Abstract

# Occupational Therapy

# SCHEDULE

## Session 1 : 11 : 00 ~ 12 : 00

**Session chair: Prof. Minoru Hoshiyama**

1. Time orientation and orientation in the elderly persons.

   Yuko Iwamoto

2. Communication with emotional materials with patients with dementia

   Sayo Yamashita

3. Comparison of behavior in young and elderly drivers using the Safe Driving Behavior Measure (SDBM)

   Y. J. Jeong, M. Jung

## Session 2 : 13 : 30 ~ 15:30

**Session chair: Prof. Yuji Sawada**

4. Analysis of the change of center of pressure sway during repeated dressing in healthy subjects

   Youta Obayashi

5. An influence of classroom furniture size on children's written test, pressure of the pen and sitting posture

   Go Igarashi

6. Current trends in occupational therapy assessment tools in Korean pediatric occupational therapy

   E. M. Jo, E. Y. Yoo

- 15 minutes rest -

**Session chair: Prof. Ji-Hyuk Park**

7. Assistive technology in Korea: Implications for occupational therapy

   N. Y. Yang, B. M. Lee, M. Y. Jung

8. Brain response for awareness: A magneto-encephalographic study

   Hitomi Yamakawa

9. A systematic review of the effects of occupational therapy for persons with dementia: A meta-analysis of randomized controlled trials

   S. Y. Kim, E. Y. Yoo, M. Y. Jung, S. H. Park, J. H. Park

10. Awareness of driving rehabilitation among occupational therapists in Korea

    H. Y. Jung, M. Y. Jung

# Time orientation and orientation in the elderly persons

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## Introduction

Recognition of time is an important cognitive function in our daily lives. This relates to most of our cognitive attributes, including perception, experience, memory, and every thought and feeling [1]. Recent studies have suggested that subjective time perception is strongly linked to what occupies the time and how one perceives it, pleasant or stressful [2, 3]. Since our life is a sequence of periods occupied with activities, understanding of time recognition is important in the field of occupational therapy [3, 4].

In the present study, we investigated time orientation to identify the perceived time of day of elderly with dementia in a care facility. The objective of the present study was to clarify the ability and characteristics of time orientation in elderly with dementia.

## Method

Twenty-six elderly participants with Alzheimer type dementia (6 men and 20 women, mean age: 87.0 ±7.0 (SD) years, range: 67-98) were involved in the present study. Participants were tested in 7 sessions during a day (Wednesday) regarding their time orientation. All data were collected by the same examiner, by testing one or two participants on each Wednesday. In each session, an examiner tested their time orientation by asking the time of day. Seven sessions were performed just after every meal and tea time (meal sessions), at 9:00, 12:30, 15:30, and 18:30, and between each meal (interval sessions), at 10:30, 14:00, and 17:00. Since the time for meals and tea was fixed every day in the care facility, the meal and tea times could be cues based on oral intake in the participants. The time difference (ΔT) and absolute ΔT in minutes between the true time and perceived time of each participant was obtained in each session. For example, when a participant responded that the time was noon at 14:00, the ΔT and absolute ΔT values were －120 and 120 min, respectively. Then, the ΔT and absolute ΔT values underwent further analyses.

The ΔT values were compared by one-way (sessions) repeated measures analysis of variance (ANOVA) followed by Bonferroni-Dunn's correction for multiple comparisons among all sessions. Relationships between the absolute ΔT value and MMSE score were compared using Spearman's rank-correlation coefficient test. A p-value of less than 0.05 was considered significant. The absolute ΔT was also compared among sessions using ANOVA followed by Bonferroni-Dunn's correction.

## Results

All participants could answer during the sessions. The main effect of the sessions on the mean ΔT value was significant ($F [6, 150] = 6.93$, $p < 0.0001$, ANOVA) (Fig. 1). Multiple comparisons revealed that the ΔT value was larger in the 9:00 session than in the 17:00 and 18:30 sessions, and the 10:30 session showed a larger value than the 15:30, 17:00, and 18:30 sessions. The values in the 14:00 sessions were larger than in the 17:00 session. The correlation curve between ΔT and the time of day (minutes) was: $y = -0.2 x + 181.81$.

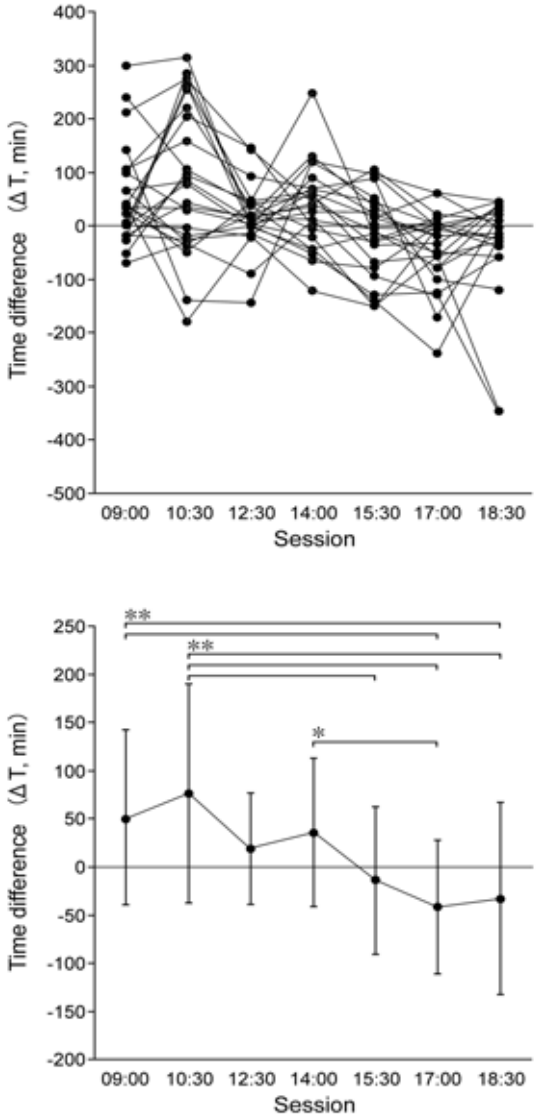
There was a main effect of sessions on the absolute ΔT value for all seven sessions ($F [6, 150] = 4.27$, $p = 0.0005$, ANOVA). Multiple comparisons showed that the absolute ΔT value at 10:30 was significantly larger than those at 12:30, 14:00, 15:30, 17:00, and 18:30 ($p < 0.01$). For comparison between after- and inter-meal sequences, there was no interaction in the absolute ΔT change between the sequences, but there was a main effect of the three sessions ($F [2, 50] = 6.34$, $p < 0.0026$, ANOVA), although there was no difference in the value between the sequences.

## Discussion

The present results are summarized as: 1) time orientation in patients with dementia was affected by the time of day, more in the morning. They perceived the time as later and earlier than the actual time in the morning and afternoon, respectively, 2) the MMSE showed no significance but a tendency toward a correlation with absolute ΔT at 14:00, 3) meals did not significantly affect time orientation.

A major finding in the present study was that time orientation depended on the time of day the examiner questioned the participants. In the morning, disruption of time orientation was evident at 10:30, and the time perceived by participants shifted to later than the actual time, and, in the late afternoon, it shifted oppositely to earlier than the actual time. The correlation curve for the subjective time of participants crossed the actual time at 15:09, which suggested that the participants gave a relatively

correct time at around 15:00, although this did not indicate that the participants correctly oriented themselves to the real time. It was interesting that elderly patients with dementia did not give the time of day randomly, but tended to orient their time around early-mid afternoon. Since the ΔT value linearly decreased during the day, as shown in Figure 1, the value does not simply seem to relate to the sum of cues during a day, such as meals or tea time.




*Figur1*.
The individual (top) and mean (bottom) values of time differences (ΔT) in all participants. Subjects perceived a later time in the morning and earlier time in the afternoon than the actual time (** p<0.01. * p<0.02). Zero (0) indicates the actual time on each question. The vertical bars in the bottom graph indicate the standard deviation. Correlation curve is: *y = -0.2x + 181.8.*

Form the results of the present study, there is a possibility that time orientation might not be randomly disrupted in each patient but stereotyped. The tendency to give a similar time of day in patients with dementia could be a kind of symptom of perseveration [5]. However, we considered another reason for the disruption of time orientation in the patients. Without information regarding time orientation due to memory disturbance, or without a memory of cues in daily living, subjective time orientation in the patients might become vague. They might then judge their subjective time of day as a similar time during a day. Memory loss regarding getting-up, meals, and experiences in a day caused vague time orientation in patients.

There are few studies on intervention specifically for time disorientation. Intervention for time orientation might be conducted partly during reality orientation therapy for patients with dementia [6]. It may not be practical to intensively apply cognitive training for time orientation, but, since time orientation is one of the basic aspects of cognition of the environment, therapists may pay more attention to enhance time orientation during conventional intervention. For example, therapists gradually presenting information on time during intervention with the aid of clocks may be effective for patients' cognition of time, especially in the morning when their time orientation was disrupted more than at any other time.

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# Communication with emotional materials with patients with dementia

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## Introduction

When patients with dementia have difficulty in verval communication with others, we, thrapists, try to communicate with them using a non-verbal way. Emotinal expression could be non-verbal information from patients as well as from therapists.

The implicit emotional processing in elderly patients with Alzheimer type dementia (AD) was different from that in healthy aging [1]. It was suggested that multi-modal sensory cortex was affected in the early stage of dementia, including memory system, and the emotional processes were also changed with pathological brain damages in the frontal and temporal regions [1]. Such disturbance in emotional perception was reported in another type of dementia, frontotemporal dementia, although underlying pathology might be different from AD [4].

On the other hand, people with severe dementia even preserve reactivity to facial expression [3]. Our clinical experience may support their result, since emotional facial expression is potentially important to communicate with patients with dementia during interventions.

It was suggested that patients and healthy elderly easier to identify happy expressions than any other basic emotions; sad, fear, disgust, bore, anger, surprise [7.3]. Another previous study concluded that that the ability to identify the basic emotional features of facial expressions was largely preserved in patients with AD, even in a severe stage, but there was poor identification of facial expression associated with non-verbal cognitive impairment [5].

In the clinical fields, how we communicate with the people with dementia is especially important when their ability in verbal communication is limited. The relation between disturbence in non-verbal communication and degree of brain dysfunction in dementia is still unclea, and only a small number of researches have dealt with the emotional communication.

