



Factors physical therapists consider before initiating gait training post-stroke

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ABSTRACT

Objective: Gait training is an integral component of rehabilitation programs that aims to help patients with stroke gain their ability to walk again. But the decision when to initiate gait training post-stroke may vary from one clinician to another. This study was done to identify the factors physical therapists consider before starting gait training in patients post stroke. **Methodology:** A questionnaire was specifically formulated for this descriptive study. Validation, pilot testing, and revisions were done prior to administration of the final version of the questionnaire. Descriptive statistics were used to analyze the responses. Data were collected from 60 licensed physical therapists (aged 27 ± 3.2), 32 males and 28 females, with 3.14 ± 1.79 years of clinical experience from a convenience sample of centers and major hospitals in the Greater Manila Area offering rehabilitation services for neurological cases. **Results:** The five priority factors considered by physical therapists were (1) level of consciousness, (2) strength, (3) balance, (4) vital signs, and (5) cognition. This ranking was based more on clinical experience rather than research findings and undergraduate education. **Conclusion:** The study showed that physical therapists consider many factors aside from the strength and balance status of a patient with stroke before deciding when to commence gait training. This may serve as a guideline for novice clinicians treating patients with stroke. Further research may be done to determine whether these factors could translate into prognostic indicators for ambulation of patients with stroke.

Keywords: stroke, gait, decision-making, examination

INTRODUCTION

Walking is our means of exploring the environment. It is a prerequisite to most daily activities, like crossing streets, managing curves, going through doors, and climbing stairs.¹ Following stroke, the ability to ambulate is greatly affected.² In fact, it is considered as one of the major devastating outcomes of hemiplegia. Twenty five percent of stroke survivors are never able to ambulate independently and in 50% of stroke cases, impairments in mobility are still observed three months after the insult.³ Patients with stroke place restoration of walking as one of the most important goals during the rehabilitation program.⁴

Gait re-training therefore, should be an important focus in any comprehensive stroke rehabilitation program.⁵ Physical therapists are challenged to come up with therapeutic interventions to help patients recover their ability to walk properly in the soonest possible time. But before they actually commence gait re-training, physical therapists must first determine the patients' readiness. They should ascertain that patients could endure all the possible treatment options geared towards

improving gait without compromising their safety and health.

It can be observed in the clinics that physical therapists consider multiple factors in determining whether or not a patient post-stroke is prepared to ambulate again. Some practitioners base their judgment on the stage of recovery of the patient. Others consider the mental status of the patient as a primary determinant, while others take into account the strength of the lower extremities as the main factor in initiating gait training. This multitude of priorities among clinicians may result in differences in decisions related to patient care and ultimately, may lead to failure in commencing gait re-training at the appropriate time.

The lack of specific guidelines on when to initiate gait rehabilitation prompted the researchers to conduct this research. This study is primarily aimed to identify the factors considered by physical therapy clinicians as important in deciding when to commence gait training of patients post-stroke. The researchers would also like to ascertain physical therapists' perspectives on what constitutes gait training in order to form an operational definition for this intervention. Furthermore, this study aims to

determine if gender and clinical years in practice affect physical therapists' decisions on when to start gait training in patients with stroke. It is hoped that novice practitioners would use the findings of this study to guide them in rehabilitating their patients with hemiplegia.

METHODOLOGY

Study design

This study employed a descriptive study design through the administration of survey questionnaires.

Development and Administration of the Survey Questionnaire

The survey instrument utilized in this research was developed following the steps prescribed by Portney LG and Warkins MP (1993) in designing surveys.⁶ First, guide questions were formulated to define and make clear the purpose of the study. Six open-ended questions were initially drafted: (1) What is gait training?; (2) What comprises gait training?; (3) What interventions are used in gait training?; (4) When do you think is the best time to initiate gait training for patients post-stroke?; (5) What subjective and objective findings do you consider before your patient will undergo gait training?; (6) How will you prioritize the physical findings according to importance?.

