주요개념 : 연하장애

The effect of sensorimotor stimulation for ingestion in dysphagic patients who have nonprogressive brain damage*

— Preliminary Study —

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I. Introduction

Nonprogressive diseases and trauma to the central nervous system may result in numerous residual problems. The residual problems associated with sensory and motor loss may interfere with the person's functional status. One of the residual problem is dysphagia.

Dysphagic problems are seen frequently in patients in rehabilitation centers(Griffin, 1974) and management of dysphagia is a common concern for nurses as well as other rehabilitation teams(Larsen & Mikulic, 1976).

When central nervous system damage occurs, the sensorimotor reflexes involved in ingestion may be weakened or damaged due to the inbalance in the neuromuscular system(Silverman & Elfant, 1979). If the upper motor neuron system or cortex are damaged or destroyed, the person may appear to be unable to initiate the act of swallowing or to coordinate the various steps involving deglutition(Larsen & Mikulic, 1976 ; Larsen, 1976).

Marshall (1985) divides the disorder of deglutition into two categories ; Oropharyngeal dysphagia and Esophageal dysphagia. Oropharyngeal dysphagia includes the oral preparatory phase, the oral phase, and pharyngeal phase. Esophageal dysphagia includes the esophageal phase. Dysphagia also can be divided according to the causes of neurological deficits into three major categories: mechanical, paralytica, and pseudobulbar (Larsen & Mikulic, 1976).

When dysphagia is continued for a long time, it can lead to malnutrition and an inadequate hydration. In addition, aspiration pneumonia, airway obstruction, and irritation of the mucus membrane may occur(Griffin, 1974 ; Loustan & Lee, 1985).

To prevent and solve these problems, nurses need to be able to facilitate deglutition for patients who have dysphagia to improve oropharyngeal function as soon as possible after the damage to the brain(Larsen & Mikulic, 1976, Gaffney & Campbell, 1974). Thus, it is important to develop effective nursing intervention methods. In the case of pseudobulbar dysphagia, during the oral-preparatory, the oral, and the pharyngeal phases, pathology usually causes a disintegration of the sensorimotor integration associated with a coordinated swallow. Therefore, sensorimotor stimulation techniques may be used in an attempt to regain / relearn oropharyngeal function. Gaffney & campbell(1974) proposed feeding techniques for dysphagic patients based on stimulating receptors which enhanced lip closure, sucking, and swallowing. Also Williams et al(1983) conducted researchh

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about sensory stimulation techniques for retraining swallowing. But, the use of sensorimotor stimulation techniques as a nursing intervention in caring for dysphagic patients who have had nonprogressive brain damage has not been sufficiently explored for implementation by nurses.

Statement of the problem

What is the effect of a nursing intervention using sensorimotor stimulation in dysphagic patients who have had nonprogressive brain damage?

Purpose

The purpose of this study is to identify the effect of a nursing intervention using sensorimotor stimulation technique in dysphagic patients.

Hypotheses

1. Degree of head and neck control post sensorimotor stimulation will be greater than pre stimulation.
2. Chewing ability post sensorimotor stimulation will be greater than pre stimultion.
3. Degree of lip control post sensorimotor stimulation will be greater than pre stimulation.
4. Degree of tongue control post sensorimotor stimulation will be greater than pre stimulation.
5. Swallowing ability post sensorimotor stimulation will be greater than pre stimulation.

Operational Definitions of Terms

Oropharyngeal dysphagia : oropharyngeal dysphagia includes uncontrolled head and neck movement, weak chewing ability, poor lip movement, tongue immobility and inability to swallow.

Sensorimotor stimulation : sensorimotor stimulation includes exteroceptive stimulation and proprioceptive stimulation. Specific stimulation techniques are found in the sensorimotor stimulation program plan (see p. 10)

Nonprogressive brain damage : damage to the brain as a result of traumatic injury, vascular damage or surgical trauma.

Theoretical Background

This theoretical background will address two issues, the physiology of normal swallowing and the rationale for sensorimotor stimulation for dysphagia.

Process of swallowing

Swallowing is a complex function and requires coordinated activity of multiple structures such as lips. tongue, palate, jaws, pharynx, larynx, and respiratory muscles(Kagel, 1983 ; Jean & Car, 1979 ; Williams et al, 1983; Sochaniwskyj et al, 1986 ; Zimmerman & Oder, 1981; Logeman, 1983).

