

# The Effectiveness of Slow-Stroke Back Massage on Hospitalization Anxiety and Physiological Parameters in School-Age Children: A Randomized Clinical Trial Study

Alia Jalalodini,<sup>1,2</sup> Manijeh Nourian,<sup>3,\*</sup> Kiarash Saatchi,<sup>4</sup> Amir Kavousi,<sup>5</sup> and Mahnaz Ghaljeh<sup>1</sup>

<sup>1</sup>Faculty of Nursing and Midwifery, Zahedan University of Medical Sciences, Zahedan, IR Iran

<sup>2</sup>Community Nursing Research Center (CNRC), Zahedan University of Medical Sciences, Zahedan, IR Iran

<sup>3</sup>Faculty of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

<sup>4</sup>Acupuncture Specialist, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

<sup>5</sup>Faculty of Industrial Safety, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

\*Corresponding author: Manijeh Nourian, Faculty of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran. Tel: +98-2188655366, Fax: +98-2188202521, E-mail: manighea@yahoo.com

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## Abstract

**Background:** The outcomes of hospitalization anxiety are mental health disorders. One of the methods of anxiety reduction is massage, which can cause reduction of pain and changes in physiological parameters.

**Objectives:** This study aimed to investigate the effects of slow-stroke back massage (SSBM) on hospitalization anxiety and physiological parameters in school-age children.

**Methods:** This clinical trial study included 80 school-aged children from Ali Ebne Abi Taleb hospital, located in Zahedan, who were selected using sequential sampling and randomly divided into two groups: a massage group (40) and a control group (40). Data were collected using a demographic questionnaire and the state-trait anxiety inventory for children (STAIC). Subjects in the massage group received SSBM, using sesame oil, for 3 days. Massage was given three times a day, and each massage session lasted for 15 - 20 minutes. Physiological parameters and hospitalization anxiety were determined from the second to fifth days. T-test and Chi-square were used for analysis data.

**Results:** There was a statistically significant difference ( $P < 0.05$ ) between the mean of systolic blood pressure (SBP), diastolic blood pressures (DBP), and pulse rate (PR) in the massage group prior to intervention ( $97.05 \pm 20.7$ ,  $60.35 \pm 16.69$  and  $95.45 \pm 13.02$  respectively) and on the fifth day ( $88.32 \pm 16.58$ ,  $55.95 \pm 12.7$  and  $90.45 \pm 15.1$  respectively). However, no difference was observed in mean respiratory rate (RR) in the massage group from the second day ( $17.55 \pm 3.6$ ) to fifth day ( $17.62 \pm 3.27$ ) ( $P = 0.096$ ). The mean of state of anxiety, which was  $36.4 \pm 5.1$  before intervention, was reduced by the fifth day to  $31.2 \pm 5.1$  in the massage group ( $P < 0.0001$ ,  $t = 5.2$ ).

**Conclusions:** The results suggest that massage reduced hospitalization anxiety, PR, and BP. Therefore, we propose that nurses can use massage to reduce anxiety in school-age children in hospital. This method has no side-effects and is easily applicable.

**Keywords:** Massage, Hospitalization, Anxiety, Pulse Rate, Blood Pressure, School-Age Children

## 1. Background

Hospitalization of children increases their levels of anxiety (1). Anxiety is defined as an unpleasant feeling accompanied by mental and physical disorders (2). Anxiety increases the levels of cortisol and norepinephrine and changes physiological parameters (3, 4). The body responds to anxiety by activating the sympathetic system, which can stimulate the hypothalamus pituitary adrenocortical axis (5). Hospitalization anxiety has adverse emotional effects and results in physical and mental health disorders; in children, it also delays growth and biological and cognitive development, as well as having adverse neu-

rodevelopmental effects (6-9).

Family-centered care and complementary treatments are used to reduce hospitalization anxiety (1, 10). Complementary or alternative treatments are natural treatments. Massage therapy is the most used and most effective type of complementary treatment (11). Massage involves the use of touch to achieve therapeutic objectives, such as pain relief, and a reduction of trait anxiety and depression (12, 13). Massage increases the levels of dopamine and serotonin hormones, leading to the relaxation of muscles; maintains blood and lymph supply; reduces fatigue; changes physiological parameters; and increases neurological develop-

ment (14-17).