A focus group discussion was then conducted among the researchers to come up with a series of interrogative statements based on the established guide questions. The output of the FGD was used to draft the preliminary questionnaire.

This first draft was then presented to four physical therapy faculty members from a university to evaluate the questionnaire in terms of its content, wording, clarity and organization. Based on their feedback, the second draft of the questionnaire was formed.

This second draft of the questionnaire was pilot tested to five physical therapists conveniently sampled from university-affiliated centers in Metro Manila. This critical step in the development of any high-quality survey⁷ was done in order to determine whether there are unclear and misleading items and to identify other possible difficulties that may be encountered by the respondents in completing the survey. Suggestions for revision included clarifying the instructions on which boxes to mark off, to add more options for probable answers and to modify questions which required them to list down and prioritize their answers to make it more "respondent-friendly". These comments, together with all the other suggestions, were taken into

consideration in the preparation of the final questionnaire.

The final questionnaire was a four-page survey with five main questions subdivided into categories to comprehensively cover all target issues concerning the initiation of gait training post-stroke. The estimated duration to finish answering the questionnaire was 10 minutes. The final questionnaire was then disseminated to all participants of the study who passed the inclusion criteria.

The survey questionnaire was hand-delivered by the researchers and other interns to the centers where they are affiliated with in the period of July-September 2005. In order to minimize non-response bias and volunteer effect,⁷ all questionnaires were personally collected by the researchers one to two weeks after the forms were distributed. Respondents who returned the survey with incomplete answers, such as age, gender and years in practice were followed up by phone.

Sample and Sampling Technique

The researchers utilized a sample of convenience. Physical therapists working in a convenience sample of rehabilitation centers and other major hospitals within Metro Manila, which offer rehabilitation services to patients with stroke were recruited for this study. They were asked to answer the questionnaire if they were licensed practitioners with a minimum of 1 year clinical working experience handling adult neurologic cases particularly stroke. Having acquired the license to practice and having completed at least 12 months of clinical exposure will have given them more experience in the field.

Physical therapy interns and volunteers who were in these centers in order to gain more experience were excluded from the study. Similarly, those working on a part-time basis were not included in the survey since their clinical hours may not be sufficient to fully monitor patients in the entire rehabilitation process.

Statistical Treatment

To summarize and analyze statistically the results of the survey, descriptive statistics were used. The mean and standard deviation of quantitative data obtained like age, clinical years of practice, were taken.

Responses to categorical questions were examined by designating point values; 1 for ticked boxes and 0 for unanswered boxes. The frequencies and percentages of the collated answers were then obtained.

To analyze answers to questions that required ranking, points were assigned to the five most

important factors chosen. The first in priority was awarded 5 points, the second in the list was 4 points, the third was 3 points, the fourth was 2 points and the fifth item earned 1 point. Points gathered were then tallied, and the item with the highest points was considered the most important.

RESULTS

From a total of 99 eligible physical therapists from different centers and major hospitals in Metro Manila, 60 physical therapists answered and returned the survey questionnaire resulting to an excellent⁶ response rate of 60.6%. Figure 1 is a consort diagram showing the distribution of questionnaire and actual returns. Table 1 shows the demographics of the surveyed population.

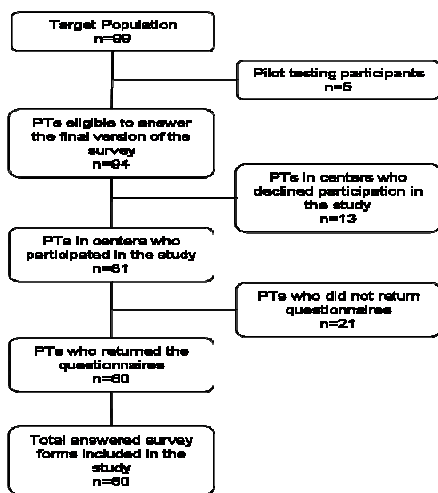


Figure 1. Diagram showing the number of physical therapists and survey forms included in the study