The aim of the present study was to clarify how we, therapists, could use emotinal materials, such as facial expression, pictures of emotinal scene, and emotional music, to communicate with patielts with dementia.

## Method

21 elderly patients (7 males and 14 females, mean age: 85.5 ± 7.93 (years, SD)) in a care facility participated in the study. The participants were divided into two groups, dementia (10 subjects) and non-dementia (11 subjects), based on the scores of the Hasegawa Dementia Scale-Revised (HDS-R).

Experiment 1: Visual emotinal information

Illustrations with emotinal face, scene or information were preseted to the subjects, and they were asked to answer their emotinal feeling. They were asked to answer by indicating one of illustrations of facial expression, as well as by verbal response.

Three cards of schematic emotinally neutral, positive, and negative faces (10-cm square) were prepared. Each face was drawn with eyes, nose, mouth, ears, and eyebrows. The cards were used for the subject's answer. Subjects were asked to answere regarding their feeling by indicating one of the emotinal faces; i.e., positive, neutral, and negative (Fig. 1). Eighteen cards (10-cm square) with illustration of scenes incluidng 6 positive, 6 negative, and 6 neutral emotional information were prepared (Fig. 2).

Each card of emotional scene was presented one by one, asking the subject's emotinal feeling by the face cards. After the answer for one card, the following card was presented. Eighteen cared of emotional scenes were presented in random order.

Fig. 1: Three emotional face for answer. Positive (left), neutral (center), and negative (right) faces.

Experiment 2: Emotinal information by music

Two positive (bright or happy) and two negative (dark or fearful) pieces of music were presented to the subjects, and their emotinal feeling was asked for each piece of music. The pieces of music were originally created by a professional musician. Prior to the present study, emotinal feelings for each pieces of music were investigated using young subjects (mean age: 27.0±6.3), and the positive and negative feelings were statistically confirmed. The intensity of sound was adjusted to the level as each subject could hear the sound clearly. In a similar way to the experiment 1, the subjects were asked regarding their emotinal

feeling by indicating one of the face cards.

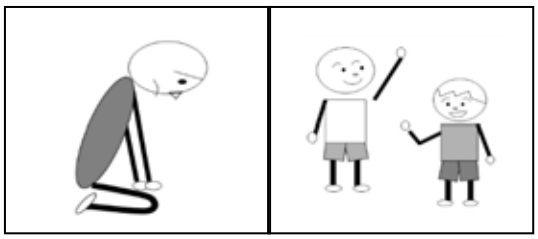

Fig. 2: Example emotional scenes: Negative (left) and neutral (right).

## Results

Regarding the cards of emotinal faces, all subjects were correctly classified the three types of emotinal faces as positive (or pleasant), negative (or unpleasant) and neutral.

Experiment 1: Visual emotinal information

First, the subjects were asked to answere verbally their emotinal feeling on each emotinal scene. For example, they answered on a positive scene as laughing, fun, happy, and pleased, and on a negative scene as crying and angry.

In 10 subjects with dementia, there were four incongruent answers in all 60 trials with negative scenes (10 subjects × 6 cards). In the 11 non-demented group, there was one incongruent anwere in 66 trials with positive scene (11 subjects × 6 cards). On the other hand, 7 / 60 were incongruent for the positive scene in the dementia group. The answeres for the neutral scenes varied in both groups.

Experiment 2: Emotinal information by music

Nine non-dementia subjects and eight dementia subjects were involved in the experiments. Four subjects could not be tested due to their hearling loss.

In non-demented group, for the negative music, in 4/18 trials (9 subjects × 2 pieces of music), the subjects judged it as negative, and 9/18 were judged as neutral. Five answered that it was positive. For the positive music, in 7/18 and 11/18 trials, they judged it positive and neutral, respectively.

In dementia group, in 3/18 trial, the negative music was judged as negative, and in 5/18 trials, were answered as positive. For the positive music, in 3 and 5 trials, congruent and incongruent answeres were obtained, respectively.

There was signigicant difference in incongruency of answere on the emotinal information given between the groups ($p<0.05$, Chi-squre test). There was no statistical relationship in the congruency of emotinal feeling between visual and auditory emotinal information.

## Discussion

The results of the present study were summerized as that visual and auditory emotinal information was differently recognized in the patients with dementia from young and healthy elderly people.

Seven core domains for emotional cognition were suggested in the previous study: i.e., processing speed, executive function, sustained attention, verbal memory, capacity in working-memory, inhibition/impulsivity, and sensorimotor function [6]. Those factors may facilitate the emotional process via amygdale function [2]. Degenerative change of responsible brain region to those factors in the elderly and patients with dementia may cause amount of emotional response to the emotional information, which leads a 'neutral' judgment for the negative/positive information. However, incongruent emotional judgment was significantly more in the patients with dementia, compared to the healthy subjects. Origin of such qualitative incongruence in the process of emotional information remains unclear, although disturbance of retrieve of emotional memory into working memory might be one of the reasons [8].

Regarding the communication with patients with dementia, we, therapists, should carefully observe whether emotional information was properly given to the patients. Combinations of modalities of emotional information could be tried to facilitate emotional communication during interventions.

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# Comparison of behavior in young and elderly drivers using the Safe Driving Behavior Measure (SDBM)

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**Introduction**

In Korea, the population of people over the age of 65 will be more than 15.7% of the general population by the year 2020 signaling an aged society. In addition, the number of people who hold driver's license among the elderly will increase and it is expected that the driving population will reach 18.4%.

However, with increasing age, decline in cognitive, visual, physical functioning in addition to reaction time is also likely and this will make driving more difficult. Impairments in driving skills brought about by aging and other health issues may lead to unsafe driving, vehicle crashes, or driving cessation. In reality, compared with other drivers, older drivers have a higher fatality rate than any other age group.

Despite what we know, research concerning driving behaviors in the elderly population are insufficient. Only few research have addressed the role of personality in age-related assessment, driving performance, driving cessation and transitioning from driving to non-driving.

The Safe Driving Behavior Measure (SDBM) is a precise and accurate measure for detecting safe driving behaviors among the elderly. Respondent's descriptions provide a rich item set reflecting the complex nature of driving behavior and illustrating the theoretical concepts of person, vehicle, and environment.

Thus, the purpose of this pilot study was to develop a self – report driving measure for old people in Korea. We compared driving behaviors between young drivers and elderly drivers and analyzed reliability by using the Safe Driving Behavior Measure (SDBM).

**Materials and Methods**

*Participants: :* The participants were individuals who visited the SENDEX Senior & People with Disabilities Exposition from August 30$^{th}$ to September 2$^{nd}$ of 2012 with a driving experience of over 3 years. In this study, we categorized participants over the age of 65 as the elderly driver group and individuals between the ages of 40 to 50 as the young driver group.

*Procedures:* The SDBM was translated using the translation-back translation process as follows(1) Forward translation from English to Korean; (2) Backward translation : One bilingual who did not know about the original English version of the SDBM translated the Korean-to-English translated version of the SDBM into English; (3) Review: One bilingual occupational therapy professor who did not know about the original English version of the SDBM compared the two English versions of the questionnaire for accuracy and inconsistencies; (4)Finalization: After verifying the backward translation, we revised some items in the Korean version of the SDBM and proceeded with the survey.

*Assessment of driving:* We used demographic characteristics (age, gender, education, employment status, driving experience) and SDBM. SDBM is a 68-item self-report measure to assess safe driving behaviors. The measure score represents the reported level of difficulty for the items given the participant's ability level. It is scored on a 5-point adjectival scale: Cannot do(1), very difficult(2), somewhat difficult(3), a little difficult(4), no difficult(5) with a total possible score of 340.

*Data analysis:* We used Cronbach's α value to evaluate the questionnaire's internal consistency. We managed the participant demographic data using descriptive statistics of SPSS Version 17.0. When comparing the SDBM total scores of the two groups, we used independent t-test. The correlation of SDBM total score by age were tested with Pearson correlation.

**Results**

*Demographics:* Table 1 presents the young and elderly drivers demographics. Young driver's average age was 51.76 years old (*SD* = 4.38), and all of the participants had more than 10 years of driving experience. Elderly driver's average age was 69.89 years old (*SD* = 3.99), and 83.3% of the elderly participants also had more than 10 years of driving experience.

**Table 1 Demographics and Driving Characteristics of Young (*N*=21)and Elderly Drivers (*N*=18)**

| Characteristic | Young Drivers (*N*=21) | Elderly Drivers (*N*=18) |
|---|---|---|
| Age in years mean(SD) | 51.76 (4.38) | 69.89 (3.99) |
| Gender, n(%) | | |
| Male | 13 (61.9) | 16 (88.9) |
| Female | 8 (38.1) | 2 (11.1) |
| Education | | |
| College or University | 12 (57.1) | 10 (55.6) |
| High school | 8 (38.1) | 6 (33.3) |
| Middle school | 1 (4.8) | 2 (11.1) |
| Driving experience | | |
| ≥5years | 0 (0.0) | 3 (16.7) |
| ≥10years | 21 (100.0) | 15 (83.3) |

*Reliability:* Internal consistency was measured in the two groups to see the reliability of the Korean version of the SBDM. As a result, both young driver group and elderly driver group showed high reliability (Table 2).

**Table 2 SDBM Internal Consistency by Age Group**

| Internal consistency (Cronbach's α) | | |
|---|---|---|
| Item | Young driver | Elderly driver |
| 68 | .982 | .977 |

*SDBM total score:* In SDBM score, young driver group was 316.05 (*SD* == 28.94) and elderly driver group was 302.22 (*SD* = 25.02). The young driver group reported more safe driving behaviors compared to the elderly group. However, there were no significant statistical difference between the two groups (Table 3).

**Table 3 SDBM total score**

| | Total score (SD) | *t* | *p* |
|---|---|---|---|
| Young driver | 316.05 (28.94) | 1.58 | .87 |
| Elderly drivers | 302.22 (25.02) | | |

*Correlation between age and SDBM score:* SDBM score decreased as age increased but it was not statistically significant.

**Table 4 Correlation between age and SDBM score**

| | Total score |
|---|---|
| Pearson correlation | -.283 |
| *p* | .081 |

*p*>.05

*Item comparison:* 19 items showed significant difference (*p*= .00~.04) and those items are presented in Table 5.

