

Juvenile Rheumatoid Arthritis: Benefits from Massage Therapy¹

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Studied children with mild to moderate juvenile rheumatoid arthritis who were massaged by their parents 15 minutes a day for 30 days (and a control group engaged in relaxation therapy). The children's anxiety and stress hormone (cortisol) levels were immediately decreased by the massage, and over the 30-day period their pain decreased on self-reports, parent reports, and their physician's assessment of pain (both the incidence and severity) and pain-limiting activities.

KEY WORDS: juvenile rheumatoid arthritis; massage therapy.

Juvenile rheumatoid arthritis (JRA) is the most common rheumatic disease of childhood and one of the most common chronic diseases of childhood (Cassidy & Petty, 1995; Lovell & Walco, 1989). The JRA diagnosis is based on the observation of persistent arthritis (6 or more weeks duration) in one or more

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joints. The disease typically manifests itself before 16 years of age, with peak onset in the age groups 1 to 3 and 8 to 12 years (Varni & Jay, 1984). Common symptoms include night pain and joint stiffness both during the morning and following long periods of inactivity.

Treatment regimens for JRA have included medications, exercise, and devices such as hand splints. The overall management of JRA consists of a multidisciplinary approach to comprehensive care, incorporating pharmacotherapy, physical and occupational therapy, orthopedic surgery, and psychosocial services. Despite the comprehensive approach to patient care, pain remains an undertreated clinical problem (Lovell & Walco, 1989).

Because of the limited effects of anti-inflammatory drugs and the reluctance to use narcotics for pain reduction, investigators have been exploring other methods including meditation, progressive muscle relaxation, and guided imagery (Walco, Varni, & Ilowite, 1992). In the Walco et al. (1992) study, 5- to 16-year-old children reported lower pain levels on visual analog scales after eight sessions. In another study, modest pain reduction was achieved after training in progressive muscle relaxation, electromyogram (EMG) feedback, and thermal biofeedback (Lavigne, Ross, Berry, Hayford, & Pachman, 1992).

Children have also been given massage as a relaxation therapy, but in a sample of children and adolescents who were stressed for reasons other than physical pain (Field et al., 1992). In the Field et al. study, child and adolescent psychiatric patients were given massage to reduce their depression, anxiety, and stress hormone (cortisol) levels. In addition, their urine norepinephrine levels decreased and their sleep increased. Increased sleep is frequently noted following massage and it may contribute to the decreased pain noted in adult studies following massage. For example, in a study conducted on adults with fibromyalgia, increased sleep led to decreased pain (Sunshine et al., 1996), possibly because the pain-inducing substance P is diminished during sleep. Although these possibilities are suggestive, the underlying mechanisms for these massage therapy effects are not yet known.

The present study measured the effects of massage therapy on children and adolescents with JRA. Those receiving the massage were expected to report lower levels of anxiety, depression, and pain and to have lower cortisol levels. Teaching the parents to massage their children was expected to give the parents a positive role in their child's treatment and thereby reduce their own anxiety levels.

METHOD

Participants

Following the parents' informed consent and the children's assent, the sample comprised 20 children (14 girls) age 5.4–14.8 years ($M = 9.8$) who

had been diagnosed with JRA on average 4.4 years previously and who were recruited from two rheumatologists. Entry criteria were (a) diagnosis of JRA by the pediatric rheumatologist, (b) age range between 4 and 16 years, and (c) no other serious or chronic illness. The mothers of 30 children identified as potential candidates for the study were approached at the time of a scheduled rheumatology clinic appointment. Two mothers refused to participate, 6 failed to return for follow-up assessments, and 2 moved out of the area. Thus, the final sample comprised 20 children. The children came from middle SES families (55% nuclear families) who were moderately educated (40% having at least some college education) and were distributed 40% white, 55% Hispanic, and 5% black. Although as many as 65% of the mothers were employed, 90% were the children's primary caregivers. Ten percent of the parents and 25% of the children had previously received various kinds of massage therapy. On average the rheumatologists scored these children 7.4 on the Juvenile Arthritis Functional Assessment. This assessment was a modified form of the Activities of Daily Living Index developed by Walco et al. (1992). Our scale ranged from 0 to 46, with 0 being full functional activity and 46 being completely inactive. The physicians' average score of 7.4 suggested that the sample had mild functional limitations (dressing, bathing, eating, and gross motor activities). Children with severe limitations were excluded. The children were assigned randomly to massage therapy or relaxation therapy groups. The parents in each group were given demonstrations and videotapes demonstrating the therapy techniques.

