The 28th International Meeting of Physical Therapy Science in Korea

Chairperson: HaeJung Lee    Silla University
Place: Silla University, Busan, Korea
Date: 12-14 July 2019

Vice Chairpersons
DongWook HAN    Silla University, Korea
Chunying HU    Capital Medical University, China

Secretary General
HeonSoo HAN    International University of Health and Welfare, Japan

Communications Consultant
ChanSik AHN    Eulji University, Korea
ByoungKwon LEE    Konyang University, Korea
Qiuchen HUANG    Capital Medical University, China
MyungChul KIM    Eulji University, Korea
DongKwon SEO    Konyang University, Korea

Joint Congress with 5th Korean Society of Integrative Medicine

Society of Physical Therapy Science
Contents

I. Special Lectures

Chair: MyungChul Kim Eulji University

HeonSoo HAN International University of Health and Welfare

1. Implementation of ICF in Physiotherapy Practice
   JUMIN SONG Silla University

2. Exercise therapy “SOUTAI Methods” devised in Japan
   HIROSHI NOBORI International Society of Exercise Science

II. Poster Presentations

Poster Presentation I

Chair: JUMIN SONG Silla University

P-J01. The Development of Video Motion Capture Dynamic Evaluation System
   QIUCHEN HUANG Capital Medical University

P-J02. The effects of a stretching of quadratus lumborum muscle on the tenderness and the pulmonary functions
   YONGJIN CHO Silla University

P-J03. Effects of different internal core intervention methods on the risk of anterior cruciate ligament injury in normal adult female during takeoff and fall
   WANYU LIN Capital Medical University

P-J04. Effects of shortened hamstring length on quadriceps femoris and hamstring activation during squat exercise
   SEUNG-JOO CHO Silla University

P-J05. Characteristics of Subjective Chair Sitting Posture Using 3D Motion Capture ‘Recognition of a Chair Sitting Posture Felt By a 20's Physical Therapist’
   MASUMI SHINGAI Gunma University of Health and Welfare

P-J06. Usage of WHODAS 2.0 in Korea
   HYEJIN HAM Silla University

P-J07. Effect of ergometer exercise during typing task on typing score
   SATOSHI OTAKEY International University of Health and Welfare

P-J08. Comparison of the trunk muscles activation according to the width of both arms during plank exercise.
   DUKWOON SUR Silla University

P-J09. The Effect of Scapulothoracic exercise and thoracic mobilization on Shoulder Pain and Function in Shoulder Partial thickness Rotator cuff tear
   MYUNG-CHUL KIM Eulji University

P-J10. Effect of different fixation methods on isometric knee extension muscle strength measurements using a hand-held dynamometer
   TAKAYOSHI SAITO International University of Health and Welfare

P-J11. Effects of speed and slope of treadmill on the cardiac functions when she walks with putting high-heeled shoes
   ARA KIM Silla University

P-J12. Correlation between diaphragmatic contraction pressure and slow vital capacity
   JAESEOK LEE Silla University
Poster Presentation II

Chair: Miyoko Watanabe  International University of Health and Welfare

P-J13. The Fick illusion increases toe-clearance when going up stairs
  YOSHIYUKI MURAKAMI  Himeji Dokkyo University.....15

P-J14. The comparison of muscles activation in lower extremity according to the position of ankle dorsiflexion and plantar flexion during resistance exercise
  SOHEE KIM  Silla University.............16

P-J15. Effects of Underwater Complex Exercise Therapy on Gait and Balance in Patients with Lower Extremity Fracture due to Traumatic Injury
  MYUNG-CHUL KIM  Eulji University............17

P-J16. Effects of stepping areas of high-heel on gastrocnemius and tibialis anterior activation during ascending stairs
  HYO-EUN KIM  Silla University............18

P-J17. Association of chest and abdominal wall mobility with physical activity and sedentary behavior in community-dwelling older adults
  HIDEO KANEKO  International University of Health and Welfare....19

P-J18. Effects of kinesiology taping of the ankle joint on quadriceps femoris and hamstring activation during squat exercises
  SO-JEONG KIM  Silla University............20

P-J19. The effects of smartphone use on pain and muscle activation of upper trapezius, and on pulmonary functions
  EUNCHONG PARK  Silla University............21

P-J20. Video motion capture dynamic evaluation system: Clinical application of the evaluation system
  CHUNYING HU  Capital Medical University.............22

P-J21. The effects of iliopsoas muscle stretching on the pulmonary functions
  JINA OH  Silla University............23

P-J22. What does neck posture mean?
  YEYOOON PARK  Silla University............24

P-J23. Relationship between gait ability and gait imagery in elderly individuals who require care
  MIYOKO WATANABE  International University of Health and Welfare.................25

P-J24. Korean version of Neck Disability-10 and Fear Avoidance Beliefs Questionnaire-Neck version: reliability and linking to ICF
  SUJI KIM  Silla University............26

Poster Presentation III

Chair: Satomi Kobayashi  Tsukuba International University

P-J25. Relationship between the degree of left-right difference in hip internal rotation range of motion and static standing balance ability
  HEONSOO HAN  International University of Health and Welfare.................27

P-J26. Immediate effects of the ankle rolling exercise and the Thera-band Exercise on ankle joint R.O.M and muscles activation.
  DAEHYUN JUNG  Silla University............28

P-J27. Effects of whole-body electrical muscular stimulation on muscle strength, pain, range of
motion in subjects with lumbar instability  SUHYEON KIM  Konyang University  

P-J28. Effects of plyometric exercise and weight training on athletic performance  
MIN-JUNGJEON  Silla University  

P-J29. Search for Configuration Principle According to Inspection Method of Functional Adjustment Procedure Therapy  BYOUNG-MIN AN  Eulji University  

P-J30. Effect of exercise with rhythmic auditory stimulation on gait stability and plantar pressure in patients with diabetic peripheral neuropathy  
KEISUKE SUZUKI  International University of Health and Welfare  

P-J31. The effects of combined pattern in the proprioceptive neuromuscular facilitation (PNF) on abdominal muscle activation  HYEKYEONG CHOI  Walk Rehabilitation Hospital  

P-J32. Correlation analysis between the infection control level and cognitive level of physical therapist  MYUNG-CHUL KIM  Eulji University  

P-J33. Korean version of ICF eLearning tool is useful for ICF learning  JUYEON KIM  Silla University  

P-J34. The Effect of Different Positions of the Tongue in the Mouth on the Contraction of the Rectus Abdominis  LIWEN PA  Capital Medical University  

P-J35. Correlation between abdominal muscle strength and respiratory function in stroke patient  TAEWOOK KANG  Walk Rehabilitation Hospital  

P-J36. Effects of age on dual task performance and movement changes during performance  SATOMI KOBAYASHI  Tsukuba International University  
Implication of ICF in physiotherapy practice

JUMIN SONG, PT, PhD.

Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

The International Classification of Functioning, Disability and Health (ICF) is an international classification system that classifies the functioning level associated with health condition. The ICF facilitates communication between professionals and standardization of health-related information/data. In physiotherapy practice, it is common to adapt the conceptual framework of the ICF in classifying the patients’ status and setting their treatment goals. Moreover, the functional measurement tools used in clinical areas should reflect the ICF model. Research related to the ICF in the physiotherapy practice is increasing, evaluating the environmental factors influencing quality of life and daily functioning. The need for ICF education is also required for consistent training and the correct use of the ICF in the field.

The ICF eLearning tool was developed by WHO to provide knowledge about the ICF and the specific skills required to use the ICF in a uniform manner. This tool is easily accessible and interesting to the user. The ICF eLearning tool consists of seven chapters including the ICF: need, aims, uses, the ICF model, structure and codes, ICF qualifiers, and WHO-FIC. This also includes the glossary and references. Each of the ICF chapters has learning and quiz sections, including interactive icons to improve the learning efficiency. Various experts in the WHOFIC network were involved in the development of the tool and it was tested extensively across the world. WHO is recommending to translate the ICF eLearning tool and encouraging its use for ICF training. The tool is available at https://www.icf-elearning.com/.

World Health Organization Disability Assessment Schedule (WHODAS) 2.0 is a measurement instrument for assessing a person’s functional level and based on the ICF concept, in that the items of the instrument could be linked directly to the ICF categories. WHODAS 2.0 is included in the ICD-11 as one of functioning assessment tools. WHODAS 2.0 was developed based on an extensive cross-cultural study across the world and the items included in WHODAS 2.0 are practical for a health status assessment in different cultures. Excellent psychometric properties have been reported. The instrument is available in more than 30 languages and can be found at https://www.who.int/classifications/icf/whodasii/en/.
"SOUTAI Methods" is a unique exercise therapy born in Japan. In this lecture, we will explain "SOUTAI Methods".

At present, the therapy by physical therapists and occupational therapists currently performed in Japan is mostly Western-style exercise therapy accepted from Western leaders in around 1950. The Brunnstrom method, the Bobath method, the Vojta method, the PNF method, etc. are the typical exercise therapies.

However, unlikely these exercise therapies, Japan's own exercise therapy was also born in Japan. One of them is the SOUTAI Methods. Internal medicine doctor Keizo Hashimoto developed from around 1920 and has been clinically applied with his original theory. The basic principle of the method of manipulation is the following theory. The theory is that it is best to move in a comfortable and pleasant direction to cure pain. In addition, human beings emphasize the movement from instincts and sensitivities that human beings inherently possess, that is, primitive senses. It is an idea that following instinct and sensibility leads to being released from pain.

Furthermore, there is "moving examination" as an index instead of "evaluation" in the body maneuver method, and "moving examination" is performed as the exercise effect judgment before and after the implementation of the moving body method. This "moving examination" is not an "examination" conducted by a doctor, but an evaluation index unique to the SOUTAI Methods. In the SOUTAI Methods, there is no “The SOUTAI Methods “without "moving examination”.

As a technical feature of The SOUTAI Methods, movement of the body method is an important factor in synchronization with the breathing method. The technical feature of the maneuver is to match with breathing. It is a physiologically advantageous exercise to combine The SOUTAI Methods and abdominal breathing.
The Development of Video Motion Capture Dynamic Evaluation System

QIUCHEN HUAN, PT1, 2), SHIWEI KANG, PT3), BIN HE OT1, 2), YUE ZHOU, PT1, 2), TAO ZHENG, PT2), HAOJIE WU OT1, 2)
1) Capital medical university, School of rehabilitation medicine.
2) China Rehabilitation Research Center.
3) SPINE GUARD Musculoskeletal Pain Exercise Rehabilitation Center

[INTRODUCTION]
There are 178 million elderly people and 200 million chronic patients in China. However, the number of rehabilitation therapists in China is relatively small and the level of clinical experience is imbalance. In addition, in clinical treatment, therapists' subjective judgment is the main method, and there is little objective evidence-based medicine. Therefore, based on the current situation, it is urgent to develop an objective and quantitative evaluation system that is easy to operate and standardized. The video motion capture dynamic assessment system is a video capture assessment system jointly developed by China rehabilitation research center, Peking University and SPINE GUARD Musculoskeletal Pain Exercise Rehabilitation Center with independent patent rights. This paper mainly introduces the composition and development of this evaluation system.