**Table 5 Items with significant difference between the two age groups**

| Item | Contents |
|---|---|
| Item 3 | Turn the steering wheel? |
| Item 7 | Stop for pedestrians crossing the roadway? |
| Item 8 | Drive in good weather? |
| Item 9 | Stay in the proper lane? |
| Item 14 | Press the gas or the brake when intended? |
| Item 15 | Use the car controls (such as the turn signals, windshield wipers, or headlights)? |
| Item 16 | Place the car in the correct gear (such as drive or reverse)? |
| Item 17 | Operate the emergency brake? |
| Item 21 | Drive and hold a conversation with one or more passengers? |
| Item 24 | Drive on a highway with two or more lanes in each direction? |
| Item 25 | Keep up with the flow of traffic? |
| Item 26 | Keep distance from other vehicles when changing lanes? |
| Item 28 | Drive cautiously (to avoid collisions) in situations when others are driving erratically (such as speeding, road rage, crossing lane lines, or driving distracted)? |
| Item 33 | Share the road with vulnerable road users such as bicyclists, scooter drivers, motorcyclists? |
| Item 42 | Keep distance between his or her car and others (allow time to react to hazards) |
| Item 44 | Look left and right before crossing an intersection |
| Item 45 | Drive in a construction zone? |
| Item 46 | Drive in dense traffic (such as rush hour)? |

*p*>.05

**Discussion**

This is a pilot study with the goal of examining the validity of a self-report driving measure for old people in Korea. We compared driving behaviors between young drivers and elderly drivers and analyzed reliability by using SDBM. This study can be applied in the future as the basic research for the development of self-report driving measure.

The results, while not statistically significant, suggest that younger drivers reported more safe driving behaviors compared to older drivers. Based on the results of SDBM item comparison across the two age groups, the elderly group reported more difficulties in items regarding properly driving in particular situations (e.g., keep up with the flow, keep distance from other vehicles) than in the manipulating car control systems (e.g., gear, wiper, brake). This suggests that when providing education and assessment for elderly drivers, it may be important to consider factors about keeping proper driving performance in different types of driving situations.

This study has several limitations. First, the small sample size might limit the generalization of the research consequences. Second, the target of study included only healthy individuals. Because most of the elderly experience medical problems and/or or disability, it will be difficult to conclude that the results of the present study represents driving behaviors of the elderly population in general. Third, because, all participants had more than 5 years of driving experience, the results may not be applicable to those with less driving experience.

The advantages of this study are as follows: The relatively high internal consistency suggests that this tool may provide a good opportunity to assess driving abilities for elderly drivers who may exhibit unsafe driving behaviors. As elderly drivers are used to their driving method and driving situation, they may wrongfully think their driving way is safe. Self-report measure such as the SDBM may help them to know more objectively about their problems. Second, occupational therapists can observe problem factors related to driving behaviors through the participants' response to the questionnaire. They may then offer consulting and intervention for elderly drivers and their caregivers through driving assessment.

Future research studies are needed to compare the driving behavior measure with various subjects.

**Conclusion**

This project was a pilot study for evaluating the driving behavior of young and old healthy adults. We examined the reliability of the SDBM for use in Korea. The results suggest good internal consistency of the questionnaire and potential for further examination in future studies in assessing driving behaviors.

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**Memo**

# ANALYSIS OF THE CENTER OF PRESSURE SWAY DURING REPEATED DRESSING IN HEALTHY SUBJECTS

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## Introduction

Dressing is one of important activities of daily living (ADL). In occupational therapy, CVA patients with hemiplegia are instructed how to dress with the affected trunk or upper and lower limbs dysfunction. The appropriate postural stability and the center of pressure (COP) shift during dressing are needed to dress well. Motor learning is occurred by training repeatedly, and the dressing skills such as postural stability and COP shift are influenced by learning. There are many studies on motor learning. For example, it was reported about neuronal mechanisms of motor learning [1]. However, there are a few studies that focued on the COP sway have been reported. Thus, it is not clear that the COP sway during activity is changed by repeated training.

On the other hand, there are some studies about the evaluation of dressing. Suzuki developed the Upper-body dressing scale for stroke patients [4]. This dressing scale is a useful tool to evaluate patient's dressing performance. However, there is no study about quantative evaluation method for judgment whether continue or finish dressing training. Clinically, therapists judged from the subjective evaluation such as observation. Because the dressing activity accompanies COP shift, it might be possible that measuring of the COP sway is usefull for the therapists to judge whether continue or finish dressing training.

By dressing training repeatedly and motor learning, patients with hemiplegia and disequilibrium must learn how to balance their body appropriately to the unstability. In the graduate study in 2010, Yokoyama reported about the difference among dressing methods in the COP sway during dressing, and the difference among trials in repeatedly. Yokoyama revealed that the COP sway of healty subjects during repeared dressing was changed within constant range of the COP sway in the usual method. But the COP sway was changed in three trials in the unusual dressing method [5]. However, there is no study about the COP sway during unusual dressing by still more repeating.

Therefore, the purpose of this study was to clarify the COP sway during dressing in unusual method by repeating 15 trials from healthy subjects.

## Materials and Methods

*Subjects:* Twenty-two healthy subjects participated in this study (3 males and 19 females, age range: 21-28 years, mean age: 21.5 ±1.6 years). No subjects had a history of neurological disease or vestibular impairment. Each subject was given informed consent prior to measurement. This study was approved by the Ethical Committee of Nagoya University, School of Health Sciences (10-624).

*Experimental Procedures and Date acquisition:* Subjects sat on a chair and contacted both their feet on the exp.? board during measurement. In the first measurement, the COP sway was measured during a static sitting posture and looking at the mark at eye level 30 seconds. Secondly, the COP sway during dressing was measured. Subjects were instructed to dress in former opening shirts in the method of doing in daily life. If one subject starts from passing the arm through the right sleeve when wearing the shirts first, the condition that starts from right sleeve is treated as usual and the condition that starts from left sleeve is treated as unusual. Subjects dressed it for 15 trials in the unusual way. The data acquisition was started from telling subject to start to dress the shirt on thighs to fastening all buttons on a shirt.

*Data processing and Analysis:* 3 parameters were used for evaluation of the COP sway. In the first step, the center of COP during just sitting (reference, COPr) were measured and calculated in order to find the sitting zero points in each subject. In next step, Maximal sways(the anterior - posterior (AP) and medial - lateral (ML) directions) of the COP were measured and found the differences from the COPr. When calculating the ML direction of the COP, different calculating method was used because subject dressed different ways(first passing the arm through the sleeve (FPS: First Passing Side) and other side (SPS: Second Passing Side)) In addition, track lengths of the COP sway per second (TL/S) were calculated.

In 1st to 3rd trials of each subject, the COP Maximal sway in AP, ML, and TL/S were compared among trials, using one-way (trials) repeated measures analysis of variance (ANOVA) with post hoc tests (Fisher's PLSD). In addition, 15 trials were divided into five periods and the averages of each period about the COP Maximal sway in AP, ML, TL/S, and dressing time were compared among periods, using one-way (periods) repeated measures analysis of variance (ANOVA) with post-hoc tests (Fisher's PLSD). The level of significant was set at $p < 0.05$.

## Results

*Differences from 1st to 3rd trial* : There was no difference in the COP Maximal sway in AP, FPS, and TL/S among trials. However, in SPS, there were significant differences among 1st to 3rd trials ($F$ (2.30) = 4.96 $p < 0.05$), and the post-hoc test revealed that the sway of 1st trial was significantly larger than that of 2nd and 3rd (vs2, vs3 $p < 0.05$) (Fig.1).

*Differences from 1st to 5th period:* There was no difference in the COP Maximal sway in AP and ML among periods. However, in TL/S, there was a significant difference ($F$ (4.84) = 5.47 $p < 0.01$), and the post-hoc test revealed that TL/S of 4th period was the smallest of all periods (vs1, vs2, vs3, vs5 $p < 0.05$) (Fig.2). There was a significant difference between 2nd and 3rd ($p < 0.05$). Thus, TL/S was smaller gradually from 2nd to 4th period and got larger in 5th period.

In addition, in dressing time, there was a significant difference ($F$ (4.84) = 23.50 $p < 0.01$), and dressing time of 5th period was significantly the shortest of all periods (vs1, vs2, vs3,

vs4 $p < 0.05$) (Fig.3). There were significant differences amang period ($p < 0.05$). Thus, dressing time got shorter gradually from 1st to 5th period.

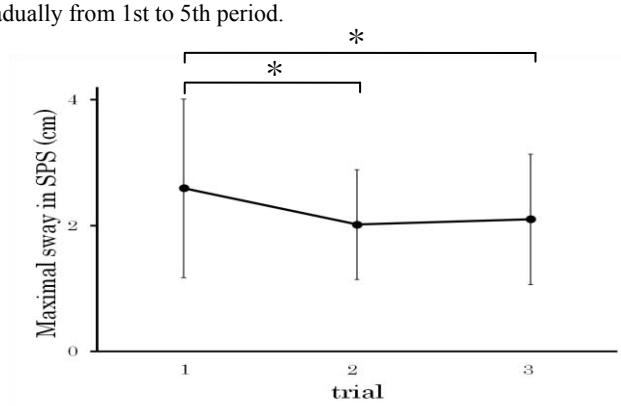


Fig1: The sway of 1st trial was significantly larger than that of 2nd and 3rd (vs2,3 $p < 0.05$). There was no difference between 2nd and 3rd.

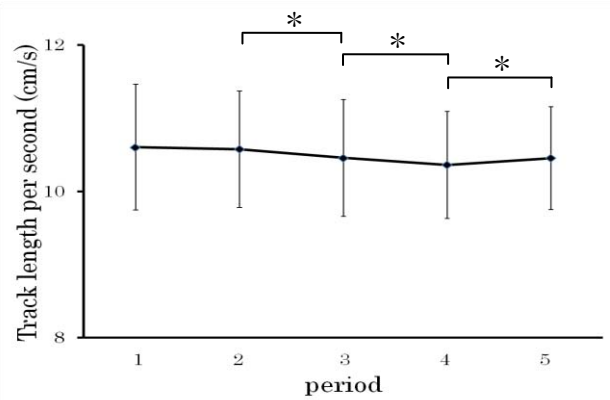


Fig2: There was a significant difference ($F$ (4.84) = 5.47 $p < 0.01$), and the post-hoc test revealed that TL/S of 4th period was the smallest of all periods ($p < 0.05$). There was a significant difference between 2nd and 3rd ($p < 0.05$). Thus, TL/S was smaller gradually from 2nd to 4th period and got larger in 5th period.

