

# Physical therapist perception survey for muscle re-education through visual feedback obtained from rehabilitative ultrasound imaging

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**Objective:** This study surveyed the perceptions of physical therapists on muscle re-education through visual feedback obtained from rehabilitative ultrasound imaging (RUSI).

**Design:** Survey.

**Methods:** For this study, 500 physical therapists who participated in a refresher training held by the Seoul City Association in March 2015 were selected for a questionnaire-based survey. Subjects were randomly selected targets physiotherapists who participated in a refresher training. The questionnaire had 21 items in total. Questions 1 to 15 could be answered by everyone. However, questions 16 to 21 could be answered only by people who used RUSI.

**Results:** The majority of respondents were aged 20 to 30 years. Respondents in their twenties, thirties, forties, and fifties accounted for 32.4%, 40.2%, 21.9%, and 5.6% respectively. Therapists with careers spanning one to 5 years accounted for 27.8%, while those with careers spanning 5 to 10 years and 10 to 15 years accounted for 34.6% and 17.0%, respectively. Those with careers over 20 years accounted for 9.2%. The types of work have not been various including work related to the nervous system (49.0%), the musculoskeletal system (41.5%), sports (0.7%), juvenile physical therapy (4.2%), and others (4.6%).

**Conclusions:** In this study, we examined the perceptions of physical therapists on rehabilitation ultrasound imaging used in muscle re-education. We also examined how to use this technique. Many therapists who participated in the refresher training were found to be unaware of RUSI. In the future, further investigations on RUSI for muscle re-education are required through refresher training or training lectures at the national level.

**Key Words:** Physical therapy, Ultrasound, Survey

## Introduction

Various diagnostic imaging techniques, including magnetic resonance imaging, computed tomography, and ultrasound imaging, are being used to treat patients. Among them, magnetic resonance imaging (MRI) provides high resolution, selective images, and multi-aspect images. Therefore, this technique is considered most effective for the observation and evaluation of soft tissues. However, it is diffi-

cult to use this technique because of high cost [1-3].

In contrast, ultrasound imaging is easy to use and control, and has low cost. Furthermore, it is being used as a non-invasive and safe means of examining myoarchitectonic characteristics [4]. Quantitative analysis on myoarchitectonics is available through ultrasound imaging [5,6]. Rehabilitative ultrasound imaging (RUSI) is a technique by which physical therapists can perform muscle re-education through visual feedback [5,7,8]. In general, muscle RUSI is being

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used to measure various aspects of muscles, including thickness, cross section, and the muscle volume in patients undergoing rehabilitation [7,9-12].

Previous studies performed overseas indicate that the increased usage of RUSI by physical therapists [5] has resulted in an increase in the use of ultrasound imaging in practice. Furthermore, therapists argue that education and environmental setting are very important to optimize the effects of rehabilitation. In addition, those authors reported that ultrasound imaging is widely used as a tool for muscle re-education by using visual feedback to review the symptoms on a real-time basis. However, there are not many opportunities for learning ultrasound imaging accurately and the costs are very high; therefore, many therapists are reluctant to learn it. Furthermore, this technique is performed with help from radiologists in many cases [5]. Potter *et al.* [9] discussed which body parts RUSI is often used on, the effects of its use, and techniques for handling the device when physical therapists use RUSI in their fields. In addition, it has been reported that the majority of physical therapists face environmental problems, difficulties in education measurement using ultrasound devices, education time, and range of utilization. It has been shown that in other countries, re-education is frequently performed by evaluating muscle structure through ultrasound imaging. In addition, associations organize lectures for the utilization of RUSI [5,9,13].

Ultrasound imaging is used very rarely for muscle re-education in patients by physical therapists in Korea. Not enough studies have been conducted in Korea; therefore, there is a lack of objective parameters on the use of ultrasound imaging for clinical training and practice, on how much therapists know about using ultrasound imaging, and on the perceptions of physical therapists.

Accordingly, this study was conducted to determine the perceptions, basic objective data, and current state of RUSI used for muscle re-education through visual feedback.

## Methods

### Subjects

For this study, 500 physical therapists who participated in a refresher training held by the Seoul City Association in March 2015 were selected for a questionnaire-based survey. Subjects were randomly selected targets physiotherapists who participated in a refresher training. The inclusion criteria of the study is a physiotherapist to attend the refresher

training. There is no exclusion criteria.