[SUBJECTS AND METHODS]
Video motion capture dynamic assessment system (hereinafter referred to as dynamic assessment system) is mainly composed of a host computer, a computer screen, three cameras and a 3-meter pressure runway. The three cameras of this dynamic evaluation system are respectively located at the front and the left and right sides, and mark points can be taken for the nose tip, shoulder, elbow, wrist, great rotor and so on. At least two markers were selected for each movement, such as neck flexion, and two markers of nasal tip — acromion were selected. The activities angle of the action accurate to 0.01 °, distance will be accurate to 0.01 mm. Moreover, the camera of this system has a feature that prompts patients with a mirror mode to minimize the external influence on patients' subjective consciousness.
The operation steps are mainly divided into patient information collection, pressure runway test, SFMA evaluation.

[RESULTS]
This set of dynamic evaluation system can conveniently screen the following results: (1) It can quickly screen out body asymmetry and changes in body force lines; (2) It can accurately screen out the movement chain and weak chain that have the greatest impact on patients; (3) The deviation of the patient's center of gravity and the static and dynamic distribution of plantar pressure can be observed; These results can quickly lead to treatments.

[DISCUSSION]
The system has been developed and formulated the corresponding software system, is currently undergoing clinical testing. The whole test process only takes ten minutes, which can conveniently provide reliable, quantitative data analysis, help the therapist quickly find the patient's problems, and save the evaluation time. Therefore, the clinical application prospect of this evaluation system can be expected.
The effects of a stretching of quadratus lumborum muscle on the tenderness and the pulmonary functions

YONGJIN CHO1), SEEWOO LEE1), BORYEON KIM1), DONGWOOK HAN, PhD, PT1)
1) Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

[Background and Purpose]
This study was to investigate the effects of a stretching of quadratus lumborum muscle on the tenderness and the pulmonary functions.

[Subjects]
The subjects of the study were 10 male and 10 female students who were attending at S university in Busan. All subjects agreed and wrote consent form to participate in this study after being well-informed of the purpose and the method of this study.

[Methods]
Threshold of the tenderness in quadratus lumborum was measured by digital pressure tester (Algometer, J-Tech Medical, USA). For the pulmonary function test, a spirometry (Pony FX, COSMED Inc., Italy) was used. The items for measurement of pulmonary functions in subjects were slow vital capacity (SVC) and maximal-effort expiratory capacity (MEC). Items of slow vital capacity (SVC) were tidal volume (TV), inspiratory reserve volume (IRV), inspiratory capacity (IC), expiratory reserve volume (ERV), and vital capacity (VC). And Items of maximal-effort expiratory capacity (MEC) were forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and forced expiratory volume in one second/forced vital capacity (FEV1/FVC). For the analysis, repeated measurement ANOVA was performed.

[Results]
Threshold of the tenderness in male and female at quadratus lumborum was increased after stretching statistically. However, there was no change meaningfully of all items in slow vital capacity (SVC) and maximal-effort expiratory capacity (MEC) after stretching of quadratus lumborum muscle in male. In case of female, tidal volume was increased after stretching of quadratus lumborum muscle. But there was no change statistically in all other items like in male.

[Conclusion]
These results show us that the stretching of quadratus lumborum muscle was no effective on increasing pulmonary functions.
Effects of different internal core intervention methods on the risk of anterior cruciate ligament injury in normal adult female during takeoff and fall

WANYU LIN 1, 2); CHUNYING HU, PT1, 2); QIUCHEN HUANG, PT1, 2)
1) Capital Medical University, School of rehabilitation medicine.
2) China Rehabilitation Research Center.

[Background and Purpose]
The anterior cruciate ligament (also called ACL) prevents the tibia from moving forward and is an important stable structure of the knee joint. Varus of knee may cause ACL damage when jumping off the ground. Proper contraction of the medial and lateral muscles of the knee during knee flexion protects the knee joint from large valgus loads and keeps the knee joint stable. By stabilizing the inner core, you can change the strength and reaction time of the muscles around the knee when landing, and enhance the stability of the knee joint.

[Subjects]
Exploring which internal core interventions can effectively reduce the risk of ACL injury during female fall. For those who have ACL injury and those with knee joint disease, the results can be used to guide their rehabilitation training, strengthen knee stability and avoid secondary injury.

[Methods]
Four groups of experimental actions were designed to change the inner core: (1) A-control group (2) B-tongue extended up to the palatine spot (3) C-contractive abdominis muscle (4) D-contracted pelvic floor muscle. The following tests were performed on 19 females: (1) isokinetic muscle strength test for knee flexion and extension; (2) surface electromyography (sEMG) of vastus medialis (VM), vastus lateralis (VL), biceps femoris muscle (HL) and semitendinosus (HM) during the fall from a platform.

[Results]
In isokinetic muscle strength test, except for the peak torque in group D, statistical analysis of the data revealed an increase of knee peak torque and average torque in both flexion and extension in group B, C, D to the control group. The surface EMG data showed that there were differences between the peaks of VM myoelectric contraction after landing, and there were differences between group D and group A: there were differences between the peak groups of HL and HM myoelectric contractions.

[Conclusion]
Stabilizing the inner core can make the muscles around the knee joint more efficient in contraction and better protect the knee joint. When jumping off the ground, the knee joint is prevented from being excessively varus mainly by strengthening the inner muscles of the knee joint and the biceps femoris. This mechanism makes the knee joint more stable and prevents ACL damage.
Effects of shortened hamstring length on quadriceps femoris and hamstring activation during squat exercise

SEUNG-JOO CHO, BO-RAM CHOI, P.T., Ph.D.

Department of Physical Therapy, College of Health and Welfare, Silla University, Republic of Korea

[Background and Purpose]
Squat exercises are generally performed to increase muscle strength and improve joint function. However, in subjects with a shortened hamstring, joint movement in the pelvis, hip, and knee can be limited during squat exercise. Therefore, the objective of this study was to examine the effects of hamstring length on quadriceps femoris and hamstring activation during squat exercises. The purpose of this study was to investigate the effect of hamstring on muscle activity of quadriceps femoris and hamstring when squatting was performed on short subjects.

[Subjects]
We recruited 28 voluntary participants. No surgical treatment of legs and waist 6 months ago, no musculoskeletal and neurological disorders, and the leg length difference was limited to less than 30mm. Among the randomly selected subjects, 110° or less was assigned to groups with shorten hamstring (13 persons, ages, height, and weight) and more than 110° was assigned to groups with normal hamstring (15 persons, ages, height, and weight).

[Methods]
We recruited 28 voluntary participants to this study. Following a hamstring length test, subjects who measured below 110° (n = 13) were assigned to the shortened hamstring group, and those who measured above 110° (n = 15) were assigned to the normal hamstring group. We measured activation of the vastus medialis, vastus lateralis, medial hamstring, and lateral hamstring using surface electromyography. We performed independent t-tests to analyze differences between the two groups.

[Results]
We found no significant differences in muscle activation between groups with respect to any of the muscles in the quadriceps eccentric section of squat exercise. In the quadriceps concentric section of squat exercise, a comparison of muscle ratios showed significant differences in the vastus lateralis:lateral hamstring and vastus lateralis:medial hamstring ratios between groups.

[Conclusion]
Therefore, subjects with a shortened hamstring should perform squat exercises with caution, to prevent increased eccentric activation of the hamstring muscles during upward movement, where this can lead to further shortening of the hamstring.
Characteristics of Subjective Chair Sitting Posture Using 3D Motion Capture
• Recognition of a Chair Sitting Posture Felt By a 20's Physical Therapist•

MASUMI SHINGAI, RPT.1, REN NIJIIMA, RPT.2, YUTO KOBAYASHI, RPT.1, RYOSUKE MIYADERA, OTR, Ph.D.1, AKIHIKO MURAYAMA, RPT, Ph.D.1, SHINJI MUKAI. Ph.D.3
1) Gunma University of Health and Welfare, Japan
2) Ishii Hospital, Japan
3) Maebashi Institute of Technology, Japan

[Background and Purpose]
Although some studies so far have focused on posture evaluation, few studies have investigated quantitatively whether the normal posture is a good posture or a bad posture. In this study, we aimed to investigate the characteristics of posture using 3D motion capture based on the sitting posture felt by a physical therapist who has knowledge about posture.

[Subjects]
The subjects were physical therapists in their 20s and 12 persons with 2 years of clinical experience in a hospital or facility. The age was 26 ± 1 year, the experience was 4 ± 1 year, the height was 175 ± 5 cm, the weight was 67 ± 8 kg, and the BMI was 22 ± 2. Prior to experimentation, the purpose of the study and ethical considerations were explained and implemented with written consent. It was conducted with the approval (approval number: 18A-22) of the Gunma University of Health and Welfare.

[Methods]
A motion capture system (VICON Nexus 2.7.0) was used for three-dimensional motion analysis. Plug in Gait Full Body AI was used. The sitting posture was taken for about 5 seconds in 3 postures with 7 infrared cameras. Thirty-eight reflective markers were attached to the body surface. The three sitting positions were taken in the order of the normal posture, the good posture, and the bad posture. The knee joint was 90 degrees, and the ankle joint was 0 degrees. The change in back movement was examined using the X axis (front-back direction) of the 10th thoracic spine. Multiple comparison tests were performed to examine the difference between the levels of each posture. The risk rate in statistical processing was less than 5%.

[Results]
The moving distance from the good posture to the bad posture of the 10th thoracic spine was 89.2 mm backward. The normal posture was 49.1 mm from the good posture to the backward. The test results showed a significant difference (p <0.05) between the combination of the good posture and the normal posture, and no significant difference between the bad posture and the normal posture. There was a significant difference between good and bad postures (p <0.01).

[Conclusion]
It was found that the position of the 10th thoracic spine changes with posture. It was found that the normal posture position was located between the good posture and the bad posture. In the future, we will conduct similar research on subjects with no knowledge of posture and compare them.
Usage of WHODAS 2.0 in Korea

HYEJIN HAM, YUKYOUNG JANG, GICHEOL JANG, JUMIN SONG, PhD., HAEJUNG LEE, PhD.

Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

[Background and Purpose]
The World health Organization Disability Assessment Schedule (WHODAS) was developed by WHO and is based on the ICF concept. WHODAS 2.0 is included in ICD-11 as a functioning assessment tool to describe and measure a person’s functioning level associated with a health condition. This study examined how widely WHODAS is used in Korea.

[Methods]
A literature review was undertaken for studies published from January 2000 to May, 2019. Electronic databases (RISS, NDSL, KISS and PubMed) and reference lists of key articles were searched to identify WHODAS use in Korea. To be included, a study should have Korean population and publish in the English or Korean language. Two reviewers performed the study selection and a final decision was made by consensus. The titles and abstracts of the peer-reviewed literature were searched and full text was also screened to be included.

