the children refused massage. The children had no massage therapy before the study started. Different staff members, whom the children knew well, gave the massage. The children could also listen to a story or music during the rest – similar to the controls.

### Controls

Six other departments at the same day-care centres served as controls. The staff at these centres had not yet received full training in massage. However, they had a positive attitude to the treatment. The children had no massage during the study. Instead, they listened to stories read by the staff members or listened to music. No individual attention was given to each child unless asked for by the child.

### Participants

In total, 110 children (60 in the massage group and 50 control children) were evaluated by both parents and staff members at all three times. Forty-seven children were 4 years old and 59 children were 5 years old. One was younger, 3.5 years and another three were 6 years old. Fifty-three were boys and 57 were girls.

### Evaluation

The first evaluation of the study was carried out in October. The children had been adjusted in their group from August when the new school year started. The parents of 154 children were asked to participate in the study and 142 accepted participation, 75 in the massage group and 67 controls. The children were evaluated after 3 and 6 months. Only 122 parents, 67 in the massage group and 55 controls evaluated their children all three times. The staff scored 149 children all three times.

A third follow-up was performed after 1 year on 36 of the massage group children. These children had continuously received massage. Parental evaluations were available for 34 children. Only the younger children, four years old at the start of the study, were possible to follow for a whole year. The older children had already started school.

The Swedish translation of the Child Behaviour Checklist (CBCL 6–18 years) was used to evaluate behaviour and emotions before the massage therapy started, after 3 months and after 6 months (10). The CBCL was filled in by one parent and by one staff member, usually a preschool teacher, who knew the child well. The version 1.5–5 years was not translated into Swedish when the study started. Questions no. 5 (acts like the opposite sex), no. 73 (sexual problems), no. 91 (talks about suicide), no. 101 (truancy), no. 105 (alcohol or drug use) and no. 110 (wishes to be the opposite sex) were omitted as inapplicable to the young age group.

### Ethics

The Ethical Committee of the Medical Faculty at Uppsala University approved the study. The parents gave their informed consent.

### Statistics

Repeated measure analysis of variance (ANOVA), with reverse Helmert (difference) as contrast, was used to compare changes over time among children in the massage group and controls in order to control for the differences between the groups in the first scoring before the massage started. Some violation from normal distribution was detected, but ANOVA is considered to be quite robust when the cells included have the similar numbers of cases (11). Kendall's W-tests were used as a validation in the smaller group of children within the 75th to the 100th percentile. Paired *t*-tests were used to compare the first and fourth (12-month) measure of the massage group.

## RESULTS

### Total sample

Parents' total CBCL scores were in the massage group  $18.9 \pm 14.2$  while the controls scored  $18.1 \pm 14.4$ ,  $t = 0.29$  (n.s.). The staff scored the massage children higher than the control children before the treatment started ( $19.6 \pm 17.6$  vs.  $12.8 \pm 13.4$ ,  $t = 2.25$ ,  $p = 0.03$ ). Parents and staff did not differ significantly in total scoring ( $18.5 \pm 14.2$  vs.  $16.5 \pm 16.1$ ,  $t = 1.09$ , n.s.). They differed as concerns attention scores ( $1.9 \pm 2.1$  vs.  $2.5 \pm 3.3$ ,  $t = 2.10$ ,  $p = 0.04$ ) and as concerns social problems ( $1.1 \pm 1.6$  vs.  $1.4 \pm 1.9$ ,  $t = 1.98$ ,  $p = 0.05$ ) but not as concerns aggressive behaviour ( $6.6 \pm 5.1$  vs.  $6.1 \pm 6.7$ ,  $t = 0.78$ , n.s.). No significant effects of massage were found when all children were included in the analyses.

### Subgroup analysis

When children with the highest scores, 75th–100th percentile of total CBCL rated either by the parents or staff, were analysed, some differences were observed. Twenty-nine children (18 children in the massage group and 11 controls) were scored high by the parents, and 28 (19 in the massage group and 9 controls) were scored high by the staff. All 57 children were included in the separate subgroup analysis.