Therefore, adequate functioning of the structure including lips, tongue, and cheeks is necessary to maintain the lip seal and transport the ingested material to the pharyngeal area of the oral cavity(Williams, et al, 1983). Other factors contributing to the normal process of swallowing include head position, sitting posture(Sochaniwskyj, 1986 ; Gaffney & Campbell, 1974 ; Ogg, 1975) and the Gag-reflex. The Gag reflex is an involuntary movement or a protective reflex. If the Gag reflex is hypoactive or hyperactive it can interfere with feeding, increasing the likelihood of choking and aspiration.

Swallowing may be initiated either voluntarily or reflexly and the swallowing is assumed to be coordinated by a swallowing center in the medulla oblongate(Larsen, 1972 ; Jean & Car, 1979 ; Silverman & Elfant, 1979 ; Zimmerman & Oder, 1981).

Sensory receptors surrounding the entrance to the oropharynx carry impulses by cranial nerves V, Ⅸ, and Ⅹ to the brain stem. A swallowing center coordinates reflex activity and relays motor signals by cranial nerves V, Ⅶ, Ⅸ, Ⅹ, and XII to the muscles that affect swallowing (Zimmerman & Oder, 1981 ; Silverman & Elfant, 1979 ; Donner, 1974).

The process of swallowing has been divided into two (Marshall, 1985), three (Dobie, 1978 ; Silverman & Elfant, 1979 ; Sochaniwskyj et al, 1986 ; Larsen, 1976), or four phases (Logemann, 1983). In this study, I have chosen to use the four phases : Oral preparatory phase, Oral phase, Pharyngeal phase, and Esopharyngeal phase as discussed by Logemann.

Sensorimotor Learning

Learning is an enduring change in a living individual that is not heralded by genetic inheritance(Bigge, 1982).

It may be considerered a change in insights, behavior, perception, or motivation or a combination of these. Accrodingly, motor learning can be considered an enduring change in motor behavior not associated with normal growth and development. Motor learning focuses almost entirely on how the skill is learned, controlled, and retained.(Gliner, 1985).

Motor learning is a combination of sensory input, motor output, and sensory feedback, Most of motor learning occurs and is integrated at subcortical levels of the nervous system(Farber, 1974). The function of the nervous system is to receive, integrate, and respond to meaningful stimuli based on previous experience and current stimuli. Over 80% of the nervous system is involved in processing or organizing sensory input and one of the primary concerns of the brain is intergration(Ayres, 1980).

Sensory integrative theory has been developed to explain the brain's ability to learn how to do something (Ayres, 1980). Therapy based upon sensory integrative theory is used in an intervention program to ameliorate neurological dysfunction and promote learning ablity (Ayres, 1980) Sensory integation can be improved through controlling sensory input to activate brain mechanisms. Sensorimotor stimulation is used as a means to enhance sensorimotor integration.

Sensorimotor stimulation is designed to produce an adaptive response(Ayres, 1980) which is defined as behavior of a more advanced, organized, flexible or productive nature than that which occurred before the stimulation(Farber, 1982). The goals of sensorimotor stimulation are to initiate desired movement, facilitate weak movement and inhibit undesired movement for purposeful and coordinated motor behavior. There are three kinds of receptors of the nervous system which are readily available for stimulation in an attempt to improve function(Regina, 1966)

In sensorimotor stimulation therapy, intervention relies on the use of the exteroreceptors and the proprioceptors and not the interoceptors. It is assumed that behaviors were learned through the exteroceptive and proprioceptive stimulation(Kelso, 1982)

There are various modalities as a means of stimulating the exteroceptors and the proprioceptors to enhance sensorimotor integration(Farber, 1982 ; Heiniger & Randolph, 1981 ; Regina, 1966).

In this study, intervention is focused on relearning of oropharyngeal function in nonprogressive brain damage patients. Icing, quick stretch, vibration, and pressure / - stretch pressure will be utilized as an exteroceptive and / or proprioceptive stimulation. These modalities have been identified as a means to improve an oropharyngeal function (Gaffney & Campbell, 1974 ; Holser-Bueheler, 1966; Williams et al, 1983 ; Silverman & Elfant, 1979 ; Farber, 1982).