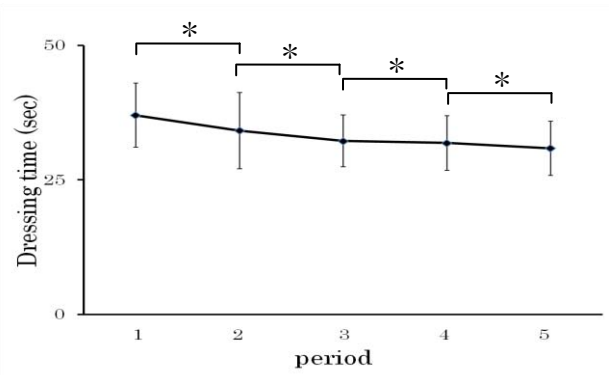


Fig3: There was a significant difference ($F$ (4.84) = 23.50 $p < 0.01$), and dressing time of 5th period was the shortest of all periods ($p < 0.05$). There were significant differences in each period ($p < 0.05$).

**Discussion**

*Differences from 1st to 3rd trial in SPS:* In the graduate study in 2010, Yokoyama revealed that the maximal sway in ML of 3rd trial was significantly smaller than the 1st in the unusual dressing way [5]. This is consistent with my results that the maximal sway to SPS in 1st was larger than in 2nd and 3rd. The last study showed that there was the COP sway in three times dressing. It is uncertain how changes in more times repeated dressing. Thus, this is the first study to revealed the COP sway during 15 times repeated dressing in unusual method.

*Differences from 1st to 5th period:* From this result, dressing time of 5th period was the shortest of all periods. Decreasing of dressing time indicates the increasing of TL/S, but the results showed that TL/S of 4th period was the smallest of all periods. This means that total track length during dressing was decreased more than the decreasing of dressing time. However, there was no difference in the COP Maximal sway in AP, ML. Therefore, The COP Maximal sway in AP and ML weren't changed during repeated dressing, but the COP sway within the range of the COP Maximal sway was changed. By repeating dressing, the subjects might unconsciously change how to use their own body. I suppose that the subjects were getting better to estimate next motion including motor speed, direction and strengthen during repeating dressing. In addition to that, the subjects were also getting better to adjust against the COP perturbation following the next motion [2, 3]. I hypothesize that these might cause changing of the COP sway, but of Maximal sway.

**Conclusions**

In the present study, I recorded the COP sway by repeated dressing activity on a chair in the unusual way from healthy subject. As a result, 1) the dressing time was getting shorter from 1st to 5th period. 2) The COP Maximal sway was not changed. 3) The TL/S was getting smaller from 1st to 4th period.

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# An influence of classroom furniture size on children's written test, pressure of the pen and sitting posture

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## Introduction

Schoolchildren spend much of their day sitting in classroom furniture. Although, recent study reports that classroom furniture is often too large or too small for schoolchildren [1] [2].

While many studies revealing the mismatch of classroom furniture, it is uncertain how these mismatch influence the schoolchildren. To examine the influence of classroom furniture mismatch on schoolchildren could be the important information for educators, and occupational therapists who engaged in special needs education.

The purpose of this study is to compare the influence of classroom furniture on children's written test, pressure of the pen and sitting posture between two conditions: appropriate furniture size and inappropriate furniture size.

## Methods

*Subjects:* A total of 110 second grade students, from an elementary school in Nagoya, Japan, participated in the study (54 females and 56 males). All subjects obtained the informed consent, and this research was approved by the Ethics Committee of the school of Health Sciences, Nagoya University.

*Measurements:* All anthropometric measurements were taken with the subjects sitting on a seat with a horizontal surface with knees bent at 90°. The human body dimensions measured in this study are the following. *Elbow height:* the vertical distance from the bottom of the tip of the elbow (olecranon) to the subject's seated surface. *Shoulder height:* the vertical distance from the top of the shoulder at the acromion process to the subject's sitting surface. *Popliteal height:* the vertical distance from the foot resting surface to the popliteal space, which is the posterior surface of the knee. *Buttock–popliteal length (thigh length):* the distance from the posterior surface of the buttock to the posterior surface of the knee.

*Furniture measurements:* Measured chairs and desks are for daily use of each subject. The dimensions of the classroom furniture that were measured are the following. *Seat height:* the distance from the highest point on the front of the seat to the floor. *Seat depth:* the distance from the back of the sitting surface of the seat to its front. *Desk height:* the distance from the floor to the top of the front edge of the desk.

All subjects' body dimensions and the sizes of desks and chairs were measured, and then subjects were divided into two groups, appropriate group (who use appropriate furniture) and inappropriate group (who use inappropriate furniture). The definitions of "inappropriate" are following.

*Seat height mismatch:* seat height that is either >95% or <88% of the popliteal height. *Seat depth mismatch:* seat depth that is either <80% or >95% of the buttock-popliteal length. *Desk height mismatch:* the maximum desk height is determined by 0.8517×elbow height + 0.1483×shoulder height + seat height [3].

*Assessments:* All subjects took written test (Developmental Test of Visual Perception: DTVP). In this study, sub test 1. Eye-motor coordination test, 2. Figure-ground test, and 5. Special relationships test were taken. Test time was determined at 20min. Pressures of the pen and sitting postures were also assessed during written test. Pressures of the pen were assessed by using carbon papers as 1: weak to 5: strong [4]. Sitting postures were recorded and assessed 1s each. The postures classified as "positive" or "negative", and total negative counts were adopted as postural score. Negative sitting are absence of following: elbows or underarm resting on desk, foot on floor, buttock in contact with at least half of the chair, contact with backrest when in listening position, pelvis in neutral, trunk facing forwards [5].

*Data analysis:* DTVP scores and postural scores were compared between appropriate group and inappropriate group by unpaired t-test. Pressures of the pen were compared between appropriate group and inappropriate group by Mann-Whitney U test. For the pressure of the pen analysis, Friedman's test was used to compare the scores between DTVP sub tests. For multiple comparisons, the Turkey-kramer test was used. Significance was set at $P<0.05$.

## Results

In seat height condition, appropriate subjects were 40 and inappropriate subjects were 70. In seat depth, appropriate were 15 and inappropriate were 95. In desk height, appropriate were 11 and inappropriate were 99. None of the subjects were appropriate in all condition (Table. 1). There were no difference in DTVP scores, pressures of the pen and postural scores between appropriate group and inappropriate group. But, both in appropriate and inappropriate groups, pressure of the pen was significantly lower in Eye-Motor Coordination test compared with Figure-Ground test and Spatial Relationships test ($p<0.01$, Table. 2). About sitting posture, as the mismatch between the furniture sizes and students' body dimensions extend, student who could keep good sitting posture tend to decrease (Fig. 1).

**Table. 2: Pressures of the pen in each condition (Mean±SD).**

| | | Eye-Motor Coordination test | Figure-Ground test | Spatial Relationships test |
|---|---|---|---|---|
| Seat height | appropriate | 2.2±1.1** | 3.8±1.1 | 3.8±1.2 |
| | inappropriate | 2.6±1.2** | 3.7±1.2 | 3.6±1.3 |
| Seat depth | appropriate | 2.3±1.0** | 3.6±1.3 | 3.9±1.3 |
| | inappropriate | 2.5±1.2** | 3.7±1.2 | 3.7±1.3 |
| Desk height | appropriate | 2.8±1.1** | 4.0±1.0 | 3.7±1.2 |
| | inappropriate | 2.4±1.2** | 3.7±1.2 | 3.7±1.3 |

****Significantly lower than Figure-Ground test and Spatial Relationships test (p<0.01).**

**Table. 1: Appropriate group and inappropriate group numbers in each condition.**

| | appropriate | inappropriate |
|---|---|---|
| Seat height | 40 | 70 |
| Seat depth | 15 | 95 |
| Desk height | 11 | 99 |
| All conditions | 0 | 110 |

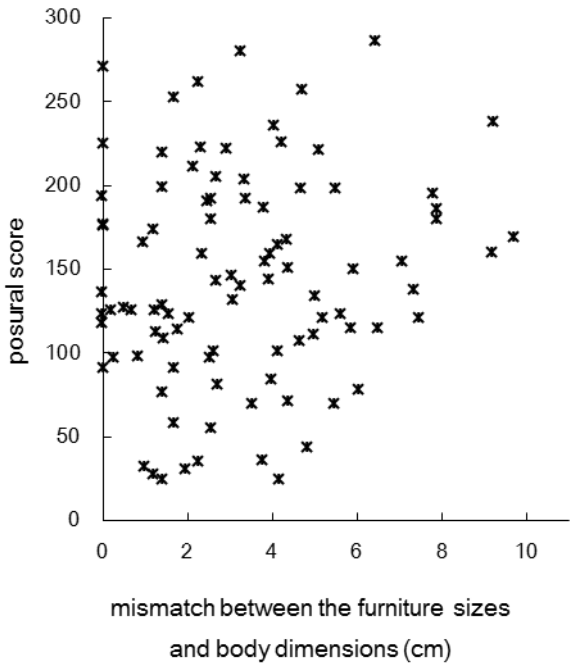


**Fig. 1: Relationships between postural scores and mismatch of furniture sizes. High postural score indicate wrong sitting posture.**

## Discussion

In this study, almost all the subjects used inappropriate furniture. Especially only 15 subjects used appropriate depth chair and 11 subjects used appropriate height desk. These results are the same as previous reports in other country [1] [2]. It is possible that mismatch of classroom furniture is widespread problem in Japan.

There were no differences of Pressures of the pen between appropriate group and inappropriate group. Although in all conditions, Eye-Motor Coordination test indicated significantly lower pressure than Figure-Ground test and Spatial Relationships test. It is possible that pressures of the pen were influenced by the test characteristics.

There were no differences of postural scores between appropriate group and inappropriate group. While the mismatch between the furniture sizes and students' body dimensions extend, student who could keep good sitting posture tend to decrease. Although appropriate size furniture not necessarily promote the good sitting posture, it is possible that inappropriate size furniture can press schoolchildren to sit wrong posture.

