Added-Purpose versus Rote Exercise for Dynamic Standing Balance Training in Hemiplegia

Ching-Lin Hsieh
ADDED-PURPOSE VERSUS ROTE EXERCISE FOR DYNAMIC STANDING BALANCE TRAINING IN HEMIPLEGIA

by

Ching-Lin Hsieh

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ADDED-PURPOSE VERSUS ROTE EXERCISE FOR DYNAMIC STANDING BALANCE TRAINING IN HEMIPLEGIA

Ching-Lin Hsieh, M.S.
Western Michigan University, 1991

Adding purpose to daily occupation in order to promote performance is a basic premise of occupational therapy. This study investigated the hypothesis that in individuals with hemiplegia, two added-purpose occupations would elicit more exercise repetitions than a rote exercise occupation. In a counterbalanced order, twenty-one hemiplegic patients aged 51 to 78 experienced all three conditions of a dynamic standing balance exercise involving bending down, reaching, standing up, and extending the arm. One condition of added purposes involved materials (small balls and a target); another prompted imagery of those materials; the third involved the same physical exercise without added purpose. A one-way ANOVA for related measures indicated that the subjects performed significantly differently among the three occupations \( (p < .001) \). A Tukey test revealed that the subjects did significantly more exercise repetitions in the added-materials occupation and in the imagery-based occupation than in the rote exercise occupation \( (p < .05) \). This study demonstrates how added purpose can enhance motor performance in individuals with hemiplegia.
ACKNOWLEDGEMENTS

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Ching-Lin Hsieh
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CHAPTER I

INTRODUCTION

Eleven recent studies (Bloch, Smith, & Nelson, 1989; Heck, 1988; Kircher, 1984; Licht & Nelson, 1990; Miller & Nelson, 1987; Mullins, Nelson, & Smith, 1987; Riccio, Nelson, & Bush, 1990; Steinbeck, 1986; Thibodeaux & Ludwig, 1988; Yoder, Nelson, & Smith, 1989; and Yuen, 1989) have investigated how added-purpose occupations promote movement and performance. For example, Yoder et al. (1989) compared a rotary arm exercise with the added purpose of stirring cookie dough to a rotary arm exercise with no added purpose. They found that the added-purpose exercise elicited more exercise repetitions than did the non-added-purpose condition. Licht and Nelson (1990) investigated the effects of adding meaning to a design copy task through adding meaningful stimuli. The added-meaning occupation elicited significantly better performance (fewer errors) than the non added-meaning occupation. Heck (1988) examined the difference between added-purpose tracing occupation and non added-purpose tracing occupation in terms of pain control. The subjects tolerated pain significantly longer while performing the added-purpose occupation.

Nelson (1988) defined occupation as the relationship between two things: occupational form and occupational performance. Occupational form is the preexisting structure that elicits, guides, or structures the human performance; occupational performance consists of the human actions taken in response to an occupational form (Nelson, 1988). In the clinic, a therapist
can vary the occupational form to change the occupational performance. The patient participating in the different occupational forms will assign different meanings to them. These meanings will elicit a sense of purposefulness, which affects the occupational performance. Occupation, therefore, is the occupational performance elicited by occupational form.

Healthy exercise can be embedded within everyday occupations. Gentile (1987), an authority in movement science, has emphasized the importance of action-oriented movement and objectives set through the interaction between performer and environment. Through engaging in an occupation, an individual may learn how to link the many degrees of freedom in the movement of different joints into a coordinative unit, so as to perform the trained skill proficiently (Tuller, Fitch, & Turvey, 1982). The study by Yuen (1988) demonstrated that subjects learn to coordinate different muscle groups when engaging in a joining dots activity in order to control the movement of a prosthesis. In Yuen's study, the subjects in the experimental group were asked to join dots using a flashlight beam inserted into the terminal device at a prosthesis. The control group was asked to practice moving the forearm component of a prosthesis without any added materials (the flashlight beam) to provide visual cues. The results reveal that subjects in the experimental group (the added-materials occupation) traced significantly better than subjects in the control group. Yuen's study suggests a new area for occupational therapists to explore involving the purposeful use of materials in motor skill training. It also supports the theoretical suggestions that provision of added purpose can enhance the development of motor skill.

