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Exploring Balance Assessment Practices and Utilization of Academy of Geriatric Physical Therapy Clinical Guidance Statement in Fall Management by U.S.-Practicing Physical Therapists: A Mixed-Methods Approach

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APPROVAL OF SUCCESSFUL DEFENSE

[**Franceah Palencia-Quijano**] has successfully defended and made the required modifications to the text of the doctoral dissertation for the [**PhD in Health Sciences**] during this [**Spring, 2023**]

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Abstract

Background: Falls and balance impairments in older adults are major public health concerns. Physical therapists (PTs) play a major role in preventing and managing falls in the U.S. healthcare system. PTs are doctoral healthcare professionals who evaluate and treat balance impairments that impact prevalence of falls. As autonomous practitioners, PTs should incorporate evidence-based tools in balance assessment and management of falls. The American Physical Therapy Association (APTA) recommends PTs utilize evidence-based tools such as the (a) Academy of Geriatric Physical Therapy (AGPT) Clinical Guidance Statement (CGS) in Community-Dwelling Older Adults (CDOA and (b) the APTA balance tests and measures in balance assessment and falls management.

Purpose: This mixed-methods study explored the balance assessment of U.S.-Practicing PTs. Specifically, the study addressed the utilization of (a) the APTA balance tests and measures, (b) the AGPT CGS for the CDOA in management of falls, and (c) the barriers associated with balance assessment practices.

Methods: The study employed an embedded mixed-methods design in which a partial qualitative strand was embedded in a primarily quantitative design. Three hundred and four U.S.-Practicing PTs completed both Part A and Part B of the Assessment of Balance Practices and Associated Barriers (ABPAB) survey. Part A contained the Saskatchewan Physiotherapists' Balance Assessment Practices Survey (SPBAPS), developed by Oates et al. (2017). Part B contained PI-developed open-ended questions associated with barriers in balance assessment practices.

Results: Of the 304 study participants, 201 responses were obtained, meeting the 80% completion rate requirement, and were included for data analysis. Overall, study participants

regularly assessed only three out of the nine components of balance with 84.5% assessing motor system, 80.3% assessing dynamic stability, and 82.1% assessing static stability. However, fewer than 50% assessed only five out of the nine components of balance. While the 32 balance tests and measures listed on the APTA website and the 23 Canadian balance tests and measures were included for analysis in this survey, movement observation was the primary reported measure to assess balance (70.5%), followed by the Timed Up & Go (64.3%), the Five Times Sit to Stand (63.4%), the Single Leg Stance (52.1%), the Functional Gait Assessment (44.1%), and the Tandem Standing/Walking (44.1%). The top three barriers that impacted PTs' clinical decision-making in balance assessment practices were lack of time (reported by 78.4%), lack of knowledge (62%), and balance tests identified as not appropriate for populations (34.3%). **Conclusions:** Movement observation, which relies on visual observation skills, was the preferred measurement, followed by time-based measures of two functional tasks. U.S.-Practicing PTs in this study are not effectively utilizing a multisystem approach to guide their balance assessment practices. Our quantitative and qualitative findings both show that some barriers in balance assessment practices are non-modifiable, such as patient status and lack of time; however, there are modifiable barriers that we should address occurring at the PT level, the organizational level, and/or at the professional level. It is imperative to promote diverse knowledge translation opportunities for PTs' multisystem approach to fall management and balance assessment.