## Conclusions

In conclusion, this study compared the influence of classroom furniture on children's written test, pressures of the pen and sitting posture. The results suggest that classroom furniture did not influence the result of written test and pressures of the pen. Sitting posture tend to be influenced by the classroom furniture sizes. Specifically, inappropriate classroom furniture sizes can disturb good sitting posture.

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# CURRENT TRENDS IN OCCUPATIONAL THERAPY ASSESSMENT TOOLS IN KOREAN PEDIATRIC OCCUPATIONAL THERAPY

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**Introduction**

Pediatric occupational therapists work with children with diverse diagnosis using various approaches (Mulligan, 2003). Through a systematic approach based on evidence and professional clinical reasoning, occupational therapists use a variety of assessment tools for goal setting in intervention and as outcome measures to determine if a client has shown improvement after receiving therapy(Thorley & Lim, 2011). In some practice settings assessment results are also used to determine whether a client meets criteria for accessing therapy services(Thorley & Lim , 2011).

However, it is unknown which assessment tools are primarily used in which practice domain because extant studies investigated just the frequency of use((Burtner et al., 2002; Miller et al.,2001).

In a study by Yoo, Jeung, Park, and Choi(2006), 25.9% of occupational therapists worked as pediatric occupational therapists in Korea. It is consequently hard to generalize the use frequency of the assessment tools to other practice domains.

The purpose of this study was hence to examine the current state in the use of occupational therapy assessment tools by Korean pediatric occupational therapists.

**Materials and Methods**

*Subjects:* The survey participants were 137 occupational therapists with at least 6 months of clinical experience as pediatric occupational therapists in Korea.

*Procedures :* The survey content was based on instruments employed in previous research(Park & Yoo, 2002; Yoo, Jeung, Park, and Choi, 2006). This survey packet was updated with more comprehensive listing of current assessments. A purpose-designed survey consisted of questions regarding the participants' general information, use of particular assessment tools(16 questions), areas of assessment tool(9 questions), assessment tool they would like to study more(1 question). Areas of assessment tool consisted of developmental assessment, sensory integration assessment, perceptual assessment, cognitive assessment, physical assessment, upper motor assessment, daily activity assessment, psychosocial·play assessment, and occupational performance assessment. Data was obtained at the 2011 Congress of Korean Occupational Therapists by means of a survey questionnaire packet, in addition to the use of e-mail and postal service mail to pediatric occupational therapists.

*Data analysis:* Descriptive statistics were calculated using SPSS.

**Results**

A total of 290 packets were distributed with a final return rate of 47.2%. The vast majority of pediatric occupational therapists who responded were female(90.5%), held a bachelor degree(51.1%), and were between 26~30 years of age(44.1%). Respondents had held a position in pediatrics for 3~5 years(27.5%) and one half of the respondent worked full-time(52.9%), and 37.5% worked on a part-time basis. The length of time for initial evaluation was 20~40 minutes(32.5%) per one patient and reevaluation periods were every 6 months(47.5%).

The difficulties reported in conducted evidenced-based assessment included lake of accessibility to a wide range of assessment tools(52.5%), lack of knowledge of accurate ways of conducting assessment(30%).

Among the assessment tools the most frequently used tools were: Denver Developmental Screening Test-Ⅱ(DDST-Ⅱ)(86.3%) for development assessment, Sensory Profile(76.3%) for sensory integration assessment, Developmental Test of Visual Perception(DTVP)(75%) for perceptual assessment, Loewenstein Occupational Therapy Cognitive Assessment (LOTCA)(15%) for cognitive assessment, oral motor examination(53.8%) for physical assessment, Grooved Pegboard Test(25%) for upper motor assessment, Wee Functional Independence Measure (Wee FIM)(61.3%) for daily activity assessment, Preschool Play Scale, Revised (PPS/PPS-K)(22.5%) for psychosocial · play assessment, and Social Maturity Scale(46.3%) for occupational performance assessment(Table 1).

Korean pediatric occupational therapists also reported they wanted to study more about cognitive assessment (52.5%), sensory integration assessment(50%), and development assessment(47.3%).

**Table 1 Assessments Tools Used in Pediatric Occupational Therapy in Korea**

| Assessments tool | Frequency (*N*=139) | Percentage (%) |
|---|---|---|
| *Development assessment* | | |
| Denver Developmental Screening TestⅡ (DDSTⅡ ) | 69 | 86.3 |
| Bruininks-Oseretsky Test of Motor Proficiency (B-OTest)Ⅱ | 25 | 31.3 |
| GesellDevelopmentalTest | 13 | 16.3 |
| *Sensory Integration assessment* | | |
| Sensory Profile | 61 | 76.3 |
| ClinicalObservation | 57 | 71.3 |
| Bruininks-seretsky Test of Motor Proficiency (B-O Test)Ⅱ | 26 | 32.5 |
| *Perceptual Assessment* | | |
| Developmental Test of Visual Perception (DTVP) | 60 | 75.0 |
| Motor-Free Visual Perception Test (MVPT) | 32 | 40.0 |
| Visual Motor Integration (VMI) | 7 | 8.8 |
| *Cognitive Assessment* | | |
| Loewenstein Occupational Therapy Cognitive Assessment (LOTCA) | 12 | 15.0 |
| Good Enough-Harris Drawing Test | 8 | 10.0 |
| Dynamic Occupation Therapy Cognitive Assessment for Children (DOTCA) | 2 | 2.5 |
| *Physical Assessment* | | |
| Oral motor examination | 43 | 53.8 |
| Reflex Test | 41 | 51.3 |
| Range of Motion( ROM) | 28 | 30.5 |
| *Upper Motor Assessment* | | |
| Grooved Pegboard Test | 20 | 25.0 |
| Box and Block Test | 15 | 18.8 |
| Purdue Pegboard | 15 | 18.8 |
| *Daily Activity Assessment* | | |
| Wee Functional Independence Measure (Wee FIM) | 49 | 61.3 |
| Assessment of Motor and Process Skills (AMPS) / School AMPS | 17 | 21.3 |
| Functional Independence Measure (FIM) | 13 | 16.3 |
| *Psychosocial · Play Assessment* | | |
| Preschool Play Scale, Revised (PPS) / PPS-K | 18 | 22.5 |
| Childhood Autism Rating Scale (CARS) | 15 | 18.8 |
| Play History | 7 | 8.8 |
| *Occupational Performance Assessment* | | |
| Social Maturity Scale | 37 | 46.3 |
| Canadian Occupational Performance Measure (COPM) | 27 | 33.8 |
| Pediatric Evaluation of disability Inventory (PEDI) | 6 | 7.5 |

**Conclusions**

Pediatric occupational therapists were the DDST-Ⅱ, SP, DTVP, LOTCA, oral motor examination, Grooved Pegboard Test, Wee FIM, PPS-K, and Social Maturity Scale. Based on the results, provisions of a more extensive educational opportunities would promote the use of a greater variety of standardized and evidence-based assessment tools by Korean pediatric occupational therapists. The results of this study indicate that the choice of evaluation tools may be dependent on the availability of assessment tools, administration length of time and degree of simplicity in administration procedure more so than the awareness of evidence-based assessment tools for the particular assessment domain.

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# ASSISTIVE TECHNOLOGY IN KOREA
# : IMPLICATION FOR OCCUPATIONAL THERAPY

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**Introduction**

Assistive technology (AT) is a concept that includes devices, services for selection and purchase of such devices and strategies (e.g., service personnel and training methods) facilitating delivery of services for individuals requiring the devices, and is applied to maintain or improve functional capacities of a disabled person. In the field of occupational therapy, AT can be a powerful therapeutic tool that enables optimal activities and social participation by overcoming the limitations of functional training. In recent years, the field of AT in Korea has shown rapid growth secondary to interest and support of the government and private enterprises, and hence, interest and utilization of AT services in the field of occupational therapy is expected to gradually increase [1].

Accordingly, the purpose of this study was to present state of Korea's AT in the field of occupational therapy. In order to do so, relevant statistics and studies must be identified and considered to represent the current status and issues of Korea's AT service, and to examinate the degree of awareness and utilization of AT services by occupational therapists.

**Materials and Methods**

For this study, both the current status report and 7 studies were analyzed. The current status report was provided by the Ministry of Health and Welfare and 7 studies published between 2007 and 2012 were identified in the Korean databawe system KERIS using the search terms 'assistive technology' and 'occupational therapy'. In addition, the studies' first author had to be certified occupational therapist.

**Results**

As of 2012, there are approximately 12 AT service centers in Korea, and 1~2 centers are being open each year. Each center has received supports from both the federal and local governments, and perform services such as rental, support, development and custom-made fitting of the devices for the disabled person. The service personnel in each center are 5~10 people that are composed of physicians, occupational therapists, physical therapists, assistive technology practitioners, social workers and engineers, for example [2].

According to the results of analyzing the studies, in 6 studies research topics were about the theoretical framework, awareness and utilization, curriculum improvement and eligibility for AT in the field of occupational therapy. The remaining 1 study was about effectiveness and satisfaction of clinical interventions using AT [3].

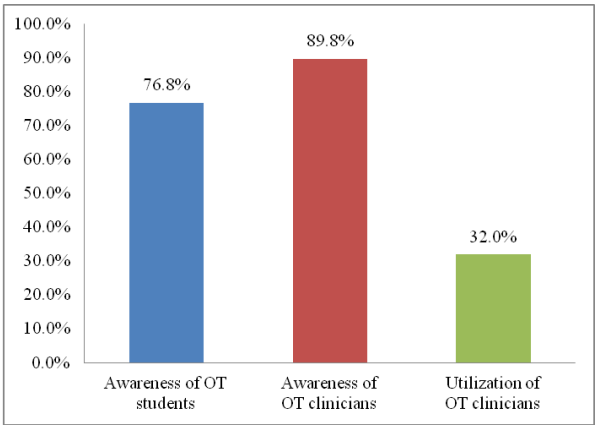
A study about theoretical framework emphasized importance of evidence-based AT interventions and research that main models are applied. The models were the rehabilitation model, need-based model, Human Activity Assistive Technology model(HAAT) and Matching Person and Technology(MPT) model [4].