### Research method

The questionnaire used in this research consisted of 18 items including open- and closed-ended questions proposed by Mckiernan *et al.* [5]. The open questions consisted of information and addressed the level of use and demographic statistics. The closed questions were restructured for the setting in Korea and consisted of perceptions on the results of training that incorporated ultrasound imaging and general information. The questionnaire consists of 21 items in total. Items 1 to 8 address general information while items 9 to 15 are about the use and perception of ultrasound imaging. Items 16 to 21 were answered by physical therapists who performed re-education through ultrasound imaging.

### Analysis

The collected data were analyzed using PASW Statistics ver. 18.0 (IBM Co., Armonk, NY, USA), which is a statistics program. Frequency analysis was performed on the perceptions of information, while the chi-square test was performed on the relationships between the type of service career and the type of education. The level of significance was set as  $p < 0.05$ .

## Results

Questionnaires were distributed randomly to 500 physical therapists and the collection rate was 60.0%. The majority of respondents were aged from 20 to 30 years. Respondents in their twenties, thirties, forties, and fifties accounted for 32.4%, 40.2%, 21.9%, and 5.6%, respectively. Therapists with careers spanning one year to 5 years accounted for 27.8%, while those with careers spanning 5 to 10 years and 10 to 15 years accounted for 34.6% and 17.0% of all therapists, respectively. Those with careers of over 20 years accounted for 9.2%. The types of work have not been various including work related to the central nervous (49.0%), the musculoskeletal system (41.5%), sports (0.7%), pediatric physical therapy (4.2%), and others (4.6%) (Figure 1).

Therapists were found to work at rehabilitation hospital (25.8%), clinic (25.2%), semi general hospital (14.7%), university hospital (11.8%), and nursing home (8.5%) (Table 1). Regarding questions about RUSI, 26.7% of the therapists surveyed had heard of muscle re-education, while 73.3% of them had not. Furthermore, only 7.6% of the therapists had used RUSI. Of the therapists who used RUSI, 1.2%, 3.6%,

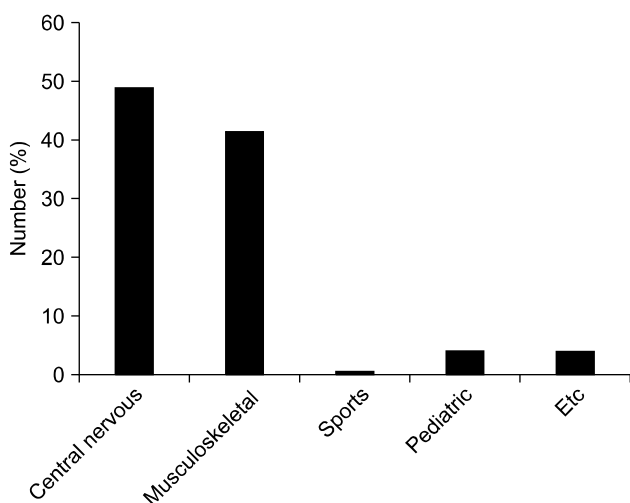


Figure 1. Question: Do physical therapy in certain areas?

Table 1. General characteristics of respondents (N=306)

Characteristic	Division	Number (%)
Gender	Male	166 (53.9)
	Female	140 (45.8)
Age (y)	20-29	99 (32.4)
	30-39	123 (40.2)
	40-49	67 (21.9)
	50-59	17 (5.6)
	Others	0 (0)
Education	College graduation	90 (29.4)
	Bachelor	161 (52.6)
	Master	48 (15.7)
	Doctor	3 (1.0)
	Others	4 (1.3)
Office	University hospital	36 (11.8)
	Semi general hospital	45 (14.7)
	Rehabilitation hospital	79 (25.8)
	Nursing home	26 (8.5)
	Clinic	77 (25.2)
	Others	43 (14.1)
Career (y)	1-5	85 (27.8)
	5-10	106 (34.6)
	10-15	52 (17.0)
	15-20	35 (11.4)
	>20	28 (9.2)
Field	Central nervous	150 (49.0)
	Musculoskeletal system	127 (41.5)
	Sports	2 (0.7)
	Pediatric therapy	13 (4.2)
	Others	14 (4.6)
No. of treatment	<10	45 (14.7)
	10-15	121 (39.5)
	15-20	39 (12.7)
	>20	88 (28.8)
	Others	13 (4.2)