[Results]
Seventy-three studies showed that WHODAS was used in the Korean population and 42 articles of them were excluded because the measurement tools included in those studies were not relevant to WHODAS. Thirty-one studies were included in the current review. Thirteen (42%) of those studies were conducted for clinical populations with low back pain, stroke, depression, schizophrenia, cancer, or acute coronary syndrome to measure the patients’ functioning level, five (16%) out of 31 studies included the elderly and six studies (19%) had the disabled in community settings for assessing functioning status. Three studies reported the individual characteristics of physical functioning in the general population, and four studies investigated psychometric properties of measurement tools, including the reliability and concurrent validity.

[Conclusion]
It was found that the application of WHODAS 2.0 and relevant research have increased gradually in various settings as well as professional areas in Korea.
Effect of ergometer exercise during typing task on typing score

SATOSHI OTAKE RPT, MS.1) KEISUKE SUZUKI RPT, Ph.D.1), TAKAYOSHI SAITO RPT, Ph.D.1)
1) Department of Physical Therapy, School of Health Sciences at Odawara, International University of Health and Welfare, Kanagawa, Japan.

[Background and Purpose]
Regular exercise and increased physical activity are recommended for their positive impact on the body. But the proportion of individuals doing regular exercise is lowest in those aged in their 30s and 40s, including many workers. In the survey conducted on reasons for not exercising, "there is no time for exercise" was a commonly given response. If we can find a way to exercise during working hours, it will not be necessary to find time to do exercise outside of working hours. By finding a way to exercise during working hours, it is possible that the proportion of people doing regular exercise will increase. Bicycle ergometers are devices that allow people to exercise while maintaining a sitting position without moving. Ergometers also allow people to exercise without using their upper limbs. We considered the possibility that, if it was work like that involved in a typing task, people could work while doing ergometer exercise. However, there was the risk that working while doing exercise may reduce work efficiency. Therefore, it was necessary to clarify the effect of working while exercising on work efficiency.

The purpose of this study was to clarify the effect of the ergometer exercise during typing tasks on typing scores and autonomic nerve function.

[Subjects]
Subjects were five healthy young males (university student, average of 20.8±0.4 years old).

[Methods]
Subjects performed typing tasks under two conditions: ① whilst sitting, ② whilst doing ergometer exercise. The typing task used the web service. Subjects typed task sentences displayed on the screen while the number of characters entered and the accuracy rate of typing in a 5 minute period were measured. In the ergometer condition, load was set at 50 watts (steady). Typing parameters (number of characters entered and the accuracy rate of typing) and subjective evaluation of task difficulty were assessed under both conditions, with differences between the two analyzed using paired t-tests (p<0.05.).

[Results]
The average number of characters entered was 389.6 ± 45.5 characters in the sitting condition and 391.0 ± 52.4 characters in the ergometer condition. The average accuracy rate of typing was 91.9 ± 3.8% in sitting conditions and 92.4 ± 4.3% in ergometer conditions. No significant difference was found between the two conditions in both the number of characters entered and the accuracy rate of typing.

Regarding the subjective evaluation of task difficulty, 4 out of 5 subjects responded that the ergometer condition was more difficult than the sitting condition due to difficulty in keeping the cadence of the ergometer.

[Conclusion]
In this study, it was found that performing typing tasks while doing ergometer exercise for a short time did not reduce working efficiency. However, since four out of five subjects showed difficulty in performing typing tasks under the ergometer condition, in the case of long-term work, accumulation of stress may decrease attention and work performance. Therefore, it is necessary to continue to consider the task-execution time and the contents of tasks.
Comparison of the trunk muscles activation according to the width of both arms during plank exercise.

DUKWOON SUR, CHUNHO YOON, YUNKYUNG JEONG, YOOJUNG HAN, TAEYOUNG OH, P.T. PhD
Department of Physical Therapy, College of Health and Welfare, Silla University, Busan, Korea

[Background and Purpose]
The purpose of the study was to compare the trunk muscle activation according to different widths of the both arms during plank exercise.

[Subjects]
Seventeen males participated in this study, with an average age of 23.50 ± 1.99 years, height of 173.85 ± 5.52 cm, weight of 71.80 ± 9.01 kg and body mass index of 23.68 ± 2.52 kg/m2, who were not involved musculoskeletal and neurological disorders at the last six months.

[Method]
The participants performed the plank exercise according to different arms width with 0 degree and 30 degree for 3 times repeat and sustained for 12 second with isometric contraction by each repeat.
We measured muscles activation of Rectus abdominis, Transverse abdominis, Upper trapezius, erector spinae, Rhomboid, Serratus anterior using by EMG (4D·MT & EMD· 11, Relive Korea).
We collected the data and calculated average value by three times exercise from EMG and analysis the data in order to compare the muscle activation according the width of arms using by paired t test on SPSS PC ver. 25.0. The statistics significance level was set to α = 0.05.

[Results]
The results of the study were as follow that right and left Serratus anterior muscle activation was significantly different according to width of arms during plank exercise as well as in case of right was 15.38±6.93 and 20.31±7.31 and in case of left was 16.46±8.25 and 20.12±25 on each width of arms.
The muscle activation of Rectus abdominis, Transverse abdominis, Upper trapezius, erector spinae, Rhomboid were not significantly difference according to width of arms but the muscles activation on 30 degree of arms showed more high value than 0 degree.

[Conclusion]
We suggest that plank exercise will be one of the useful methods in order to strengthening not only core muscles but also Serratus anterior like a scapular stabilizer. The width of arms for plank exercise could be adjust according to each purpose and particular program.
The Effect of Scapulothoracic exercise and thoracic mobilization on Shoulder Pain and Function in Shoulder Partial thickness Rotator cuff tear

MYUNG-CHUL KIM, Ph.D1), DONG-HYEON KIM, M.S.2), BYOUNG-MIN AN, M.S.2), HONG-JOON LEE3)

1) Department of Physical therapy, Eulji University, South Korea
2) Department of Physical Therapy, Graduate School, Eulji University, South Korea
3) Department of Physical Therapy, Graduate School of Health Science, Eulji University, South Korea

[Background and Purpose]

Overactivity of upper trapezius decreases the control of the lower & middle trapezius and serratus anterior and causes abnormal shoulder movement. And the increase in thoracic kyphosis induces severe stress and tension in the surrounding tissues on the spine. Traumatic symptoms shoulder rotator cuff full-thickness tear less than 1 cm, non-traumatic Symptoms Shoulder Rotator cuff partial tear is appropriate for conservative treatment. So the purpose of this study was to determine the effect of shoulder scapulothoracic exercise and thoracic mobilization on shoulder dysfunction and pain with shoulder partial thickness rotator cuff tear.

[Subjects and method]

In the study designed ‘true experimental design’, 40 subjects were recruited and randomly divided into 3 groups which have 10 subjects each: Scapulothoracic exercise with Thoracic mobilization (STwTM), Scapulothoracic exercise (ST) and Thoracic mobilization(TM) groups. All subjects were assessed for pain, mobility and disability of shoulder, angle of thoracic by Shoulder Simple Test (SST), Shoulder Pain and Disability Index (SPADI) and Thoracic kyphosis assessment (TKA) using Baseline Bubble Inclinometer before the intervention and four weeks after the intervention. The intervention including warm-up and finishing exercise was carried out twice a week for about 50 minutes for 8 weeks. Repeated one-way ANOVA were used.

[Results]

The SST scores showed that the functional level among the groups increased in the order of TM, ST and STwTM groups. The SPADI score showed no significant difference between the ST and TM, indicating that the STwTM's pain decreased compared to the two groups, STwTM showed a decrease in dysfunction relative to both groups. TKA showed a decrease over time in the order of ST, TM, STwTM. However, STwTM decreased significantly compared to the other two groups.

[Conclusion]

ST and TM were effective in improving pain and dysfunction in patients in Shoulder Partial thickness Rotator cuff tear Shoulder. Nevertheless, STwTM was found to be more effective.

[Acknowledgements]

This research was supported by the Bio & Medical Technology Development Program of the National Research Foundation (NRF) funded by the Korean government, MSIT (No. 2016M3A9B6904246).
Effect of different fixation methods on isometric knee extension muscle strength measurements using a hand-held dynamometer

TAKAYOSHI SAITO RPT, Ph.D.¹, KEISUKE SUZUKI RPT, Ph.D.¹, SATOSHI OTAKE RPT, MS.¹

1) Department of Physical Therapy, School of Health Sciences at Odawara, International University of Health and Welfare, Kanagawa, Japan.

[Background and Purpose]

The measurement of muscle strength is an important evaluation index, and isometric knee extension strength is closely associated with motor function. Isometric knee extension strength is measured using a hand-held dynamometer (HHD). However, during HHD measurement, particularly in subjects with strong knee extension strength, the thighs and pelvis are elevated because they are not fixed, and thus the measurement is inaccurate. Mendler has previously reported that a value close to the maximum may be measure if the upper limb is gripped. Therefore, grasping the upper limb allows for an effective measurement of muscle strength; however, there is no consensus on where the limb should be grasped. Therefore, we devised a pelvic fixation method using items readily available in the rehabilitation room.

The purpose of this study was to examine the effect of our novel fixation method on isometric knee extension muscle strength measurements using HHD.

[Subjects]

25 healthy young adult men participated (mean age was 20.3 ± 0.5y, the height 171.2 ± 5.3cm, and the weight 65.2 ± 8.2 kg).

[Methods]

An HHD (μTAS F1 by Anima Co., Ltd.) device was used to measure isometric extension strength at a 90° knee flexion angle in three postural conditions. (1) no fixation (Standard measurement method, arms along the sides of the body), (2) grasp bed (to prevent pelvis elevation by grasping the edge of the bed), and (3) pelvis fixation (to prevent pelvis elevation by connecting pelvis with the bed using a fixation belt). The measurements were performed in each condition in a random order, and strength values were analyzed using one way analysis of variance.

[Results]

The grasp bed condition showed significantly greater strength values (58.3 ± 12.4 kgf) than the no fixation (46.1 ± 7.4 kgf) or pelvic fixation (50.2 ± 6.8 kgf) conditions (p < 0.01), and the pelvic fixation condition showed significantly greater force than the no fixation condition (p < 0.05).

[Conclusion]

These results suggest that the no fixation method (standard measurement) and the newly devised belt fixation method provide insufficient support for knee extension muscle strength measurements in healthy adults in their 20s. Future studies should examine different methods of fixations and consider additional methods to obtain more accurate values.
Effects of speed and slope of treadmill on the cardiac functions when she walks with putting high-heeled shoes

ARA KIM1), HANA GU1), HYOJIN KANG1), JUNHYUN PARK1), DONGWOOK HAN, PhD, PT1)

1) Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

[Background and Purpose]
This study was conducted to investigate how, in walking with high-heeled shoes and flat shoes on treadmill, the change of its speed and slope affects the cardiac functions.