Based on the theoretical background that has been reviewed, following theoretical definitions were developed. Since the interventions are based upon theoretical explanations of how muscles learn to behave in an integrated manner, the conceptual framework of this study is based on sensorimotor integration theory as a motor learning theory.

In order to improve oropharyngeal function in the dysphagic patient with nonprogressive brain damage, sensory input that facilitates desired patterns of motor behavior, inhibits undesired patterns of motor behavior, and imitates lost patterns of motor behavior in the process of swallowing will be selected.

Sensory input through exteroceptors and proprioceptors will be integrated in the spinal cord and subcortical level. As a result, motor behavior may be learned. Ultimately, oropharyngeal function may be improved and complication due to dysphagia may be prevented. Theoretical definitions for sensorimotor stimulation and its applicability to dysphagic patient care is presented in figure 1.

Constructs	Sensorimotor stimulation	Learning process	Functional motor behavior
Concepts	Exteroceptive & Proprioceptive stimulation	C.N.S. integration··· Motor out put	New / Relearned Adaptive motor behavior
Operational definition	Icing & Quick stretch, etc.	Development of engrame	Improved oroph aryngeal function

Figure 1. Theoretical definition for the use of sensorimotor stimulation to enhance learning.

Method

Subjects

The subjects were dysphagic patients who have had nonprogressive brain damage as adults and hospitalized in the oriental medicine hospital of K. University. The subjects were selected by the following criteria for the duration of the study.

1) Subjects who were diagnosed as having nonprogressive brain damage by the physician.
2) Patients who had an oropharyngeal dysfunction (oropharyngeal function test score : below 1 for two items)
3) Patients or patient representatives who have consented to participate in this study.

Eight patients with dysphagia were selected. But, two subjects were excluded from an analysis of the study because of mortality.

Design

The disign of this study was an one group pretest-posttest design which is a pre-experimental design. All subjects were treated with sensori-motor stimulation and their oropharyngeal function were measured pre and post stimulation.

Sensorimotor stimulation program plan

A specific stimulation plan were devised based on a dysfunctional area of the subjects. For each modality, subjects were systemically stimulated for 30 minutes, prior to each meal and 3 times per day. Treatment was implemented for a week.

The specific sensorimotor stimulation program was as follows :

Head and neck control

- For neck flexion, quick stretch the patient's extensor neck muscle toward the direction of the bend(5 times).
- For lateral bend, quick stretch push the patient's head laterally(5 times).

Chewing ability

- Vibrate masseters bilaterally.
- Stretch mouth wide open, closing.

Lip control

- for lip closure,
  1) quick stretch orbicularis oris(5 times)
  2) push the top lip up and bottom lip down using the thumb and forefinger.
- For opening,
  1) quick stretch the top lip down and bottom lip up (5 times)
  2) slight pressure with finger or spoon on the chin just below the lower lip
- For retraction, stretch the commissares of the lips laterally(5 times)
- For pursing, blow paper ball.
- For sucking, quick stretch to orbicularis oris by pushing top lip up and bottom lip down(5 times).

Tongue control

- For protraction, push on the tongue tip with the spoon handle(5 times)
- For retraction, vibrate under the chin with finger(5 times)
- For lateralization, press the spoon handle intermitten-

tly against the lateral surface of the tongue(5 times)

- For elevation, use the spoon handle to touch the roof of the mouth(5 times)

Swallowing

- Quick icing at sternal notch (for 3 seconds, total time of application : 30 seconds.)
- Place thumb on the patient's chin and press downward toward his sternum(5 times).

Measuring tool

Oropharyngeal function was assessed by oropharyngeal function evaluation tool which was modified from Silverman and Elfant's pre-feeding evaluation tool(1979) and the Dayhoff and Lai's oropharyngeal assessment tool(1980). This modified tool assesses five oropharyngeal function areas and is comprised of 13 items. The degree of function in the each item were measured by 4 point scale and a score of each functional area were obtained by summing the score of each item belonging to the area. Higher scores indicated better oropharyngeal function. In the study, the interrater reliability of the tools which measured 5 oropharynageal function area were as follows: Head & neck control(r=.9803), Chewing ability(r=1.0), Lip control(r=.9865), Tongue control(r=1.0). Swallowing ability(r=1.0), Overall, interrater reliabilty was very high, indicating, the modified tool was highly reliable.

Analysis of data

The data collected were analyzed by the paired t-test to test hypotheses on the effect of sensorimotor stimulation for dysphagic patients.

