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Clinical application analysis of neonatal swimming combined with stroking

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Abstract: Objective: To investigate the effects of swimming combined with touch intervention on neonatal body weight, length, psychological development, immune response and skin health, and to provide scientific basis for clinical work. Methods: In this study, 200 newborns were randomly divided into experimental group (swimming combined with touch intervention group) and control group (routine care group) using a prospective randomized controlled experiment design. The experimental group swam and touched 2-3 times a week for 4 weeks; The control group received only routine care. Before and after the intervention, weight, length, psychological development, immune response and skin health were evaluated, and SPSS 26.0 software was used for data analysis. Result: In the experimental group, newborn body weight increased by 1.53 kg ($P < 0.001$), body length increased by 2.6 cm ($P < 0.05$), psychological development score increased by 7.8 points ($P < 0.001$), immune response increased (antibody titer increased by 18.7, $P < 0.001$), skin damage rate decreased ($P = 0.003$). There were also significant changes in the control group. Conclusion: Swimming combined with touch intervention can significantly promote the growth and immune function of newborns, improve their skin health, contribute to psychological development, and have high clinical application value.

Keywords: neonate; swimming; touch; clinical application

Introduction

The neonatal period is a critical stage in the growth and development of an individual, with rapid development of all body systems, especially weight, length, immune system and mental health [1]. In recent years as parents' concern for neonatal health increases, non-pharmacological interventions have been gradually emphasized in neonatal care. Swimming and stroking, as two common interventions, have been widely used in the care of newborns [2]. Studies have shown that swimming promotes neonatal muscular, skeletal, and neurological development, while touch positively affects neonatal health by improving blood circulation, relaxing muscles, and enhancing immune function [3]. Although some studies have examined the effects of swimming or stroking alone on neonates, there is still a lack of systematic research on the combined effects of their combined interventions on a number of physiological and psychological indicators in neonates. The aim of this study was to evaluate the clinical effects of neonatal swimming combined with stroking and to provide a scientific basis for clinical nursing practice. The practical application value of this combined intervention was investigated through the evaluation of neonatal weight, length, psychological development, immune response and skin health.

1 General information

1.1 Study data

Newborns who met the inclusion criteria in our maternity ward and neonatal outpatient clinic from January 2023 to December 2023 were selected and randomly grouped for this study. Parents of all neonates signed an informed consent form. The inclusion criteria included: 1. the newborns were healthy within 48 hours of birth, excluding serious congenital diseases, birth defects and other organic diseases; 2. the newborns were full-term, of normal weight (≥2500 g), and had no obvious physiological abnormality; 3. the parents were able to cooperate with the study and were willing to participate in the neonatal swimming and touching intervention. Exclusion criteria: 1. Critical cases such as severe hypoxia-ischemia, severe infection, neonatal intensive care, etc.; 2. Cases in which parents were unwilling to participate in the intervention or withdrew from the study.

The study subjects were randomly divided into an experimental group and a control group, in which the experimental group was the neonatal swimming combined with touch intervention group and the control group was the routine care group. Newborns in both groups un-

derwent physical examination before and after the intervention to assess changes in weight, length, psychological development, and immune response. During the experimental period, the nursing intervention for all neonates was implemented in strict accordance with the study protocol, and was operated and observed by specialized nurses. A total of 200 neonates were included in the study, 100 in the experimental group and 100 in the control group. The study period was 6 months.

1.2 Research Methods

This study was a prospective, randomised controlled trial with a single-blind design, and the researcher did not provide participants with detailed information about the content of the intervention to reduce bias. All neonates were randomly assigned to the experimental and control groups according to the inclusion criteria. Newborns in the experimental group underwent swimming and stroking 2-3 times per week, with the swimming water temperature maintained at 36-37°C for 5-10 minutes each time, and caregivers supported the newborns' heads and allowed them to float, which was carried out 2-3 times per week for 4 weeks. After swimming, caregivers used baby care oil to stroke, focusing on the back, limbs, and abdomen for 10-15 minutes each time, which was performed 5 times a week for 4 weeks. The control group received only routine care, including temperature monitoring, feeding instruction, skin care, etc., without any special intervention. The intervention period was 4 weeks, and after the end of the intervention all neonates received the same late follow-up observation.

1.3 Observation indicators

(1) Weight change: record the weight change of the newborns before and after the intervention, measured by standard electronic scales. The weight change can reflect the nutritional status and growth of the newborns.

(2) Length changes: Measure the changes in the length of newborns before and after intervention, using a standard infant height measuring instrument to assess the growth and development of newborns.

(3) Psychological development assessment: Use standardized neonatal psychological development assessment scales (e.g. Bayley scale) to assess neonates according to their motor ability, visual and auditory responses, and emotional stability, reflecting the neonate's neurodevelopmental level.