[Subjects]
The subjects of the study were 18 female students who were attending at S university in Busan. All subjects agreed and wrote consent form to participate in this study after being well-informed of the purpose and method of the study.

[Methods]
French heel which the height of heels was 7 cm in this study. The treadmill protocol consisted of a total of three stages and was designed to change the speed and slope according to each stage. The ECG and heart rate was measured using Exercise electrocardiogram (CASE, GE, USA). Blood pressure and rate pressure product was measured using automatic blood pressure meters (Tango M2, Suntech, USA). And the rate of perceived exertion (RPE) was measured using Borg scale. All items were measured in each stage. Oxygen saturation measurements were taken from the start of the experiment until the end of the experiment. Independent sample t-test was conducted to determine that there were any differences in cardiac functions between walking in flat shoes and walking in high-heeled shoes.

[Results]
In the result of this study, the heart rate (HR), the systolic blood pressure (SBP), and the rate of perceived exertion (RPE) of high-heeled shoes group compared with flat shoes group were noticeably increased during walking on a treadmill. Especially, there was meaningful change when treadmill speed was 3.8km and slope was 10°. In the other conditions, there were no differences in the change of cardiac conditions between walking in high-heeled shoes and walking in flat shoes.

[Conclusion]
The results show that faster speed including slope increasing in walking with putting high-heeled shoes on treadmill occur more stress to the heart. So, the one who are putting high-heeled shoes should slowly walk at condition like with high speed and slope increasing to prevent heart stress.
Correlation between diaphragmatic contraction pressure and slow vital capacity

JAESEOK LEE¹), DONGWOOK HAN, PhD, PT²)
¹) Department of Physical Therapy, Donga University Hospital. Korea
²) Department of Physical Therapy, College of Health and Welfare, Silla University. Korea

[Background and Purpose]
This study measured the external pressure during diaphragmatic contraction and correlation between diaphragmatic contraction pressure (DCP) and actual vital capacity (VC) to determine whether the measured pressure values can represent diaphragmatic contractility.

[Subjects]
The subjects of the study were total 32 healthy adults (16 male and 16 female) who were living in Busan. All subjects wrote consent form willingly to participate in this study after being well-informed of the purpose and the method of this study.

[Methods]
To measure DCP, a real-time monitoring pressure device was inserted inside a belt placed on the front of the abdomen and diaphragmatic contractility during maximum inspiration was checked. And slow vital capacity (SVC) was measured using a digital spirometer (Pony Fx, COSMED, Italy).

[Results]
DCP showed significant positive correlations with the following among SVC values: vital capacity (VC), inspiratory reserve volume (IRV), and inspiratory capacity (IC). Among these, mean and maximum DCP showed strong positive correlations with IC. In males, DCP showed significant positive correlations with IRV and IC and significant negative correlation with expiratory reserve volume (ERV). In females, significant positive correlation with tidal volume (VT), but significant correlation was not found with any other values.

[Conclusion]
DCP measured using diaphragmatic pressure belt (DiP Belt) showed high correlations with inspiratory flow and it can be viewed as a useful method to checking the difference in diaphragmatic contractility.
The Fick illusion increases toe-clearance when going up stairs

YOSHIYUKI MURAKAMI, RPT, PhD.¹), TOMOHIRO MIZUNO, RPT, MS.¹), YUKI YAMANAKA, RPT, PhD.¹), MING HUO, RPT, PhD.¹), SHINICHIRO MURAKAMI, RPT, PhD.¹)

¹) Department of Physical Therapy, faculty of Health Sciences, Himeji Dokkyo University, Japan

[Background and Purpose]
Falls is increased by Japan, that is social problem. There is also one of the problems, we have to work on which immediately. Tripping is a common factor in falls. The typical safety strategy to avoid tripping on stairs is to increase toe clearance over the step edge. In the study we asked toe-clearance when going up stairs could be increased using a visual illusion.

[Subjects]
Eighteen subjects (9 males and 9 females) were recruited from the University student population. This study was approved by the Medical Ethics Committee of Himeji Dokkyo University. The study was explained to the subjects, and consent was obtained.

[Methods]
The perceptual illusion was produced by superimposing visual patterns onto a step in one of two configurations. These patterns introduce a version of the Fick illusion in which vertically-oriented lines appear longer than horizontal. Measurements were taken for two conditions: the version of the Fick illusion and the normal version of the step, using a randomized order of testing. During a simple going up stairs task, the distance of the toe-clearance changed by an amount corresponding to the size of the visual illusion. Two version of going up stairs task were performed at random three times. We took it Digital-Camera (Panasonic, Japan) at high-speed from the left side way. The SPSS (ver.23) was used to perform statistical analyses. The significance of differences between the distance of the toe-clearance with two going up stairs task were determined by the Wilcoxon signed-ranks test. Statistical significance was accepted for values of p<0.01.

[Results]
There were significant differences between the Fick illusion and the normal version in the distance of the toe-clearance (p<0.01). Compared to Fick illusion, the distance of the toe-clearance was significantly increased the normal version of subjects.

[Conclusions]
Perception of the height of a step was significantly affected by the configuration of the pattern superimposed on the step, with the perceived step height being larger when the narrow, vertical sine wave gratings were placed on the step riser. The perceived height of a step can be manipulated using a simple visual illusion, leading to the adoption of a safer stepping strategy in terms of greater toe-clearance going up stairs. In addition, the strong link found between perception of a visual illusion and motor action.
The comparison of muscles activation in lower extremity according to the position of ankle dorsiflexion and plantar flexion during resistance exercise

SOHEE KIM, EUNJIN JEONG, GAYOUNG CHUN, SOHYEON KIM, TAEYOUNG OH. P.T. PhD

Department of Physical Therapy, College of Health and Welfare, Silla University, Busan, Korea

[Back ground and Purpose]
The change of industry type and development of transportation system has been decreased physical activities and limited the walking time in daily life of people. The numbers of peoples who complained muscle weakness in lower extremities and uncomfortable conditions of daily activities were increasing.
The purpose of this study was to find out the effect of ankle joint position on muscle strength of lower extremity during performed resistance exercise.

[Subjects]
8 male students in Silla University who had not musculoskeletal and neurological problems participated voluntarily on this study.

[Method]
The participants performed resistance exercise with raising the lower leg with ankle dorsiflexion or plantar flexion on sitting position at table. The participants were repeated 10 times per a set and totally performed 3 sets and the resting time was given 3 second between each sets. The resistance was applied maximum load for 6 seconds using by manual.
Muscle activation were measured on Vastus lateralis, Vastus medialis, Tibialis anterior muscles using by EMG(4D-MT & EMD-11, Relive Korea) at position with ankle dorsiflexion and plantarflexion.
We performed paired t test using by SPSS PC.ver.25.0 to compare the muscle activation of Vastus lateralis, Vastus medialis, Tibialis anterior muscles between the ankle position with dorsiflexion and plantarflexion.

[Result]
There was no difference of muscle activation of Vastus lateralis and Vastus medialis, Tibialis anterior between the position with ankle dorsiflexion and plantarflexion. The average of three muscles strength was not different between the ankle position with dorsiflexion and plantarflexion

[Conclusions]
We could suggest that in case of the strengthening exercise to improve Vastus lateralis, Vastus medialis, Tibialis anterior, it may not consider either the ankle position with dorsiflexion or plantarflexion during performing resistance exercise with raising the lower leg at sitting position.
Effects of Underwater Complex Exercise Therapy on Gait and Balance in Patients with Lower Extremity Fracture due to Traumatic Injury

MYUNG-CHUL KIM, PhD.1), HYUN-JAE LEE, M.S.2), HONG-JUN LEE2), MI-HYE PARK2)
1) Department of Physical Therapy, Eulji University, South Korea
2) Department of Physical Therapy, Graduate School of Health Science, Eulji University, South Korea

[Background and Purpose]
Unlike ground, underwater minimizes the effects of gravity on the body. Aquatic exercise overcomes the resistance of water and helps to improve the function of the musculoskeletal system by allowing walking, stepping, lifting the weight in the water. The purpose of this study is to investigate the effect of gait training and balance training on traumatic injuries of lower extremity fracture patients using underwater buoyancy for weight reduction effect.

[Subjects]
The subjects of this study were 30 patients who attended “K” hospital located in Gyeonggi-do and understood and agreed on the contents of the experiment.

[Methods]
The subjects were randomly assigned to the aquatic exercise group (concept of Halliwick method, balance exercise, one leg standing, and stair up and down) and the ground exercise group (balance exercise, one leg standing, same action like concept of Halliwick method). All subjects were performed for 8 weeks and twice a week total 16 exercises. The exercise time was 30 minutes at once. To measure walking ability, time up and go (TUG) test and 6 minute walking test were performed. The balance ability measurement was conducted by the Bug Balance Scale (BBS) and the balance ability measurement system. All statistical analyzes were performed using the Window SPSS / PC 22.0 statistical program.

[Results]
In this study, 15 participants in the aquatic exercise group and 15 participants in the ground exercise group (Table 1). There was a significant difference in the TUG test between experimental group and control group (p<0.05). However, there were no significant difference in the test such as 6m walk test and BBS and front, rear, left, right moving range test by using balance ability measurement system (p>0.05). There were significant difference in the all test in the each group (p<0.05).

[Conclusion]
There was no significant difference in the degree of improvement between the two groups of the aquatic exercise group and the ground exercise group, but it was found that the aquatic exercise performed in a safer environment was as effective as the exercise performed on the ground.

[Acknowledgements]
This research was supported by the Bio & Medical Technology Development Program of the National Research Foundation (NRF) funded by the Korean government, MSIT (No. 2016M3A9B6904246).
Effects of stepping areas of high-heel on gastrocnemius and tibialis anterior activation during ascending stairs

HYO-EUN KIM, BO-RAM CHOI, P.T., PhD

Department of Physical Therapy, College of Health and Welfare, Silla University, Busan, Republic of Korea

[Background and Purpose]
Wearing high-heeled shoes leads to foot and ankle instability, which requires leg muscles to remain in constant contraction, and increases muscle fatigue around the leg and ankle joints during tasks such as walking and climbing. Previous studies of the impact of stair climbing in high-heeled shoes have involved placing the entire stepping area of the shoe on the stair. However, high-heeled shoe wearers sometimes unconsciously contact the stair using only half of the stepping area.

[Subjects]
The purpose of this study was to examine differences in leg and ankle muscle activation according to stepping area during stair climbing in high-heeled shoes.

[Methods]
Twenty young women in their early 20s voluntarily agreed to participate in this study. We used surface electromyography to measure gastrocnemius and tibialis anterior activation in the right leg during stair climbing under three conditions: barefoot, using half of the high-heeled shoe stepping area, and using the entire high-heeled shoe stepping area. Means were compared using one-way analysis of variance (ANOVA) and significant differences were assessed post-hoc using the Bonferroni method.