Procedures

Standard Medical Care

During the study the children continued to receive standard medical care including examinations by a pediatric rheumatologist.

Massage Therapy

These children received a daily 15-minute massage by one of their parents for 30 days. This 15-minute massage comprised two standardized phases given in a progressive sequence typically followed by massage therapists. For the first phase, the child was placed in a supine position, and oil was applied to ensure smooth, continuous stroking movements. The parent stroked the child's body in the following sequence: 1. *Face*: (a) strokes along both sides of the face, (b) flats of fingers across the forehead, (c) circular flat finger strokes over the nose, cheeks, jaw, and chin; 2. *Stomach*: (a) hand over hand strokes in a paddlwheel fashion, avoiding the ribs and the tip of the rib cage, (b) circular motion with

fingers in a clockwise direction starting at the appendix; 3. *Legs*: (a) strokes from hip to foot, (b) gently squeeze and twist in a wringing motion from hip to foot, (c) massage foot and toes, (d) stretch the Achilles tendon, and (e) gently stroke the legs upward toward the heart; 4. *Arms*: (a) strokes from the shoulders to the hands, and (b) same procedure as for the legs.

For the second phase, with the subject in a prone position, his or her back was massaged in the following sequence: (a) gentle downward strokes along the back, (b) hand-over-hand movements from the upper back to the buttocks, (c) hands from side to side across the back, including the sides, (d) circular motion from head to buttocks along, but not touching, the spine, (e) simultaneous strokes over the sides of the back from the middle to the sides, (f) rub and knead shoulder muscles, (g) gently rub the neck, (h) gentle strokes along the length of the back, and (i) gentle strokes from crown to feet.

The parent most involved with the child's medical regime was trained to administer the massage by a massage therapist who demonstrated the massage on the child. After the parent learned the procedure the massage therapists watched the parent massaging the child. The parent was then given a written description of the massage as well as the videotaped demonstration and was asked to massage the child at bedtime everyday for 30 days.

Relaxation Therapy

These children experienced a 15-minute relaxation session with their parents every night for 1 month. On the first day of the study therapists trained and provided the parents with written instructions on the relaxation sessions. These sessions were performed with the subjects laying on their back and being instructed to tighten and relax different muscles of the body in a head to feet progression as was done in a study on children with psychiatric problems (Platania-Solazzo et al., 1992). The following large muscle groups were involved: (a) face, (b) back, (c) arms, (d) hands, (e) thighs, (f) calves, and (g) feet. The parent was then given a written description of the relaxation session as well as the videotaped demonstration and was asked to conduct a relaxation session at bedtime everyday for 30 days.

Assessments

A pediatric rheumatologist assessed the child's pain, and the parents completed questionnaires on their perception of their child's pain. Pain was also assessed by the child. A behavior observation of the child's anxiety level was made and the child's saliva was assayed for stress hormone (cortisol) levels.

Pre-Post Session Assessments

These assessments were made before and after the sessions on the first and last days of the 30-day study.

The State Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The STAI was used to tap the parent's anxiety level. The inventory consists of 20 items such as "I feel . . . very tense, tense, or not tense," "I feel . . . very relaxed, relaxed, or not relaxed." Research has demonstrated that the STAI has adequate concurrent validity and adequate internal consistency ($r = .83$; Spielberger et al., 1970).

