

UTILIZING THE ICF TO INCORPORATE EVIDENCE-BASED PRINCIPLES IN CLINICAL PRACTICE

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INTRODUCTION

In order to achieve and sustain the highest level of functional outcomes for their patients, physical therapists must practice in compliance with the strongest evidence that guides evaluation and intervention. The well researched principles of skill acquisition and physical activity should be the foundational blocks of a rehabilitation program that yields effective and enduring results. The intent of this paper is to demonstrate how The International Classification of Functioning, Disability and Health (ICF) can provide therapists with a practical framework to develop comprehensive, evidence-based intervention strategies. This paper will describe the basic components of the ICF, review the evidence from the principles of skill acquisition and physical activity, and present a case study to integrate these concepts into an effective intervention program for an elderly patient.

THE INTERNATIONAL CLASSIFICATION OF FUNCTION, DISABILITY AND HEALTH (ICF)

The ICF has received much attention and endorsement in recent years as the preferred conceptual framework for clinical classification and guidelines (references).¹ It was highlighted and referenced in many presentations at the most recent Combined Sections Meeting (CSM) in New Orleans, and featured in the March issue of *PTJ* by Atkinson and Nixon Cave.² Published by the World Health Organization in 2001,³ the ICF offers a broad perspective of an individual's health status, viewing his or her functional limitations not simply as "consequences of disease," but as a product of multiple and interacting "components of health."

These components of the ICF are organized in 2 major parts:

Part 1. Functioning and Disability

- a) Body Functions and Structures (eg, strength, muscles and bones)

- b) Activities and Participation (eg, walking, cooking, being a spouse)

Part 2. Contextual Factors

- a) Environmental factors (eg, weather, lighting, social attitudes)
- b) Personal factors (eg, lifestyle, fitness, coping styles)

Figure 1 illustrates how the components interact in this framework.

tors." This is a powerful concept with practical implications for how physical therapists practice.

A critical concept of the ICF is that all components are expressed in positive or negative terms called *qualifiers*. A simple example of a qualifier is that of an individual's strength (considered a body function, and referred to as "muscle

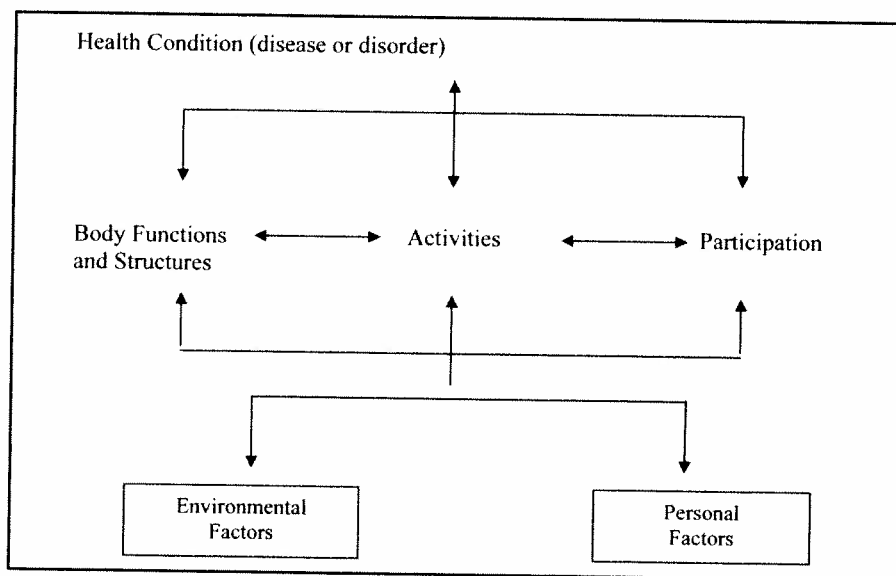


Figure 1

Note that the ICF positions activities at the center of the framework. Activities are affected by multiple components in an individual's life, and simultaneously they influence body functions, structures, health conditions, and participation. Health conditions such as pathologies clearly play a critical role in affecting activities, but they no longer occupy a primary, hierarchical position in this model. An injury or illness is only one of multiple components that may lead to disability, and the influence of any one component varies based on the dynamic circumstances of the individual's life. As the authors of the ICF state, "a person's functioning and disability is conceived as a dynamic interaction between health conditions (eg, diseases, disorders, injuries, traumas, etc) and contextual fac-

power" in the ICF). If strength is compromised, it is qualified as an "impairment," using a negative scale (0-100% impairment). Another straightforward example applies to activities. If an individual's ability to stand is compromised, it is qualified as a "difficulty," using the same negative scale (0-100% difficulty). This, of course, is common sense to physical therapists, and the basis for evaluation and intervention.