A different line of research has emphasized the importance of mental
imagery in the development of motor skills. Imagery is an internal psychological process involving the evocation of the physical characteristics of objects or events that are absent from the perceptual field (Denis, 1985). In the fields of physical education, psychology, and movement science, imagery is often used as mental practice for the sake of learning or enhancing a new motor skill. Richardson (1967) stated that mental practice, the practice of physical activity with mental images, is the tool used by most investigators to make the individual's latent movement potential greater. In a study by physical therapists, Fansler, Poff, and Shepard (1985), one-legged balance time was compared after subjects completed one of three intervention conditions: (1) mental practice with vivid images, (2) progressive relaxation, and (3) a control condition involving meaningless instructions distracting the subjects' attention. Contrary to expectation, the improvement in performance following mental practice was not significantly more than in the other conditions. The authors believed that this result was produced by subject individuality and small sample size, and argued that mental practice of a physical task can improve performance and may be useful in the rehabilitation of elderly people. Further studies in this field were urged by the authors.

Clinicians have made use of imagery to motivate their patients to engage in repetitive exercise patterns. Riccio et al. (1990) investigated the effects of verbally elicited imagery through the use of two exercise (e.g., reaching up to pick apples and reaching down to pick up coins) with elderly women. The results indicated the imagery condition elicited significantly more repetitions of the reaching up exercise than did the control condition of exercise without imagery ($p = .012$). The results in the two reaching down conditions
were generally in the same direction ($p = .055$). This study presented a beginning step in the consideration of the potential use of imagery in occupational therapy. It also introduced a way to enhance purposefulness and occupational performance without the use of physical materials. The authors have urged clinicians to explore the advantages and disadvantages of imagery-based occupations in treatment.

As Hopkins and Smith (1983) emphasized, occupational therapy is based on the belief that purposeful activity (occupation), including its human and non-human aspects, may be used to mediate dysfunction and elicit maximum adaptation. For occupational therapists, added-purpose occupation becomes an agent for learning new skills (Gliner, 1985). In hemiplegia, as Brunnstrom (1970) stated, the ambulation problems prevent the patient from independence. Ambulation training depends on the development of dynamic standing balance. Brunnstrom emphasized that restoring safe standing leads to the development of a normal gait pattern. The skill of dynamic standing balance depends on postural control (e.g. weight bearing and weight shifting of lower extremities). In addition, as Bobath (1978) asserted, the most effective method of normalizing muscle tone is through weight bearing over the hemiplegic side. In order to encourage the patient to shift his or her weight to the hemiplegic side, the therapist can put bean bags on the floor on the patient's affected side. This is a technique frequently used by occupational therapists in Taiwan, R.O.C.. The patient uses his or her uninvolved hand to pick up a bean bag from the ground, stands up, and throws it at the target. Throwing the bean bags, therefore, helps inhibit abnormal muscle tone and aids postural control. Kottke, Halpern, and Easton (1978) indicated that the coordination of
multimuscular activities is not achieved by conscious motor control. The added-purpose or added-meaning occupation can transfer the patient's conscious attention to the purpose or meaning of the occupation, so that the patient does not concentrate on the movement itself. Therefore, multimuscular coordination will be completed more easily than if the patient simply does the exercise for its own sake (rote exercise).

According to Nelson and Peterson (1989), occupation can be categorized as: (a) naturalistic; (b) simulated; or (c) imagery based. As Nelson (1988) pointed out, naturalistic and simulated occupations usually involve materials or props, whereas imagery-based occupations, elicited by verbal or pictorial stimuli, usually involve no materials.

In the 11 studies referenced in the first paragraph, the subjects were residents of nursing homes, retirement homes, and foster care homes, or they were normal young adults. The samples did not involve hemiplegic patients.

In the present study, the differences among three occupational forms (added-materials occupation, imagery-based occupation, and rote exercise occupation) in terms of exercise repetitions by hemiplegic patients were investigated. Would added-purpose occupations result in better performance than non added-purpose occupations? The added-materials occupation involved the throwing of small balls: the subject bends down, uses his or her uninvolved hand to pick up a small ball, stands up, and throws it at the target. Small balls were used instead of the bean bags often used in Taiwanese hospitals in order to provide a familiar image in the imagery-based condition. In the imagery-based occupation, the subject imagined using his or her good hand to pick up a small ball from the ground and throw it to the target as if he or she
was doing the occupation of throwing small balls. The occupation of rote exercise was the control condition in which the subject just did the physical exercise (using his or her uninvolved hand to touch the ground, stand up, elevate his or her uninvolved arm, flex his or her uninvolved elbow, and stretch his or her uninvolved arm forward quickly). The same basic physical exercise occurred in these three occupational forms. The added-materials and imagery-based occupations served as the added-purpose occupations, to be contrasted with the occupation of rote exercise. We predicted that the hemiplegic patients would perform significantly better in the two added-purpose occupations than in the rote exercise occupation.
CHAPTER II

