

## Preschoolers' Cognitive Performance Improves Following Massage\*

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Preschoolers (*M*age = 4 years, 4 months) were given WPPSI subtests, including Block Design, Animal Pegs and Mazes, before and after receiving a 15-minute massage or spending 15 minutes reading stories with an experimenter. Results revealed that performance on Block Design improved following massage and accuracy was greater on Animal Pegs in the massage group, particularly in more temperamental children.

**Key words:** Massage, cognitive performance, temperament

Massage therapy helps reduce stress and depression in child and adolescent psychiatric patients (Field, Morrow, Valdeon, Larson, Kuhn & Schanberg), benefits toddlers with sleep disturbances (Field & Hernandez-Reif, in review), and enhances attentiveness in children with autism (Field, Lasko, Mundy, Henteleff, Kabat, Talpins & Dowling, 1997) and with attention deficit disorder (Field, Quintino & Hernandez-Reif, in press). Massage therapy also enhances cognitive functioning. Adults who received a chair massage in their office showed increased speed and accuracy on

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math computations, along with EEG wave changes suggesting heightened alertness (Field, Ironson, Scafidi, Nawrocki, Goncalves, Pickens, Fox, Schanberg & Kuhn, 1996). In another study on the cognitive performance of infants, those who received a massage prior to an audio-visual task showed greater response recovery following habituation, again suggesting superior cognitive performance (Cigales, Field, Lundy, Quadra & Hart, in press). The present study assessed massage effects on the cognitive performance of preschoolers.

## METHODS

### *Participants*

Twenty preschoolers ranging in age from 3.3 to 5.5 ( $M = 4.4$ ) years and from upper-middle socioeconomic status ( $M = 2.1$  on the Hollingshead two-factor index), Caucasian ( $N = 16$ ), Hispanic ( $N = 2$ ) African-American ( $N = 1$ ) and Asian ( $N = 1$ ) families were randomly assigned to the massage therapy or the play control group following informed consent.

### *Procedures*

Teachers rated each child on a temperament checklist. The checklist consisted of 6 items, each on a four-point scale, yielding a maximum score of 24. The six scales were:

- (1) calm....over-active,
- (2) placid....intense,
- (3) easy-going....difficult,
- (4) laid back....irritable,
- (5) low key....high-strung,
- (6) care free....anxious.

Low scores ( $\leq 12$ ) indicated that a child was seen by teachers as calm and easy going, high scores ( $\geq 13$ ) indicated that the child was seen as high-strung and anxious.

The children were seen individually in their classroom by a graduate student experimenter who was "blind" to the study's hypotheses. After becoming acquainted with the experimenter, the child was tested on the cognitive performance tasks (WPPSI-R). Immediately following the pre-test session, children in the massage therapy group received a 15-minute massage from a massage therapist and children in the play control group spent 15 minutes reading stories with an experimenter. Afterward, the children were tested in the post-test session by the experimenter.

*Wechsler Preschool and Primary Scale of Intelligence — Revised* (WPPSI-R; Wechsler, 1989). Three perceptual-motor (Performance) subtests were administered. These were:

1. *Block Design*, requiring the child to analyze and reproduce patterns made from two-colored blocks, within a specified time limit;
2. *Animal Pegs*, a matching task requiring the child to place pegs of the correct colors in holes below a series of pictured animals. Scores on both speed and accuracy summarized the children's performance; and
3. *Mazes*, in which the child was required to solve pencil-and-paper mazes of increasing difficulty, under time constraints. Only three subtests of the WPPSI-R were administered because of the long administration time required in administering the test in its entirety and evidence suggesting that some of the selected subtests tap into abilities to focus attention (Kaufman, 1979; Goldstein & Herson, 1990).

*Massage Therapy.* A massage therapist gave the children in the massage therapy group a 15-minute massage, comprised of two standardized phases. In the first phase, the child was placed in a supine position and stroked in the following sequence: *Face:* (a) strokes along both sides of the face, (b) flats of fingers across the forehead, (c) circular strokes over the temples and the hinge of the jaw, and (d) flat finger strokes over the nose, cheeks, jaw, and chin; 2. *Stomach:* (a) hand over hand strokes in a paddlewheel 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) squeezing and twisting in a wringing motion from hip to foot, (c) massaging foot and toes, (d) stretching the Achilles tendon, and (e) stroking the legs upward toward the heart; 4. *Arms:* (a) strokes from the shoulders to the hands, using (b) same procedure as for the legs.

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

*Play.* Children in the play control spent 15 minutes with the experimenter reading a Dr. Seuss story. The child and experimenter were seated close together on a carpeted area for this session.