The ICF also assigns qualifiers to the individual's environmental and personal factors. The factor is qualified as a "facilitator," if it has a positive influence on the individual's function, and a "barrier," if it has a negative influence. A simple example is poor lighting in an individual's home that qualifies as a barrier to safe function. Physical therapists should be

cognizant of the negative effects of other more subtle but important factors such as societal attitudes towards the elderly, limited access to community settings, absence of sidewalks and walking surfaces, poor motivation, and limited presence of friends and caregivers.

PRINCIPLES OF SKILL ACQUISITION

For many elderly individuals, changes in their body functions and structures, functional abilities and environment necessitate that they learn new motor skills. Optimal rehabilitation employs the principles of motor learning, motor development, and neuroscience in assisting the patient to reorganize the body and brain to acquire new skills and functions. There are many important principles related to skill acquisition that have come from the research in neurology and neuroscience, but only 3 will be discussed for the purposes of this paper.

Frequency and Intensity of Practice

Many studies and publications suggest that higher frequencies (referred to as "intensity") correlate with better functional outcomes.^{4,5} One of the most intensive regimens of therapy is Constraint Induced Movement Therapy,⁶ in which patients with hemiparesis have their less involved upper extremity physically restrained, thereby forcing practice and use of the paretic arm and hand. Encouraging changes in functional movement were achieved with the original protocol for this treatment, which included constraint and practice for a minimum of 6 hours per day, 5 days a week, for two to 3 weeks. Although more recent studies have suggested that time parameters may be modified, the principle continues to point to the necessity for continuous and frequent practice.

In the proceedings from the 2005 III Step Conference, sponsored by the American Physical Therapy Association, developmental psychologist Karen Adolph identified that typical infants and toddlers practice extensively in acquiring crawling and walker skills.⁷ Infants crawl on average 5 hours a day, taking approximately 1000 to 3200 steps and covering about 60 to 188 meters (two football fields). Once walking, infants spend an average of 6 hours per day walking, covering a minimum of 2700

meters, or the equivalent of 29 football fields. While, the clinical focus of this publication is the elderly population, Adolph's work stresses the importance of practice frequency beyond two to 3 days a week in therapy sessions.

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Taxonomy and Specificity of Tasks

The conditions of any task vary circumstantially, and naturally affect its difficulty and skill requirements. Ann Gentile's well known task taxonomy⁸ matrix depicts the progression of task difficulty based on the individual's behavior and environmental conditions. An example of task with least difficulty is a "closed" task of a patient standing inside parallel bars, while an example of task with most difficulty is an "open" task of an individual wielding a quad cane to navigate a busy subway station.

As older individuals become more restricted in their activities and less exposed to dynamic conditions, they begin to gravitate towards simpler tasks on the taxonomy matrix, thereby jeopardizing their ability to accomplish more difficult tasks. Examples include the elderly woman who no longer goes to her church because she is afraid she will lose her balance negotiating through crowds, or the older man who moves into a single story residence so that he no longer has to negotiate stairs. Soon, these individuals lose advanced skills and confidence. If therapists believe that their patients are able to re-acquire advanced skills, they must incorporate the appropriate conditions in their intervention to elicit and develop these skills.

Additionally, it is important that therapists consider the growing body of research in the area of dual tasking that demonstrates how concurrent attention demands can compromise task performance (eg, an individual walks more slowly and less safely while she is distracted by a mental task).⁹ Therapists must be as comprehensive as possible in

considering all the environmental factors that affect an individual's performance when designing interventional strategies.

Motivation and Brain Plasticity

Studies from the field of neuroscience suggest that motivation is a powerful factor that changes in the brain during skill acquisition or motor re-learning. Nudo et al trained squirrel monkeys in novel reaching activities, and found that there was an expansion of the upper limb representation in the monkeys' motor cortex, particularly the fingers, after they acquired the skill.¹⁰ Kleim et al found similar changes after training rats in novel reaching activities, as well as increases in neuronal dendrite branching, spine density, and neuronal synapses.¹¹ What was the common condition for these studies? The animals were all reaching for food pellets, and were motivated by their desire to eat.