Key words balance assessment, balance practices, physical therapists, clinical practical guidelines, barriers balance assessment/practices

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I. Introduction

Background of the Problem

Falls in older adults are a major health concern. According to the United States Centers for Disease Control and Prevention (CDC, 2021), approximately 25% of older adults over the age of 65 fall each year. Falls can lead to serious medical consequences. Head injuries (Gelbard et al., 2014), hip fractures (Parkarri et al., 1999), and deaths are amongst the fatal sequelae. Falls are one of the primary causes of death in older adults. The CDC (2020) National Center for Injury Prevention and Control (NCIPC) reported that unintentional falls were the top 10 leading causes of death in adults over the age of 65. Furthermore, according to the CDC, the death rate from falls in adults over the age of 65 has increased by 31% from 2007 to 2016 (Burns & Kakara, 2018). Fall-related injuries resulted in three million emergency room visits; these included 800,000 hospital admissions and more than 28,000 deaths (CDC, 2017). Although some falls do not result in serious injuries, quality of life can be impacted. Increased caregiver burden (Dow et al., 2013), fear of falling, loss of independence, and loss of confidence (Ambrose et al., 2013) have been noted as non-traumatic consequences of falls.

Fall-associated injuries create a financial burden on the healthcare system. A systematic review (Heinrich et al., 2010) showed that the average cost for a victim per fall and fall-related hospitalization varied anywhere from $2,000 to $30,000 depending on the severity of the fall. The overall interventions for fall accidents cost Medicare, Medicaid, and private payers 50 billion dollars; it is speculated that as the population ages, the cost of falls will increase (Florence, et al., 2018).

Physical therapists (PTs) play a major role in preventing and managing falls in the U.S. healthcare system. According to the Guide to Physical Therapist Practice (APTA, 2023). PTs

have preventative roles in promoting health, wellness, and fitness in diverse populations. PTs are involved in primary prevention when they identify risk factors and implement services to reduce risk in individuals and populations. PTs' role in health and wellness, which includes screening individuals at risk for falls, and providing assessments and interventions associated with falls, is valued in the medical community. A recent study in the U.S. has shown that an emergency room physical therapy (PT) consultation related to a ground-level fall reduced the odds of a fall-related revisit (Lesser et al., 2018). Specifically, this study showed that a PT consultation within 30 days reduced the revisit odds by 35% and within 60 days by 32% when compared to no PT consultation for older adults who had fallen.

PTs are part of the healthcare team who are autonomous practitioners and practice with direct access. Direct access allows PTs to provide evaluation and treatment services without a prescription from a doctor or any other health care professional in accordance with the state law (APTA, 2023). Direct access is important in clinical practice because it enhances patient safety, promotes efficiency in care, and is cost-effective (Denninger et al., 2018). Direct access empowers PTs to have key roles in fall prevention and managing secondary impairments resulting from falls. Thus, it is imperative that PTs perform a falls risk assessment on all adults over the age of 65, identify risk factors, and manage falls prevention programs as a means to reduce healthcare costs and wait times, and to promote fall prevention.

As healthcare professionals who practice with direct access, it is imperative that PTs incorporate evidence-based practice (EBP) into clinical practice as opposed to their reliance on old habits. As cited by the APTA, EBP is "the integration of best-available evidence, clinical expertise, and patient values, and circumstances related to patient and client management, practice management, and health policy decision-making" (APTA, 2023, Evidence-Based

Practice Resources section). According to a systematic review by Screiber and Stern (2005), EBP is important in guiding PTs' clinical decision-making and ensuring that the interventions PTs provide for their patients are based on best available scientific data. Therefore, PTs must stay abreast of advances in falls assessments, preventative strategies and interventions to ensure that they provide their patients with the most effective and appropriate plan of care. As EBP professionals, PTs and other healthcare professionals are encouraged to utilize the CDC recommendation for falls management.

The CDC (2021) recommends Stopping Elderly Accidents Death and Injuries (STEADI) as an evidence-based tool for healthcare professionals to guide the evaluation of falls risk and generate individualized fall interventions. The STEADI incorporates the American and British Geriatrics Societies' clinical practical guidelines (CPGs) for fall prevention. According to the National Institute of Medicine (2011), CPGs are "statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options" (Avin et al., 2015, p. 816). The STEADI is a CPG for falls risk evaluation and individualized fall interventions that clinicians, such as PTs, can incorporate into clinical practice settings. Similarly, in the United Kingdom, the National Institute for Health and Care Excellence (NICE, 2013) recommends CG 161 for healthcare professionals who are taking care of older adults over the age of 65. The purpose of this CPG is to lessen the incidence and risk of falls, and the related distress, pain, injury, loss of confidence, loss of independence, and mortality (NICE, 2013). The CDC's STEADI and NICE's CPGs were developed by an inter-professional expert panel. The CPGs recommend the use of multifactorial assessments and corresponding interventions when addressing fall management by

all healthcare professionals. Thus, these CPGs are not explicitly targeted for PTs' utilization, but rather are intended for use by all healthcare professionals.