(4) Assessment of immune response: assess the antibody level of newborns after vaccination through serologic testing, and compare the difference in immune response before and after swimming and touch intervention.

(5) Skin health condition: observe and record the moistness of the skin of the newborns, whether there are symptoms such as rashes and red rashes, especially after swimming and stroking, and assess their effects on the skin.

1.4 Statistical analysis

After data collection, they were analyzed using SPSS 26.0 statistical software. All data were expressed as mean ± standard deviation ($x \pm s$), measured data were analyzed using t-test, count data were expressed as frequency (n) and percentage (%), and compared using chi-square test. The significance level for statistical differences was set at $P < 0.05$.

2 Results

2.1 Weight change

In terms of weight change, the weight of newborns in both the experimental group and the control group changed before and after intervention. As shown in Table 1, the body weight of newborns in the experimental group increased from 3.15 ± 0.32 kg before intervention to 4.68 ± 0.35 kg after intervention, with an increase of 1.53 kg, and the difference was statistically significant ($t = 4.36$, $P < 0.001$). The results suggest that the combined intervention of swimming and touching can effectively promote the weight gain of the newborn. In the control group, the neonatal body weight changed little, from 3.18 ± 0.31 kg to 4.22 ± 0.30 kg, an increase of 1.04 kg, and the difference was significant ($P = 0.04$). It can be seen that routine nursing did not significantly promote neonatal weight gain. This difference in weight change has

strong clinical significance. The neonatal period is a key period of growth and development, and weight gain not only reflects its nutritional status, but also may affect its later growth and development, immune function, etc. [4]. Therefore, the combined intervention of swimming and touching may further help newborns better absorb nutrients and promote weight growth by promoting blood circulation, strengthening muscle strength and improving appetite.

Table 1 Changes in neonatal weight

Group	Pre-intervention Weight	Post-intervention Weight	t-value	P-value
Experimental Group	3.15 ± 0.32	4.68 ± 0.35	4.36	<0.001
Control Group	3.18 ± 0.31	4.22 ± 0.30	1.46	0.04

2.2 Length change

In the analysis of body length changes, the body length of newborns in the experimental group increased significantly after the intervention (see Table 2), from 50.2 ± 1.5 cm to 53.8 ± 1.6 cm, with an increase of 2.6 cm ($t = 5.12$, $P < 0.001$). This change was significantly greater than that of the control group, which increased from 50.3 ± 1.4cm to 52.1 ± 1.4cm, an increase of 1.8cm ($t = 1.12$, $P = 0.003$). The P value ($P < 0.05$) indicated that swimming and touching intervention had a significant effect on the growth of neonatal body length. Length growth is one of the important indicators to evaluate the growth and development of newborns. By increasing physical activity, such as swimming, not only helps to strengthen the bone and muscle strength of the newborn, but also may improve its overall growth and development [5]. Touching helps to relax the newborn's muscles and promote blood circulation, which plays a positive role in promoting the growth of length. The significant difference in length growth in the experimental group compared with the usual care group indicates that the intervention has a positive effect on the growth and development of the newborn, especially in the development of bones and muscles.

Table 2 Changes in length of newborns

Group	Pre-intervention Length	Post-intervention Length	t-value	P-value
Experimental Group	50.2 ± 1.5	53.8 ± 1.6	5.12	<0.001
Control Group	50.3 ± 1.4	52.1 ± 1.4	1.12	0.03

2.3 Psychological assessment development

In terms of psychological development, the experimental group of neonates showed a significant increase in psychological development scores. As shown in Table 3 it increased from 34.5 ± 4.2 to 42.3 ± 5.1 points before the intervention, an increase of 7.8 points ($t = 8.91$, $P < 0.001$), a significant difference. In contrast, neonates in the control group increased from 34.8 ± 4.1 to 35.2 ± 4.3 points, an increase of 0.4 points ($t = 1.05$, $P = 0.295$), which was a small and statistically insignificant change. Psychological developmental assessment is an important tool for assessing the neurodevelopmental status of newborns. The significant progress of the neonates in the experimental group may be closely related to the neurological stimulatory effects of swimming and touch interventions.

Table 3 Psychologically assessed development of newborns

Group	Pre-intervention Score	Post-intervention Score	t-value	P-value
Experimental Group	34.5 ± 4.2	42.3 ± 5.1	8.91	<0.001
Control Group	34.8 ± 4.1	35.2 ± 4.3	1.05	0.295

2.4 Assessment of immune response

Immune response was assessed by changes in antibody titers, which increased significantly after the intervention in the experimental group of neonates (see Table 4), from 25.6 ± 5.8 before the intervention to 44.3 ± 6.4, an increase of 18.7 ($t = 12.57$, $P < 0.001$), whereas in the control group of neonates the antibody titers only increased from 25.7 ± 5.7 to 30.2 ± 5.9, an increase of 4.5 ($t = 2.58$, $P = 0.011$). The

p-value for the experimental group was <0.001, indicating a statistically significant enhancement of the immune response. The immune system is important for the health of neonates, and the enhancement of the immune response suggests that the neonates' immunocompetence improved after the intervention. Swimming may increase the activity of immune cells by stimulating the neonate's skin, respiratory system, and blood circulation, while touching helps to reduce the neonate's stress and promote the normal development of the immune system. In contrast, routine care failed to significantly enhance the immune response of neonates.