## RESULTS

The massage therapy and play control group data were first compared to ensure the equivalence of the two groups on background characteristics. The two groups did not differ on the demographic measures. Correlation analyses were then conducted to determine whether any of the demographic measures were related to the dependent variables. Since none of these variables were significantly related to

**Table 1** Mean WPPSI Subtest Scores of Subjects Pre- and Post-massage and Play

	<i>Massage</i>		<i>Play</i>		<i>p</i>
	<i>Pre</i>	<i>Post</i>	<i>Pre</i>	<i>Post</i>	
Blocks	11.3 <sub>a</sub>	13.1 <sub>b</sub>	11.0 <sub>a</sub>	11.3 <sub>a</sub>	.05
Mazes	11.1 <sub>a</sub>	11.6 <sub>a</sub>	10.8 <sub>a</sub>	11.6 <sub>a</sub>	n.s.
Animal Pegs – Accuracy	19.3 <sub>a</sub>	19.7 <sub>a</sub>	19.6 <sub>a</sub>	17.4 <sub>b</sub>	.05
– Speed	142 <sub>a</sub>	159 <sub>a</sub>	158 <sub>a</sub>	163 <sub>a</sub>	n.s.

*Note.* Horizontal row means bearing different subscripts differ at  $p < .05$  or less revealed by post hoc comparisons.

outcome measures, they were not used as covariates in the multivariate and univariate analyses of variance.

### *Cognitive Performance as a Function of Massage Therapy Versus Play*

A repeated measures group (massage therapy/play control) by session (pre/post) MANOVA was conducted on the four WPPSI subtest scores: Block Design and Mazes, and both speed (number of seconds to completion) and accuracy (number of correct items) for Animal Pegs. Following a significant MANOVA, repeated measures analyses of variance were conducted on each of the dependent measures followed by post hoc Bonferroni *t* tests. As can be seen in Table 1, performance on Block Design improved following massage therapy  $F(1,17) = 4.9, p < .05$ , but not following play. Accuracy on Animal Pegs remained stable following massage therapy but deteriorated following play  $F(1,17) = 5.1, p < .05$ .

To examine whether the treatment effects were related to child temperament, comparisons were made between high- and low-scoring subjects on the temperament scale. Six of the subjects in the massage therapy group and 6 of the play control subjects were in the high-temperament group. The 2 high-temperament groups and the 2 low-temperament groups did not differ on the background variables, including age, sex or ethnicity. For subjects in the play control group, the effects of child temperament on difference scores (post minus pre scores) on the WPPSI subtests were not significant. For subjects in the massage therapy group, scores of high-

**Table 2** Difference Scores on WPPSI Subtests of High- and Low-temperament Subjects in the Massage Therapy and Play Control Groups.

	<i>Low-Temperament</i>	<i>High-Temperament</i>	<i>p</i>
Massage Therapy Group			
Blocks	.7	2.2	.05
Animal Pegs-Accuracy	.0	1.5	.05
Play Control Group			
Blocks	.4	.3	n.s.
Animal Pegs-Accuracy	-1.8	-2.4	n.s.

temperament subjects were more optimal than those of low-temperament subjects on Block Design  $t(9) = 2.32, p < .05$ , and on accuracy scores on Animal Pegs  $t(9) = 2.09, p < .05$ .

## DISCUSSION

Massage therapy enhanced the cognitive performance of these preschoolers, consistent with similar studies on infants and adults (Cigales *et al.*, in press; Field *et al.*, 1996). On the Block Design test of abstract reasoning, the children who were massaged improved on the post-test. In contrast, the control group scores did not improve. On the Animal Pegs matching task, the massaged children maintained the levels of accuracy they had shown on the pre-test while children in the control group became less accurate. The possibility that these results may be related to the control group's greater exposure to the experimenter needs to be ruled out in future research. The group differences may have related to the massaged children becoming increasingly alert following the massage not unlike the heightened alertness shown by wave changes in adults following massage. EEG might be measured in a future study of this kind with preschoolers.

Massage was particularly beneficial to children rated as high-strung and anxious. Compared with children rated by their teachers as calm and easy-going, high strung/anxious children receiving massage showed greater improvements on Block Design and they maintained greater accuracy on Animal Pegs. In contrast, cognitive performance of children in the play control group did not differ by child temperament. Possibly, massage was more advantageous for more anxious children because it alleviated stress. Massage therapy studies with adults have found that improved cognitive performance in job-stressed adults was associated with heightened alertness combined with reduced stress, as indicated on self-report measures and on stress hormone (cortisol) levels (Field *et al.*, 1996). Increased on-task behavior in children with attention deficit hyperactivity disorder has also been associated with behavioral evidence of reduced stress, such as less fidgeting, and lower scores on teachers' ratings of anxiety (Field *et al.*, in press). Further studies are needed to examine the relationship between cognitive performance and stress in preschoolers.

That preschoolers' cognitive performance is enhanced by massage therapy raises some concern since little touch takes place in preschools and progressively less positive touch occurs across ages from the infant to toddler to preschool nurseries (Field *et al.*, 1994). Whether touch deprivation is a source of stress among preschoolers is an important question for future research. Additional research must also address whether touch therapy would benefit preschoolers from less privileged backgrounds. Finding that touch therapy is particularly advantageous to children who appear more stressed suggests a pressing need for replications with high-risk children, such as preschoolers in Head-Start programs who may be exposed to more stressful events. Finally, since the long term effects of massage therapy have not yet been established, further studies are needed to determine the extent to which touch therapy needs to be incorporated in the preschool curriculum.

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