Currently, there are no CPGs exploring falls assessment and prevention strategies that can be uniquely employed by PTs in the U.S. The absence of a specific PT-related falls CPGs is a major problem that contributes to PTs' challenges in fulfilling their unique roles in falls prevention. Recognizing this limitation, the Subcommittee on Evidence-Based Documents of (SEBD) of the Academy of Geriatric Physical Therapy (AGPT) was created in 2012 (Avin et al., 2015) to provide a clinical guidance statement (CGS) that can guide PTs in clinical decision-making when managing falls in community-dwelling older adults (CDOA) to improve fall-related healthcare outcomes.

As evidenced-based professionals, PTs must recognize that CPGs and CGS are similar as evidence-based tools in fall management; however, they have distinct differences. According to Avin et al. (2015), while a CPG is a "systematic review of all available literature to develop statements and recommendations appropriate for healthcare decisions" (p. 816), a CGS is derived from multiple CPGs. Table 1 depicts the key distinctions.

Table 1

Clinical Practical Guidelines Versus Clinical Guidance Statements

Clinical Practical Guidelines (CPGs)	Clinical Guidance Statement (CGS)
•"systematic review of all available literature to develop statements and recommendations appropriate for healthcare decisions" (Avin et al., 2015, p. 816)	• "systematically compares and synthesizes CPGs of similar topic areas" (Avin et al., 2015, p. 816) • "derived from multiple CPGs of similar topic areas" (Avin et al., 2015, p. 816)
•Not explicitly targeted for PTs' utilization, but rather for use by **all healthcare professionals**	•Explicitly **used by PTs** for CDOA
• Stopping Elderly Accident Death and Injury, (STEADI) CPG, recommended by the CDC	•AGPT CGS in falls management, recommended by APTA
• National Institute for Health and Care Excellence (NICE) CG 161, recommended by NICE in the United Kingdom	

The SEBD committee and one content expert formed the AGPT expert panel. The AGPT expert panel who developed the CGS was comprised of PTs with expertise in rehabilitation science, kinesiology, motor control, geriatrics, measurement, and fall prevention; they were also referred to as the core-working group. The core-working group participated in discussions of agreements, differences, and comparisons of various CPGs that would result in the AGPT CGS in falls management.

Of the 4,027 evidenced-based articles, the core-working group selected five CPGs. The inclusion criterion for the CPGs were: they had to be published between 2000 and 2013, had to be in the English language, and had to be targeted for adults over the age of 65 residing in an assisted living facility or a community. CPGs that reported on older adults in acute care, skilled nursing facilities, or long-term care settings were excluded because the falls management approaches for these settings were different from approaches to falls management for CDOA. As such, the AGPT CGS was specifically targeted for managing falls in CDOA and does not apply

to older adults in acute care, skilled nursing facilities, and long-term care settings; therefore, this results in a clear limitation of the AGPT CGS.