According to analysis of awareness and utilization, 76.8% of occupational therapy students and 89.8% of occupational therapists were aware of AT. Additionally, more than 50.0% answered that they were aware of AT through their university or college courses [5, 6]. However only 32.0% of occupational therapists utilized AT in therapeutic setting, but 49.6% answered positively that they had plans to use AT in therapeutic intervention (Table 1) (Fig 1) [7].

**Table 1 Studies on awareness and utilization and courses among occupational therapists for AT**

| Study | Participants | Outcome |
|---|---|---|
| Jang MY, et al.(2010) | 9 AT clinicians | ① Courses for OT students: AT, functional anatomy, splint, OT for physical dysfunction, ergonomics, ADL, therapeutic crafts, OT for musculoskeletal disorder, augmentative and alternative communication, rehabilitation psychology, OT for children, manual muscle testing, human anatomy<br>② Advanced courses: House and work place remodeling, wheelchair seating and positioning, mechatronics, AT devices, interface, upper extremity prosthesis, theory of seating and standing |
| Jang MY, et al.(2007) | 30 Departments of OT<br>256 OT clinicians | ① 10.9 courses in a university, 9.3 courses in a college<br>② 89.8% were aware of AT<br>③ 53.1% were aware of AT in their university or college courses<br>④ Higher educational and vocational experience showed a higher awareness($p<.05$) |
| Chae SY, et al.(2007) | 312 OT students | ① 76.8% were aware of AT<br>② 68.3% were dissatisfied with information related to AT<br>③ 72.7% replied that AT introduction needs into OT student curriculum |
| Jang MY, et al.(2007) | 256 OT clinicians | ① 32.0% had utilizations with AT<br>② 64.4% replied that application was low in therapeutic environment<br>③ 49.6% had a plan to use a AT in therapeutic intervention<br>④ Higher educational experience showed a higher utilization($p<.01$) |

**Figure 1 Awareness and utilization of occupational therapists for AT**




Most of the studies offered realistic problems in propagating AT services by occupational therapists such a shortage of qualidied personnel and a lack of specialty. The solutions offered included setting up more university education courses, launching advanced placement courses and introducing a certification system. In a study on a group of 9 AT clinicians using the Delphi method, it was reported that to train AT specialists the university education curriculum should include 14 courses such as assistive technology, functional anatomy and activities of daily living (ADL), for example. Also it was shown that the advanced placement program should include 7 courses that relate to clinical interventions such as house and work place remodeling [8].

**Discussion**

Through this study, it was identified that the awareness of Korea's occupational therapy students and therapists for AT was high, while the actual utilization was low. Thus, as emphasized in the studies, to establish a more active AT in the field of occupational therapy, practical training of specialists is essential.

In Korea, there is no a legal criteria on qualifications of a AT specialist. For this reason, in the past two to three years social and legal requirements has been offered by the government to establish [9].

The Korean Society of Assistive Technology (KSAT), consisting mainly of Members of The Korean Association of Occupational Therapists (KAOT) was founded in 2009. The KSAT is providing an education program for training of AT specialists. The program embraces a diverse range of courses such as understanding of AT, counseling and evaluation, interface and delivery system, funding management, splint fabrication and application, seating and positioning and driving rehabilitation. Certifications on AT specialist are given to KAOT members through completion of the courses and passing of qualifying examinations. Besides the 50 departments of occupational therapy in korea are making every effort to improve awareness and develop knowledge of AT by setting up courses such as assistive technology, ADL and splint.

These program and courses can be used as the basis in the near future when the legal ground is enacted by the government. In this regard, occupational therapists are expected to enhance the opportunity to play a pivotal role as specialists in the field of AT.

**Conclusions**

This study summarized the current status of AT service centers and conditions of service personnel in Korea as well as the awareness and utilization for AT among occupational therapists and students. In addition it was identified that the problems of Korea's AT are a shortage of the personnel and a lack of specialty, and the solutions are to set up courses, launch advanced placement programs and introduce the certification system.

As the field of AT grows rapidly in Korea, the role and proportion of occupational therapists are now recognized to play an important role. On this account academic association and societies in relation to occupational therapy are carrying out continuing educational and research activities.

The results of this study are expected to be utilized as the basic materials for research and educational activities in the future, which can present a systematic direction to Korea's AT and contribute to enhancement of occupational therapists's capabilities.

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# BRAIN RESPONSE FOR AWARENESS: A MAGNETO-ENCEPHALOGRAPHIC STUDY

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## Introduction

Awareness of an object is the starting point of a behavior. The awareness may be not only a cue for an action, but also a sign of consciousness. Since every conscious activity of us accompanies with awareness of something, brain processes for awareness, as a fundamental brain activity, have been investigated (Koivisto and Revonsuo, 2010).

Brain processes for awareness should involve those for categorization and discrimination, and we finally aware what was presented. Previous study suggested that our brain select a target and suppressed irrelevant information to the target information through interaction between the target and irrelevant information detection processes (Conci et al., 2006). Occupational therapy, which supports meaningful activities occupying client's time, it may be important to know what clients are aware of through an intervention. Therefore, to understand brain mechanisms for awareness, as well as cognitive process, has been especially important for OT, with knowledge of neuroscience (Katz et al., 2002; Carey, 2010).

I conducted a basic research for awareness of face in the present study. Since recognition of face is one of the most fundamental and important activities at the beginning of intervention to communicate face to face with the client. I considered that brain responses before awareness should be clarified to know the brain process leading awareness. A magneto-encephalographic system (MEG) has been a powerful tool to investigate when and where a response of brain was activated following stimulation/information.

## Materials and Method

Ten healthy volunteers participated in the present study (2 males and 8 females, mean age: 24.9 ±7.62 (SD) years). Schematic pictures were presented on the center of a screen in front of the subjects (Fig. 1). The visual stimulation included three categories of pictures; i.e., two faces of lateral and oblique views, two non-face and intermediate pictures (Fig. 2). For example, a white dot was placed at the center of a large circle, and, by adding a small white dot, the picture was presented as face, non-face or, or intermediate schema. Therefore, The face, non-face and intermediate pictures were different in position of a small dot (Fig. 1). Presented period for each picture was 1 sec, and magnetic signals were recorded for 2 sec after the onset of the visual stimulation. Sampling frequency was 2k Hz, and the initial bandpass filter was between 1 to 100 Hz. Each picture was presented 50 times during one session in random order, thus 50 evoked brain responses following each face, non-face and intermediate picture were obtained. The subjects asked to judge whether a pictures seemed to be face or not, by pressing button in their right hand, just after the offset of the visual presentation.

The brain response recorded as magnetic fields, were averaged for each category of visual stimulation. We analysed the initial response, at approximately 150 ms after the onset of the visual stimulation, since the response differ in magnetic fields among the categories of the stimulation. Peak latency and strength of the global field power, which were obtained as a root-mean square (RMS) of intensity of magnetic signals at each sampling point, were compared among the categories.

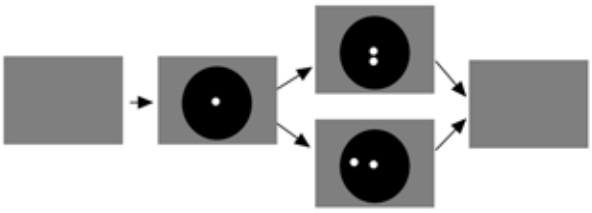

Fig. 1: Visual stimulation: Initial schema was a small dot in a large black area (left-center), and another small dot was added to change the initial schema to face, non-face or intermediate picture (right-center, face and non-face were presented). This presentation enabled to evoke brain response for different categories by adding a small white circle. The MEG signal was recorded from the onset of the right-center picture.

## Results

The MEG waveforms recorded from a representative subject were shown in Fig. 2. The brain responses after the onset of adding a small dot were obviously different among the picture

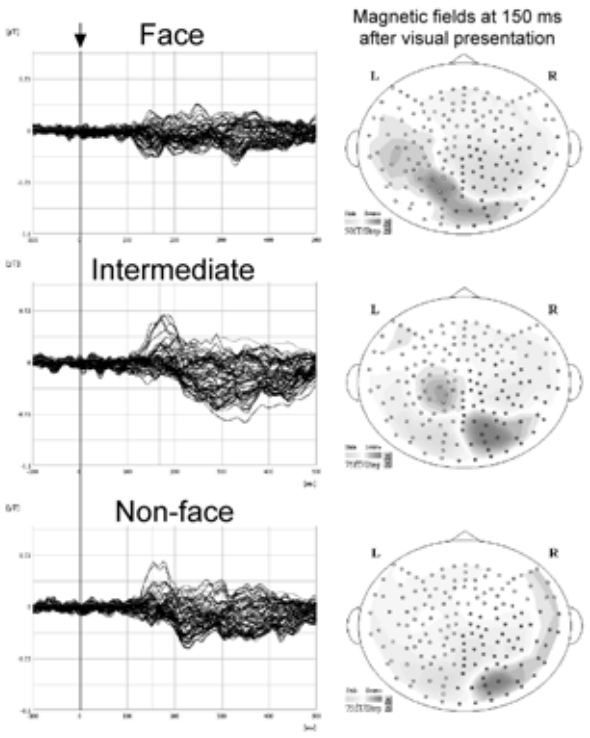


Fig. 2: The MEG waveforms obtained from the right hemisphere following visual stimulation of each category. Fifty waveforms were superimposed (left), and patterns of magnetic fields at150 ms after the onset of visual stimulation by adding the second dot were shown (right). The arrow indicate the onset of the stimulation; i.e., the onset of adding small circle.

categories (Fig. 2).Statistical analysis showed large brain response following the intermediate pictures than that after face pictures (Bonferroni-Dunn's test, $p<0.05$, Fig. 3). Latency of the response was not changed among the categories. The generator source for the response at 150 ms after the visual stimulation was estimated in the inferior temporal area in each hemisphere.

**Discussion**

The present results showed a large brain response following the intermediate pictures, which were ambiguous, and the face picture evoked smaller response than that for intermediate picture. The brain response for the intermediate and non-face response might include responses for non-familiar stimulation, since those pictures were relatively unusual than the face pictures. I considered that the large response following the intermediate ambiguous pictures needed more brain activity to identify what was the picture. The brain activity might involved suppressive response that resulted in "this was not face nor non-face", as Conci et al. (2006) indicated as a detection process. The present results suggested that awareness for face, at least for face as a familiar stimulation, might be preceded by absent of brain responses for "ambiguousness" or "unusualness".