Behavior Observation of the Child's Anxiety Level. This behavior rating scale was originally used to assess behavior following relaxation therapy classes (Platania-Solazzo et al., 1992). The behavior of each subject is rated by an observer (who is blind to group assignment) on a 3-point continuum on scales including anxiety-like behavior. Interrater reliability was calculated using Cohen's kappa, a chance-corrected statistic (Cohen, 1968) on 20% of the observations. Cohen's kappa averaged .74 for these observations.

Cortisol Samples. These were collected 30 minutes prior to and 30 minutes after the first and last session. Due to the 20-minute lag in cortisol change, saliva samples reflect responses to stimulation occurring 20 minutes prior to the sampling. Saliva cortisol samples were obtained by having the children place a cotton dental swab dipped in sugar-free lemonade crystals along their gumline for 30 seconds. The swab is then placed in a syringe and the plunger depressed to insert the saliva into a microcentrifuge tube. Saliva samples were frozen and subsequently assayed for cortisol levels at Duke University. Ten percent of the samples were sent twice to document reliability.

First Day/Last Day Assessments

Parents' Assessment of the Child

The Varni/Thompson Pediatric Pain Questionnaire-Parent Form (PPQ; Varni & Thompson, 1985) is administered within a structured interview format to assess the parents' perceptions of the child's pain prior to the child's physical examination by the pediatric rheumatologist. Pain is assessed on a visual analog scale (VAS) (a 10-cm horizontal line with no number, marks, or descriptive vocabulary words along the length of the line but anchored by the phrases "no pain" and "severe pain"). The parent rated present pain and the worst pain for the previous week, pain severity at 9 a.m. and 9 p.m., and whether pain limited the child's school activity.

In addition to administering the parent version of the PPQ, parents were

asked to answer how often the child's pain limited *vigorous* activities (e.g., running, bicycling, lifting heavy objects, or participating in strenuous sports), *moderate* activities (e.g., bending, walking several blocks, lifting, or stooping), and *mild* activities (e.g., walking one block, standing, sitting). Responses are made on a 6-point scale: 0 (*none of the time*), 1 (*1 day only*), 2 (*2–3 days*), 3 (*4–7 days*), 4 (*more than 1 week*), 5 (*more than 2 weeks*), and 6 (*more than 3 weeks*); designed to measure the frequency of the limitation. The total score, thus, has a range of 0 to 6, with optimal scores being lower.

In addition, the parents calculated the number of severe pain points the child was experiencing (on a drawing of the body). Using dorsal and frontal body diagrams, parents were asked to mark with an X the number of points where they believed the child was experiencing pain. Parents marked the most severe or painful points with a 1, moderately painful points were marked 2, and mildly painful points were marked 3. A total score for severe pain points was derived by adding the number of points marked 1, with a lower number reflecting fewer severe points.

Child Assessment

The Varni/Thompson Pediatric Pain Questionnaire–Child Form (PPQ; Varni, Thompson, & Hanson, 1987) is also administered within a structured interview format to assess the children's perceptions of their pain. The child is interviewed by a researcher prior to his or her physical examination by the pediatric rheumatologist. Present pain and worst pain intensity for the previous week (pain past week) are assessed by a VAS. Each VAS is a 10-cm horizontal line with no numbers, marks, or descriptive vocabulary words along the length of the line. The child VAS is anchored with developmentally appropriate pain descriptors and happy and sad faces. A color-coded pain-rating scale also measures pain intensity. Four developmentally appropriate categories of pain descriptors are provided along with 8 standard crayons and a body outline. The child is instructed to color in the four boxes underneath each descriptive category representing pain intensity, and then to color in the body outline with the selected color/intensity match to determine the number of severe pain points. To assess the sensory, affective, and evaluative qualities of the child's pain experience, a list of pain descriptors is provided, with the child instructed to circle the words that most appropriately described his or her pain (words for child pain).

