

Massage and motion training for growth and development of infants

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Background: Massage and motion training are considered to promote physical and mental health of infants. This study was conducted to elucidate their effect on the early development of normal infants.

Methods: Infants were randomly assigned to two groups according to their age: 0-month group and 6-month group. Growth and development of all infants were evaluated regularly. For the 0-month group, 90 infants were included in the experimental group and 90 in the control group. After one year, the number of infants decreased to 54 in the experimental group and 62 in the control group because of the lost to follow up. For the 6-month group, the number of infants in the experimental group was 62, and that in the control group was 52. After half a year, the number of infants in the experimental group was 52, and that in the control group was 39 because of lost to follow up. Infants in the experimental group received massage and motion training. Growth and development of all infants were evaluated regularly and compared between the two groups.

Results: Infants in the experimental group who received massage and motion training in the newborn period had a higher level in length and body weight than those in the control group in the first 6 months of life. At age of 6 months, the developmental quotient (DQ) of the experimental group was significantly higher than that

of the control group. At age of one year, the DQ of the experimental group was significantly higher than that of the control group. For the infants receiving motion training beginning from 6-month old, the body length and weight of infants in the experimental group were slightly higher than those of infants in the control group at age of 12 months. Significant difference was found in the body length. Also the DQ of adaptive behavior and language was significantly higher than that of infants in the control group.

Conclusions: Massage and motion training can significantly promote the physical and intelligent development of infants beginning from birth or at age of 6 months.

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Key words: infant;
massage;
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Introduction

Children's development depends on the interaction of genetic factors and environmental factors adaptive with their temperament. Early experiences not only affect the growth and development in the early life but have an important effect on the intelligent development and social adaptation in childhood, adolescence and adulthood.^[1] Infants' psychological development is mainly reflected by their motion because of limited language ability. Mature motion is the basis of other psychological development.^[2-4] The motion development of infants is related not only to their growth and development but also to their psychological development.^[5] It is also a direct, effective and important way to promote infants' development of intelligence. Studies have indicated that massage is beneficial for infants to increase weight, enhance immunity, improve sleeping rhythm, and promote the maturity of intelligence and social adaptation.^[6-9] Focusing on the motion development of

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infants in early education, we adopted the massage and motion training such as doing initiative and passive exercise on infants to promote the overall development. This prospective study was to explore the role of massage and motion training on neuropsychological and physical development of infants.

Methods

Subjects

Written consent was obtained from the parents of infants before the study which was approved by the Medical Research Ethics Committee of Sun Yat-sen University.

0-month group

A total of 180 infants were randomly assigned into two groups: experimental group (90 infants) and control group (90). Infants in the experimental group received massage and motion training and those in the control group were given no training. The status of growth and development of all infants were evaluated regularly. Due to the lost to follow up after one year, the number of infants in the experimental group was 54, and that in the control group was 62.

6-month group

The number of infants in the experimental group was 62, and in the control group 52. Infants in the 6-month group also met the above criteria and they had never received systematic motion training before 6 months old. The number of infants in the experimental group after half a year was 52 and in the control group was 39 owing to the lost to follow up.

Massage and motion procedures

Motion training, including gross motion and fine motion, was performed on the basis of Johnson infant massage. A set of training programs was used adapting to age and development of infants. In the experimental group, the parents of the infants were trained to learn the procedures of massage and motion training. All the parents were given manuals and VCD to learn to proceed the procedures. Massage and motion training were performed on their infants 1-2 times every day regularly. From birth to 6-month old, massage lasted for 15 minutes, and motion training for 5 minutes every time. From age of 6 months, the duration for massage lasted for 8 minutes and motion training for 12 minutes every time.

The two groups were given the same instructions for feeding and nursing, and status of growth was evaluated every month for infants under 6 months, every two months from 6 to 12 months, and every

three months for infants over 12 months. The status of neuropsychological development of infants in the 0-month group was assessed by Gesell Developmental Schedules at 1, 6 and 12 months, while that of the 6-month group was assessed at 6 and 12 months. Staff members were trained to standardize their operation technique of massage and motion training, then they taught the parents to use the procedures. The Gesell Development Test was carried out by 2-3 professionals.

Statistical analysis

All data were analyzed with the SPSS software for Windows. Independent-Samples *t* test and Chi-square test were used ($P < 0.05$).