METHOD

Subjects

Twenty one subjects were selected from the Ron-Min General Hospital in Taipei, Taiwan, R.O.C.. All the subjects met the following selection criteria: (a) unilateral cerebral hemiplegic patients, (b) first onset or second onset within 6 months, (c) at least 50 years old, and (d) ability to follow and interpret verbal instructions, including the ability to respond to an imagery-eliciting cue: “Bend down and imagine using your good hand to pick up a pebble from the ground and throw it forward.”

On the basis of these screening criteria, the sample was comprised of 12 males and 9 females. Their ages ranged from 51 to 78 years, with a mean age of 64.48 years (SD = 8.86). This was the first onset of cerebro-vasculo accident for 14 subjects (it was the second onset for the others). The duration from the most recent onset until data collection ranged from 23 to 176 days, with a mean duration of 81.62 days (SD = 46.52). The sample consisted of seven persons with left hemiplegia, and 14 with right hemiplegia. The period of data collection was 69 days.

The Brunnstrom (1970) arm and lower extremity recovery stage for hemiplegia was used to described the physical dysfunction of these patients. Brunnstrom defined six stages of arm and lower extremity recovery of hemiplegia as follows: (a) flaccidity--no voluntary movement, (b) synergies and/or
spasticity developing, (c) synergies performed voluntarily, (d) synergy deviation, (e) independence from the basic synergies, and (f) isolated joint movements freely performed with near normal coordination. Each subject was evaluated separately for the two involved extremities. The upper extremity stage of these subjects ranged from two to six with a mean stage of 3.86 (SD = .96). The lower extremity stage of this sample was from three to six with a mean stage of 4.43 (SD = .75).

Procedure

After obtaining informed consent, the subjects were randomly assigned to three different orders in accordance with a counterbalanced design. In order one (n = 7), the subjects performed the added-materials condition first, the imaging condition next, and then the control condition. In order two (n = 7), the subjects performed the imaging condition first, the control condition next, and then the added-materials condition. In order three (n = 7), the subjects performed the control condition first, the added-materials condition next, and then the imaging condition. Each subject received each condition on different days with approximately equal intervals between sessions. Every subject completed all three conditions within a week. Sessions were conducted at the same time of day in the same place and with the same occupational therapist.

In the added-materials condition, the board with a cut out face was placed four meters away and the small balls were put near the patient's unin­volved leg. The patient was given the following instructions by the occupa­tional therapist:

"Exercise is good for health. Now we are going to exercise our
extremities. Listen to all of the directions first. I will demonstrate the exercise and then give you a chance to try. First, bend down and use your good hand to pick up a small ball from the ground. Then, stand up, move your good arm upward, bend your elbow, and throw the small ball at the target. Watch me. [Demonstrate.] Now you try. [Let the subject practice no more than twice and correct subject if necessary.] Do you have any questions? When I tell you to begin, pick up and throw as many small balls as you can. Nonstop. Stop when you are too tired. Ready? Begin."

Before the imaging condition, the same board with a cut-out face was placed at the same distance from the subject, but no balls were present. The subject was given the following instructions:

"Exercise is good for health. Now we are going to exercise our extremities. Listen to all of the directions first. I will demonstrate the exercise and then give you a chance to try. First, bend down and use your good hand to touch the ground as if you are picking up a small ball from the ground. Then stand up as if you are grasping a small ball move your good arm upward, bend your elbow, and stretch your arm forward quickly, as if you are throwing the small ball at the target. Watch me. [Demonstrate.] Now you try. [Let the subject practice no more than twice and correct subject if necessary.] Do you have any questions? When I tell you to begin, pick up and throw as many small balls as you can. Nonstop. Stop when you are too tired. Ready? Begin."

The subject participating in the control condition was told the following instructions:
“Exercise is good for health. Now we are going to exercise our extremities. Listen to all of the directions first. I will demonstrate the exercise and then give you a chance to try. First, bend down, and reach your good hand to touch the ground. Now stand up. Then, raise your good arm, bend your elbow so that your hand is above your shoulder, and stretch it forward quickly so that your arm is out straight. Watch me. [Demonstrate.] Now you try. [Let the subject practice no more than twice and correct subject if necessary.] Do you have any questions? When I tell you to begin, do as many as you can. Nonstop. Stop when you are too tired. Ready? Begin.”