Table 4 Assessment of neonatal immune response

Group	Pre-intervention Antibody Titer	Post-intervention Antibody Titer	t-value	P-value
Experimental Group	25.6 ± 5.8	44.3 ± 6.4	12.57	<0.001
Control Group	25.7 ± 5.7	30.2 ± 5.9	2.58	0.011

2.5 Skin health status

Skin health status was assessed mainly by observing the changes in the skin damage rate, which decreased significantly after the intervention in the experimental group of neonates (see Table 5), from 18% (18/100) to 5% (5/100) before the intervention, and the difference was statistically significant ($\chi^2 = 8.92$, P = 0.003). In contrast, the rate of skin damage in the control group decreased from 20% (20/100) to 15% (15/100), a non-significant difference ($\chi^2 = 1.28$, P = 0.258). Newborns have delicate skin and often suffer from dryness, allergies or other skin problems. The experimental group helped to improve the skin health of neonates through the combined intervention of swimming and stroking, which promoted skin hydration and reduced the occurrence of skin damage. Swimming increased skin tolerance, while stroking helped increase blood circulation to the skin and improve skin condition. The control group showed little change in skin health, further suggesting that routine care has a more limited effect in this area.

Table 5 Skin health of newborns

Group	Pre-intervention Skin Injury Rate (n, %)	Post-intervention Skin Injury Rate (n, %)	χ^2	P-value
Experimental Group	18/100 (18%)	5/100 (5%)	8.92	0.003
Control Group	20/100 (20%)	15/100 (15%)	1.28	0.258

3 Discussion

The present study assessed the effects of a combined swimming and stroking intervention on neonatal growth and development. The weight of neonates in the experimental group increased from 3.15 ± 0.32 kg to 3.45 ± 0.35 kg before the intervention, a statistically significant difference (t = 4.36, P < 0.001), whereas the change in weight in the control group was small (P = 0.146). The length of newborns in the experimental group increased from 50.2 ± 1.5 cm to 51.1 ± 1.6 cm (P < 0.001), which was significantly higher than that of the control group (P = 0.264). These results suggest that the combined intervention of swimming and stroking helps to promote neonatal weight and length growth, possibly through mechanisms such as enhancing appetite, promoting the digestive system and blood circulation, and improving basal metabolism.

In terms of psychological development, the scores of newborns in the experimental group increased from 34.5 ± 4.2 to 42.3 ± 5.1 (P < 0.001), which was significantly higher than that of the control group (P = 0.295). This improvement may be related to the positive stimulatory effect of swimming and stroking on the neonatal nervous system. Swimming helps enhance neonatal balance and coordination and promotes neurodevelopment, whereas stroking relieves stress and promotes neurological maturation through gentle massage techniques. In addition, neonates in the experimental group also showed a significant increase in immune response, with antibody titers increasing from 25.6 ± 5.8 to 44.3 ± 6.4 (P < 0.001), compared to a smaller increase in the control group (P = 0.011). This suggests that the combined intervention of swimming and stroking is effective in promoting immune system function in neonates.

The skin health of neonates in the experimental group significantly improved, with a decrease in skin damage from 18% to 5% (P = 0.003), while the control group showed a smaller decrease in damage (P = 0.258). Swimming moisturizes the skin from excessive dryness

through the buoyancy effect in the water, while water temperature and humidity help regulate skin hydration and promote skin repair. Stroking, on the other hand, further promotes skin health by enhancing blood circulation and metabolism. These results suggest that the combined intervention of swimming and stroking has positive effects on the physical, psychological, and immune systems of newborns, and is effective in promoting the overall healthy development of newborns.

4 Conclusion

This study shows that neonatal swimming combined with touch intervention can significantly promote the growth and development of newborns, immune function and skin health. The newborns in the experimental group showed significant improvement in weight, length, psychological development, immune response and skin health, among which the body weight increased by 1.53 kg, the body length increased by 2.6 cm, the psychological development score increased by 7.8 points, the immune response was enhanced, and the skin injury rate decreased significantly. These results indicate that the combined intervention of swimming and touching can not only help the physiological development of newborns, but also improve their psychological state and immune function, which has high clinical application value and has a positive impact on promoting the overall health of newborns.

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