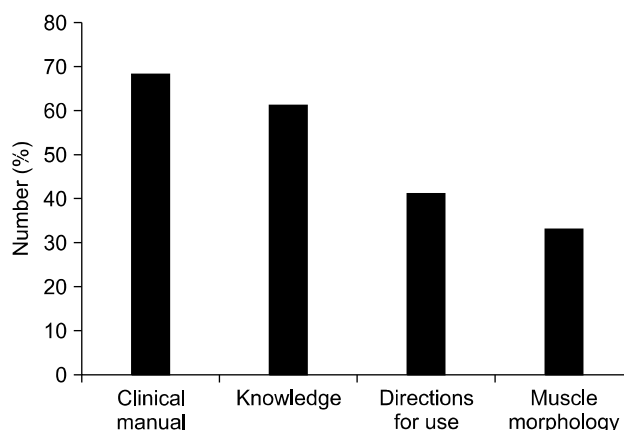


Figure 2. Question : Do you think that information you about the rehabilitative ultrasound image needed for muscle re-education?

0.4%, and 1.2% used this technique at their universities, graduate schools, academies, and seminars, respectively. However, none of the therapists and used or are currently using the technique at their work places. Regarding the information on the use of RUSI for muscle re-education, the questions related to use in clinical trials, basic information on ultrasound imaging, handling machines, and the morphology of muscle accounted for 68.9%, 61.4%, 41.4%, and 33.5% of the questions, respectively (Figure 2).

Regarding the information on RUSI according to education level, there were significant differences in the answers on the use of this technique ( $p < 0.05$ ), while no significant difference was found in the other answers (Table 2).

When asked about education on RUSI, 49.8%, 21.5%, 18.7%, and 15.5% of the respondents preferred training lectures, refresher training, online education, and individual study, respectively (Figure 3).

Regarding questions about measurement of education on RUSI according to career, significant differences were found in online education ( $p < 0.05$ ) while the other answers did not show significant differences (Table 3).

When asked about how the therapists would utilize RUSI even if they did not currently use it, 61.0%, 43.4%, 37.1%, and 26.7% of the therapists answered that they will use it for motivating patients, obtaining biofeedback, checking results from rehabilitation therapy, and application to various therapeutic environments.

### Discussion

This study examined the perceptions of therapists on RUSI. Many therapists were found not to use RUSI.

**Table 2.** Use of rehabilitative ultrasound image in accordance with the education

Ultrasound information	Types of education					Total	X <sup>2</sup> /p
	1	2	3	4	5		
Knowledge	47 (59.50)	81 (59.10)	23 (60.50)	1 (100)	3 (100)	155 (60.07)	2.72/0.61
Directions for use	33 (41.80)	57 (41.60)	21 (55.30)	0 (0)	1 (33.30)	112 (43.41)	3.33/0.50
Clinical manual	60 (75.90)	89 (65.00)	31 (81.60)	0 (0)	1 (33.30)	181 (70.15)	9.69*/0.05
Muscle morphology	26 (32.90)	43 (31.40)	15 (39.50)	0 (0)	2 (66.70)	86 (33.33)	2.89/0.58
Etc.	2 (2.50)	2 (1.50)	1 (1.60)	0 (0)	0 (0)	5 (1.93)	0.49/0.98

Values are presented as number (%).

1: associate degree, 2: bachelor degree, 3: master, 4: doctor, 5: etc.

\* $p < 0.05$ .

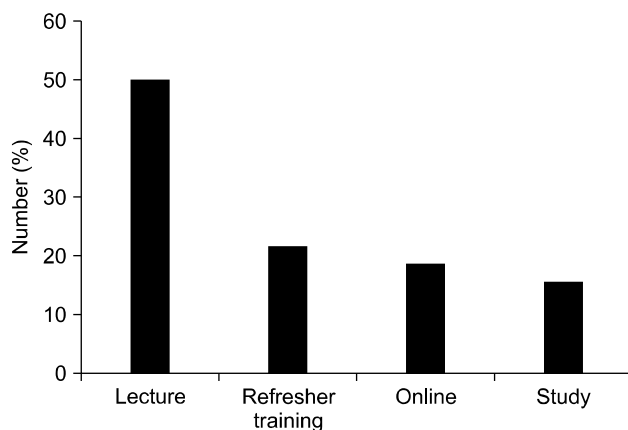
**Table 3.** Training methods of rehabilitative ultrasound image in accordance with the work experience