[Results]
Both muscles showed significant activity differences among the three stair climbing conditions. Gastrocnemius activity was significantly different between the high-heeled shoe conditions (P = 0.032), and tibialis anterior activity was significantly different between barefoot stair climbing and climbing with half of the high-heeled shoe stepping area (P = 0.021).

[Conclusion]
The stepping area increased as heel size increased, thus increasing excessive gastrocnemius and tibialis anterior activity to control excessive ankle joint movement. We infer that using half of the high-heeled shoe stepping area prevents muscle fatigue by reducing excessive leg and ankle muscle activation.
Association of chest and abdominal wall mobility with physical activity and sedentary behavior in community-dwelling older adults

HIDEO KANEKO, RPT, PhD. 1)

1) Department of Physical Therapy, School of Health Sciences at Fukuoka, International University of Health and Welfare, Japan

[Background and Purpose]
Chest and abdominal wall mobility are affected by age-related changes in the rib cage and spine mobility. However, the association of chest and abdominal wall mobility with physical activity and sedentary behavior remains unclear. We aimed to investigate the associations of chest and abdominal wall mobility with physical activity and sedentary behavior in older adults.

[Subjects]
A total of 62 community-dwelling older adults aged ≥65 years (78 ± 6 years, 25 men and 37 women) were included in this study. Subjects with lung diseases, neurological diseases, airflow limitation, obesity, and cognitive disorders were excluded.

[Methods]
For assessing chest and abdominal mobility, the breathing movement scale for deep breathing at three regions (upper chest, lower chest, and abdomen) that has a range of 0–8 (reduced mobility, <4) based on normal breathing movements in the supine position, was measured using a custom-made breathing movement-measuring device. The measurements in each region were performed twice, and the maximal scale value was recorded. Physical activity and sedentary behavior were measured using a tri-axial accelerometer. The accelerometer recorded physical activity in metabolic equivalents (METs) for 10 s epochs (7 consecutive days). Locomotive and non-locomotive moderate-to-vigorous physical activity (MVPA, ≥ 3 METs), steps (steps/d), and percentage sedentary time (time of ≤ 1.5 METs of non-locomotive PA/wear time) were calculated. Stepwise multiple regression analyses were performed to assess associations of the variables of scale values with locomotive and non-locomotive MVPA, steps, and sedentary time after adjusting for sex and age as the possible confounding factors.

[Results]
The numbers (percentages) of subjects with reduced mobility at the upper chest, the lower chest, and the abdomen were 19 (31%), 26 (42%), and 14 (23%), respectively. Non-locomotive MVPA was only independently associated with the scale values of the abdominal region.

[Conclusion]
We found that there is limited association of chest and abdominal wall mobility with physical activity and sedentary behavior in community-dwelling older adults. The results suggested that non-locomotive MVPA, such as washing windows, mopping, and vacuuming, may help preserve the abdominal wall mobility of older adults.
Effects of kinesiology taping of the ankle joint on quadriceps femoris and hamstring activation during squat exercises

SO-JEONG KIM, BO-RAM CHOI, P.T., Ph.D.
Department of Physical Therapy, College of Health and Welfare, Silla University, Republic of Korea

[Background and Purpose]
Squat exercise, ankle joints act as a connection between the leg joints and the force on the ground. Instability of ankle joints slows muscle reactions to leg joint and torso movements and interferes with normal body movements (Karlsson and Andreasson, 1992). Squat exercise is a representative exercise that can be performed using the principle of closed motor chain together with exercises such as lunge, calf raise and leg press, and by simultaneously using co-activation of the leg muscles, which can be performed without the need to shear the joint (Mansol et al., 2016; Yoo et al., 2004). In previous studies, however, there are indicate about the width of both feet, and there is insufficient research on the effects of squat exercise due to the damage of the subject’s ankle joint or stability of the ankle joint. The purpose of this study was to examine the effect of ankle joint stability on quadriceps femoris and hamstring activation during squat exercises.

[Subjects]
Twenty-three subjects volunteered to participate in this study. The subjects had no musculoskeletal and neurological disorders problems in the waist and leg joints within 6 months, had no experience of surgery, and had never conducted a squat exercise before. After the purpose of the research and how to proceed, the agreement was received and approved by the ethics committee of Silla University.

[Methods]
The participants in this study were 20 volunteers who performed squat exercises with and without kinesiology tape. We measured quadriceps femoris and hamstring activation using surface electromyography. The ankle joint was stabilized with kinesiology tape using the ankle balance taping (ABT) method. A paired t-test was performed to compare differences between taping conditions.

[Results]
Vastus medialis and vastus lateralis activation was greater following squat exercises with kinesiology tape than without; however, the difference was not significant. Medial and lateral hamstring activation was not significantly different between taping conditions.

[Conclusion]
Although it is difficult to maintain stability using kinesiology tape alone, ankle joint stability is believed to affect quadriceps femoris muscle activity, which increases the effectiveness of the squat exercise.
The effects of smartphone use on pain and muscle activation of upper trapezius, and on pulmonary functions

EUNCHONG PARK1), JIWOON PARK1), JAEWOO SON1), JISU HONG1), DONGWOOK HAN, PhD, PT1)
1) Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

[Background and Purpose]
This study was to investigate the effects of smartphone use on pain and muscle activation of upper trapezius, and on pulmonary functions.

[Subjects]
The subjects of the study were healthy 15 female students who were attending at S university in Busan. All subjects agreed and wrote consent form to participate in this study after being well-informed of the purpose and the method of this study.

[Methods]
The smartphone used in this study was LG Q6. The test was performed in siting position with lumbar upright and knee joint and hip joint as flexion 90 degree. Muscle activation was measured in upper trapezius using EMG (4D-MT&EMD-11, Relive, Korea) and% MVIC value was used for analysis. Pain was measured in upper trapezius using digital pressure tester (Algometer, J-Tech Medical, USA). Pulmonary functions were measured using Spirometry (Pony FX, COSMED INC, Italy) and the items were SVC and FVC. All tests were performed at basic position, at after 20 minutes without using smartphone, and at after using the smartphone for 20 minutes. In each session, all tests were performed 3 times and the two values with small deviation were averaged and used for the analysis. For the analysis, repeated measurement ANOVA was performed.

[Results]
After using the smartphone, the pressure threshold of the left and right upper trapezius was lowered. There was no statistical change in muscle activation. On the other hand, IRV, IC, VC, and ERV among the items of slow vital capacity decreased after using smartphone. Also, FVC, FEV1, and FEV1/FVC values decreased after use of smartphone.

[Conclusion]
The prolonged use of the smartphone may increase muscle activation and cause pain. It can also cause a decrease in respiratory function. Therefore, in order to prevent the musculoskeletal diseases caused by the use of the smartphone, it is necessary to reduce the use time of the smartphone and to exercise for relaxation the related muscles.
Video motion capture dynamic evaluation system: Clinical application of the evaluation system

CHUNYING HU, PT¹, ²), CHUNRONG ZHANG, PT³), BIN HE OT¹, ²), YUE ZHOU, PT¹, ²), TAO ZHENG, PT²), HAOJIE WU OT¹, ²)

¹) Capital Medical University, School of rehabilitation medicine.
²) China Rehabilitation Research Center.
³) SPINE GUARD Musculoskeletal Pain Exercise Rehabilitation Center

[INTRODUCTION]
Since the 1990s, the aging process speeded up day by day in China. Currently, more than 60 years of the elderly population had reached 220 million; China had entered the ultra-aging society. Among of them, chronic low back pain and shoulder pain were the most common diseases, showing that a large demand for therapy and rehabilitation people were needed in China. During the rehabilitation, the dynamic assessment system was commonly used in clinical practice. These techniques were so subjectively measurements by therapists that a standardized and objective evaluation system was urgently needed to provide a fast and accurate exercise assessment method for the patients. The screening technology based on the international mainstream musculoaponeurotic movement chain, the video motion capture dynamic evaluation system was researched and developed by three centers who were China Rehabilitation Research Center, Peking University and SPINE GUARD Musculoskeletal Pain Exercise Rehabilitation Center jointly, which the effect of its clinical application in this article were discussed.

[METHODS]
The system consisted of a mainframe, a computer screen, three cameras and a 3 meter foot pressure runway. The patient was asked to stand between the pressure track and the camera, then the camera would capture to take following SFMA actions: 1. Neck flexion/extension; 2. Neck rotation; 3. Shoulder flexion / shoulder abduction; 4. Multi-stage flexion; 5. Multi-stage extension; 6. Multi-stage rotation; 7. Standing on one leg; 8. Overhead Squat. When the patient was testing, the computer was operated by the physical therapist and gave the instruction to let the patient complete the corresponding action and the superimposed action. The computer automatically calculated the corresponding value and drew an evaluation report. According to this report, the therapist would formulate a treatment plan, such as SET and other methods for manual technique therapy.

[RESULTS]
This system has been entering the clinical trial phase, where a case report of one patient’s clinical treatment effects was performed.

[DISCUSSION]
After one month of treatment, according to the evaluation results of this system, the patient’s body functions had a significant improvement. For example, neck flexion from 35.11° to 42.21° improved by 7.1°, which indicating the accuracy of the assessment. Compared to the subjective measurement, a video motion capture dynamic evaluation system has not only owned a high accuracy and a high efficiency function, but also acted a simple convenient operation system. So this system was hoped to urgently to be used on the clinical practice and providing a standardized rehabilitation division to other therapists in medical institutions in China who were lack of an objective and a rapid assessment system.
The effects of iliopsoas muscle stretching on the pulmonary functions

JINA OH\textsuperscript{1}), TAEWOO KIM\textsuperscript{1}), YEONGBIN SHIN\textsuperscript{1}), DONGWOOK HAN, PhD, PT\textsuperscript{1})

\textsuperscript{1}) Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

[Background and Purpose]
This study was to investigate the effects of iliopsoas muscle stretching on the pulmonary functions.

[Subjects]
The subjects of the study were 12 male students who were iliopsoas muscle shortened and were attending at S university in Busan. All subjects agreed and wrote consent form to participate in this study after being well-informed of the purpose and method of the study.

[Methods]
Thomas test was used to confirm that iliopsoas muscle was shortened. And we used goniometer to measure the angle in hip joint. For the pulmonary function test, a spirometry (Pony FX, COSMED Inc., Italy) was used. The items for measurement of pulmonary function in subjects were slow vital capacity (SVC) and maximal-effort expiratory capacity (MEC). Items of slow vital capacity (SVC) were tidal volume (TV), inspiratory reserve volume (IRV), inspiratory capacity (IC), expiratory reserve volume (ERV), and vital capacity (VC). And Items of maximal-effort expiratory capacity (MEC) were forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and forced expiratory volume in one second/forced vital capacity (FEV1/FVC). For the analysis, repeated measurement ANOVA was performed.