After the instructions were given, the recorder sat facing the patient about two meters away. If a patient asked when he or she can stop or how many exercises he or she should do, the recorder replied, “Try your best; stop when you are too tired.” In the added-materials condition if a patient ceased repeating the performance or took a rest for five seconds (a discontinuity), the recorder asked, “Can you pick up and throw more balls? Pick up and throw as many small balls as you can; stop when you are too tired.” In the imaging condition, if a patient ceased repeating or took a rest for five seconds, the recorder asked the patient, “Can you imagine picking up and throwing more balls? Pick up and throw as many small balls as you can; stop when you are too tired.” In the control condition, if the same situation happened, the recorder asked the patient, “Can you do more exercises? Do as many as you can, stop when you are too tired.”
Apparatus

A rectangular board (135 cm x 100 cm) with a cut out face (eyes, nose, and mouth) was used as the target for the added-materials occupation (the occupation of throwing small balls) and the imagery-based occupation. The small plastic balls (five cm in diameter and six gm in weight) were put on the ground near the uninvolved leg by the research assistant standing behind the patient.

Measurement

The recorder measured the frequency and duration of exercise repetitions. The frequency of discontinuities that lasted at least five seconds was also counted. The recorder used a stopwatch to measure the total time that the subject engaged in each condition. The recorder kept the stopwatch out of the subject's sight, and the operation of the stopwatch was not heard by the subject. The use of the counter was silent. A repetition was figured when the patient completed a cycle of bending down, reaching the hand within five cm of the floor, standing up, raising the arm, flexing the elbow, and extending the arm forward quickly. During the data collection intervals, the subject was not informed of the purpose and measurements of this study. Furthermore, the recorder and the research assistant were not told about the purpose of this study.

To establish interobserver reliability with the primary recorder, a research assistant randomly selected and independently measured one-third of the sessions. Interobserver reliability was calculated by dividing the smaller
frequency by the larger frequency and multiplied by 100. The interobserver reliabilities for frequency, duration, and discontinuity were 98.62%, 97.21% and 100%, respectively.
CHAPTER III

RESULTS

Preliminary testing indicated that skewness of the frequency variable under each of the three conditions was less than an absolute value of 1. Table 1 shows that there was no significant order effect. The one-way analysis of variance for related measures demonstrated that there was significant difference between the three occupations, $F(2,40) = 16.8, p < .001$. The performances under the three occupational forms are compared in Table 2. As recommended by Stevens (1986, p.420), a Tukey (a posteriori procedure) revealed that the subjects performed significantly more repetitions in the added-materials occupation and in the imagery-based occupation than in the rote exercise occupation (at the .05 level). The difference between the added-materials occupation and the imagery-based occupation was not significant ($p > .05$).

Most of the subjects had no discontinuities, and the range of distribution in this variable was quite small (0-2). The duration data were not analyzed statistically because of their interrelatedness with the frequency variable.
Table 1

One-Way Analyses of Variance Examining Any Possible Carryover Effect.

<table>
<thead>
<tr>
<th>Condition</th>
<th>$F$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Added-materials</td>
<td>.04</td>
<td>.96</td>
</tr>
<tr>
<td>Imagery-based</td>
<td>.12</td>
<td>.89</td>
</tr>
<tr>
<td>Rote Exercise</td>
<td>.35</td>
<td>.71</td>
</tr>
</tbody>
</table>

Note: The $F$ tests revealed that there is no evidence of an order effect.

Table 2

Comparison of the Performances for the Added-materials, Imagery-based, and Rote Exercise Occupations.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Added-materials</th>
<th>Imagery-based</th>
<th>Rote Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of repetitions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>23.86 *</td>
<td>23.57 *</td>
<td>17.29</td>
</tr>
<tr>
<td>$SD$</td>
<td>9.53</td>
<td>8.26</td>
<td>5.91</td>
</tr>
<tr>
<td>Duration (in second)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>166.62</td>
<td>159.71</td>
<td>116.86</td>
</tr>
<tr>
<td>$SD$</td>
<td>72.75</td>
<td>62.97</td>
<td>47.44</td>
</tr>
<tr>
<td>Frequency of discontinuities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>0.62</td>
<td>0.62</td>
<td>0.57</td>
</tr>
<tr>
<td>$SD$</td>
<td>0.74</td>
<td>0.81</td>
<td>0.75</td>
</tr>
</tbody>
</table>