Personal demographics of the participants (n=60)	
Age (in years)	
Mean	27 ± 3.1
Range	22-41
Gender	
Male	32 (53.33%)
Female	28 (46.67%)
Clinical Practice (in years)	
Mean	3.14 ± 1.79
Median	3
Mode	2
Range	1-9
Highest Educational Level	
Bachelor's (BS) Degree	58 (96.67%)
BS Degree with MA/MS Units	2 (3.33%)

Table 1. Personal demographics of the participants in the study

Defining Gait Training

Gait training is a composite intervention to normalize walking performance. According to 98.3% of the respondents, it involves task specific training. Training for standing balance and tolerance, strengthening exercises for both upper and lower limbs, endurance exercises were also highly considered as components of the gait

training program. PNF techniques and treadmill training were other strategies added in gait training. Table 2 shows the percentage of responses of the PT's who selected these treatment procedures as part of the gait training program.

Activities that comprise gait training	
Task Specific Training	98.3%
Training for Standing Balance	91.7%
Training for Standing Tolerance	90.0%
Strengthening Exercises for Lower Extremity	88.3%
Strengthening Exercises for Upper Extremity	81.7%
Endurance Exercises	70.0%
Others (PNF, Treadmill)	8.3%

Table 2. Activities that comprise gait training

For task specific activities in gait training, on top of the list is ambulation with assistive device with 56 responses, followed by walking outside and inside parallel bars which were selected by 52 PT's, providing obstacles to challenge the patient was chosen by 46 respondents and practicing walking through different surfaces such as stairs and ramps were picked by 45 and 34 practitioners, respectively.

If training for standing balance is included in the gait training program, 50 practitioners resort to altering the patient's base of support, 39 make use of reaching activities, 36 incorporate neck and head movements, 35 apply external perturbation, 29 change the support surface and 19 make the eyes of the patient move in various directions.

Although several practitioners answered that they utilize both open and closed chain exercises in strengthening both upper and lower limbs, data showed that in terms of upper extremity strengthening, open chain exercises were preferred more than closed chain exercises, while in the lower extremity strengthening program the converse is true. In terms of endurance training, the clinical restorator is the preferred activity of 48 respondents over walking (41 respondents) and the use of arm ergometer (32 respondents).

Factors Considered Before Initiating Gait Training

The most frequently chosen factors to consider before commencing gait training are shown in Table 3.

Before engaging the patient in gait training, one must have good standing balance according to 47% of the respondents while 36% believe that a fair balance grade is enough. In terms of sitting balance, 50% believed a fair grade should be achieved first by the patient. Vital signs, like blood pressure (94.8%), heart rate (82.8%), respiratory rate (35%) and temperature (25%), should also be monitored according to clinicians. As to cognitive functions, attention (87.9%) got the highest percentage from the respondents while

concentration, frustration tolerance, short-term memory, immediate recall and long term memory got 77.6%, 58.6%, 34.5%, 32.8% and 20.7% respectively.

Major factors considered before initiating gait training

Balance	98.3%
Vital Signs	96.7%
Cognition	96.7%
Level of Consciousness	95.0%
Tolerance	95.0%
Communication Ability	93.3%
Strength	93.3%
Range of Motion	93.3%
Co-Morbidities	93.3%
Coordination skills	90.0%
Endurance	90.0%
Psychological	85.0%
Muscle Tone	83.3%
Sensory Perceptual	83.3%
Social	80.0%
Personal Demographics	70.0%

Table 3. Major factors considered before initiating gait training

Among the 56 respondents who thought that level of consciousness is a necessity before deciding when to train patients for ambulation, 5.33% answered that they can train obtunded patients to walk, while 23% answered that they can perform gait training on lethargic patients. Majority (80.4%) answered that being alert and aware of their surroundings are important in training a patient to ambulate. In relation to this, majority (93.3%) of the therapists agreed that the ability to communicate is also important in gait training and 64.3% answered that a patient should at least be able to understand instructions even if their speech may be inappropriate.