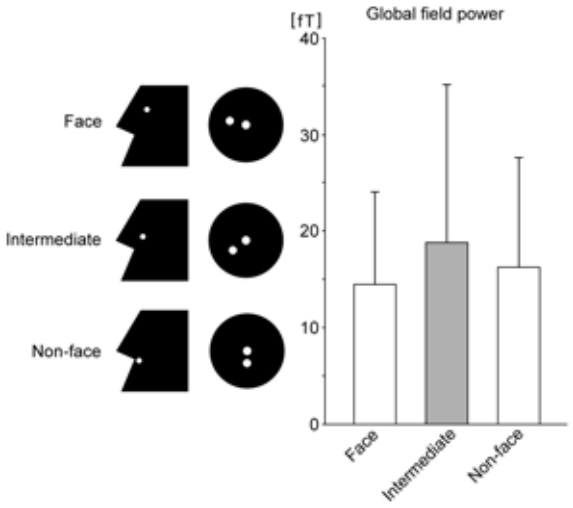


Fig. 3: The global field power at the peak of the components at 150 ms after the visual stimulation. Significantly larger response (gray bar) was obtained after the Intermediate simulation.

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# A SYSTEMATIC REVIEW OF THE EFFECTS OF OCCUPATIONAL THERAPY FOR PERSONS WITH DEMENTIA: A META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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**Introduction**

With population aging, the number of elderly people who are being diagnosed with dementia, which is a representative disease for the elderly, is continuously increasing. As the number of persons with dementia is increasing, studies on effective occupational therapy(OT) intervention need to be organized to be used in evidence-based practice and will provide useful information for clinicians providing therapy for persons with dementia. However, no systematic studies to examine the degree of effectiveness across OT interventions for persons with dementia have been conducted recently, and the effect of various OT interventions for persons with dementia has not been sufficiently demonstrated. Therefore, there is a need for a systematic study on the effectiveness of OT interventions to provide clinically effective OT to persons with dementia.

Meta-analysis was conducted to examine the effects of OT interventions based on sensory stimulation, environmental modification and functional task activity on the behavioral problems and depressive symptoms of individuals with dementia.

**Materials and Methods**

*Search strategy:* An extensive search in databases such a MEDLINE, CINAHL, ProQuest Medical Library, an Cochrane in addition to 11 OT-related journals was performed.

*Selection criteria:* Potential studies were idenfied through the following keywords: dementia or Alzheimer, randomize controlled trials (RCTs) and occupational therapy o occupational therapist or ADL or sensory stimulation o Snoezelen or environmental modification or education fo caregivers.

*Data collection and analysis:* Two reviewers independentl identified studies, extracted data, and assessed methodologica quality of the studies. Effect size was estimated usir standardized mean difference with 95% confidence interval Significant heterogeneity and publication bias we investigated.

**Results**

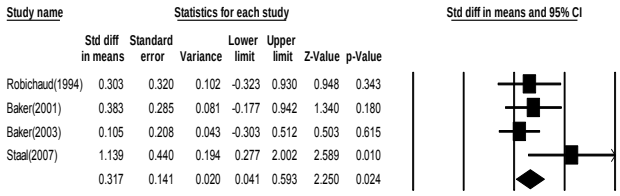
The characteristics of the 9 studies included for me analysis are shown in Table 1. Nine studies identified we RCTs and showed random assignment and a low dropout rat The methodological quality of the primary data was assesse by PEDro. The quality of seven out of nine studies was hig The results of Funnel Plot analysis found that there was r publication bias. In the homogeneity test, no statistical significant heterogeneity .

The OT intervention in four of the nine studies was senso stimulation [1,2,3,4], intervention of three studies w functional task activity [5,6,7] and intervention of two studi was environmental modification [8,9]. The interventic duration was from four weeks to six months. We reviewed RCT studies and failed to find one common outcome. Th common dependent variable of OT interventions based c sensory stimulation and environmental modification w behavioral problems(agitation, disruptive behavior, memo related problems) and that of OT intervention based c functional task activity was depression(apathy, sadness, depressive symptoms).

*Effects of OT intervention based on sensory stimulation on behavioral problems:* A total of 250 subjects were included in four studies [1,2,3,4], and all studies compared sensory stimulation therapy and general treatment. The range of effect size in this meta analysis was from 0.11 to 1.14. The overall effect size was statistically significant at 0.32 (95% CI, 0.04 to 0.59, $p < 0.05$) (Fig.1) and can be interpreted as small.

*Effects of OT intervention based on envrionmental modification on behavioral problems:* A total of two studies [8,9] involving 298 participants were included to examine the effects of OT intervention based on environmental modification. Meta analysis found that the range of effect size was from 0.13 to 0.14. The overall effect size was not statistically significant at 0.13 (95% CI, -0.09 to 0.36, $p > 0.05$) (Fig.2).

*Effects of OT intervention based on functional task activity on depression:* Three studies [5,6,7] involving 203 people were analyzed to examine the effect of OT intervention based on functional task activity. The range of effect size of meta analysis was from 0.08 to 0.25. The overall effect size was not statistically significant at 0.15 (95% CI, -0.17 to 0.47, $p > 0.05$)



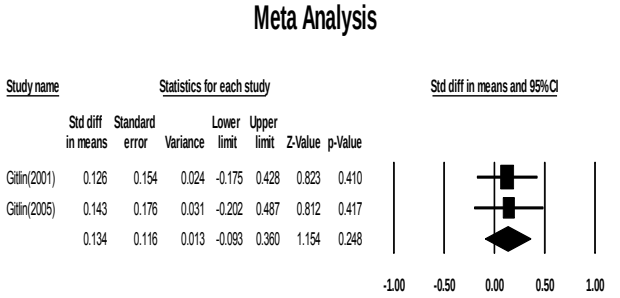
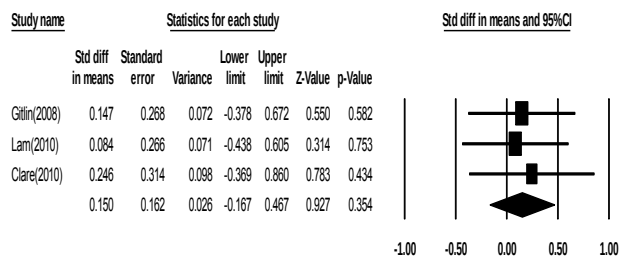




**Figure 3 Forest plot of the effect of OT intervention based on functional task activity on depression**



Meta Analysis






## Discussion

This review explored the efficacy of several OT interventions on behavioral problems and depression for dementia. The overall effect size of OT interventions based on sensory stimulation, environmental modification and functional task activity was 0.32, 0.15, 0.15. The available evidence suggests that sensory stimulation is an effective intervention to improve behavioral problems while OT interventions based on environmental modification and functional task activity are not effective to improve behavioral problemsand depression.

The overall effect size of OT interventions based on sensory stimulation was 0.32 that revealed small but statistically significant effects in improving behavioral problems of persons of dementia. Although the effect size is small, sensory stimulation was found to be effective in improving behavioral problems based on our meta analysis. Dementia is the result of degenerative changes in the central nervous system [10]. The onset of dementia leads to gradual deterioration, with multiple cognitive deficits and a significant decline from previous levels of functioning [11]. Therefore, a small effect size in dementia studies can be interpreted as meaningful and OT intervention based on sensory stimulation can be used to improve behavioral problems that is a common symptom in dementia patients and contribute to the distress of their caregivers.

There are several limitations of this meta analysis that should be considered in interpreting the findings. First, this review sought only RCT of OT interventions and this resulted in only a small number of studies being found. As such, this review included studies that did not classify type and severity of dementia clearly. Therefore, there is a limitation to generalizability of the present findings as different types (Alzheimer's type dementia and vascular dementia) and severity of dementia were represented in our analysis. It is arguable whether intervention effect in people with Alzheimer dementia is sufficiently similar to that in people with vascular dementia to justify inclusion in the same study population or whether intervention effect between different stages of dementia is same, or whether the inclusion of such a mixed population would have a confounding effect. Therefore, the result of this review should be considered cautiously. Lastly, as this review included only studies published in English, studies published in other languages may have been missed. Such limitations suggest an urgent need for more RCT studies evaluating specific categories of OT intervention for specific type and severity of dementia.

This study is meaningful in that a meta analysis was performed for the first time to assess the overall effect by integrating the results of independent studies to examine the effects of OT interventions on behavioral problems and depression for persons with dementia. In conclusion, sensory stimulation provided by occupational therapist is an effective clinical intervention that can be used for dementia. For scientific studies in the future, further studies are needed by classifying type and severity of dementia since the characteristics can be different depending on type and severity of dementia.

## Conclusions

The result of meta analysis indicated that OT interventions based on sensory stimulation have a small but significant effect on improving behavioral problems for persons with dementia. However, since these conclusions were draw from 2 to 4 RCTs, it should be treated with caution until replicated in future research.