When the scores obtained after 3 months were compared, no differences were observed between the groups. Both groups had decreased in comparison to the observations made before the study started (Table 1). As the numbers of children in each group were quite small, we wanted to validate the ANOVA model with a nonparametric test. The Kendall's W-test was used and showed no different pattern.

When the ratings performed by the parents were analysed, some differences appeared between the massage group and the controls (Table 1). The factors that differed significantly between the groups were aggressive behaviour and somatic problems. The changes from 3 to 6 months were

**Table 1** Ratings of CBCL scores (mean  $\pm$  SD) of children with the highest scores (75–100 percentile) who had regular massage ( $n = 18$ ) at the day-care centre compared to children with no massage (controls;  $n = 11$ )

	Massage			Control			From 3 to 6 months	
	0 months	3 months	6 months	0 months	3 months	6 months	F*	p-value
Aggressive behaviour	13.2 $\pm$ 4.2	8.8 $\pm$ 5.4	7.4 $\pm$ 4.0	13.0 $\pm$ 3.9	7.4 $\pm$ 5.1	9.1 $\pm$ 5.9	4.65	0.04
Attention problems	4.2 $\pm$ 2.5	2.3 $\pm$ 2.6	2.1 $\pm$ 1.8	4.0 $\pm$ 2.3	2.1 $\pm$ 1.5	2.3 $\pm$ 2.1	0.51	n.s.
Anxious/depressed	3.7 $\pm$ 3.3	2.2 $\pm$ 2.6	2.4 $\pm$ 2.6	6.5 $\pm$ 4.1	3.1 $\pm$ 4.1	3.9 $\pm$ 3.1	0.24	n.s.
Social problems	2.2 $\pm$ 1.4	1.1 $\pm$ 1.0	0.9 $\pm$ 0.7	3.4 $\pm$ 2.7	1.7 $\pm$ 1.5	1.9 $\pm$ 1.7	0.02	n.s.
Somatic problems	1.9 $\pm$ 1.8	1.2 $\pm$ 1.9	1.1 $\pm$ 1.4	0.6 $\pm$ 0.6	0.9 $\pm$ 1.6	1.1 $\pm$ 1.2	5.77	0.02
Total	36.8 $\pm$ 10.4	23.9 $\pm$ 14.8	20.6 $\pm$ 8.7	38.8 $\pm$ 15.1	22.8 $\pm$ 16.6	26.6 $\pm$ 16.2	3.53	0.07

Parental ratings before treatment (0 months), after 3 and 6 months.

\*Interaction from 3 to 6 month with respect to different mean values at 0 month.

**Table 2** Ratings of CBCL scores (mean  $\pm$  SD) of children with the highest scores (75–100 percentile) who had regular massage ( $n = 19$ ) at the day-care centre compared to children with no massage (controls;  $n = 9$ )

	Massage			Control			From 3 to 6 months	
	0 months	3 months	6 months	0 months	3 months	6 months	F*	p-value
Aggressive behaviour	15.3 $\pm$ 7.1	10.4 $\pm$ 7.5	9.7 $\pm$ 6.0	12.8 $\pm$ 7.0	5.9 $\pm$ 3.6	10.2 $\pm$ 6.3	6.50	0.02
Attention problems	6.4 $\pm$ 3.8	3.9 $\pm$ 3.3	3.6 $\pm$ 3.2	6.7 $\pm$ 5.3	4.0 $\pm$ 3.5	5.3 $\pm$ 4.6	0.28	n.s.
Anxious/depressed	4.8 $\pm$ 2.9	1.6 $\pm$ 1.2	2.0 $\pm$ 2.2	5.8 $\pm$ 4.0	2.1 $\pm$ 1.7	2.6 $\pm$ 1.4	0.03	n.s.
Social problems	4.1 $\pm$ 2.2	2.7 $\pm$ 1.8	2.1 $\pm$ 1.7	3.4 $\pm$ 1.8	2.3 $\pm$ 1.9	3.0 $\pm$ 2.4	7.38	0.01
Somatic problems	0.4 $\pm$ 0.3	0.2 $\pm$ 0.4	0.4 $\pm$ 0.6	0	0	0.2 $\pm$ 0.4	0.23	n.s.
Total	40.2 $\pm$ 17.1	24.6 $\pm$ 14.8	23.9 $\pm$ 14.9	35.0 $\pm$ 15.4	16.8 $\pm$ 7.0	27.2 $\pm$ 9.6	8.98	0.006