Clinicians vary greatly in setting the tolerance and endurance requirement. Forty eight percent of them believed that 10-20 minutes in sitting and standing are necessary. Twenty percent believed that ability to perform activities continuously for 10 minutes is enough to qualify a patient to start gait training. While another 20% believed that 20 minutes of activity without fatigue is necessary.

In examining range of motion, physical therapists believed that the following movements need to be assessed first: elbow and wrist extension, shoulder flexion and extension for the upper extremity, and ankle dorsiflexion, hip flexion and extension, and knee flexion and extension for the lower extremity. These were consistent with the muscles most commonly tested by the respondents: elbow extensors, wrist extensors, shoulder flexors and extensors, ankle dorsiflexors, hip flexors and extensors, and knee flexors and extensors. A muscle grade of at least 3/5 on the affected and unaffected upper extremity, as well as the affected lower extremity is necessary for

gait training according to 32%, 43% and 42% of the respondents, respectively; while a grade of 4/5 on the unaffected lower extremity is required by the 42% of the practitioners.

When assessing muscle tone and coordination, 83.3% of the respondents focused more attention on the lower extremity. Twenty-five percent believed that patients with grade 1+ upper and lower extremity muscle tone could start gait training while only 5% responded that a grade 3 muscle tone on the lower extremity is amenable for gait training. Proprioception is the most important sensory perceptual factor according to 75% of the respondents while light touch (15%) and pain sensations (20%) were considered least important.

Obtaining the patient's age (83.3%) and assessing level of motivation (73%), family support (68.3%) and co-morbidities like heart disease (70%) and diabetes (55%) are also important factors to consider before initiating ambulation in patients as implied by the data gathered in the survey. Financial support ranks the least in the list of social factors to be assessed.

Prioritizing Examination Procedures and Results

When the respondents were asked to choose 5 major factors from their previous answers and rank them from highest to lowest in terms of importance, patient's level of consciousness ranked the highest with 162 points, followed by strength with 122 points, balance with 121 points, vital signs with 91 points and cognition with 65 points. It is interesting to note that this ranking was different from the most frequently utilized examination procedures prior to engaging patients in ambulation post-stroke presented in Table 3. The five factors with the least points were co-morbidities (14 points), range of motion (14 points), psychological factors (2 points), and social factors and personal demographics that garnered no points.

When prioritization points were compared based on years of clinical experience, those with 3 or more years and those with less than 3 years of practice, it was observed that the top five examination procedures were the same for both groups. They differed only in ranking (Table 4). It is also noteworthy that the older group gave more emphasis on endurance while the younger group gave more regard on muscle tone and co-morbidities. (Table 4)

When prioritization points were compared based on gender (Table 4), it was noted that both male and female physical therapists agreed that level of consciousness is the most important. For male therapists, cognition should be in the five most important examination procedures while female therapists believed that muscle tone should be one

of the foci in training. Aside from this, female therapists rated communication ability and co-morbidity highly as compared to the male therapists.

Ranked Factors	≥ 3 years experience	<2 years experience	Males	Female	Total
1. Level of Consciousness	88 (1)	74 (1)	87 (1)	85 (1)	182
2. Strength	51 (3)	71 (2)	60 (3)	82 (2)	122
3. Balance	64 (2)	57 (3)	75 (2)	46 (3)	121
4. Vital Signs	40 (5)	51 (4)	48 (5)	45 (4)	91
5. Cognition	41 (4)	24 (5)	47 (4)	18	65
6. Tolerance	17	11	14	14	29
7. Muscle Tone	7	20	8	21 (5)	27
8. Endurance	18	8	10	12	22
9. Sensory Perceptual	10	11	11	10	21
10. Communication Ability	9	7	5	11	16
11. Coordination Skills	9	8	11	4	15
12. Co-Morbidities	0	14	1	13	14
13. Range of Motion	8	8	5	9	14
14. Psychological	2	0	2	0	2
15. Personal Demographics	0	0	0	0	0
16. Social	0	0	0	0	0