Stroking massage involves a soft motion of the hand on the skin in such a way that the hand slides on the skin and does not result in deep muscle movement (18). Slow-stroke back massage (SSBM) uses this slow stroke. SSBM was first introduced within a hospital context by Elizabeth in 1996 as slow, gentle, and rhythmic hand movements on the patient's back at a steady speed (about 60 movements per minute), with mild and gentle pressure, for 3 - 10 minutes (19, 20). SSBM has been performed for more than 1,000 years in ancient China and India (14).

Researchers have made significant findings about the effectiveness of massage therapy on anxiety and physiological parameters (13, 21-23). A study conducted by Baron and Faubert (2005) showed that anxiety decreased after massage therapy (24). Haun et al. (2009) concluded that massage therapy reduced state and trait anxiety. In that study, massage reduced the respiratory rate (RR) but did not result in significant changes in pulse rate (PR) and blood pressure (BP) (25).

## 2. Objectives

Because of the unpleasant effects of hospitalization anxiety on children, this study was implemented to investigate the effectiveness of SSBM on hospitalization anxiety and physiological parameters in school-age children.

## 3. Methods

### 3.1. Study and Samples

This randomized controlled trial (RCT) study included 80 school-age children (9 - 12 years of age) who were admitted to Emam Ali hospital in Zahedan, Iran, in 2013. The Emam Ali hospital is a general hospital and dependent on Zahedan University of Medical Sciences, which comprises four special wards (NICU, PICU, CCU, and ICU) and three public wards (pediatrics, surgery, and internal) for hospitalization of adults and children. The Pediatrics wards included two internal wards with 78 beds and a hematology ward with 9 beds.

The subjects were selected by sequential sampling and were randomly divided into two groups: 1, the massage group (40 subjects); and 2, the control group (40 subjects). The researcher selected the eligible participants for the sampling. The subjects were chosen using simple random sampling with a lottery method. For the selection of subjects, the eligible participants were numbered on separate slips of paper. The numbers were then folded and mixed up in a box. The numbers of slips were selected for the desired sample size. Every day, for example, 3 participants

out of 5 or 6 participants were selected using the lottery method. Sampling in both groups was done every other week. This means that one week, massage group subjects were selected, and the next week the control group subjects were selected.

Sample size was calculated according to similar studies and by calculating the 5% significance level and 5% sample attrition, 5.5 clinically significant difference, and 90% power, based on the formula ( $1-\beta = (0.90)$ ,  $\alpha = (0.05)$ ,  $\sigma = (5.5)$ ,  $\sigma_1^2 = (6.78)^2$ ,  $\sigma_2^2 = (8.06)^2$ ) (26) (Equation 1). Total sample size was calculated as 80, so we required 40 subjects randomly selected for each group (40 massage group and 40 control group).

$$n = \frac{(\sigma_1^2 + \sigma_2^2) \times (Z_1^2 + Z_\beta)^2}{\sigma^2} \quad (1)$$

Inclusion criteria were as follows: 1, subjects were of Iranian nationality; 2, aged between 9 and 12 years of age; 3, without any physical and mental disorders; 4, without any history of mental disorders, cardiac disorders, or cancer; 5, having no back inflammation, wounds, or burns; 6, having hearing ability and the ability to read and write.

Exclusion criteria were as follows: 1, inability to physically and mentally prepare for the massage; 2, discharge from the hospital; 3, refusal to participate in the study; 4, avoiding answering questions; 5, death; 6, having cancer, heart diseases, spina bifida, convulsions, or dermatitis.

### 3.2. Measurement

Data were collected through a demographic questionnaire and the state-trait anxiety inventory for children (STAIC).

The demographic questionnaire was divided into three parts: 1, demographic questionnaire for mother and child. This questionnaire included five items (age, birth order, child's educational level, educational level of mother, and); 2, items on the features of disease, child's hospitalization, and reasons for hospitalization; 3, recording tabulation of physiological parameters.