Staff ratings before treatment (0 months), after 3 and 6 months.

\*Interaction from 3 to 6 month with respect to different mean values at 0 month.

more prominent in the massage group as compared to the controls ( $F = 4.65$ ,  $p = 0.04$  and  $F = 5.77$ ,  $p = 0.02$ ).

When the staff ratings were analysed, a similar pattern appeared. In analogy with the parents' ratings, a decrease was found at 3 months in both groups. There were no differences after 3 months but were there after 6 months. The aggressive behaviour score decreased between 3 and 6 months after the start of treatment in the massage group ( $F = 6.50$ ,  $p = 0.02$ ). Further, the social problem score was lower at 6 months in the massage group ( $F = 7.38$ ,  $p = 0.01$ ). However, no significant differences were found in the factor somatic problems (Table 2).

A common pattern in the observations by both the parents and the staff was that the values for the majority of the CBCL factors decreased in both groups after 3 months. Furthermore, an interesting observation was that the boys in both groups showed decreased levels of social problems ( $F = 3.79$ ,  $p = 0.06$ ) according to parental ratings and that the intensity of activities diminished from 0 to 3 months in the control group ( $F = 6.03$ ,  $p = 0.02$ ) according to the staff.

#### Long-term effects

The evaluation after 12 months showed a continuous decrease in the CBCL subscales aggressive behaviour and withdrawal. However, only about half the children in the

massage group were evaluated. Both the parents and the staff made the same observations. Parents also rated a decrease of attention problems and somatic problems. The staff observed a decrease of anxiety symptoms (Table 3).

#### DISCUSSION

A short daily period of massage-like touching over a period of 6 months seems to have some beneficial effects on the behaviour of the most deviant preschool children. Both staff and parental ratings of aggressive behaviour of CBCL showed reduced scores. However, the decrease at home was not as clear as the reduction of aggression at the day-care centre. This is expected, as aggression is usually more prominent in groups of children, and consequently more easily identified by the staff than by the parents. In addition, social problems decreased and the children behaved in the day-care setting. Physical complaints were reduced at home. The study groups were small and the power of this study is a problem, but the statistical techniques used minimise the risk.

Children in both groups improved after 3 months. A placebo effect, often found in controlled therapy studies, could explain this, as the control group also received some extra attention. The fact that the children in the control group deteriorated after the next 3 months supports this

**Table 3** Parental (n = 34) and staff (n = 36) ratings (CBCL) of preschool children in day-care who received massage during mid-day rest over 12 months (mean  $\pm$  SD)