Physician Assessment

The pediatric rheumatologist, who was blind to the child's group assignment, assessed (a) the degree of pain; (b) the amount of morning stiffness (clinic

was held during the mornings); and (c) the number of joints affected based on the physician’s assessment. During the physical examination the child’s pain level was also rated as severe, moderate, mild, quiescent (no physical or laboratory signs, on medication), and remission quiescent (2 months without medication). The clinical acumen served as the protocol to determine if a joint was active based on evidence of inflammation including calor (heat), dolor (pain), rubor (redness), or effusion (fluid). The pediatric rheumatologist completed this rating at the conclusion of the physical examination of the child.

RESULTS

A MANOVA on the demographic characteristics of the two groups revealed no significant effects, suggesting the groups were similar at baseline.

Pre-Post Session Assessments

A MANOVA on the pre-post session for immediate effects variables yielded a Group × Time (pre-post session) interaction effect. Post hoc analyses by *t* tests revealed the following immediate effects favoring the massage group including (Table I): (a) lower parent anxiety by self-report on the State Anxiety Inventory; (b) lower child anxiety based on behavioral observation; and (c) lower stress hormone levels (salivary cortisol) in the children receiving the massage.

Table I. Pre-Post Assessments for Massage and Relaxation Groups

	Day 1				Day 30			
	Pre		Post		Pre		Post	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Parent anxiety (STAI)								
Massage	33.2	11.0	27.0 ^a	6.8	35.9	11.5	34.3 ^a	10.6
Relaxation	30.5	9.0	29.5	7.1	30.7	9.6	32.4	8.9
Child anxiety (behavior) ^b								
Massage	2.5	0.7	3.0 ^a	0.9	2.4	0.5	2.9 ^a	0.7
Relaxation	2.6	0.9	2.6	0.7	2.5	0.4	2.2	0.4
Child saliva cortisol (ng/mg) ^c								
Massage	1.5	0.6	1.1 ^a	0.4	1.1	0.5	0.7 ^a	0.6
Relaxation	1.4	0.4	1.5	0.7	1.3	0.4	1.1	0.8

^a*p* < .05.

^bHigher rating is optimal.

^cValues typically range from a low of 0.5 to a high of 2.0.

Table II. First Day/Last Day Massage and Relaxation Groups
Child Self-Assessments

	First day		Last day	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Words for pain				
Massage	14.1	9.8	6.4 ^b	4.1
Relaxation	10.5	7.6	12.0	8.6
Pain: Present				
Massage	4.1	1.9	1.1 ^b	0.7
Relaxation	4.9	2.1	4.4	2.1
Pain: Past week				
Massage	4.8	2.0	1.6 ^a	0.9
Relaxation	3.5	1.7	4.2	2.0
No. of severe pain points				
Massage	4.6	2.3	1.6 ^a	1.1
Relaxation	4.9	2.5	4.3	2.4

^a*p* < .05.^b*p* < .005.*First Day/Last Day Assessments*

Child Assessments of Self. A MANOVA on the first day/last day child assessments of self yielded a significant Group × Time (first day/last day) interaction effect. Post hoc analyses by *t* tests revealed the following changes reported by the children. The changes favored the massage group including (Table II) (a) fewer words for pain; (b) less pain at present; (c) less pain over the past week; and (d) fewer severe pain points.

Parents' Assessment of Children. A MANOVA on the first day/last day parent assessment measures yielded a significant Group × Time (first day/last day) interaction effect. Post hoc analyses by *t* tests revealed the following changes by the last day as reported by the parents favoring the massaged children including (Table III) (a) less pain at present; (b) less pain over the past week; (c) fewer severe pain points; (d) less pain severity at 9 p.m. in the evening; and (e) less pain limiting of vigorous activity.

Physician's Assessment of Children. A MANOVA on the first day/last day physician's assessment yielded a significant Group × Time (first day/last day) interaction effect. Post hoc analyses by *t* tests revealed the following changes by the last day as reported by the physician. These changes favored the massaged children including (Table IV) (a) a lesser degree of pain; and (b) less morning stiffness.