The take-home extrapolation is simply that therapists must ascertain what motivates their patients to improve in a skill, and design intervention activities accordingly. This will increase the likelihood of patient carry-over and compliance. It is helpful to consider the patient's current *as well as past* participation in life (eg, spouse, singer, church member), to derive activities that are relevant to the patient. This concept is extremely useful in working with patients with dementia, for whom the past is the current reality.

PHYSICAL ACTIVITY GUIDELINES FOR OLDER PEOPLE

In 2007, the American College of Sports Medicine and the American Heart Association published recommendations regarding dosage, intensity, and types of physical activity for older people,¹² based on evidence from multiple studies. Two of many important concepts are summarized below.

Aerobic Activity and Older People

The ACSM/AHA guidelines recommend that older adults should engage in at least 150 minutes (2 hours and 30 minutes) per week of moderate-intensity aerobic physical activity for "maximal health benefits." The guideline definition of moderate-intensity is an individual's rating of 5 to 6 out of 10 (if sitting is 0 and all-out effort is 10) and a noticeable increase in heart rate. The

guidelines state that given the range of fitness for older adults, moderate intensity for some individuals is a slow walk, and for others, it is a brisk walk. Aerobic exercise should be performed in episodes of at least 10 minutes. Since walking at any speed tends to be the predominant means of aerobic exercise for the older patients, it is important to consider conditions and strategies that facilitate prolonged or frequent periods of walking that accumulate to 150 minutes a week.

Muscle Strengthening and Older People

Additionally, the guidelines recommend that older adults perform muscle strengthening at least twice a week to maintain or increase muscular strength and endurance. The guidelines recommend that 8–10 exercises be performed on at least two nonconsecutive days per week, using the major muscle groups. To maximize strength development, a resistance should be used that allows 10–15 repetitions for each exercise before noticeable fatigue or loss of technique. The level of effort for muscle-strengthening activities should be moderate to high.

PUTTING IT ALL TOGETHER WITH THE ICF

The following case study will demonstrate how therapists can use the ICF framework to incorporate the principles of skill acquisition and physical activity in the development of effective interventions.

Meet Ms. Quincy

Ms. Quincy is an 87-year-old widow who suffered a fall 6 weeks ago, when she fell backwards while attempting to stand up from her kitchen chair. She reports that she reached back for the chair while sitting down, the chair slid back, and she fell on the floor, sustaining bruises without serious injury. She reports that prior to the fall she was noticing progressive difficulty with standing up from any surface and walking. She lives alone in an apartment in a senior citizen high rise, where there is a community area on the first floor, busy with various organized and informal activities. Ms. Quincy reports that she has many friends in the building, with whom she spent much time in the community center regularly, but that since the fall she stays mostly in her apartment. She does not understand why she is feeling more fatigued

now that she does less. Ms. Quincy has a part time home aide for heavy housekeeping. Her two daughters live locally and provide her with food and staples. Her daughters and friends are concerned about her inactivity and isolation. Ms. Quincy is discouraged, misses her friends and states, “I think I want to get back to life, but maybe it’s too late.”

Her primary care physician has ordered physical therapy, 3 times a week for 8 weeks, for strengthening and gait training. She has multiple conditions that are being addressed medically, including Parkinson’s disease, which presents as stage 2 on the Hoehn and Yahr scale.

Highlights from the physical therapy evaluation include mild thoracic kyphosis, mild bradykinesia, gait deviation with small steps that do not shuffle, mild intention tremor, and 1/4 rigidity on the UPDRS rigidity scale. Standardized test results include: Functional Gait Assessment (FGA) = 13/30; Gait speed: .7m/sec; Six Minute Walk (6MW): 800 feet; 5 times sit-to-stand: unable without using arms from 17.5” chair. Patient performed all walking tests with a cane and required occasional contact guard for loss of balance backwards during the more challenging components of the FGA.

Ms. Quincy’s Body Functions and Structures and Activities

Ms. Quincy presents with classic body impairments and activity problems of an individual with early Parkinson’s disease. She demonstrates early signs of retropulsion, with loss of balance posteriorly. This is likely exacerbated by her posture. Gait speed and endurance are compromised, influenced by small strides, bradykinesia, and limited active range of motion in her hips. Weakness and limited awareness to weight shift forward affect her ability to stand from a 17-inch-high chair. Most physical therapists would agree upon a physical therapy program of strengthening, aerobic conditioning, postural correction, balance activities, and gait training.