The core-working group engaged in a series of steps to critique and appraise the five CPGs, ultimately resulting in the AGPT CGS. The AGPT CGS underwent several drafts. First, the core-working group discussed the five CPGs through four telephone conference calls and one meeting, which resulted in the first draft. In the second draft, an external review group, which consisted of expert opinions from two PTs with board certification in geriatrics, a consultant on legislative affairs and reimbursement, a public health policymaker, a primary care physician, and a geriatrician, was consulted. Finally, the last step was completed after the core-working group made a public announcement via email and social media platform to the members of the geriatric section of the APTA; members were allowed to comment on the draft document. The core-working group reviewed the comments through a conference call, resulting in the fourth and final draft. Upon completion of this process, three of the five CPGs were recommended for use in the AGPT CGS:

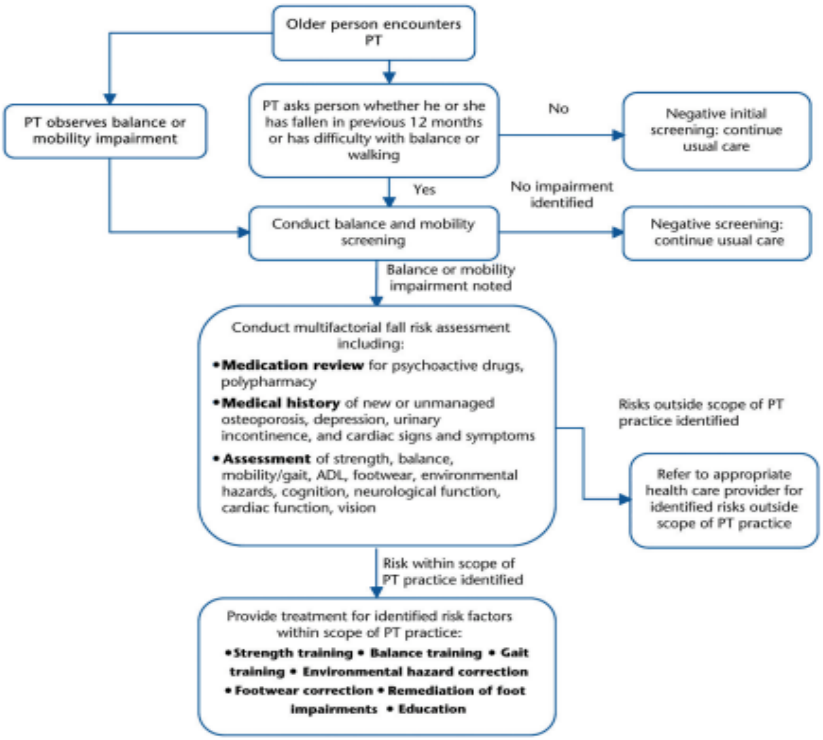
- National Institute for Health and Care Excellence (NICE) CG 161 in falls management
- American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons and Recommendations (AGS/BGS)
- The Chartered Society of Physiotherapy (CSP) Guidelines for the Physiotherapy management of older people at risk of falling

The primary clinical implication of the AGPT CGS is that PTs should screen all CDOA over the age of 65 for falls risk. This should be performed by asking CDOA: if they had fallen within the last year, or if they had concerns with their balance and ambulation, or if the PT observes that a CDOA has balance or mobility issues. If the screening is positive for falls risk, a

multifactorial assessment based on the algorithm presented in Figure1 should be employed. The first step noted in Figure 1 occurs when a PT encounters a CDOA; the PT should ask if the client fell within the last 12 months (Avin et al., 2015). If the client answers no, then the screen is negative and the PT should proceed with routine care (Avin et al., 2015). If the client answers yes, then the screen is positive and the PT is prompted to perform a balance and mobility screening (Avin et al., 2015). Furthermore, if the PT observes balance or mobility impairment, then the screen is positive. Therefore, the PT is required to perform a balance or mobility assessment.

Figure 1

Falls Screening Algorithm for Community-Dwelling Older Adults from the Academy of Geriatric Physical Therapy Clinical Guidance Statement



Note. Figure one was taken from peer-reviewed journal, "Management of falls in community-dwelling older adults: Clinical guidance statement from the Academy of Geriatric Physical Therapy of the American Physical Therapy Association." *Physical Therapy*, *95*(6), 815–834. (Avin et al. 2015). Reprinted with permission from Oxford University Press.