Table III. First Day/Last Day Massage and Relaxation Groups Parent Assessments

	First day		Last day	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Pain				
Present				
Massage	2.9	1.7	0.7	0.4
Relaxation	3.4	2.1	3.5	2.0
Past week				
Massage	6.9	3.8	1.7 ^d	1.2
Relaxation	6.8	3.1	6.2	4.3
No. of severe pain points				
Massage	6.0	4.2	4.1 ^a	2.4
Relaxation	8.2	4.7	6.4	3.7
Severity at 9 a.m.				
Massage	4.0	3.0	4.9	3.0
Relaxation	6.0	4.7	5.0	3.9
Severity at 9 p.m.				
Massage	4.0	2.2	0.9 ^b	0.4
Relaxation	5.2	2.9	6.0	3.2
Pain-limiting activities				
School activity				
Massage	2.3	1.4	2.0	1.4
Relaxation	2.8	1.9	2.4	1.0
Vigorous activity				
Massage	4.2	2.1	1.9 ^c	0.7
Relaxation	4.6	2.4	4.1	2.9

^a*p* < .05.

^b*p* < .01.

^c*p* < .005.

^d*p* < .001.

Table IV. First Day/Last Day Massage and Relaxation Groups Physician Assessment

	First day		Last day	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Degree of pain				
Massage	30.0	19.2	14.1 ^a	10.8
Relaxation	29.2	16.4	20.8	12.3
Morning stiffness (min)				
Massage	5.7	2.7	1.2 ^a	0.8
Relaxation	1.7	0.9	4.2	2.1
No. of joints				
Massage	2.2	1.6	1.7	0.9
Relaxation	2.6	1.2	2.5	1.3

^a*p* < .05.

DISCUSSION

The immediate effects of the massage therapy including the reduced anxiety levels in the parents administering the massage, lower child anxiety based on behavioral observations, and lower stress hormone (salivary cortisol) levels in the children are perhaps not surprising because other studies on massage therapy with children have reported similar effects. For example, studies on diabetic and asthmatic children (Field, 1995), and child psychiatric patients (Field et al., 1992) have also revealed the immediate anxiety-alleviating and stress hormone-reducing effects of massage therapy.

The longer term effects bear on the pain-alleviating properties of massage therapy. Several measures based on assessments made by the children and parents converged to suggest less pain during the present and past weeks and fewer severe pain points. The children also provided fewer words for pain which has been a reliable measure in other studies on JRA (Varni & Bernstein, 1991). Additional measures completed by the parents also suggested less severe pain during the evening (9 p.m.) and less pain limiting of vigorous activity. Finally, the physician's assessment provided confirmatory data suggesting a lesser degree of pain and less morning stiffness by the end of the month of massage therapy.

These pain-alleviating effects may derive from simple relaxation and anxiety-reducing effects of massage therapy as has been reported in other studies on the use of relaxation therapy with children experiencing JRA (Lavigne et al., 1992; Varni & Jay, 1984) and other studies on the use of massage therapy with children experiencing other medical conditions (Field, 1995). Direction of causality (i.e., whether reduced anxiety and stress hormones led to reduced pain or reduced pain led to less anxiety and lower stress hormones) is impossible to know from this study. Parent and child anxiety have been known to at least exacerbate painful medical conditions (Fries, Spitz, & Young, 1982).

The results in this study parallel those noted in a recent study on the use of massage therapy with adults diagnosed with fibromyalgia (Sunshine et al., 1996). Two possible interpretations were offered for those data including the gate theory (i.e., pressure receptors are longer and more myelinated than pain fibers and therefore the pressure stimuli are transmitted faster, closing the gate to pain signals) (Melzack & Wall, 1965). Another more recent theory is that massage therapy increases restorative (deep or quiet) sleep and thus less substance P (a pain transmitter) is released (Sunshine et al., 1996). Future studies might record sleep patterns to assess this potential mechanism as well as other possible explanatory measures.