Results

Comparison of body weight and length

0-month group

The body weight and length of infants in the experimental group were lower than those of the infants in the control group at the time of birth. At age of 6 months, the two parameters in the experimental group were higher than those in the control group significantly. The growth rate of infants in the experimental group was significantly different from that in the control group in the first 6 months of life ($P < 0.05$). But this difference was not found in the following half year (Table 1). The growth rate was defined as the difference value of body weight and length between two different time points.

6-month group

At age of 6 and 12 months, no significant difference was found in the body weight and length of infants between the experimental and control groups. The growth rate of infants in the experimental group was significantly different from that in the control group in the second 6 months of life ($P < 0.05$) (Table 2).

Comparison of DQ

0-month group

Gesell evaluation revealed that the development quotient (DQ) of the experimental group who received massage and motion training in the newborn period was significantly higher than that of the control group at 1, 6 and 12 months. At age of 1 month, higher DQ for adaptive behavior, language and personal-social behavior was noted in the experimental group than in the control group. At age of 6 months, DQ for adaptive behavior, gross motor, fine motor, language and personal-social behavior was significantly different between the two groups. At age of 12 months, such

Table 1. Comparison of body development in the experimental group versus the control group (0-month group) (means±SD)

Age	Development indexes	Experimental group	Control group	<i>t</i>	<i>P</i>
0 mon	Weight (kg)	3.30±0.37	3.37±0.38	-1.018	0.311
	Length (cm)	49.91±1.37	50.25±1.51	-1.312	0.192
1 mon	Weight (kg)	4.70±0.71	4.50±0.63	1.655	0.100
	Length (cm)	54.85±2.07	54.71±1.97	0.369	0.713
6 mon	Weight (kg)	8.65±1.09	8.15±1.04	2.618	0.010 [†]
	Length (cm)	68.68±2.29	67.55±2.81	2.476	0.015 [*]
12 mon	Weight (kg)	10.28±1.61	9.80±1.07	1.898	0.060
	Length (cm)	76.63±2.48	75.92±2.18	1.635	0.105
0-6 mon	Weight enhancement (kg)	5.35±1.09	4.79±1.02	3.007	0.003 [†]
	Length enhancement (cm)	18.74±2.81	17.25±3.13	2.787	0.006 [†]
6-12 mon	Weight enhancement (kg)	1.62±0.77	1.64±1.10	-0.139	0.890
	Length enhancement (cm)	8.08±1.41	8.33±2.97	-0.589	0.557

*: *P*<0.05; †: *P*<0.01.

Table 2. Comparison of body development in the experimental group versus the control group (6-month group) (means±SD)

Age	Development indexes	Experimental group	Control group	<i>t</i>	<i>P</i>
6 mon	Weight (kg)	8.11±1.13	8.32±0.85	-0.982	0.329
	Length (cm)	67.14±4.18	67.75±1.88	-0.851	0.397
12 mon	Weight (kg)	10.03±1.36	10.06±1.24	-0.096	0.924
	Length (cm)	76.90±2.82	75.96±2.37	1.690	0.094
6-12 mon	Weight enhancement (kg)	1.95±0.89	1.74±0.79	1.208	0.230
	Length enhancement (cm)	9.82±3.97	8.20±1.58	2.394	0.019 [*]

*: *P*<0.05.

Table 3. Comparison of the DQ by Gesell between the two groups (0-month group) (means±SD)

Age	DQ	Experimental group	Control group	<i>t</i>	<i>P</i>
1 mon	Adaptive behavior	126.25±34.23	113.03±28.35	2.39	0.018 [*]
	Gross motor	119.36±24.80	110.75±25.96	1.912	0.058
	Fine motor	133.27±42.47	128.66±47.28	0.581	0.562
	Language	112.15±20.52	102.04±18.80	2.908	0.004 [†]
	Personal-social behavior	101.22±22.24	89.81±20.71	3.004	0.003 [†]
6 mon	Adaptive behavior	106.56±9.11	99.49±9.24	4.350	0.000 [†]
	Gross motor	100.56±9.72	96.59±10.89	2.162	0.032 [*]
	Fine motor	105.58±12.13	98.69±10.31	3.474	0.001 [†]
	Language	104.10±9.51	99.95±10.17	2.380	0.019 [*]
	Personal-social behavior	105.75±10.97	99.34±11.23	3.254	0.001 [†]
1 y	Adaptive behavior	105.20±9.77	99.41±11.39	2.931	0.004 [†]
	Gross motor	102.25±12.73	99.40±16.51	1.036	0.302
	Fine motor	106.87±9.90	98.75±9.52	4.522	0.000 [†]
	Language	104.95±11.04	97.05±9.62	4.136	0.000 [†]
	Personal-social behavior	105.35±8.77	99.16±11.20	3.297	0.001 [†]

*: *P*<0.05; †: *P*<0.01. DQ: development quotient.