Results

Of the six subjects, two were male and four were female. All the subjects has cerebral infarction(Cb. Infarction). Only one subject had complete oropharyngeal dysfunction. The characteristics and oropharyngeal function prestimulation of all subjects are shown in <Tabel 1> and <Table 2>

<Table 1> Characteristics of subjects

Subject No.	Sex	Age	Medical diagnosis
1	F	54	Cb. infarction, ishomic heart disease
2	M	60	Cb. infarction, pneumonia
3	F	54	Cb. infarction
4	F	59	Cb. infarction
5	F	65	Cb. infarction, hypertension
6	M	61	Cb. infarction

<Table 2> Score of Oropharyngeal function Prestimulation

Area & item	Subject No.	1	2	3	4	5	6
Head & neck control		12	4	0	8	12	4
flexion		3	1	0	2	3	2
extention		3	1	0	2	3	2
turn R.		3	1	0	2	3	0
turn L.		3	1	0	2	3	0
Chewing Ability		2	0	0	2	3	0
Lip control		8	0	0	4	1	2
closure		1	0	0	2	0	0
opening		2	0	0	2	0	2
retraction		2	0	0	0	1	0
parsing		2	0	0	0	0	0
sucking		1	0	0	0	0	0
Tongue control		9	0	0	5	6	8
protraction		3	0	0	1	2	2
retraction		2	0	0	2	2	2
lateralization		2	0	0	2	2	2
elevation		2	0	0	0	0	2
Swallowing ability		0	0	0	2	1	2

The analysis of effects of sensorimotor stimulation. The mean of head and neck control pre stimulation was 6.67 and the mean of head and neck control post stimulation was 10.0. This was significant by different($t=-2.71$, $df=5$, $p=.042$). Therefore the first hypothesis was supported<see Table 3>.

〈Table 3〉 Differences in Head & neck control Pre and Post stimulation

	Mean	S.E	t-value	df	p
Pre stimulation	6.67	1.98	−2.71	5	.042*
Post stimulation	10.00	.89			

*p<.05

The chewing ability post stimulation has increased but did not show statistical significance(t=−2.00, df=5, p=.102). Therefore, the second hypothesis was not supported 〈see Table 4〉.

〈Table 4〉 Differences in Chewing ability Pre and Post stimulation

	Mean	S.E	t-value	df	p
Pre stimulation	1.17	.54	−2.00	5	.102
Post stimulation	1.83	.48			

The degree of lip control pre stimulation was 2.50 and degree of lip control post stimulation was 7.33. Therefore, the third hypothesis was supported(t=−4.77, df=5, p=.005)〈see Table 5〉.

〈Table 5〉 Differences in Lip control Pre and Post stimulation

	Mean	S.E	t-value	df	p
Pre stimulation	2.50	1.26	−4.77	5	.005**
Post stimulation	7.33	1.91			

**p<.01

The mean of tongue control pre stimulation was 4.67 and the mean of tongue control post stimulation was 6.83. This was significantly different(t=−3.61, df=5, p=.015). Therefore the hypothesis 4 was supported.〈see Table 6〉.

〈Table 6〉 Differences in Tongue control Pre and Post stimulation

	Mean	S.E	t-value	df	p
Pre stimulation	4.67	1.59	−3.61	5	.015*
Post stimulation	6.83	1.67			

*p<.05

The swallowing ability post stimulation has increased but did not show statistical significance(t=−2.24, df=5, p=.076). Therefore the hypothesis 5 was not supported 〈see Table 7〉.

〈Table 7〉 Differences in swallowing ability Pre and Post stimulation

	Mean	S.E	t-value	df	p
Pre stimulation	.83	.40	−2.24	5	.076
Post stimulation	1.33	.49			

Discussion

The result of this study should be interpreted with limited sample size and subject as it's own control. Even though hypothesis 2 and 5 was not supported, all of the oropharyngeal function has increased after the sensorimotor stimulation.

These results support previous studies results [Holser-Buebler(1966) ; McCracken (1978) ; Silverman & Elfant (1979), Zimmerman and Oder (1981)].

There were significant differences in degreee of head and neck control between pre and post stimulation. This results adds to the earlier studies which reported degree of head and neck control increase.

Chewing ability post stimulation has increased, but did not reach statistical significance.