[Results]
The angle of right and left hip joint was increased after stretching statistically. In the slow vital capacity (SVC), tidal volume (TV), inspiratory reserve volume (IRV), inspiratory capacity (IC), and vital capacity (VC) were increased significantly after stretching. Also, after stretching, forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) values were increased meaningfully.

[Conclusion]
These results show us that the stretching of iliopsoas muscle was effective on increasing pulmonary functions. So, it is necessary to add the stretching of iliopsoas muscle in the exercise program to improve the pulmonary functions.
**What does neck posture mean?**

YEYOON PARK, JAE EUN SEOL, YOUNGEUN LEE, HAE JUNG LEE, PhD.
*Department of Physical Therapy, University of Health and Welfare, Silla University*

**[Background and Purpose]**
Musculoskeletal problems due to the use of electronic devices such as smartphones and the malalignment of posture due to incorrect posture and poor lifestyle are increasing proportionally. Various studies on treatments for incorrect posture have been conducted to work on solving this issue. However, these studies face challenges with accurately diagnosing malalignment because of varying definitions, measurement methods, and criteria for posture. The purpose of this study is to integrate and analyze domestic papers related to the definition of posture and measurement methods.

**[Methods]**
The papers on posture in this study were selected for analysis through Korean databases of domestic studies. We entered the terms ‘posture’, ‘cervical’, ‘neck’, ‘shoulder’, ‘round shoulder’, ‘forward head posture’, ‘turtle neck’, and ‘sway back’ in the four following search engines: the Koreanstudies Information Service System (KISS), the National Assembly Library of Korea, the National Digital Science Library (NDSL), and the Research Information Service system (RISS). The search results were not filtered according to their publication date, and EndNote was used to save and analyze the search results.

**[Results]**
According to the results of the search, there were 7,457 study in total with 2,233 study from the KISS, 202 study from the National Assembly Library of Korea, 1,652 study from the NDSL, and 3,370 study from the RISS. All of the results were saved in EndNote. First, we removed duplicate papers and checked the title and abstract to exclude papers which were unrelated. Through this process, 1,245 papers were selected and 6,205 papers were excluded. Subsequently, through full-text verification, 240 papers were finally selected. The studies can be categorized into four areas: defining posture (14 study), physical characteristics (100 study), effects and method of intervention (111 study), and developing a measurement tool (15 study).

**[Conclusion]**
Through analyzing the search results related to posture, this study found that the definition and measurement criteria used in the papers related to posture differed and were not unified. In conclusion, there is no clear meaning of posture. Therefore, an integrated definition and standards regarding posture will have to be developed.
Relationship between gait ability and gait imagery in elderly individuals who require care

MIYOKO WATANABE, RPT, PhD., YOHEI SAWAYA, RPT, MS., MASASHIRO ISHIZAKA, RPT, PhD., HIROAKI TANI, RPT, MD.

Department of Physical Therapy, School of Health Sciences, International University of Health and Welfare, Japan

[Background and Purpose]
This study aims to validate the correlation between gait speed and accuracy of gait imagery in elderly individuals who require care.

[Subjects]
Thirty-nine elderly individuals (mean age: 76.5 ± 9.9 years) requiring care for basic activities for daily living, as ambulatory rehabilitation users, participated in this study. Although all the participants were able to walk independently, 28 used assistive devices, such as a cane or walker.

[Methods]
The accuracy of gait imagery was measured using the mental chronometry method. The participants performed the imagery task followed by the execution task during the 5-m gait task with the fastest speed. The accuracy of gait imagery was assessed based on time differences between imagery and execution times. When the time difference was small, the motor imagery was more accurate. The relationship between gait speed and accuracy of gait imagery was analyzed using correlation coefficient. For the accuracy of motor imagery, one-sample t-test was performed to analyze the significance of overestimation and underestimation.

This study was approved by the ethics committee of International University of Health and Welfare (17-Io-140-2 & 17-Io-189-4).

[Results]
The mean gait time for the execution of the 5-m gait task was 9.97 ± 6.69 s, whereas the gait speed was 0.50 m/s. The correlation coefficient between gait time and accuracy of gait imagery was significant (r = 0.40, p < 0.05). In the participants who used assistive devices, the one-sample t-test showed significant overestimation (t = 1.83, p = 0.08).

[Conclusion]
Gait ability correlated with the accuracy of gait imagery in elderly individuals who require care. Moreover, elderly individuals with slower gait speed or those using assistive devices, i.e., those with decreased gait ability, overestimate their gait speed.

[Acknowledgement]
This work was supported by JSPS KAKENHI Grant Number 17K18053.
Korean version of Neck Disability-10 and Fear Avoidance Beliefs Questionnaire-Neck version: reliability and linking to ICF

SUJI KIM, HYOEUN JO, DONGHWA JUNG, DAIM KIM, JUMIN SONG, PhD., HAEJUNG LEE, PhD.

Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

[Background and Purpose]
The functioning measure is important in physiotherapy practice and can give clinicians a better understanding of a patients’ status when it is considered with the information of psychological distress and illness behavior. The Neck Disability-10 (ND-10) is a functional scale for patients with neck pain and the Fear Avoidance Beliefs Questionnaire-Neck version (FABQ-N) assesses a patient’s beliefs regarding pain and his/her work/physical activity. This study investigated the reliability of the ND-10 and the FABQ-N. In addition, linking the items of both instruments to the International Classification of Functioning, Disability, and Health (ICF) was also performed because it can facilitate communications between health professionals in the area.

[Subjects]
Fifty volunteers (Mean age=36.0 ± 14.7 years, 16-63 years, thirty females) were invited to this study that examined the test-retest reliability of the two tools.

[Methods]
The ND-10 and FABQ-Ns were assessed twice on different occasions with an interval of three to seven days, depending on the participants' availability. The test-retest reliability of the instruments was analyzed using the Intraclass Correlation Coefficient (ICC). The linking process was performed by two experts following the linking rule.

[Results]
Both instruments demonstrated excellent test-retest reliability (ND-10: ICC=0.96 and FABQ-N: ICC=0.95). Ten items in the ND-10 were linked to 15 categories of the ICF: two from the body function domain, 13 from the activity and participation domain. In the FABQ-N, physical activity was limited to be linked to the ICF categories. This may because the physical activity was not defined as specifically as in that of the ICF. The FABQ-N includes bending, lifting, walking, and driving as examples of physical activity. These examples could be linked to the ICF categories. The items of work in the FABQ could be linked to the category of remunerative employment in ICF.

[Conclusion]
The Korean versions of ND-10 and the FABQ-N demonstrated excellent test-retest reliability and ten items in the ND-10 showed a link with the ICF categories. Therefore, the ND-10 and the FABQ-N could be used in clinical settings to assess patients with neck pain.
Relationship between the degree of left-right difference in hip internal rotation range of motion and static standing balance ability

HEONSOO HAN, PT, PhD¹, AKIRA KUBO, PT, PhD¹, MASAHIRO ISHIZAKA, PT, PhD¹, HITOSHI MARUYAMA, PT, PhD²
¹) Department of Physical Therapy, International University of Health and Welfare, Japan
²) Department of Physical Therapy, School of Graduate School, International University of Health and Welfare, Japan

[Background and Purpose] Left-right difference in hip internal rotation (IR) range of motion (ROM) is an evaluation tool for low back pain in clinical physical therapy. The piriformis muscle limits the total hip IR ROM, as it functions to externally rotate the hip joint. The IR ROM may represent a change in the position of the sacroiliac joint in the pelvis. Thus, left-right differences in IR ROM may be related to static standing balance ability. This study aimed to examine the relationship between the degree of left-right difference in hip IR ROM and static standing balance ability.

[Participants] The study included 81 physical therapy students (42 males and 39 females).

[Methods] The left and right hip IR ROMs were measured three times in the prone position. The measurement was performed at 5° units using a goniometer. As an index of static standing balance ability, total trajectory length was used to evaluate body sway in a two-leg standing position, and one-leg standing time was used to evaluate one-leg standing position holding ability. Both were measured with eyes open and closed. One-leg standing time was measured as the time taken for participants to lose balance and for the raised leg to reach the floor. The left-right difference in IR ROM was classified into 3 patterns: ≥ 10° difference with 1) left > right (n=5) or 2) left < right (n=7) and 3) < 10° difference with left ≈ right (n=69). We examined the correlation of the total trajectory length in the two-leg standing position and the one-leg standing time with left-right difference in IR ROM for each pattern and that of the hip IR ROM with the standing balance index. (IUHW Ethics Review Board approval number: 18-Io-42)

[Results] In the left > right group, the correlation coefficients were: left-right difference in IR ROM and total trajectory length, eyes open (r = -0.90); left-leg standing time, eyes open, and total trajectory length, eyes closed (r = -0.92). In the left < right group: left-right difference in IR ROM and total trajectory length, eyes open (r = 0.62, p = 0.13); left IR ROM and total trajectory length, eyes open (r = -0.88); left-right difference in IR ROM and right-leg standing time, eyes closed (r = -0.92). In the left ≈ right group: 1) left-right difference of IR ROM and total trajectory length, eyes open (r = -0.03 and right-leg standing time, eyes closed, and 2) left IR ROM (r = -0.26), 3) right IR ROM (r = -0.32), and 4) left-right difference in IR ROM (r = 0.24)

[Conclusion] Static standing balance ability is related to left-right difference in hip IR ROM. Different trends were observed on the left and right sides. The total trajectory length in the two-leg standing position decreases as the left-right difference in IR ROM increases if the left IR ROM is larger and increases if the right IR ROM is larger. When left IR ROM was larger, the total trajectory length decreased with increasing left-leg standing time. When right IR ROM was larger, the right-leg standing time decreased as the left-right difference in IR ROM increased. Future studies should use a larger sample and assess the external rotation ROM.
Immediate effects of the ankle rolling exercise and the Thera-band Exercise on ankle joint R.O.M and muscles activation.

DAHYUN JUNG, YUJIN KANG, DOYEON SIM, EUNJUNG KWAK, TAEYOUNG OH, P.T. PhD.

Department of Physical Therapy. College of health and welfare. Silla University, Busan, Korea

[Background and Purpose]
The purpose of this study was to compare the immediate effects of the ankle rolling exercise and the Thera-Band exercise to improve the R.O.M and Muscle activation for ankle motion.

[Subjects]
The 22 men and women in their 20s at S University in Busan participated voluntarily for the study and they was randomized divided into 11 members of the ankle rolling exercise group and 11 members of the ankle Thera-band exercise group.

[Methods]
The rolling exercise group instructed the participants to roll forward and backward using the dominant ankle joint, with the roller that is 7cm in diameter. The Thera-Band exercise group was forced to select own Thera-band of reasonable resistance and then to resist by pulling the band with his or her arms, forcing the band to press on the dominant sole, and repeating the dorsiflexion and plantarflexion of the ankle joint. Two group had guided to adjust the knee joint angle to be 90 degrees in a sitting posture, and they carried out for 10 minutes and given one minute of rest after four minutes of exercise.
The muscle activation of the Lateral Gastrocnemius, Medial Gastrocnemius, and Tibialis anterior muscles were measured by using EMG(4D-MT & EMD-11, Relative, Korea) and were conducted after 5 minutes of rest after the exercise. The protractor for ankle (JOSPT) used to measure the angle of joint, and the axis was the lateral malleolus.
We performed ANCOVA to compare the effects between pre and post according two group using by SPSS PC ver.25.0.