The STAIC is a standard inventory. It comprises two 20-item scales that measure state and trait anxiety in 9- to 12-year-old children (27). The first set of 20 items measures state anxiety and is based on how the children are feeling at a given time. Each item begins with I feel... (28). The second set of 20 items measures trait anxiety. The child gives answers to these items based on how they feel. Each item under the state-trait parameter has three options and is rated on a three-point scale, with 1 indicating almost never, 2 indicating sometimes, and 3 indicating often (29). STAIC scores range from 20 to 60. The scores from 20 to 33 indicate mild anxiety, 34 to 46 moderate anxiety, and 47 to 60 indicate severe anxiety (28).

The validity of the STAIC was assessed by 10 faculty members of the school of nursing. Content validity indexes (CVIs) were estimated at 89 and 78 in the state-anxiety subscale and trait-anxiety subscale.

The reliability of the STAIC has been confirmed in some studies (9, 27, 30). The Cronbach alpha coefficient of the STAIC-State form was determined as 0.89 by Spielberger (1973), and it was found to be 0.88 by Aytekin et al. (2015) (30, 31). Despite the high reliability of the STAIC, in this study, Cronbach's alpha was calculated to determine the reliability of the STAIC. Cronbach's alpha was calculated as 0.93 for the state subscale and 0.98 for the trait subscale.

In our study, to measure hospitalization anxiety, state anxiety was used for subjects to express their feelings at the moment of completion of the inventory.

Tools for Measuring of physiological parameters were a sphygmomanometer (ALPK2 analogue, Japan) and stethoscope (Japan). For the reliability of physiological tools, calibration was used. A medical engineer compared the physiological tools with standard tools and the errors of the physiological tools were revised as a result.

### 3.3. Protocol for Massage Therapy

The researcher selected the eligible participants from those admitted to the pediatrics unit of Emam Ali hospital. Written and verbal mother's consent was obtained after adequate explanations to the subjects and mothers. In the massage group, the goals of the study were explained to the mothers and subjects. They were assured that the information would remain confidential. Mothers did not attend during treatment sessions. Massage was not implemented during nursing and medical interventions, such as medication, visiting time, and medical examinations. The environmental temperature was between 24 and 28°C.

On the second day of hospitalization (1 hour before the first massage therapy [at 9:00 am]), the STAIC and demographic questionnaire were used to determine hospitalization anxiety and physiological parameters (systolic blood pressure [SBP], diastolic blood pressure [DBP], RR, and PR) for both groups. BP (mmHg) was measured from the left arm and hand after resting and lying on back. RR was measured by the researcher for one minute for both groups, and for measurement of PR (beat per minute), the researcher recorded the physiological parameters.

In the massage group, children lay in the prone position and were given SSBM using sesame oil. Petrissage massage was initiated by applying circular pressure using the outside of the thumbs at the junction of the upper end of the sternocleidomastoid muscle with the occiput downward in the neck. Massage was performed three times, from the end of the neck to the end of the sacrum, with

the thumbs of both the hands on the sides moving simultaneously and gradually downwards and upwards. Massage was performed toward the outside, with the palm alongside the ribs, from the thoracic region to the sacrum. At the end of the therapy, effleurage massage was given by gently moving the palm from the upper neck to the sacrum and vice versa. Effleurage massage consists of light or gentle stroking massage performed longitudinally along the length of a muscle or body segment (32). Petrissage massages are generally performed more vigorously and more rapidly than effleurage techniques, with deeper pressure administered to the underlying muscular tissues (32). The researcher has massage therapy certification from an accredited agency. The researcher carried out the massages alone, in a quiet place.

This intervention was performed three times daily (at 10:00 am, 3:00 pm, and 7:00 pm) for three days (from the second to fifth day of hospitalization). Each massage session lasted for 15 - 20 minutes. Physiological parameters and hospitalization anxiety were measured at 8:00 pm every day from the second to fourth days after hospitalization. The STAIC was completed by the subjects. The physiological parameters were measured again on the fifth day after hospitalization at 9:00 am (after intervention) (Figure 1).