Table 4. Comparing points given in the prioritization of examination procedures based on years of clinical experience and gender

Bases of Clinical Decision Making

Sixty-three percent (63%) of the physical therapists responded yes when asked whether the medical diagnosis (thrombotic, embolic, hemorrhagic, lacunar stroke) of the patient affect their decision when to initiate gait training while 13% answered no. Seventeen percent (17%) answered not much and the remaining 7% didn't answer the question. This distribution of responses was consistent across respondents regardless of years of clinical experience and gender.

Respondents were then asked regarding the basis of their answers to previous questions. Responses are shown in Figure 2.

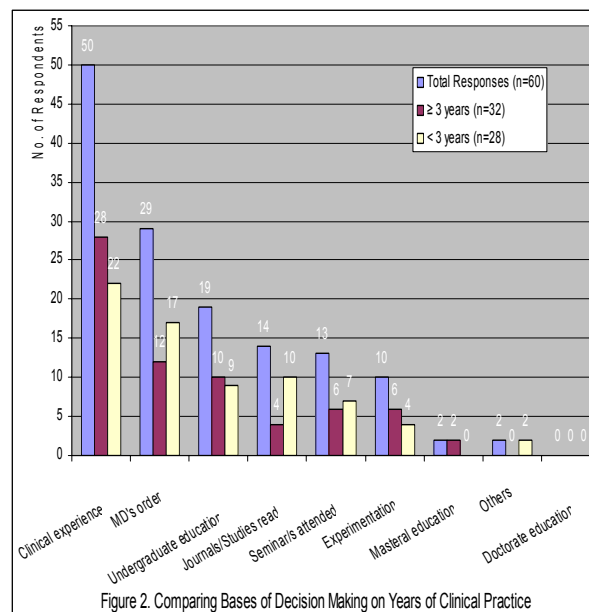
DISCUSSION

Walking dysfunction arises not only from the impairments associated with cerebrovascular accident but also from the deleterious neural, muscular, psychological and cardiovascular adaptations that accompany disuse, as well as use of maladaptive behaviors.⁸ It is therefore necessary to perform a comprehensive examination of a patient before commencing ambulation training post stroke.

Based on the results of this study, physical therapy clinicians consider different factors prior to gait training with very high regard for level of consciousness, strength, balance, vital signs and cognition.

Level of Consciousness and Gait Training Initiation

No past studies have been found to correlate the patient's level of consciousness to the success of



gait training initiation although most motor control theories emphasize that an individual must be able to perceive the movement of the body¹⁰ and the environment¹¹ to which the movement is made for proper movement to occur. A patient who is obtunded (difficult to arouse and confused when awake) or lethargic (slow motor process, drowsy) may be engaged in gait training according to 5.33% and 23% of the respondents respectively. These levels of consciousness will limit active participation of the patient and impose a lot of demand in terms of support and cueing on the side of the therapist.

Strength and Commencement of Gait Training

This study showed that strength is a factor that therapists closely monitored in stroke patients before gait training. Muscle strength of the ankle dorsiflexors, hip flexors and extensors, and knee flexors and extensors are necessary for gait training initiation and a muscle grade of 3/5 on the affected extremity and 4/5 on the unaffected extremity is a necessity. Motor function of the lower extremity, particularly the muscle strength of affected hip flexors, knee extensors, and ankle plantarflexors, appears to be directly related to gait spatiotemporal characteristics. Major energy generation takes place at push-off by plantarflexor activity. The second most important source of power is from the hip flexors during late stance and early swing, which serves to pull the limb forward. The knee extensors are primarily absorbing energy during stance.¹ Weakness of these muscles contributes greatly to impairment in walking and may later lead to the emergence of faulty gait patterns.