	Parents				Staff			
	0 months	3 months	6 months	12 months	0 months	3 months	6 months	12 months
Aggressive behaviour	6.9 $\pm$ 5.7	4.9 $\pm$ 4.6	4.8 $\pm$ 4.2	4.4 $\pm$ 4.0**	4.2 $\pm$ 5.2	3.1 $\pm$ 5.4	3.1 $\pm$ 4.7	2.4 $\pm$ 4.2*
Attention problems	2.1 $\pm$ 2.3	1.2 $\pm$ 1.4	1.2 $\pm$ 1.6	1.2 $\pm$ 1.7*	2.2 $\pm$ 2.7	2.3 $\pm$ 2.9	2.0 $\pm$ 3.2	1.8 $\pm$ 3.6
Anxious/Depressed	1.4 $\pm$ 2.2	0.9 $\pm$ 1.7	0.9 $\pm$ 1.5	1.0 $\pm$ 2.0	1.8 $\pm$ 2.1	1.2 $\pm$ 1.7	1.4 $\pm$ 2.0	0.9 $\pm$ 1.9*
Social problems	1.0 $\pm$ 1.4	0.5 $\pm$ 1.0	0.5 $\pm$ 0.9	0.5 $\pm$ 1.3†	1.2 $\pm$ 1.6	1.2 $\pm$ 1.3	0.9 $\pm$ 1.8	0.8 $\pm$ 1.02†
Somatic problems	0.9 $\pm$ 1.4	0.6 $\pm$ 1.1	0.4 $\pm$ 0.9	0.3 $\pm$ 0.6**	0.2 $\pm$ 0.5	0.3 $\pm$ 0.6	0.2 $\pm$ 0.5	0.2 $\pm$ 0.5**
Withdrawn	1.3 $\pm$ 1.7	0.8 $\pm$ 0.9	0.8 $\pm$ 0.9	0.8 $\pm$ 1.3*	1.3 $\pm$ 1.6	0.9 $\pm$ 1.6	1.0 $\pm$ 1.3	0.5 $\pm$ 1.2**
Total	19.0 $\pm$ 15.2	12.7 $\pm$ 10.9	12.2 $\pm$ 9.2	11.3 $\pm$ 10.9***	13.7 $\pm$ 12.6	10.6 $\pm$ 11.3	10.6 $\pm$ 11.4	7.7 $\pm$ 11.6***

t-test between 0 and 12 months, two-tailed significance.

†p < 0.1, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

assumption. Aggression in children tends to decrease with increasing age, which could be another explanation (2).

This study differs from previous studies since it was performed on a long-term basis in a normal day-care setting. The staff, mostly preschool teachers, working at the day-care centres, performed the massage. In our prolonged study, the effects of the massage were reinforced and sustained.

Our findings are in line with those of previous studies. Massage therapy in humans reduces pain, increases alertness and reduces stress symptoms and reduces stress hormones (6,12). Furthermore, stress reduction in various somatic diseases and autism has been demonstrated. Improved growth and maturation in preterm infants have also been reported (13,14).

It might be argued that this study was not performed in a blind fashion and was not randomized. An external observer could have been used to carry out the study in a blind fashion. However, this would have been very time-consuming and expensive since several observers would have been needed. Interobserver agreement should also have been checked. Another practical aspect is that trained observers are very difficult to find. Thus, it was not possible to perform the study in a blind way. Another objection to the result is that there might be an allegiance bias towards the massage method, which cannot be completely ruled out. However, the fact that similar results were obtained in both massage and control groups after the first 3 months does not support this assumption. An alternative explanation could be that the individual attention given to the massaged children contributed to the positive effect.

The CBCL evaluations are widely used and considered to be reliable when performed by teachers and parents (15). Different behaviours rated by external observers, teachers and parents who know the child well have been reported to have a satisfactory correlation (16). However, as in most studies, parents and teachers differ somewhat in their scoring of children's behaviour (17).

It has been suggested that daily touching is diminishing within the families during the last decades. The reason is that most children, at least in Sweden, are not in the care of the family during daytime. Instead, the parents are working

out of home. Thus, more intimate contacts are less frequent. Reconciliatory behaviour after conflicts, such as touching, playful activities are considered to decrease future aggression, stress and frustration and to increase co-operation and tolerance (18,19).

Oxytocin has calming and socializing effects. It is released during social interaction. Thus, oxytocin release may have diminished. Together with present-day stress, this may influence the behaviour of today's children. Further studies are needed to validate our findings. However, the study indicates a possibility, if confirmed, to decrease small children's aggressive behaviour easily and inexpensively within the resources of ordinary daycare.