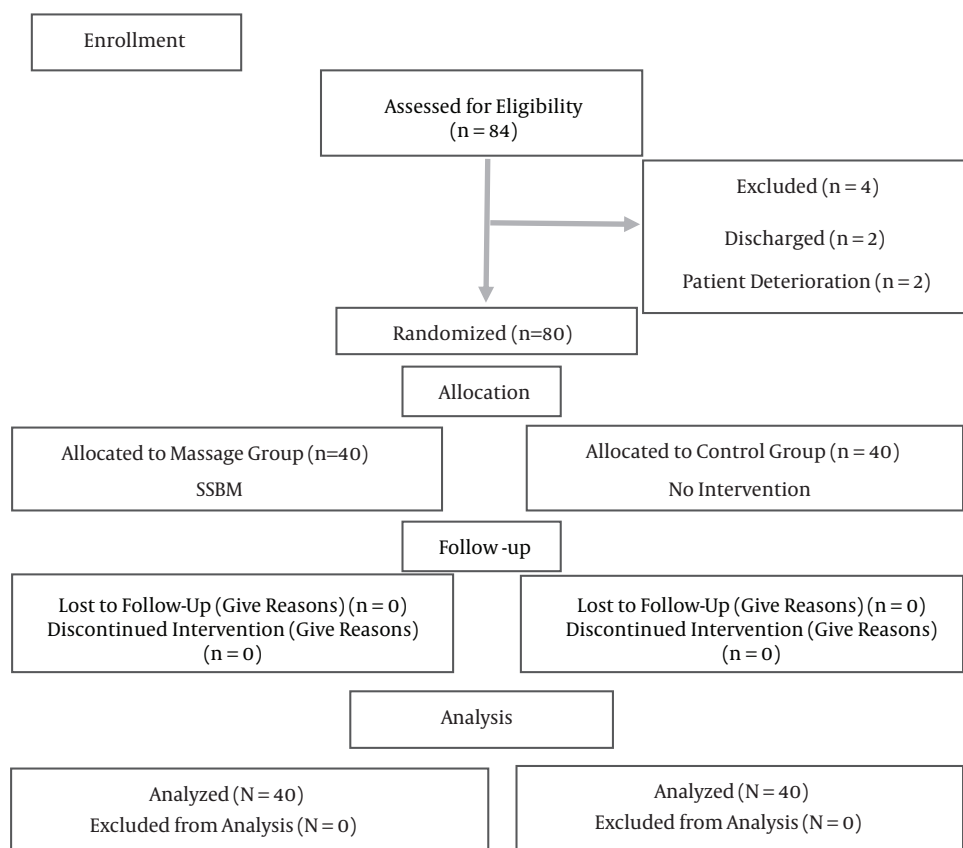
In the control group, children were only controlled with routine care, without massage at the mentioned times. The physiological parameters and hospitalization anxiety were also assessed for this group.

### 3.4. Ethical Considerations

This clinical trial study was approved by the committee of ethics at Shahid Beheshti University of Medical Sciences, Tehran, Iran. Registry code in the Iranian clinical trial registry center was IRCT201205199798N1.

### 3.5. Statistical Analysis

Data were analyzed by SPSS v.18 (SPSS, Chicago, IL) and by using Chi-square, independent, and paired t-test samples. Chi-square was used to control qualitative demographic variables. The t-test was performed to compare the means of anxiety and physiological parameters before and after intervention in each group and between the two groups. We wanted to compare the means of anxiety and physiological parameters daily, not only on the second day and fifth day, so a repeated measure for analysis of data was not used. A K-S test was used to check normal distribution. Data are presented as mean  $\pm$  standard deviations (SD). Significant P values were considered less than 0.05.



**Figure 1.** Time Course of the Study

## 4. Results

### 4.1. Demographic Characteristics

Findings showed that the mean age of the children in the massage group was  $(11.01 \pm 1.07)$ , and of the control group it was  $(10.79 \pm 1.30)$ . [Table 1](#) shows the main characteristics studied in both groups. The main demographic characteristics were not significant differences between the two groups ( $P > 0.05$ ).