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**Table 1 Characteristics of included RCTs**

| Study | Participants | Intervention | Duration/ Frequency | Outcome Measures | Methodological quality |
|---|---|---|---|---|---|
| Baker (2001) [1] | N = 50<br>(Exp: Con = 25:25)<br>Mean age: 78.0<br>Gender: 25M, 25F | Exp group: sensory stimulation<br>Con group: usual activity | 30 min/session, 2 times/week for 4 weeks | BMD<br>BRS | 5 |
| Baker (2003) [2] | N = 136<br>(Exp: Con = 65:71)<br>Mean age<br>(Exp: Con=81.0: 83.0) | Exp group: sensory stimulation<br>Con group: usual activity | 30 min/session, 2 times/week for 4 weeks | BMD<br>BRS | 6 |
| Robichaud (1994) [3] | N = 40<br>(Exp:Con = 22:18)<br>Exp group<br>Mean age: 76.6<br>Gender: 8M, 14F<br>Con group<br>Mean age: 80.1<br>Gender: 4M, 14F | Exp group: sensory stimulation ; sensory integration program- activities emphasizing physical response, sensory stimulations, cognitive stimulations<br>Con group: usual activities | 30~45 min/session, 3 times/week for 10 weeks | RMBPC | 6 |
| Staal (2007) [4] | N = 24<br>(Exp:Con = 12:12)<br>Mean age<br>(Exp:Con =80.3:72.0) | Exp group: sensory stimulation (Snoezelen)<br>Con group: standard care | 25~30 min/session, 6 times | PAS<br>SANS | 6 |
| Clare (2010) [5] | N = 69<br>Mean age: 77.78<br>Gender: 28M, 41F | Exp group: performing functional task activity ; goal-oriented activity using practical aids and strategies<br>Con group: no treatment | 60 min/session, 1 time/week for 8 weeks | HADS | 6 |
| Gitlin (2008) [6] | N = 60<br>(Exp:Con = 30:30)<br>Exp group<br>Mean age: 78.0<br>Gender: 15M, 15F<br>Con group<br>Mean age: 80.8<br>Gender: 19M, 11F | Exp group: performing functional task activity ; tailored activity program- target activity based cognition, interest and role<br>Con group: routine care | 90 min/session, 6 home visits, 15 min/session, 2 telephone contacts; 8 times for over 4 months | CSDD | 8 |
| Lam (2010) [7] | N = 74<br>(Exp:Con = 37:37)<br>Exp group<br>Mean age: 83.1<br>Gender: 12M, 25F<br>Con group<br>Mean age: 83.8<br>Gender: 7M, 30F | Exp group: performing functional task activity ; functional enhancement program- tailored functional activity and skills training<br>Con group: general care | 45 min/session, 2 times/week for 8 weeks | CSDD<br>NPI | 8 |
| Gitlin (2001) [8] | N = 171<br>(Exp: Con = 93:78)<br>Exp group;<br>Mean age: 77.78<br>Gender: 31M, 62F<br>Con group<br>Mean age: 78.36<br>Gender: 27M, 51F | Exp group: environmental modification ; physical, social environmental modifications<br>Con group: routine care | 90 min/session, approximately 1 time/every other week for over 3 months | MBPC | 6 |
| Gitlin (2005) [9] | N = 127<br>Mean age<br>(Exp:Con = 79.2:82.9)<br>Gender: 38M, 89F | Exp group: environmental modification ; home environmental skill building program- problem solving, simple home modification<br>Con group: routine care | 90 min/session, 5 home visits, 1 telephone contact; 6 times for over 6 months | RMBPC | 4 |

Exp: experimental; Con: control; M: male; F: female; BMD: Behavior and Mood Disturbance Scale; BRS: Behavior Rating Scale; HADS: Hospital Anxiety and Depression Scale; MBPC: Memory and Behavior Problems Checklist; RMBPC: Revised Memory and Problem Behavior Checklist; CSDD: Cornell Scale for Depression in Dementia; NPI: Neuropsychiatric Inventory; PAS: Pittsburgh Agitation Scale; SANS: Scale for the Assessment of Negative Symptoms

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**Memo**

# Awareness of Driving Rehabilitation among Occupational Therapists in Korea

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**Introduction**

Mobility within the community has been recognized as a unique area of occupational therapy as an instrumental activity of daily living. Community mobility through public transportation such as a bus or a taxi or driving constitutes "independent movement" [1]. Driving is the most basic method of mobility for both nondisabled individuals and people with disability and is the most important method of transportation in instrumental activities of daily living at the same time. Driving requires interaction of considerable perceptual, visual, and cognitive abilities [2]. Individuals requiring assistance such as those with disabilities may be able to use public transportation such as bus and subway but they may not have easy access because of the lack of facility. In addition, many taxi drivers oftentimes refuse to take individuals with disability as passengers. As such, individuals with disability often prefer to drive their own car [3]. Especially given the growing proportion of the elderly, their expressed need for driving in order to actively participate in social activities is also increasing. Furthermore, to evaluate individuals post-accident or injury who have acquired physical impairment is another important part of driving rehabilitation [4]. The occupation of driving is thus one of the newly emerging social issue in Korea as the elderly population grows. In fact, 12.2% of the elderly population drive their own cars while 21.3% report they also experience difficulty in driving [5].

This age group is also at a greater risk for motor vehicle crashes due to medical conditions, medication use, and functional impairments that are common in the older population than the general adult age group [6]. In Korea, vehicle accident fatalities in older drivers is increasing gradually at 11.6% [7]. Similar numbers are being reported in the United States and Canada. To solve such problems, there is a greater demand for governments interventions, including mandating physical and cognitive evaluation to renew the driver's license [8].

Therefore, the need for driving assessment and driving rehabilitation is rising. This study was based on examining mobility within the community and collecting basic data for future research by investigating the awareness and the necessity of driving rehabilitation among occupational therapists.

**Materials and Methods**

A total of 209 occupational therapists with 3.1 years of clinical experience who are members of the Korean Association of Occupational Therapists (KAOT) completed the survey (Table 1). There were 8 questions pertaining to driving rehabilitation and 14 questions regarding utilization of driving rehabilitation in clinical practice.

**Table 1 General characteristic** **(N=209)**

| Characteristic | Frequency | % |
|---|---|---|
| Age distribution | | |
| 20~29 years | 175 | 83.7 |
| 30~39 years | 29 | 13.9 |
| 40 years and up | 5 | 2.4 |
| Gender | | |
| Male | 53 | 25.4 |
| Female | 156 | 74.6 |
| Highest level of education | | |
| 3 years Bachelor' | 114 | 54.5 |
| Bachelor's degree | 90 | 45.4 |
| Place of Employment | | |
| Rehabilitation hospital | 87 | 41.6 |
| Nursing home | 52 | 24.9 |
| University hospital | 54 | 25.8 |

**Results**

180 of the participants reported the need for driving rehabilitation intervention. 116 participants (55.5%) had taken a driving rehabilitation course during undergraduate education, and if continuing education course in driving rehabilitation is open following licensure, 188 (90%) occupational therapists indicated they would enroll in such education programs (Table 2).

**Table 2 Awareness of driving rehabilitation among occupational therapists**

**(*N*=209)**

| Questions | Frequency | % |
|---|---|---|
| Driving rehabilitation intervention necessity | | |
| Necessary | 180 | 86.1 |
| Not necessary | 29 | 13.9 |
| Enrollment in driving rehabilitation course during undergraduate education | | |
| Yes | 116 | 55.5 |
| No | 91 | 21.0 |
| Willingness to participation in driving rehab continuing education | | |
| Yes | 188 | 90.0 |
| No | 21 | 10.0 |

In regards to questions regarding ways to enhance accessibility to driving rehabilitation related courses, 86.1% reported that it is necessary to have more courses made available through professional associations, while 82.3% responded that certification may not be necessary (Table 3).

**Table3 Means to increase accessibility to driving rehabilitation courses**

**(*N*=209)**

| Questions | Frequency | % |
|---|---|---|
| Additional education | | |
| Necessary | 180 | 86.1 |
| Not necessary | 29 | 13.9 |
| Require Certification | | |
| Necessary | 91 | 43.5 |
| Not necessary | 116 | 55.5 |

On questions regarding actual experience of applying driving rehabilitation in clinical settings, 197 participants (94.3%) indicated that they did not have experience in providing driving rehabilitation in clinical practice. However, 125 participants (59.8%) reported that clients express the need for driving rehabilitation (Table 4).

**Table 4 Application of driving rehabilitation in clinical practice (*N*=209)**

| Questions | Frequency | % |
|---|---|---|
| Driving rehabilitation provided in clinical setting | | |
| Implemented | 12 | 5.7 |
| Not implemented | 197 | 94.3 |
| Client desire for driving rehabilitation | | |
| Demanded | 125 | 86.1 |
| Not Demanded | 84 | 13.9 |

To questions concerning the degree of applicability of driving rehabilitation in the current place of employment, 143 participants (68.4%) reported that there is a difficulty in immediate application of driving rehabilitation. When inquired about future plans of implementing driving rehabilitation, 125 occupational therapists (59.8%) indicated that they plan to provide driving rehabilitation in the future when systematic and physical set-up is finalized, suggesting that there is a desire to provide driving rehabilitation. Some of the interfering factors in implementing driving rehabilitation currently included absence of necessary equipment and facilities (87.9%) (Table 5).

**Table 5 Applicability of driving rehabilitation (*N*=209)**

| Questions | Frequency | % |
|---|---|---|
| Applicability of driving rehabilitation in current work environment | | |
| Possible | 63 | 31.1 |
| Not possible | 143 | 68.4 |
| Plan to apply driving rehabilitation in the future | | |
| Yes | 125 | 59.8 |
| No | 80 | 38.3 |
| Obstacles to providing driving rehabilitation (multiple responses) | | |
| Absence of facilities, equipment, space, vehicle for practice | 157 | 87.9 |
| Absence of experts | 53 | 19.6 |
| Lack of insurance coverage | 50 | 18.5 |

**Discussion**

This study was conducted across 209 occupational therapists in order to examine the awareness and the perceived need for driving rehabilitation in the current clinical practice setting.

The results are consistent with studies conducted through the American Occupational Therapist Association (AOTA). Participants reported the need for driving rehabilitation, as well as more specialized driving rehabilitation specialists. Such results indicate greater need for continuing education for occupational therapists in this area.

Clinical experience through hands-on training for therapists working in the area of driving rehabilitation is needed, and there is a desire to be trained by driving rehabilitation specialists to enhance their therapy experience. However, too much focus has been on curriculum-based education in driving rehabilitation, with relative lack of exposure to actual clinical application of driving rehabilitation.

Driver-trained occupational therapists (DTOTs) are qualified occupational therapists who specializes in the rehabilitation of driving in Australia, even if issued through a variety of assessment and the actual highway rating (On-Road Driving Test) is parallel [10].

In Korea, such driving rehabilitation certification system with a wide range of professional training programs targeting impaired drivers are lacking, with deficiency in professional training or practice facilities, and the need is urgent to expand the composition of the environment, provide more sufficient and safe driving education and training that can be provided by professionals.

The results of this study will assist the efforts made by qualified occupational therapist striving to broaden the field of driving rehabilitation .

Especially given the growing proportion of the elderly and disabled, it is essential to make the foundation for driving rehabilitation within the curriculum and active interest and participation of occupational therapist are also required.

The limitations of this study are that this research was conducted with a proportionate number of occupational therapists. Moreover, further studies are necessary regarding specific and systematic means to examine the effectiveness of driving rehabilitation.

**Conclusion**

The preesent study demonstrated there is still a significant need for education and clinical training in the clinical field of driving rehabilitation in occupational therapy. Thus, it will be essential to implement more education in driving rehabilitation and training support.

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