In a study of Silverman and Elfant(1979), clinical improvement was observed. But, their validity and effectiveness have not been measured objectively.

Hypothesis 2 was not supported because of small sample size. But the increase occured in the predicted direction. There were significant differences in the degree of lip control between pre and post stimulation. Gaffney and Campbell(1974) reported an increase on the degree of lip control post stimulation in the care of an elderly woman who had paralysis of muscles of lips.

The result of this also supports previous studies (McCracken 1978), Silverman & Elfant(1979), Zimmerman & Oder(1981)

There were significant differences on the degree of tongue control between pre and post stimulation. This result were supported with previous study [Gaffney, and Campbell(1978) ; Farber(1982)].

The swallowing ability post stimulation also increased but possible explanation is that hypothesis 5 was not supported because of small sample size. Whereas, previous studies reported an increase in swallowing ability post stimulation [Regina(1974) ; Holser-Baebler(1966) ; Gaffney & Campbell(1974) ; Silverman & Elfant(1979); Eimmerman & Oder(1981)].

Therefore one can infer from this study that the sensorimotor stimulation using icing, quick stretch, vibration, pressure / stretch pressure was effective in improving oropharyngeal function in patients with dysphagia.

Further study with larger study with control groups will be necessary before generalizing it to other population. However, it is encouraging to obtain an improvement of function in this small population.

Summary

This study was conducted to identify the effect of a nursing intervention using sensorimotor stimulation technigue in dysphagic patients.

The subjects were 6 dysphagic patients who have had nonprogressive brain damage as adults and hospitalized at the oriental medicine hospital of K. university from march through may 1988. All subjects were treated sensorimotor stimulation and their oropharyngeal functions were measured pre and post stimulation.

The data collected through above methods were analyzed by paired t-test and resuts were as follows.

1. Degree of head & neek control, lip control, and tongue control post sensorimotor stimulation were greater than prestimulation.
2. The chewing ability and swallowing ability post stimulation has increased but did not show statistical significance.

Therefore, one can infer from this study that sensorimotor stimulaion using icing, guick streteh, etc. was effective in improving oropharyngeal function in patient with dysphagia.

References

Ayres, A. J. *Sensory integration and the child,* L. A. : Western Psychological Services, 1979.

Ayres, A. J. *Sensory integration and learning disorders,* L. A. : Western Psychological Services, 1980.

Bigge, M. *L. Learning theories for teachers* (4th ed.), New York : Harper & Row Publishers, 1982.

Dayhoff, N. E., & Lai, C. L. *Oral-pharyngeal function : Assessment and evaluation,* Indianapolis : Indiana University, unpub lished, 1980.

Dobie, R. A. Rehabilitation of swallowing disorders, *American Family Physician,* 17(5), 84-95, 1978.

Farber, S. D. *Neurorehabilitation : A multisensory approach. Philadelphia : W.B.* Saunders & Co., 1982.

Gaffney, T. W., & Campbell, R. P. Feeding techniques for dysphagic patients. *American Journal of Nursing,* 74(12), 2194-2195, 1974.

Glimer, J. A. Purposeful activity in motor learning theory: An event approach to motor skill acquisition. *The American Journal of Occupational Therapy,* 39 (1), 28-34, 1985.

Griffin, K. M. Swallowing training for dysphagic patients, *Archives of Physical Medical and Rehabilitation,* 55, 467-470, 1974.

Heiniger, M. C., & Randolph, S. L. *Neurophysiological concepts in human behavior.* St. Louis : The C. V. Mosby Co., 1981.

Helfrich-Miller, K. R., Rector, K. L., & Straka, J. A. Dysphagia : Its treatment in the profoundly retarded patient with cerebral palsy. *Archives of Physical Medical and Rehabilitation,* 67, 520-525, 1986.

Holser-Buehler, P. The Blanchard method of feeding the cerebral palsied. *The American Journal of Occupational Therapy,* 2, 79-85, 1966.

Jean, A., & Car, A. Inputs to the swallowing medullary neurons from the peripheral afferent fibers and the swallowing cortical area. *Brain Research,* 178, 567-572, 1979.

Kelso, J. A. Scott. Human motor behavior an introduction, Hillsdale : New Jersey, *Lawrence Erlbaum Associates,* Inc., 1982.

Larsen, G. L. Rehabilitation for dysphagia paralytica. *Journal of Speech and Hearing Disorders,* 187-193, 1972.