### 4.2. Physiological Parameters

[Table 2](#) shows that the means of SBP and DBP on the second day (before intervention) in the massage group were  $97.05 \pm 20.7$  and  $60.35 \pm 16.69$ , respectively, which had changed to  $88.32 \pm 16.58$  and  $55.95 \pm 12.7$ , respectively, on the fifth day ( $P < 0.0001$ ,  $t = 6.1$  and  $P = 0.002$ ,  $t = 3.7$  respectively). The results of the paired t-test revealed no significant difference in changes of SBP and DBP in the control group before care by the fifth day ( $P = 0.075$ ,  $t = -2.08$

and  $P = 0.131$ ,  $t = -1.76$ ). The results of an independent t-test showed that the means of SBP and DBP reduced significantly from before intervention to the fifth day between the two groups ( $P < 0.0001$  and  $P = 0.002$ , respectively).

The mean of PR before intervention in the massage group was  $95.45 \pm 13.02$ , which had changed significantly to  $90.45 \pm 15.1$  by the fifth day ( $P = 0.001$ ,  $t = 3.47$ ). However, the mean of PR in the control group did not change significantly from before care to the fifth day ( $P = 0.353$ ,  $t = -1.76$ ). The results of the independent t-test showed that the mean of PR was significantly different from before intervention to the fifth day between the two groups ( $P = 0.003$ , [Table 3](#)).

No significant difference was observed between the mean of RR between the groups from before intervention to the fifth day ( $P = 0.096$ ).

### 4.3. State Anxiety

The results in [Table 4](#) show that the mean of state anxiety, which was  $36.4 \pm 5.1$  before intervention, was reduced by the fifth day to  $31.2 \pm 5.1$  in the massage group ( $P <$

**Table 1.** The Main Characteristics Studied in Both Groups<sup>a</sup>

Variables	Massage Group (N = 40)	Control Group (N = 40)	P-Value
Age (Mean ± SD)	11.01 ± 1.07	10.79 ± 1.30	0.412 <sup>b</sup>
<b>Birth orders</b>			0.080 <sup>b</sup>
1 - 2	16 (40)	23 (57.5)	
3 - 4	24 (60)	17 (42.5)	
<b>Educational level of child</b>			0.093 <sup>c</sup>
Primary school	28 (70)	20 (50)	
Secondary school	12 (30)	20 (50)	
<b>Reasons for hospitalization</b>			0.965 <sup>c</sup>
Hematological disorders	13 (32.5)	12 (30)	
Gastric disorders	12 (30)	11 (27.5)	
Respiratory disorders	4 (10)	5 (12.5)	
Neurological disorders	4 (10)	4 (10)	
Other	7 (17.5)	8 (20)	
<b>History of separation from parents</b>			0.491 <sup>c</sup>
Yes	6 (15)	4 (10)	
No	34 (85)	36 (90)	
<b>Educational level of mother</b>			0.252 <sup>c</sup>
Primary school	25 (62.5)	29 (72.5)	
Secondary school	3 (7.5)	4 (10)	
High school	3 (7.5)	4 (10)	
University	9 (22.5)	3 (7.5)	

<sup>a</sup>Values are expressed as No. (%) unless otherwise indicated.

<sup>b</sup>t-test.

<sup>c</sup>χ<sup>2</sup> test.

0.0001,  $t = 5.2$ ). The mean of state anxiety before care in the control group was  $34.3 \pm 4.4$  and by the fifth day was  $33.9 \pm 4.2$ , showing that the mean of state anxiety in the control group was not significantly different from before care to the fifth day ( $P = 0.267$ ,  $t = 1.13$ ). The changes in state anxiety were significantly different between the two groups from before intervention to the fifth day ( $P < 0.0001$ ).

The change in mean of state anxiety was not significantly difference between the two groups from the second (after intervention) to third days ( $P = 0.241$ ; [Table 4](#)).

The means of state anxiety on the second day (after intervention) in the massage and control groups were  $33.5 \pm 4.2$  and  $33.48 \pm 4.3$ , respectively, and on the fourth day reached  $34.5 \pm 4.49$  and  $33.08 \pm 4.8$ , respectively ( $P = 0.071$ ,  $t = -1.8$  and  $P = 0.420$ ,  $t = 0.8$ , respectively). Although the results of the paired t-test revealed no significant differences in changes of state anxiety in the massage group from the second to the fourth days, the independent t-test showed that the mean of state anxiety reduced significantly be-

tween the two groups from the second to fourth days ( $P < 0.05$ ).