It must be noted that the respondents failed to include the ankle plantarflexors as an important muscle group to strengthen. This may be attributed to gait training that is more focused on the swing

phase of the gait or the ability of the patient to make a step rather than on the propulsion segment of ambulation.

Balance and Ambulation Preparation

This study shows that most respondents preferred to start gait training in stroke patients once they have good standing balance. This is in contrast with a previous study where having a poor standing balance does not necessarily indicate that patient is not eligible for gait retraining¹². Walking was done on a treadmill with the body weight of the subject supported on a harness. With patients having low ambulatory status as subjects, the use body weight supported treadmill gait training could be initiated early on and produce an improvement on the patients' walking conditions.^{13, 14}

Clinicians' decisions not to initiate gait training in patients with poor standing balance may be due to lack of knowledge about body weight supported ambulation training or the unavailability of this equipment in most rehabilitation centers in the country.

Vital Signs and Ambulation Training

Hypertension is one of the modifiable risk factors of stroke.² It is common practice among clinicians to regularly monitor vital signs to determine the patient's reaction to treatment, of which, the blood pressure is most frequently taken. Activity performed in patients with unstable vital signs could lead to occurrence or worsening of symptoms.

Cognition and Gait Training Initiation

Cognitive deficits after stroke are common,² hampering progress in the rehabilitation process. The importance of cognition is best evidenced in pragmatic, functional, task-oriented and problem-oriented willed-movements such as ambulation. Dilemmas of rehabilitation for people with cognitive deficits arise and interfere with recovery. First, individuals may not be able to accomplish the demands of motor performance because they cannot easily understand the instructions of the therapist. Second, they may not be able to concentrate on motor learning because of attention problems. Third, they may not be able to use cognitive function to direct motor learning because cognitive function is separated from the motor process. Finally, repetition of motor performance tasks may be impaired because these individuals may not remember what has been done.

Clinical Reasoning and Gait Training Post Stroke

Clinical reasoning is important in deciding when to start gait re-training for patients post-stroke. This cognitive skill is a process by which the clinician's knowledge is accessed and widely deployed in a

clinical encounter and by which new knowledge, derived from clinical practice, is assessed and appropriated into existing and adapting knowledge frameworks.¹⁵ It is therefore critical to exercise this skill when treating patients for gait training.

Clinical experience is still the major basis for making decisions. This could suggest that physical therapists, being in direct contact with stroke patients, modify gait training and other interventions depending on the response of their patients to the treatment. This also means that majority of the physical therapists who participated in this survey exercise their clinical reasoning skills when dealing with patients with stroke who are ready for ambulation.

Limitations of the Study

The results of this study may have limited external generalizability due to the use of convenience sampling in recruiting physical therapists in Metro Manila to answer the survey questionnaire.

CONCLUSION AND RECOMMENDATION

It is imperative for physical therapists to determine when a patient with stroke is prepared to start gait training to improve his walking performance. Among all the factors to consider, level of consciousness, strength, balance, vital signs, and cognition are considered most important by the respondents.

Gait training should be initiated if level of consciousness is at least lethargic; when the affected lower extremity strength is 3/5 and the unaffected is 4/5; when balance is good (assumes and keeps standing postural alignment with dynamic activities); when his vital signs, particularly blood pressure, are stable; and when his cognitive faculty permits him to pay attention to the task at hand. Clinical experience remains to be the main basis for making the decision when to initiate ambulation training. These findings could guide and help novice physical therapists and interns establish the readiness of their patients to undergo gait training and start this intervention in the most appropriate time and condition.

Further research must be done in order to determine whether the five major factors identified could be used as prognostic indicators for early ambulation among patient who suffered stroke.

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