Larsen, G. L. Rehabilitating dysphagia : Mechanica, paralytica, pseudobulbar, *Journal of Neurosurgical Nursing,* 8(1), 14-17, 1976.

Larsen, G. L., & Mikalic, M. A. Nursing interventions in dysphagia rehabilitation. *Rehabilitation Nursing,* 1(4), 13-16, 1976.

Leopold, N. A., & Kagel, M. C. Swallowing, ingestion, and dysphagia : A reappraisal. *Archives of Physical Medicine and Rehabilitation,* 64, 371-373, 1983.

Logemann, J. A., & Veis, S. L. Swallowing disorders in persons with cerebrovascular accident, *Archives of Physical Medicine and Rehabilitation,* 66, 372-375, 1985.

Logemann, J. *Evaluation and treatment of swallowing disorders,* San Diego : College-hill Press, 1983.

Loustau, A., & Lee, K. A. Dealing with the dangers of dysphagia, *Nursing* 85, 15(2), 47-50, 1985.

Marshall, J. B. Dysphagia : Pathophysiology, causes and evaluation, *Postgraduate Medicine,* 77(5), 58-68, 1985.

McCracken, A. Drool control and tongue thrust therapy for the mentally retarded. *The American Journal of Occupational Therapy,* 82(2), 79-85, 1978.

Ogg, H. L. Oral-pharyngeal development and evaluation. *Physical Therapy,* 55(3), 235-241, 1975.

Regina, E. Sensory stimulation techniques. *American Journal of Nursing,* 66(2), 281-286, 1966.

Silverman, E. H., & Elfant, I. L. Dysphagia : An evaluation and treatment program for the adult. *The American Journal of Occupational Therapy,* 33 (6), 382-392, 1979.

Sochaniwskyj, A. E. et al. Oral motor functioning, frequency of swallowing and drooling in normal children and in children with cerebral palsy. *Archives of Physical Medicine and Rehabilitation,* 67, 866-873, 1986.

Williams, H., et al. Treating dysphagia, *Journal of Gerontological Nursing,* 9(12), 638-647, 1983.

Zimmerman, J. E., & Oder, L. A. Swallowing dysfunction in acutely ill patients. *Physical Therapy,* 61 (12), 1755-1763, 1981.

국문초록-

연하장애 환자의 구강인두 기능회복을 위한 감각운동 자극의 효과*

강 현 숙**

·운동학습이론인 감각운동 통합이론을 본 연구의 개념적 틀로하여 한방병원에 입원한 뇌졸중 환자중 구강인두기능이 저하된 환자를 대상으로 감각운동자극이 구강인두기능에 미치는 효과를 조사하기 위하여 1988년 3월초부터 5월 중순까지 예비실험연구하였다.

감각운동자극을 주기 전에 구강인두기능을 사정하고 대상자 전원에게 저하된 구강인두기능에 따라 감각운동자극을 선택하여 하루 3번 매식후 30분전에 주었으며, 이를 일주일 동안 계속하였다.

일주일 후 다시 구강인두기능을 측정하여 자극을 주기 전, 후의 기능정도를 paired t-test로 비교 분석하였으며 다음과 같은 성적을 얻었다.

1. "자극을 주기 전보다 준 후에 머리와 목운동 조절점수가 높을 것이다"라는 제1가설은 지지되었다 ($t=-2.71$, $df=5$, $p=.042$).
2. "자극을 주기 전보다 준 후에 씹는 능력이 증가되었으나, 통계적으로는 유의하지 않았다 ($t=-2.00$, $df=5$, $p=.102$).
3. "자극을 주기 전보다 준 후에 입술운동의 조절점수는 높을 것이다"라는 제3가설은 지지되었다 ($t=-4.77$, $df=5$, $p=.005$).
4. "자극을 주기 전보다 준 후에 혀운동 조절점수가 높을 것이다"라는 제4가설은 지지되었다 ($t=-3.61$, $df=5$, $p=.015$).
5. 자극을 주기 전보다 준 후에 연하능력이 증가되었으나 통계적으로는 유의하지 않았다 ($t=-2.24$, $df=5$, $p=.076$).

이상의 결과로 감각운동자극은 연하장애환자의 구강인두기능을 증진시키는데 효과적인 방법이라고 할 수 있다.

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