The paired t-test showed that the average of state anxiety reduced significantly from the third to fourth days in the massage group ( $P = 0.023$ ,  $t = 2.3$ ). No significant difference was observed between the mean of state anxiety from the third to the fourth days in the control group ( $P = 0.251$ ,  $t = -1.15$ ). The independent t-test showed that the mean of state anxiety reduced significantly between the two groups from the third to the fourth days ( $P = 0.017$ ).

## 5. Discussion

This study evaluated the effects of SSBM on anxiety hospitalization and physiological parameters in school-age children. Massage therapy is one of the oldest forms of treatment known as a kind of complementary therapy (13). The effects of massage refer to the influence of automatic nervous system stimulation from different areas of

**Table 2.** Changes of Means in SBP and DBP From the Second to Fifth Days in the Two Groups<sup>a,b</sup>

Physiological Parameters	Massage Group (N = 40)	Control Group (N = 40)	P (t-Test) <sup>c</sup> ±
<b>SBP</b>			< *0.0001 <sup>d</sup>
Second day (before intervention)	97.05 ± 20.7	91.52 ± 17.85	
Second day (after intervention)	93.32 ± 15/6	88.5 ± 21.3	
Third day	97.32 ± 17.5	95.8 ± 14.94	
Fourth day	93.35 ± 18.76	91.05 ± 17.18	
Fifth day	88.32 ± 16.58	95.48 ± 14.26	
Mean differences of the second to fifth days	8.38 ± 8.72	11.97 ± 3.9-	
P (Paired t-test)	P < 0.0001*, t = 6.1, Df = 39	P = 0.075, t = -2.08, Df = 39	
<b>DBP</b>			*0.002 <sup>d</sup>
Second day (before intervention)	60.35 ± 16.69	56.55 ± 11.7	
Second day (after intervention)	58.98 ± 13.85	51.32 ± 11.49	
Third day	58.38 ± 9.5	56.12 ± 9.7	
Fourth day	57.38 ± 11.38	56.98 ± 12.01	
Fifth day	55.95 ± 12.7	56.62 ± 10.31	
Mean differences of second to fifth days	7.45 ± 4.40	11.03 ± 3.07-	
P (Paired t-test)	P = 0.002*, t = 3.7, Df = 39	P = 0.131, t = -4.76, Df = 39	

Abbreviations: DBP, Diastolic blood pressure; Df, degrees of freedom; SBP, systolic blood pressure.

<sup>a</sup>Values are expressed as mean ± SD.

<sup>b</sup>p < 0.05.

<sup>c</sup>Independent sample t-test.

<sup>d</sup>Comparison between the two groups from before intervention to fifth day.

the body. Gentle massage stimulates a parasympathetic response, while the low pressure of massage may stimulate a sympathetic system response (33). There is contact between the body of the patient and the researcher's hands during massage therapy. Physical contact can lead to reductions in anxiety, BP, and PR (13, 34). Peng et al. (2015) have written that massage reduces nervous emotions and provides a great balance between parasympathetic and sympathetic nervous system activities (35). Massage can increase the pressure in tissues, so, the gradient of pressure will increase between tissues and vessels. It can lead to facilitating the movement of liquids between tissues and vessels. This movement regulates BP (36).

The results indicated that SSBM reduced PR, SBP, DBP, and state anxiety during the three-day period. However, changes in RR during this period were not significantly different between the two groups.

Researchers have made significant findings about the effectiveness of massage therapy on anxiety and physiological parameters (13, 21, 23). Haun et al. (2009) concluded that massage therapy effected significant changes in RR, while PR, SBP, and DBP did not show any significant difference. One of the reasons for non-effectiveness of mas-

sage in Haun et al.'s study was the small sample of patients. Nonetheless, in their study, massage reduced state and trait anxiety (25).

Ejindu (2007) examined the effects of foot and facial massages on sleep induction and physiological parameters. Results of his study indicated that, as an affective intervention, massage therapy can reduce SBP and DBP, which was consistent with the results of the present study (37). The main differences between the studies are that we conducted SSBM on school-age children, whereas Ejindu's study conducted foot and facial massages on adults.