Education system	Type of service career					Total	X <sup>2</sup> /p
	1	2	3	4	5		
Lecture	39 (42.90)	47 (58.00)	20 (50.00)	13 (59.10)	12 (52.20)	131 (57.70)	4.62/0.33
Refresher training	23 (25.30)	17 (21.00)	8 (20.00)	3 (13.60)	3 (33.30)	54 (20.93)	2.62/0.62
Online	17 (18.70)	10 (12.30)	6 (15.00)	4 (18.20)	10 (33.30)	47 (18.21)	11.98*/0.02
Study	15 (16.50)	12 (14.80)	8 (20.00)	4 (18.20)	2 (66.70)	41 (15.89)	1.57/0.81
Etc.	1 (1.10)	1 (1.20)	0 (0)	0 (0)	1 (4.30)	3 (1.16)	2.76/0.56

Values are presented as number (%).

1: 1 year-less than 5 years, 2: 5 year-less than 10 years, 3: 10 year-less than 15 years, 4: 15 year-less than 20 years, 5: over 20 years.

\* $p < 0.05$ .

**Figure 3.** Question : Do you think that any way appropriate to the training methods through the rehabilitative ultrasound image?

According to the results from this study, only 10% of the therapists had used ultrasound imaging for rehabilitation. Furthermore, none of them used this technique in the clinical setting. In addition, 73.2% of physical therapists answered that they did not use ultrasound imaging, but had heard of RUSI being necessary for muscle re-education. As indicated by our study, many physical therapists have not heard of

RUSI, but cannot use it in practice. Thus, there needs to be accurate information and education on how to use RUSI. In previous studies, more than 60% of therapists were trained in ultrasound. And that 67% of therapists have been trained in a short period of time. More than 30% of therapists were also in possession of an ultrasound equipment for practice [5].

Of the physical therapists, 68.9% have shown interest in the clinical usage of RUSI. Furthermore, 61.4% of the therapists were found to be interested in learning basic information on ultrasound imaging. Further, 49.8% of physical therapists wanted to participate in a training program. In cases of other countries, physical therapists are receiving enough education through lectures held by associations or through refresher training. Similar results came out before the Institute. Many wanted to receive further education, and wish to be through workshops and dvd [5,9]. Furthermore, many researchers are conducting studies on the utilization of RUSI [14].

For re-education with patients through visual feedback, therapists need accurate technique and ample practice [15]. Among the therapists who participated in this study, 54.6% and 36.9% have been found to work with the nervous system

and the musculoskeletal system, respectively. For having an accurate posture and therapeutic reaction of patients with nervous or musculoskeletal problems, high level of stimulation through visual feedback is required to motivate patients better [16,17]. Currently, visual feedback from RUSI is being provided actively for the abdominal muscles as well as the diaphragm and pelvic floor [18,19].

The results from this study have also shown that physical therapists who were surveyed recognized that ultrasound imaging helps muscle re-education by enabling closer visualization of the screen than by MRI and computed tomography, which is the merit of RUSI [20]. We found that 61.4% of therapists answered that motivation of patients is required, whereas 43.4% answered that biofeedback is required. van Vliet and Wulf [21] performed re-education through visual feedback and argued that rehabilitation ultrasound imaging is required for effective treatment. More studies need to be conducted on the merits and usage of RUSI. Furthermore, the restrictions and difficulties of using RUSI need to be addressed.

A limitation of this study is from a 60% response rate. For that reason it did not complete the questionnaire. And not everyone is submitted. For reasons that are not submitted people had no interest in ultrasound. And that was annoying surveys. We are also introduced to the questionnaire, and were encouraged to break every hour. But it seems that not enough attention because it is not subject gathered for the questionnaire. In addition, it seems that even a lack of interest in the ultrasound.

In this study, we examined the perceptions of physical therapists on rehabilitation ultrasound imaging used in muscle re-education. We also examined how to use this technique. Many therapists who participated in the refresher training were found to be unaware of RUSI. For this reason, the questionnaire collection rate was 60.0%; those who did not answer may not be aware of or be interested in RUSI.

However, the therapists who did answer were found to be very interested in RUSI and were well aware of its merits and utility. Respondents have shown perceptions on material or lecture for learning ultrasound imaging and wanted to learn through training lectures.

In the future, further investigations on RUSI for muscle re-education are required through refresher training or training lectures at the national level. The results from this study can be used as the basic data for increasing awareness on ultrasound imaging, and to establish a manual by which therapists can use the technique easily and a manual for important

of muscles re-education.

## Conflict of Interest

The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

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