*Significantly greater at the .05 level than the rote exercise occupation.
CHAPTER IV

DISCUSSION

The results of this study indicate that under certain conditions, the adding of purpose to therapeutic occupations can elicit superior performance. These results support a basic principle of occupational therapy, that added purpose can be embedded in occupations. As described in the introduction, previous studies have reported that added purpose has a positive effect on exercise in certain populations. The outcome of this study is consistent with past studies, and extends the ideas to an exercise pattern used in hemiplegia. This study also demonstrates that the effect is not significantly different between the added-materials occupation and the imagery-based occupation.

In the added-purpose occupations, the patient used or imagined his or her uninvolved hand picking up and throwing the small ball at the target. In contrast, in the rote exercise occupation, the patient simply did the same physical pattern of exercise without having added purposes. In the added-purpose occupations, the added materials and imagery transferred the patient's conscious attention from exercise to purpose and satisfaction. Therefore, the patient completed the two added-purpose occupations more easily than in the rote exercise occupation. This added practice should contribute to dynamic standing balance.

This study's findings support the idea that added-purpose occupations can serve as intrinsic motivators to promote performance. This study also provides support to the tenet of occupational therapy concerning the use of
typical, socioculturally recognized occupations. Individuals are able to employ added-purpose occupations as intrinsic motivators to influence their physical and mental health and their social and physical environment (Hopkins & Smith, 1983). In the study by Thibodeaux and Ludwig (1988), subjects reported significantly more enjoyment in the added-purpose condition than the non-added-purpose condition. In the present study, one subject said, "I gained achievement from throwing the small ball at the target" (translated from Chinese). Another subject commented, "I imagined I was a pitcher and threw as many baseballs as I could." This satisfaction is a key property of intrinsic motivation for sustaining and promoting performance.

The findings of this study specifically support the use of adding materials into therapeutic occupations. According to Nelson and Peterson (1989), an added-materials occupation offers the following advantages: (a) it provides additional information to the individual which elicits and supports movement; (b) it often involves social prompts (e.g., competition, cooperation) to promote movement; (c) it can divert conscious attention away from the movement or the pain; and (d) the best rehabilitation results occur when the patient is able to combine exercise with the daily routine of occupations.

Nelson and Peterson also mentioned the possible disadvantages of the clinical use of materials: (a) added materials may distract an individual when conscious attention is needed; (b) added materials may cause a patient to remember a past experience and consequently lead to undesirable results (for example, the person who used to be a pitcher might become depressed on seeing how poor his or her throwing has become); and (c) planning, staffing, use of space, and expenditure are all complex issues to consider when
materials are employed. Practitioners should be aware of these potential disadvantages as well as the advantages and take individual needs and situations into consideration as they employ added-materials occupations.

There were a few differences between the two added-purpose occupations. In the imagery-based occupation where the patient imagined that he or she was picking up a small ball and throwing it at the target, the imagination served to transfer the patient's conscious attention from exercise to purpose. Use of a small ball represented the difference between these two added-purpose occupations. The target (a physical material) was present in both conditions, and this may have helped the subjects to imagine throwing a ball. The results demonstrated no significant difference between the added-materials occupation (use of balls) and the imagery-based occupation. The results also revealed that the imagery-based occupation elicited significantly more exercise repetitions than the rote exercise occupation. These findings support and encourage clinicians to use imagery-based occupations in order to promote performance.

According to Riccio et al. (1990), there are several advantages in the clinical use of imagery. These advantages are as follows: (a) the clinician is not confined by materials; (b) imagery is more gradable (e.g., in terms of range) than physical materials; (c) imagery can be used in combination with standard equipment related to rote exercise (e.g., the jogging machine); and (d) imagery can communicate complicated events. For example, in order to obtain a specific movement, such as palmar pinch, the clinician telling the patient to "imagine picking up a baseball" is more likely to be successful than the clinician describing the complex finger movements involved in performing
Riccio et al. (1990) asserted that imagery is involved with many developmental occupations, particularly occupations that depend on memories of past occupations.