In a study by Albert et al. (2009), the results showed a significant difference in the means of SBP and DBP for the massage and control groups on the second and third days, although this difference was not observed on the fourth and fifth days. In that study, fewer than 10% of the participants had used massage before surgery, thus, anxiety and physiological parameters were higher during massage therapy, and so these variables were not reduced on the fourth and fifth days. Furthermore, deep pressure massaging caused tension in various parts of the body (26). Albert et al. (2009) wrote that patients lying in a lateral position are less relaxed than when lying in a prone position (for the

**Table 3.** Changes of Mean in PR and RR from the Second to Fifth Days in the Two Groups<sup>a,b</sup>

Physiological Parameters	Massage Group N = 40	Control Group N = 40	P (t-Test) <sup>c</sup> ±
<b>PR</b>			*0.003 <sup>d</sup>
Second day (before intervention)	13.02 ± 95.45	91.82 ± 12.9	
Second day (after intervention)	17.12 ± 94.1	92.3 ± 10.26	
Third day	12.2 ± 94.92	93.6 ± 10.6	
Fourth day	92.62 ± 13.3	90.02 ± 12.28	
Fifth day	90.45 ± 15.1	95.8 ± 10.5	
Mean differences of second to fifth days	9.02 ± 5	14.21 ± 3.97	
P (Paired t-test)	P = 0.001*, t = 3.47, Df = 39	P = 0.353, t = -1.76, Df = 39	
<b>RR</b>			0.096 <sup>d</sup>
Second day (before intervention)	17.55 ± 3.6	19.48 ± 5.43	
Second day (after intervention)	18.08 ± 3.05	19.18 ± 5.51	
Third day	18.28 ± 3.17	18.7 ± 4.03	
Fourth day	19.20 ± 3.8	19.65 ± 4.81	
Fifth day	17.62 ± 3.27	18.5 ± 3.03	
Mean differences of second to fifth days	1.74 ± 0.07	3.49 ± 0.97	
P (Paired t-test)	P = 0.783, t = -0.27, Df = 39	P = 0.081, t = 1.76, Df = 39	

Abbreviations: PR, pulse rate; RR, respiratory rate; Df, degrees of freedom.

<sup>a</sup>Values are expressed as mean ± SD.

<sup>b</sup>\*P < 0.05.

<sup>c</sup>Independent sample t-test.

<sup>d</sup>Comparison between the two groups from before intervention to fifth day.

back massage). Inability to complete relaxation could have prevented decreased physiological parameters.

Dreyer et al. (2015) examined the effects of Swedish massage on pain, anxiety, relaxation, and tension for 3 days after colorectal surgery. The results indicated that Swedish massage reduced anxiety and physiological parameters significantly in patients. In that study, the high sample size and performance of massage by a massage therapist with special training and experience working in the hospital could be the cause of the positive effects of massage on psychological characteristics and physiological parameters (12).

Results of the study by Baron and Faubert (2005) showed that anxiety decreased after intervention (24). The results of the present study about anxiety are consistent with those of the study by Haun et al. (2009) (25) and Dreyer et al. (2015) (12) but are different from the report by Albert et al. (2009) (26). Albert et al. concluded that massage therapy was ineffective in reducing anxiety significantly (26).

The different effects of massage therapy in the present study can be attributed to the massage performed by the researcher. However, the results may be different if the

same massage is performed by mothers. It is possible that massage for more than three days can have different effects than those observed in this study. We recommend further research to explore whether performance of SSBM by mothers might reveal positive effects on anxiety and physiological parameters in children admitted to a hospital for treatment.

### 5.1. Strengths and Limitations of Study

The present study had several important points. It was the first study to measure hospitalization anxiety in Iran. In previous studies, the effects of stroking and Swedish massages on anxiety and physiological parameters were examined, while in present study, the effects of SSBM were examined on these variables. These results strongly suggest that Sims be carried out on children to reduce their anxiety during hospitalization and to reduce their BP and PR during hospitalization, because children are less able to cope with hospitalization anxiety, which includes absence of parents, especially mothers, and application of invasive procedures, such as intravenous (IV) therapy and tracheotomy. No side-effects were observed in subjects. Subjects reported that their massage made them feel relaxed.