In summary, this study suggests that parents massaging their children with JRA before bedtime each day can help decrease their anxiety and stress hormone levels. After 30 days of massage therapy, the children were also experiencing less pain, thus confirming the pain-relieving effects of massage therapy. Al-

though the underlying mechanism for the massage therapy–pain reduction relationship is not known, massage seems to be a cost-effective therapy for children with juvenile rheumatoid arthritis. The parents reported that they enjoyed massaging their children and felt that they were “contributing to their treatment.” Massage therapy may have been more effective than relaxation therapy because the children may have been too young for understanding and actively participating in the relaxation therapy. Further research is needed to compare the relative efficacy and the costs and benefits of these therapies in different age groups, as well as any long-term effects. Finally, studies are needed on the underlying mechanisms that might explain the pain-reducing effects of massage therapy.

REFERENCES

- Cassidy, J. T., & Petty, R. E. (1995). *Textbook of pediatric rheumatology* (3rd ed.). Philadelphia: W. B. Saunders.
- Cohen, J. (1968). Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. *Psychological bulletin*, *70*, 213-220.
- Field, T. (1995). Massage therapy for infants and children. *Developmental and Behavioral Pediatrics*, *16*, 105-111.
- Field, T., Morrow, C., Valdeon, C., Larson, S., Kuhn, C., & Schanberg, S. (1992). Massage reduces anxiety in child and adolescent psychiatric patients. *Journal of the American Academy of Child and Adolescent Psychiatry*, *31*, 124-131.
- Fries, J., Spitz, P., & Young, D. (1982). The dimensions of health outcomes: The health assessment questionnaire, disability and pain scales. *Journal of Rheumatology*, *9*, 789.
- Lavigne, J. V., Ross, C. K., Berry, S. L., Hayford, J. R., & Pachman, L. M. (1992). Evaluation of a psychological treatment package for treating pain in juvenile rheumatoid arthritis. *Arthritis Care and Research*, *5*, 101-110.
- Lovell, T., & Walco, G. (1989). Pain associated with juvenile rheumatoid arthritis. *Pediatric Clinics of North America*, *36*, 4.
- Melzack, R., & Wall, P. D. (1965). Pain mechanisms: A new theory. *Science*, *150*, 971-978.
- Platania-Solazzo, A., Field, T., Blank, J., Seligman, F., Kuhn, C., & Schanberg, S. (1992). Relaxation therapy reduces anxiety in child/adolescent psychiatry patient. *Acta Paedopsychiatrica*, *55*, 115-120.
- Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *The State Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.
- Sunshine, W., Field, T., Schanberg, S., Quintino, O., Kilmer, T., Fierro, K., Burman, I., Hashimoto, M., McBride, C., & Henteleff, T. (1996). Massage therapy and transcutaneous electrical stimulation effects on fibromyalgia. *Journal of Clinical Rheumatology*, *2*, 18-22.
- Varni, J. W., & Bernstein, B. H. (1991). Evaluation and management of pain in children with rheumatic diseases. *Rheumatic Disease Clinics of North America*, *17*, 4.
- Varni, J. W., & Jay, S. M. (1984). Biobehavioral factors in juvenile rheumatoid arthritis: Implications for Research and Practice. *Clinical Psychology Review*, *4*, 543.
- Varni, J. W., & Thompson, K. L. (1985). *The Varni/Thompson Pediatric Pain Questionnaire*. Unpublished manuscript.
- Varni, J. W., Thompson, K. L., & Hanson, V. (1987). The Varni/Thompson Pediatric Pain Questionnaire. I: Chronic musculoskeletal pain in juvenile rheumatoid arthritis. *Pain*, *28*, 27-38.
- Walco, G. A., Varni, J. W., & Ilowite, N. T. (1992). Cognitive behavioral pain management in children with juvenile rheumatoid arthritis. *Pediatrics*, *89*, 1075-1079.