Ms. Quincy’s Participation

Ms. Quincy has already expressed that she misses participating with her friends in the building in social activities. Further interviews with Ms. Quincy and her daughters reveal that Ms. Quincy at-

tended church and went shopping with her daughters regularly, until several months ago, when these activities became more difficult. Ms. Quincy also enjoys popular American music from the 40s and 50s, and would dance to swing music when she was younger. She’s afraid to dance now, but her demeanor brightens as she recollects her dancing days, and she shakes her head and body to demonstrate her dancing.

Ms. Quincy’s Environmental Factors

Ms. Quincy’s apartment is a small, uncluttered one-bedroom apartment. Maximum walking distance from any room to another is less than 150 feet. She has 4 chairs (no arm rests) that are 17 ½ inches high around her kitchen table. The kitchen is 15 feet in length, with a counter that takes up one wall. She usually sits in the living room, in a height-adjustable recliner with a power controller, and spends much of her time reading, watching TV, and sleeping. She owns a full size bed with a 22” height surface. It appears that she does not sleep in it regularly (sleeps in the arm-chair often), but she is able to complete sit-to-stand from the bed without using her arms, with difficulty, but without help. She has a raised commode in her bathroom and grab bars by the toilet. She sponge bathes at the bathroom sink regularly, and once a week she showers with the supervision of her health aide. She has a walk-in shower with grab bars and a shower chair.

Ms. Quincy’s third-floor apartment is approximately 100 feet from the elevator. It takes her about 5 minutes to walk from her apartment to the community room on the first floor (including the time in the elevator). The total distance is about 225 feet. The main halls on the each floor of the building are carpeted, wide enough for 3 people, and measure about 400 feet end to end. There are also two 6-step flights of stairs between each floor, separated by a landing, with bilateral railings. The steps are accessible through a heavy fire door at both ends of the hall.

Ms. Quincy only uses her cane when she is outside her apartment. In the apartment, she uses the walls and furniture for occasional support.

Ms. Quincy’s Personal Factors

Despite Ms. Quincy’s fear and dis-

couragement, she is a social person and motivated to re-engage in community activities with her friends in the building and at church. She would also like to go grocery shopping again with her daughter to take advantage of sales and coupons that her daughters usually neglect. The concepts of exercise and increased physical activity are foreign to her and do not resonate with her. She has never considered dancing exercise.

Applying the ICF Framework to Ms. Quincy

It is difficult to imagine how therapy 3 times a week can meet the requisites of intensity, frequency, task specificity, and dosage to optimize Ms. Quincy's function. An effective intervention program must reach beyond the constraints of the prescribed therapy. Additionally, the strategies of the intervention must be based on conditions that are personally valid to Ms. Quincy, so that post-therapy carry-over is sustainable.

This is where the ICF framework is extremely valuable, both as a diagnostic tool to assess the patient's problems more comprehensively, and as a framework to

identify opportunities for functional carryover and health promotion. Figure 2, below, captures Ms. Quincy's findings using the ICF framework. The (+) and (-) symbols depict whether the environmental and personal factors are facilitators or barriers.

Interventions and Strategies

Based on the multiple interacting factors that describe Ms. Quincy's health and functional status, the physical therapist might instruct and recommend the following strategies to Ms. Quincy, her friends in the building, and her daughters, to complement the interventions that occur during the physical therapy sessions. All activities are initially developed and reviewed during therapy sessions, and recommended after they are deemed safe without the therapist present:

1. Sit to stand from the bed, without use of arms, at least twice a day. Work up to 5 in row, ultimately to 12 in a row. Ms. Quincy should feel how much easier it is when she puts her "nose over toes" (skill acquisition and strengthening).
2. Practice sitting and standing, with-

3. Stand at kitchen counter and "dance" to several favorite songs. Practice side stepping, back stepping, trunk rotation, weight shifting, holding the counter for safety. Use songs with zippy rhythms. Each song is usually about 2 1/2 minutes long. Work up to 3 to 4 songs for a total of 10 minutes (balance, motivation and endurance).
4. Walk to the community room, working up to 3 times a day for total of 30 minutes per day. Ask friends to call her, pick her up on the way downstairs, and discuss current events while walking (endurance, motivation, and dual tasking).
5. Walk the distance of the halls alone, or better yet, with a friend. Reminder that bigger steps equals faster speed. Time how long a lap takes and work up to more laps in less time (skill acquisition and endurance).
6. Walk up and down one flight of stairs twice with aide or daughter, as instructed in therapy. Progress to 3 times a week (strength, range of motion, endurance).
7. Start going to church again. Use techniques for getting in and out of the car as instructed to daughters and Ms. Quincy (endurance and skill acquisition).
8. Start going to the store to get the best buys. Daughter points out sales items and calculates savings, while Ms. Q moves the store cart like a walker. Keep track of distance and time walking in store (motivation, endurance, and dual tasking).