[Result]
The rolling exercise group showed the increase of the R.O.M of inversion and dorsiflexion and the muscle activity of the Lateral Gastrocnemius and Medial Gastrocnemius significant.
The Thera-band exercise group showed the increase of the R.O.M of inversion, muscle activation of Lateral Gastrocnemius, Medial Gastrocnemius and Tibialis anterior significant.
The rolling exercise group had a more significant R.O.M, but the Thera-band exercise group had a more significant muscle activation.

[Conclusion]
We suggest that the combination of the rolling exercise and the Thera-band exercise in ankle joint would be an effective exercise method to increase muscle strength and range of motion, and could be apply to the stroke patients who have foot drop phenomenon in clinics.
Effects of whole-body electrical muscular stimulation on muscle strength, pain, range of motion in subjects with lumbar instability

SUHYEON KIM, YEONGEUN EOM, YULIM LEE, JIEUN LEE, DEOKJONG SEO, SANGIL YOON, SEUNGHWAN BAEK, EUINO SEO, SEUNGHUL CHON

Department of Physical Therapy, College of Medical Sciences, Konyang University, South Korea

[Background]
Lumbar instability is an important cause of low back pain and can be associated with substantial disability. Applying whole-body electrical muscular stimulation (WB-EMS) has promising positive effects but there are few methodological limitations as well as previous studies.

[Purpose]
The purpose of this study is to identify the effects of WB-EMS on muscle strengthening, pain, and range of motion (ROM) in subjects with lumbar instability.

[Subjects]
Thirty subjects with lumbar instability were recruited for this study. They were randomly divided into 15 experimental group with WB-EMS and 15 control group without WB-EMS, respectively.

[Methods]
Both groups received a total of 30 minutes of intervention programs, respectively. Measurements were used before and after the intervention. The muscular strength was measured the trunk flexor and extensor muscle using hand held dynamometer. The pain was used the Visual analogue scale (VAS) and Oswestry disability index (ODI). The ROM was used the modified Schober test and the finger to floor test.

[Results]
The results showed significant improvement in low back pain, muscle strength of trunk extensors and trunk range of motion in WB-EMS group, while there was no significant difference in Control group. However, there was no significant difference in muscle strength of trunk flexors in both two groups. Separate mixed 2-way analysis of variance showed significant differences in the muscular strength of the trunk flexor (F1,28=3.546, p=.019) and the trunk extensor (F1,28=32.410, p=.025) between the groups. The VAS (F1,28=12.389, p=.001) and ODI (F1,28=25.231, p=.025) measures at pain significantly differed between the groups, respectively. Modified Schober test (F1,28=21.102, p=.034) and the finger to floor test (F1,28=41.311, p=.001) were significantly improved between the groups, separately.

[Conclusion]
The findings suggest that exercise program with WB-EMS may be more effective in improving muscle strength, pain and ROM than that without WB-EMS.

Corresponding author: Seungchul Chon  keyjune@konyang.ac.kr
This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (2017R1D1A3B03031876).
Effects of plyometric exercise and weight training on athletic performance

MIN-JUNG JEON, BO-RAM CHOI, PhD., PT

Department of Physical Therapy, College of Health and Welfare, Silla University, Busan

[Background and Purpose]

Plyometric exercise is an exercise exerting forceful power in a brief period using isotonic activation. It is effective to improve reaction of muscle, agility, endurance and athletics performance.

Weight training is an exercise improving muscular strength, endurance and respirating ability applying diversely in frequency and load of exercise. Plyometric exercise and Weight training is to facilitate the athletics performance though improving the function of lower limb muscle, there is a difference that Plyometric jump squats is the way to improve agility and Weight training is the way to improve muscular strength. Therefore, it is necessary to know how this difference effects on athletics performance as measuring ankle, ROM, and jumping ability.

[Subjects]

This study was conducted with the voluntary participation of 40 university students, who were randomly assigned to jump squat and calf raise groups (n = 20 per group).

[Methods]

For each subject, we measured the range of motion of the ankle joint before and after exercise, as well as a standing broad jump and vertical jump test performance. We compared the performance indices before and after exercises using paired t-tests, and between groups using independent-samples t-tests.

[Results]

Both jump squat and calf raise exercises improved ankle joint dorsiflexion and plantar flexion, as well as standing broad jump and vertical jump height performance. However, there were no significant differences before versus after exercise, or between exercise types.

[Conclusion]

Although jump squats and calf raises have different purposes, it is thought that, in combination, these exercises improve performance more effectively than either alone, and that such a combined exercise program improves the quality of training in both the general public and athletes in various sports.
Search for Configuration Principle According to Inspection Method of Functional Adjustment Procedure Therapy

BYOUNG-MIN AN, M.S.1), DONG-HYEON KIM, M.S.1), HAE-IN KIM1), JEONG-HEE JANG3)

1) Department of Physical Therapy, Graduate School, Eulji University, South Korea
2) Department of Physical Therapy, Graduate School of Health Science, Eulji University, South Korea

[Background and Purpose]
This study was carried out to objectively present the unique academic identity of functional adjustment, which is a field of frequency manipulation, by grasping the configuration principle according to inspection method of functional adjustment.

[Subjects and method]
To achieve the purpose of this study, this study investigated the history and developmental directions of manipulative therapy, and through literature review, examined the characteristics of the test method of chiropractic and osteopathic techniques, which are manipulative therapy techniques implemented in a systematic program.

[Results]
From the results of investigating the diagnostic method and treatment characteristics of functional adjustment, the configuration principle of functional adjustment was found to be as follows. First, the diagnostic characteristics of functional adjustment were found to have more reliable diagnosis through overlapping test by finding and interpreting seven interrelated test methods among several manipulative therapy tests. Second, functional adjustment is not a total correction of a body part that has an abnormality. But functional adjustment is that by finding the most problematic part of each part of the body based on the information obtained through the duplicate diagnosis method, the major part is confirmed and the part is corrected. Third, the functional adjustment were first approached on the functional and structural problems of the human body, not on the subluxation of chiropractic problems of the nervous system and on the problems of the human circulatory system of osteopathy. Fourth, because functional adjustment firstly considers the structural problems of the human body, functional and structural problems are required to be solved through a functional adjustment complex exercise program as well as a manual correction method.

[Conclusion]
It was found that the configuration principle of the functional adjustment was duplicated to increase the reliability of diagnosis according to the abnormality of the human body, and had a unique inspection method to find out the complex problems of the disease more accurately by finding the major. The results of this study confirmed that the functional adjustment can be developed into a new field of study based on clinical studies by revising and supplementing the existing manipulative therapy method.

[Acknowledgements]
This research was supported by the Bio & Medical Technology Development Program of the National Research Foundation (NRF) funded by the Korean government, MSIT (No. 2016M3A9B6904246).
Effect of exercise with rhythmic auditory stimulation on gait stability and plantar pressure in patients with diabetic peripheral neuropathy

KEISUKE SUZUKI RPT, Ph.D.¹), DAISUKE ENDO RPT, MS.²), TOMOHIKO KAMO RPT, Ph.D.³), SATOSHI OTAKE RPT, MS.¹), TAKAYOSHI SAITO RPT, Ph.D.¹)

¹) Department of Physical Therapy, School of Health Sciences at Odawara, International University of Health and Welfare, Kanagawa, Japan.
²) International University of Health and Welfare Atami Hospital, Shizuoka, Japan.
³) Department of Physical Therapy, Japan University of Health Science, Saitama, Japan.

[Background and Purpose]
Diabetic peripheral neuropathy (DPN) reduces stability during walking and increases plantar pressure. Rhythmic auditory stimulation (RAS) can influence conscious and subconscious abilities and thereby improve gait function. RAS intervention improves the co-contraction of the shank muscles during walking in patients with DPN. However, little is known about how RAS affects gait function in patients with DPN. Thus, we aimed to determine whether RAS affects the stability and peak plantar pressure (PPP) in patients with DPN during walking.

[Subjects]
Total 47 patients with DPN were randomized to a RAS group (n = 25, mean age, 61.1 ± 8.3 y; weight, 65.6 ± 22.3 kg; height, 1.63 ± 0.08 m; body mass index (BMI), 24.4 ± 5.8 kg/m²) or control group (n = 22, mean age, 61.1 ± 11.7 y; weight, 67.0 ± 16.2 kg; height, 1.59 ± 0.10 m; BMI, 26.3 ± 3.9 kg/m²).

[Methods]
All participants underwent a 2-week supervised rehabilitative treatment (40 min/day) as inpatients. This included walking twice a day, during which the RAS group participants walked in time with a metronome set at a self-chosen, comfortable rate. In both groups, gait speed, gait stability, and PPP before and after the intervention were compared. The change in score for each parameter was calculated and compared between groups with unpaired t-tests and ANCOVA.

[Results]
The RAS group had significantly improved gait speed and stability in all axes, but no significant increase in PPP of the heel and hallux was observed. In the control group, there was no change in gait stability (mediolateral, vertical, and anteroposterior) or PPP. Compared with the control, the RAS group showed improvements in gait stability (anteroposterior, total) but no significant difference in PPP.

[Conclusion]
These data suggest that RAS intervention improves gait stability in patients with DPN. The improvements in gait stability were significantly better than those with conventional exercise, even after adjusting for covariates. RAS may be helpful in improving gait stability in patients with DPN.
The effects of combined pattern in the proprioceptive neuromuscular facilitation (PNF) on abdominal muscle activation

HYEKYEONG CHOI, PT, MPTc1), TAEWOOK KANG, PT, PhD1), DONGWOOK HAN, RPT, PhD2)

1) Department of Physical Therapy, Walk Rehabilitation Hospital, Republic of Korea
2) Department of Physical Therapy, College of Health and Welfare, Silla University, Republic of Korea

[Background and Purpose]

The purpose of this study was to investigate the effect of combined pattern, upper extremities pattern, and lower extremities pattern in the proprioceptive neuromuscular facilitation (PNF) on abdominal muscle activation.

[Subjects]

The subjects of the study were 25 healthy male who were living in Busan. All subjects wrote consent form willingly to participate in this study after being well-informed of the purpose and the method of this study.

[Methods]

In applying the PNF pattern, abdominal muscle activation was measured by surface electromyogram (4D-MT & EMD-11, Relative, Korea). Three patterns were applied. Upper extremities pattern was extension/adduction/medial rotation. And lower extremities pattern was flexion/adduction/lateral rotation. Last combined pattern was what the upper and lower extremities pattern were applied simultaneously. All of three patterns were randomly applied to all subjects. Three times per pattern was measured and the average value was used for analysis. Repeated Measure ANOVA test and Bonferroni test was used for analysis.