## References

1. The Swedish national council for crime prevention (Brå). Crime statistics, Persons found guilty of offences by principal offence 1975-2006. [www.bra.se/extra/pod/?action=pod\\_show&id=21&module\\_instance=11](http://www.bra.se/extra/pod/?action=pod_show&id=21&module_instance=11). Accessed 18 July 2008.
2. Côté SM, Vaillancourt T, LeBlanc JC, Nagin DS, Tremblay RE. The development of physical aggression from toddler hood to pre-adolescence: a nation wide longitudinal study of Canadian children. *J Abnorm Child Psychol* 2006; 34: 71-85.
3. Olweus D. Stability of aggressive reaction patterns in males. A review. *Psychol Bull* 1979; 86: 852-75.
4. Uvnäs-Moberg K, Bruzelius G, Alster P, Lundberg T. The antioxiceptive effect of non-noxious sensory stimulation is partly mediated through oxytocinergic mechanisms. *Acta Physiol Scand* 1993; 149: 199-204.
5. Uvnäs-Moberg K. Oxytocin may mediate the benefits of positive social interaction and emotions. *Psychoneuroendocrinology* 1998; 23: 819-35.
6. Escalona A, Field T, Singer-Strunck R, Cullen C, Hartshorn K. Brief report: improvements in the behavior of children with autism following massage therapy. *J Autism Dev Disord* 2001; 31: 513-16.
7. Hollander E, Bartz J, Chaplin W, Phillips A, Sumner J, Soorya L, et al. Oxytocin increases retention of social cognition in autism. *Biol Psychiatry* 2007; 61: 498-503.
8. Heinrichs M, Baumgartner T, Kirschbaum C, Ehlert U. Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biol Psychiatry* 2003; 54: 1389-98.

9. Axelson H, Hedberg U. *Massage att börja med - den klassiska massagens grunder*. Stockholm: Hälsas förlag, 1995.
10. Achenbach TM, Edelbrock CS. *Manual for the child behaviour checklist and revised child behaviour profile*. Burlington, VT: University of Vermont, Department of Psychiatry, 1983.
11. SPSS. Base 7.5 application guide. 1997, p 141.
12. Khilnani S, Field T, Hernandez-Reif M, Schanberg S. Massage therapy improves mood and behavior of students with attention-deficit/hyperactivity disorder. *Adolescence* 2003; 38: 623–38.
13. Field T, Hernandez-Reif M, Diego M, Schanberg S, Kuhn C. Cortisol decreases and serotonin and dopamine increase following massage therapy. *Int J Neurosci* 2005; 115: 1397–413.
14. Field TM. Massage therapy effects. *Am Psychologist* 1998; 53: 1270–81.
15. Achenbach TM, Howell CT, Quay HC, Conners HK. National survey of problems and competencies among four- to sixteen-year-olds. Monograph of the Society for Research in Child Development 56-1-119, 1991.
16. Reid JB, Baldwin DV, Patterson GR, Dishion TJ. Observations in the assessment of childhood disorders. In: Rutter M, Tuma AH, Lann IS, editors. *Assessment and diagnosis in child psychopathology*. London: David Fulton Publishers, 1998: 156–95.
17. Giovannini S, Haffner J, Parzer P, Steen R, Klett M, Resch F. Parent- and teacher-reported behavior problems of first graders [in German]. *Prax Kinderpsychol Kinderpsychiatr* 2005; 54:104–25.
18. Kappeler P, van Schaik C. Methodological and evolutionary aspects of reconciliation among primates. *Ethology* 1992; 92: 51–61.
19. Ljungberg T, Westlund K, Lindqvist Forsberg AJ. Conflict resolution in 5-year-old boys: does postconflict affiliative behaviour have a reconciliatory role? *Anim Behav* 1999; 58: 1007–101.