Therapists must pursue all strategies to use environmental factors to facilitate functional activities. Clearly written, well placed reminders (eg, a note in the bathroom or bedroom to practice sit to stand without using arms) are useful to remind the individual to follow through with recommended activities. Additionally, to increase Ms. Quincy's participation, she is provided with a simple grid of activities for easy reading and documentation (Figure 3). She is encouraged to document her activities between

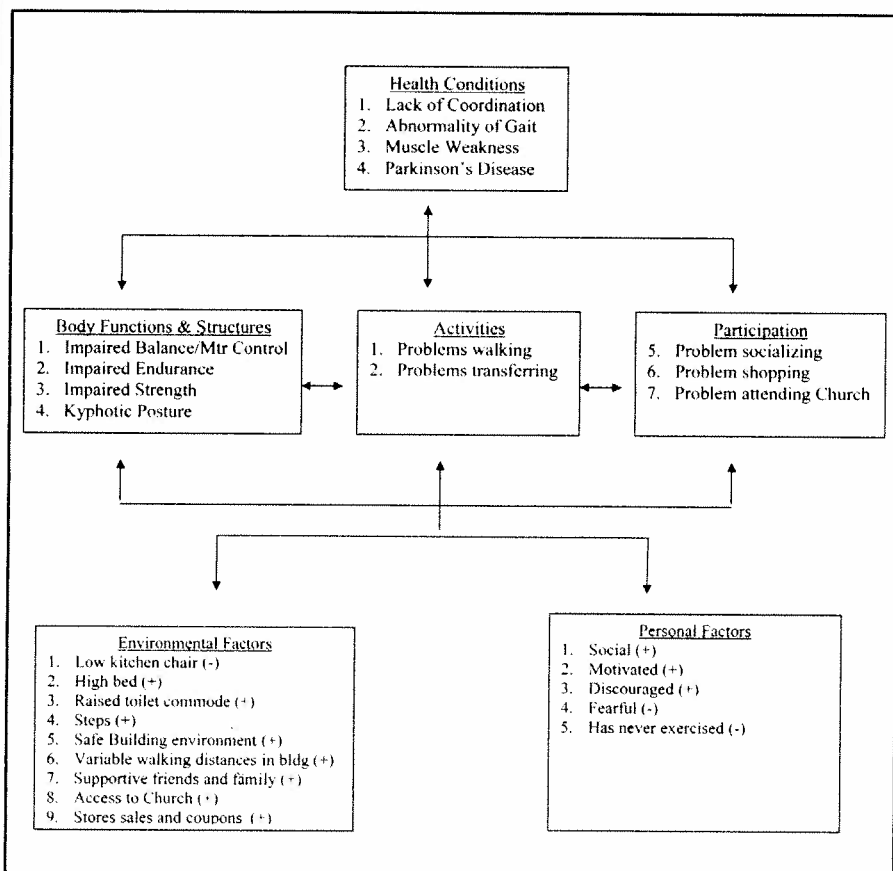


Figure 2

MS. QUINCY'S ACTIVITIES
Date: 3-6-2011

WRITE WHAT YOU DID THIS WEEK

ACTIVITIES	SUN	MON	TUES	WED	THURS	FRI	SAT
Sit/ stand from bed	5 times	5 times twice	5 times			5 times	
Dance at counter			2 songs		3 songs with Ethel		
Walk to community room	1 time	3 times		1 time	3 times		1 time
Walk in hall	1 time		4 laps with Ethel		2 times	4 laps Ethel	
Stairs	1 time down						1 time down
Church	Yes						
Shopping							
How do feel today?	Tired!	Good	Tired	Rest!	OK	OK	Tired

Figure 3

therapies for review at the beginning of each session. The grid can also serve as a guide for the content of each treatment session.

SUMMARY

This paper proposes a functional application of the ICF to incorporate evidence-based principles of skill acquisition and physical activity into a comprehensive plan of intervention. This was formulated from the perspective of a practicing clinician who sees patients in their home environment and has the opportunity to assess and use the patient's environmental and personal factors. By applying the ICF framework to the evaluation and intervention process, physical therapists may serve their patients more effectively and comprehensively.

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