**Table 4.** Changes of the Mean in State Anxiety From the Second to Fifth Days in the Two Groups<sup>a,b</sup>

State Anxiety	Massage Group	Control Group	P(t-Test) <sup>c</sup>
Second day (before intervention)	36.4 ± 5.1	34.3 ± 4.4	* < 0.0001 <sup>d</sup>
Fifth day	31.2 ± 5.1	33.9 ± 4.2	
Mean differences of second to fifth days	-5.2 ± 6.2	-0.43 ± 2.5	
P (Paired t-test)	P<0.0001*, t=5.2, Df=39 <sup>e</sup>	P=0.267, t=1.13, Df=39 <sup>e</sup>	
Second day (after intervention)	33.5 ± 4.2	33.48 ± 4.3	0.241
Third day	33 ± 4.7	33.5 ± 3.7	
Mean differences of second to third days	-0.52 ± 2.03	0.02 ± 2.1	
P (Paired t-test)	P=0.113, t=1.6, Df=39 <sup>e</sup>	P=0.941, t=- 0.73, Df=39 <sup>e</sup>	
Second day (after intervention)	33.5 ± 4.2	33.48 ± 4.3	*0.051
Fourth day	34.5 ± 4.49	33.08 ± 4.8	
Mean differences of second to fourth days	1.02 ± 3.5	-0.4 ± 2.9	
P (Paired t-test)	P=0.071, t=-1.8, Df=39 <sup>e</sup>	P=0.420, t=0.8, Df=39 <sup>e</sup>	
Third day	33 ± 4.7	33.5 ± 3.7	*0.017
Fourth day	34.5 ± 4.49	33.08 ± 4.8	
Mean differences of third to fourth days	1.55 ± 4.19	-0.42 ± 2.3	
P (Paired t-test)	P=0.023*, t=2.3, Df=39 <sup>e</sup>	P=0.251, t=-1.15, Df=39 <sup>e</sup>	

<sup>a</sup>Values are expressed as mean ± SD.

<sup>b</sup>\*P < 0.05.

<sup>c</sup>Independent sample t-test.

<sup>d</sup>Comparison between the two groups from before intervention to fifth day.

<sup>e</sup>Degrees of freedom.

Given the effects of SSBM on hospitalization anxiety and physiological parameters, healthcare professionals and nurses can use massage therapy to reduce hospitalization anxiety in children. Nurses can teach massage therapy to the mothers of children, and nursing supervisors can recommend massage therapy in pediatrics workshops for nurses. It was observed that this method had no side-effects and is easily applicable.

More research with larger samples and longer follow-up periods are needed for validation of these results. In addition, massage therapy programs can be conducted after open heart surgery in children to reduce anxiety and BP after surgery.

The limitations of this study include the inability to control potential intervention variables that were beyond the researcher's control, such as the emotional, physical, cultural, and social conditions of the included children, and the delay in implementation of massage due to subjects sleeping or meeting with family at the intended time of massage implementation.

## 5.2. Conclusion

The results of the present study showed that the SSBM was effective in reducing state anxiety in school-age chil-

dren in the three-day period. This reduction is probably due to a reduction of stress hormones (epinephrine) and the release of beta-endorphins stimulated by massage (38). However, SSBM was ineffective in reducing state anxiety in the second to third days because the patients in the massage group had not yet received sufficient intervention.

The results also showed that SSBM significantly reduced SBP, DBP, and PR during the three-day period. However, SSBM was ineffective in reducing RR during the three-day period. Physiological indicators, including PR and BP, changed over the 30 minutes after the massage, but the effects of massage on RR were unclear (22).

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## Footnotes

**Authors' Contribution:** Alia Jalalodini and Manijeh Nourian conceived the study and contributed in the design



of the study and the drafting of the manuscript; Alia Jalalodini conducted the protocol; Kiarash Saatchi advised on the method of massage therapy, and Amir Kavousi advised on data analysis; Mahnaz Ghaljeh revised and approved the manuscript.

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