[Results]

There was a difference of abdominal muscle activation among upper extremities patterns, lower extremities pattern, and the combined pattern. In the result of Bonferroni test showed significant differences in combine patterns compared with upper and lower extremities pattern. But there was no meaningful difference between single pattern of upper and of lower extremities.

[Conclusion]

The results showed that the combined pattern among three PNF patterns was the most efficient way to strengthen the abdominal muscle.
Correlation analysis between the infection control level and cognitive level of physical therapist

MYUNG-CHUL KIM, PhD.(1), MI-HYE PARK(2), HAE-IN KIM(3), JEONG-HEE JANG(2)
1) Department of Physical Therapy, Eulji University, South Korea
2) Department of Physical Therapy, Graduate School of Health Science, Eulji University, South Korea
3) Department of Physical Therapy, Graduate School, Eulji University, South Korea

[Background and Purpose]
The purpose of this study is to analyze the perception of infections in the physical therapy room and to compare the performance of infection management according to the level of awareness.

[Subjects]
This study was conducted on physical therapists who attended conservative education in Gyeonggi-do. A questionnaire was distributed to a total of 200 physiotherapists attending conservative education. Among them, 178 subjects were selected except for 22 questionnaires which were not suitable for data processing.

[Methods]
Before the survey, we explained the purpose and contents of the study to the regional chairman of the Korean Physical Therapist Association and asked for cooperation. After the researcher explained the purpose and contents of the research on the day of the maintenance education, the questionnaire was distributed to the person who agreed to the questionnaire and the questionnaire was read and answered by himself. The completed questionnaire was collected by the researcher respectively. The questionnaire items used in this study consisted of three parts, questions about the general characteristics of the subjects, questions about infection awareness level, and questions about performance. Questionnaires were constructed using the Likert-type 5-point scale. In order to analyze the results of this study, SPSS 25.0 was used. To analyze the general characteristics of the subjects, frequency analysis was carried out, technical statistics of the variables related to cognitive level and performance were given, Multiple regression analysis was performed to investigate the effect of cognitive level on performance.

[Results]
As a result of this study, items of environment and equipment (tool) category showed the lowest recognition and performance among items related to infection recognition level and performance.

[Conclusion]
In future studies, it is necessary to investigate in detail the reasons of low awareness and low level of this area. In addition, it is difficult to grasp the cognitive level and performance of national physical therapists. Therefore, guidelines and guidelines for physiotherapists nationwide will be needed to secure these limitations and problems. Sufficient infection control education is also needed for undergraduates' curriculum.

[Acknowledgements]
This research was supported by the Bio & Medical Technology Development Program of the National Research Foundation(NRF) funded by the Korean government, MSIT(No. 2016M3A9B6904246).
Korean version of ICF eLearning tool is useful for ICF learning

JUYEON KIM, JIHYE GWON, HWAJEONG LEE, MIRA JEON, JUMIN SONG, PhD., HAEJUNG LEE, PhD.

Department of Physical Therapy, College of Health and Welfare, Silla University, Korea

[Background and Purpose]
The need for standardized education on the understanding and utilization of ICF has been suggested, however, there is a lack of standardized curriculum and educational tools available in Korea. The aim of the study was to develop a Korean version of ICF eLearning tool (KICF eLearning tool).

[Subjects]
One-hundred and twenty-six volunteers (forty male) were invited to examine the KICF eLearning tool. Participants were students and health professionals, including areas of physiotherapy, occupational therapy, rehabilitation medicine, health research and education, and community health.

[Methods]
KICF eLearning tool was produced by consensus between the experts: two physiotherapists, one occupational therapist, one speech pathologist, and two social workers. A field test was conducted to determine if the Korean version was adapted culturally and suitable for its use in Korean population. A questionnaire was administered to collected opinions about KICF eLearning tool with regards to the content level, the characteristics of the tool, and Korean term.

[Results]
One hundred and two (83%) of the participants reported that the contents of the eLearning tool were easy to understand and the examples included were also helpful in learning the contents without further assistance (105 respondents, 86%). The majority of participants reported that the level and scope of the content was appropriate for ICF education. The eLearning tool is easy to use (n=101, 82%), interactive (n=101, 82%), and intuitive for search (n=106, 87%). The majority of participants (n=84, 66%) said that the Korean terms or expression used in the tool were easy to understand. One hundred fourteen participants would recommend the tool to another person (90%). In general, the participants, professionals and students had similar experience in using the KICF eLearning tool. The ICF eLearning tool was available at https://www.icf-elearning.com.

[Conclusion]
The study suggests that KICF eLearning tool is ready for use in public for ICF education.
The Effect of Different Positions of the Tongue in the Mouth on the Contraction of the Rectus Abdominis

LIWEN PA 1, 2; CHUNYING HU, PT1, 2; QIUCHEN HUANG, PT1, 2
1) Capital Medical University, School of rehabilitation medicine.
2) China Rehabilitation Research Center.

[Background and Purpose]
To test whether there is obvious contractile enhancement through different positions of tongue and contraction of rectus abdominis, so as to achieve stable core, enhance body strength and prevent or alleviate clinical symptoms.

[Subjects]
Combined with literature research ideas and daily life observation, different positions of the tongue were tested with contraction of the rectus abdominis, we will analyze the data, and then it is used in daily life and clinical treatment.

[Methods]
8 sets of test actions were designed. ① The control group ② A-middle position, thrusting on the lingual surface of incisive teeth (MID) ③ B-extended up to the palatine spot (UP) ④ C-lying on the lower arch of the mouth (LOW) ⑤ D-Contract the transverse abdominis + pelvic floor muscle ⑥ A-middle position, thrusting on the lingual surface of incisive teeth (MID) + D-Contract the transverse abdominis + pelvic floor muscle ⑦ B-extended up to the palatine spot (UP) + D-Contract the transverse abdominis + pelvic floor muscle ⑧ C-lying on the lower arch of the mouth (LOW) + D-Contract the transverse abdominis + pelvic floor muscle. Each group was separately performed Isokinetic muscle strength assessment test, Measurement of the transverse area of the rectus abdominis, Time up and go test (TUG), Measurement of the distance from the functional front and the muscular discharge, Measurement of the duration of a 10-meter walk and the amount of muscle power released. Each set of data was recorded and analyzed.

[Results]
Found in data analysis of the distance from the functional front, when extended tongue up to the palatine spot (UP), the distance from the functional front increased. Found in data analysis of measurement of the transverse area of the rectus abdominis, when extended tongue up to the palatine spot (UP) or contract the transverse abdominis + pelvic floor muscle at the same time, and, lying tongue on the lower arch of the mouth (LOW), these strengthened the rectus abdominis.

[Conclusion]
Different positions of the tongue affect the contraction of rectus abdominis. Among them, when extended tongue up to the palatine spot (UP) affects most functions.
Correlation between abdominal muscle strength and respiratory function in stroke patient

TAEWOOK KANG1), DONGWOOK HAN, PhD, PT2)
1) Department of Physical Therapy, Walk Rehabilitation Hospital. Korea
2) Department of Physical Therapy, College of Health and Welfare, Silla University. Korea

[Background and Purpose]
This study aimed to investigate the correlation between the abdominal muscle strength and respiratory function in stroke patients.

[Subjects]
The subjects of the study were total 17 stroke patients (12 male and 5 female) who were admission at W rehabilitation hospital in Busan. All subjects wrote consent form willingly to participate in this study after being well-informed of the purpose and the method of this study.

[Methods]
Abdominal muscle strength was assessed using digital manual muscle tester (MicroFET2, HOGGAN, USA). Abdominal muscle strength test was measured for 5 seconds after contacting the sternal notch of participants to bend the trunk. The respiratory function was assessed using a spirometry (Cardio7-S, BIONET, Korea). Items of respiratory functions were forced vital capacity (FVC), forced expiratory volume in one second (FEV1), forced expiratory volume in one second/forced vital capacity (FEV1/FVC), and peak expiratory flow (PEF). Measurements for variables were three times and mean value was used for analysis. The collected data were analyzed by pearson correlation analysis and the significance level was α=0.05.

[Results]
A statistically significant correlation was found between abdominal muscle strength and forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and peak expiratory flow (PEF). However, there was no significant correlation between abdominal muscle strength and forced expiratory volume in one second/forced vital capacity (FEV1/FVC).

[Conclusion]
This study demonstrated that there is a relationship between abdominal muscle strength and respiratory functions. Therefore, abdominal muscle strengthening exercise program is needed to improve respiratory function of stroke patients.
Effects of age on dual task performance and movement changes during performance

SATOMI KOBAYASHI, RPT, PhD.1), KOICHI IWAI, PhD.2)
1) Department of Physical Therapy, School of Health Sciences, Tsukuba International University, Japan
2) Department of Human Science Center, School of Health Science, Ibaraki Prefectural University of Health Sciences, Japan

[Background and Purpose]
In elderly people, it has been reported that the decrease in dual task performance is related to the occurrence of falls. In addition, it has been reported that the ability to perform dual tasks is affected by aging, and in particular, cognitive performance is involved in the performance when a cognitive task is added. However, in most cases the dual task performance ability is discussed only with changes in performance results, and it is not clear about the movement changes at that time.
The purpose of this study was to find out whether there is an age-related change in movement during dual task execution.

[Subjects]
7 healthy young adults (4 males and 3 females) and 8 community-dwelling elderly (6 males and 2 females)

[Methods]
The subjects of the study were equipped with headphones, a headset-type microphone, and an IC recorder, and a 3-axis accelerometer was attached to both sides. The measurement conditions were four conditions: only walking, adding reaction time measurement to walking, adding a cup carrying water containing walking to walking, and adding a calculation task to walking. The walk under the above four conditions was performed on a 31 m walkway including the runway. The analysis index was the walking speed and the time (10 steps) from the landing on one side of the heel to the grounding on the opposite side. For the walking speed, the rate of change from the case of walking alone was calculated, and the coefficient of variation was calculated for the time from the contact of one side of the heel to the contact of the opposite side. A two-way analysis of variance with age and conditions as factors was performed, and if a main effect was observed, a post-test test was performed. The 28 Kai significance level was less than 5%.

[Results]
In walking speed, in each condition, a significant speed delay was observed in the elderly group compared to the young group. In addition, in the young group, a significant speed delay was observed under the condition that the reaction time measurement was added to the normal walking. In the elderly group, a significant speed delay was observed in the condition that added the calculation task than normal walking. In the rate of change in walking speed, in the elderly group only, a significant increase in the rate of change was observed under the condition that the calculation task was added rather than the condition in which the reaction time measurement was added. No significant difference was found in the coefficients of variation for the time from the landing on one side to the landing on the other side.

[Conclusion]
In the dual task condition in both groups, the walking speed decreased, but in the elderly group, a significant speed decrease was observed in the 7-subtract task. It is thought that this is a strategy to ensure the stability of the operation.