Table 4. Comparison of the DQ by Gesell between the two groups (6-month group) (means±SD)

Age	DQ	Experimental group	Control group	<i>t</i>	<i>P</i>
6 mon	Adaptive behavior	101.69±9.62	97.36±11.58	1.948	0.055
	Motion	101.46±6.76	97.69±8.48	2.358	0.021 [*]
	Language	96.60±7.79	95.33±8.91	0.720	0.474
	Personal-social behavior	97.85±9.25	91.54±12.25	2.800	0.006 [†]
1 y	Adaptive behavior	102.41±9.16	97.36±6.70	2.907	0.005 [†]
	Motion	105.90±7.73	100.00±9.43	3.277	0.001 [†]
	Language	100.92±10.54	92.39±9.88	3.921	0.000 [†]
	Personal-social behavior	99.89±9.69	94.75±9.02	2.582	0.011 [*]

*: *P*<0.05; †: *P*<0.01. DQ: development quotient.

significant difference still existed except DQ for gross motor between the two groups (Table 3).

6-month group

At age of 6 months, DQ in motion and personal-social behavior in the experimental group was significantly different from that in the control group. At age of 1 year, the DQ was significantly higher for adaptive behavior, motion, language and personal-social behavior (Table 4).

Discussion

Effects of massage and motion training on physical development of infants

Body length and weight are the main indexes for evaluating the status of nutrition and physiological development of children. The length is the index reflecting bone development, especially the reserve of calcium and protein in the body, which can be affected by the long-term nutrition. The index of weight can reflect the body protein-energy nutritional status, which is more sensitive in judging the body developmental speed than the length.^[10] In this study, although the length and weight in the experimental group at the time of birth were lower than those in the control group, they were higher in the experimental group than in the control group after 1 month. The two parameters were significantly different in the two groups after 6 months. The growth rate in consideration of the body weight and height was significantly higher in the experimental group than in the control group in the first half year of life, but this difference disappeared in the following half year. The above results and recent reports^[1,11-13] all indicate that massage plus motion training can accelerate the physical development of infants, which is more obvious in the first half year. Other studies showed that regular daily massage and motion training can benefit the metabolism, digestion, absorption and appetite of infants, thus leading to their rapid growth of muscles, bones, joints, tendons and physical development.^[6,10,14-16] The growth and development of infants are faster in the first half year than in the second half year. For example, the weight is increased by 5 kg in the first half year, but no more than 2 kg in the second half year. Physical development is strongly affected by environmental factors in the period of fast development. In the first half year, food of infants is mainly milk and they infrequently fall sick because of the passive immunity from mother, while in the second half year, the infants begin to receive food supplements and the advantage of passive immunity is lost. Hence physical development of the infants is more influenced

by nutrition and diseases. The long-term effects of massage and motion training on physical development of infants need further study.

Effects of massage and motion training on the neuropsychological development of infants

The Gesell test is a diagnostic tool for evaluation of development which can judge the maturity status of the nervous system of infants. The test includes 5 aspects: adaptive behavior, gross motor, fine motor, language and personal-social behavior, among which adaptive behavior is the most important aspect and the pioneer of intelligence in the future. Massage and motion training will promote the development of neuropsychology in the period of infancy. Face to face talk with smile to infants, encouragement with language, training on gross motor and fine motor will influence dredging channels of nerves and spirit of infants. Increasing the chance for the parents to contact infants, train infants to listen to talks of parents and play games with parents will promote the development of sense and perception of the infants. In our study, the ability of gross motor DQ was not significantly different in the period of infancy, we realize that the development of gross motor nerves is mainly influenced by biologic mature factors. The status of development in infancy will influence their later development even to the whole life.^[17] For the overall development of children, routine massage and motion training for infants are scientific.

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Ethical approval: This study was approved by the Data Inspectorate of China and by the Regional Committee for Medical Research Ethics.

Competing interest: None declared.

Contributors: JJ is the guarantor and proposed the study. LXH analyzed the data and wrote the first draft. All authors contributed to the design and interpretation of the study.

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