On the other hand, the use of imagery in the clinic may have some disadvantages: (a) it might be difficult for some populations to experience mental images; (b) some movements are difficult or impossible to perform without materials (e.g., grasp); and (c) one individual's image and/or memory based on personal experiences may differ from another's image (Riccio et al., 1990). Therefore, the cue given by the therapist might not result in the intended movements. However, the imagery-based occupation which is not limited by materials and space can sometimes serve the same therapeutic function as the added-materials occupation. Therefore, it may be more convenient for therapists and patients to employ the imagery-based occupation than the added-materials occupation in clinical intervention as well as in home programs. Another possibility is a mixture of imagery and materials, as in this study when the subjects were asked to throw imaginary balls at a real target.

There were several variables in this study which were difficult to control. The first variable was the difference among subjects in imagining the small ball. Subjects might have had different images of the size, weight, shape, or color of the ball. Nevertheless, regardless of the type of the ball imagined by the subjects, this potential difference did not affect the results.

In the imagery-based condition, the presence of materials might represent another difference. The actual target in the imagery-based occupation might have promoted the subject's imagery. Without a target, it is possible that the patients might have perceived less purpose in the occupation. The
The presence of materials eliciting imagery-based occupations should be of concern to future researchers.

In the clinical setting, therapists can adjust the distance from the target in order to maximize the patient’s motivation to engage in the occupation. However, in this study the target was placed four meters ahead of every subject, and this might have represented a different level of challenge for each individual. This difference might have affected the value of the added-material occupation as an intrinsic motivator.

As Yerxa and Baum (1986) pointed out, the same occupation may have a great number of different meanings depending on the goal of the individual, the environmental context, or the individual’s mood. Furthermore, the individual may also attach individual meanings to occupations, or find no meaning at all. Therefore, it is vital for occupational therapists to investigate not only the difference between various kinds of added-purpose occupations and rote exercise occupations, but also the differences among different types of added-purpose occupations. In controlled experimental research, there is little opportunity for individualization because everyone must follow the same procedure. In clinical practice, individualization, especially the variation from person to person in terms of occupational interests and meanings, is one of the most important criteria for therapists to consider when choosing a specific therapeutic occupation. The chosen occupation should meet the patient’s needs as well as promote his or her performance.

Further studies which examine the differences between different added-purpose occupations to better understand how to maximize the patient’s motivation and performance are needed. Also, future studies should investigate
various exercise qualities and patterns in different populations, especially hemiplegia. These variables include not only repetition and duration but also range of motion, strength, coordination, and speed. These further studies will contribute to increasingly effective treatment.

Conclusion

These results help to substantiate one of occupational therapy's basic tenets, that added-purpose occupation is a motivating factor in performance. Purpose may be effectively added to an exercise through the use of actual materials or through the use of imagery. Further study must be done to ensure that the effects are generalizable across occupations and across movement patterns.
Appendix A

Letter of Informed Consent
Dear Volunteer:

I, Ching-Lin Hsieh, am a graduate student of occupational therapy at Western Michigan University in the United States. Participation in this project will contribute to knowledge concerning techniques to encourage dynamic standing balance training.

The information collected in this study will be coded so that no one will be able to identify you in any way. You are free to stop participating in the study whenever you wish without penalty; participation is voluntary. There are no special risks to you through participation in this study; a research assistant will stand behind you to protect you.

On three different occasions over a week's period, you will be asked to bend down, then rise up, and then move your arm. This exercise is commonly helpful for people with your clinical condition. Each session will take about five minutes.

Any questions you have about this study will be answered immediately by the occupational therapist conducting this study.

______________________________
INFORMED CONSENT FORM

I have read and understood all the above information. All of my questions have been answered and I agree to participate.

Signature of Volunteer _______________ Date _______________

Signature of Witness _______________
Informed Consent Form in Chinese

同意書

本人已閱讀並了解所有的內容。我同意參加此實驗。

______________________________  ________________________________
簽名                                      日期

見護士簽名
Appendix B

Approval Letter from the Human Subjects
Institutional Review Board
Date: January 7, 1991
To: Ching-Lin Hsieh
From: Mary Anne Bunda, Chair
Re: HSIRB Project Number 90-12-17

This letter will serve as confirmation that your research protocol, "Added Purpose versus Rote Exercise for Dynamic Standing Balance in Hemiplegia" (as revised), has been approved after expedited review by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application.

You must seek reapproval for any change in this design. You must also seek reapproval if the project extends beyond the termination date.

The Board wishes you success in the pursuit of your research goals.

xc: David Nelson, Occupational Therapy

Approval Termination: January 7, 1992
BIBLIOGRAPHY


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