There are two types of falls risk factors derived from the AGPT CGS (Figure 1). Multifactorial falls risk factors include intake of psychoactive drugs, unmanaged osteoporosis, depression, urinary incontinence, and cardiac signs and symptoms (Avin et al., 2015). Based on Figure 1, the first grouping of falls risk factors is outside the scope of physical therapy practice. Therefore, the PT should refer the patient to an appropriate provider (Avin et al., 2015). The

second grouping of falls risk factors includes weakness, **decreased balance**, gait disturbance, home hazard vulnerability, and inappropriate footwear (Avin et al., 2015). This group of risk factors, notably **decreased balance**, is within the scope of PT practice; therefore, the PT should perform a balance assessment (Avin et al., 2015).

Impairments in balance are common in older adults. However, balance is a modifiable risk factor that a PT can address to reduce falls (Avin et al., 2015, Woollacoot & Shumway-Cook, 1996). Addressing and managing balance and falls are major areas that PTs focus on across the patient's lifespan. According to Woollacott and Shumway- Cook (1996), balance is "the ability to maintain the center of body mass (COM) within limits of stability determined largely by the base of support" (p. 215). Woollacott and Shumway-Cook (1996) further stated that balance control issues are primary contributor to falls in older adults. While the APTA developed the AGPT CGS to assist PTs' clinical decision-making in falls management for CDOA, it does not identify a universal balance test and measure specific to balance assessment, which should be employed by PTs.

Furthermore, recognizing the lack of consistency in the literature surrounding balance tests and measures employed by PTs, the APTA provides several balance tests and measures that are based on the most current available evidence. Figure 2 highlights the APTA (2023) balance tests and measures for the geriatric, neurologic, and adult populations.

Figure 2

Balance Tests and Measures Taken from the APTA Website

Balance tests and measures recommended by the American Physical Therapy Association (APTA): geriatrics, neurologic and adult population

1. Functional Gait Assessment
2. Activity Measures for Post-Acute (AM-PAC)- "6 clicks" inpatient short forms
3. Physical Activity Readiness Questionnaire (PAR-Q, PAR-Q+)
4. Cervical Arterial Dysfunction (CAD) Assessment (Vertebrobasilar Insufficiency, VBI) Test, Vertebral Artery Test (VAT), Neck Extension-Rotation Test)
5. Passive Head-Shaking nystagmus test (pHSN)
6. Head Thrust Test (HTT)/Head-impulse Test (HIT) for Vestibular hypofunction
7. Cervical Joint Position Error (JPE), cervical kinesthetic sense, Cervical Joint Position Error Test (Cervical JPET)
8. Sharp-Purser Test (SPT)
9. Marx Acitivty Rating Scale (MARS)
10. 2-minute walk test (MWT)
11. Four Square Test (FSST)
12. Functional Independence Measure (FIM)
13. Falls Risk Assessment Tool (FRAT)
14. X-step Stair Climb Test (SCT)
15. Western Ontario and McMaster Universities Osteoarthritis Index
16. Self-Paced Walk Test (SPWT)
17. Falls Efficacy Scale _ International (FES-I)
18. Elderly Mobility Scale (EMS)
19. Fullerton Advanced Balance Scale (FAB) FOR older Adults
20. Activitities-specific Balance Confidence (ABC) scale for multiple sclerosis
21. Berg Balance Scale (BBS) for stroke
22. 360-degree turn around
23. Dizziness Handicap Inventor (DHI) for benign Paroxysmal Positional Vertigo
24. Ankle Dorsiflexion ROM
25. Balance Error Scoring System (BESS)
26. Berg Balance Scale for Parkinsons Disease (PD)
27. Berg Balance Scale for Spinal Cord Injury
28. Berg Balance Scale for Stroke

Note. PI compiled a list of balance tests and measures taken from the APTA (2023), Tests and Measures Section.

Statement of the Problem

Falls and balance impairments in older adults are major public health concerns. As

autonomous practitioners, PTs should incorporate evidence-based tools in balance assessment and management of falls such as those identified by the APTA. Recognizing the need for EBP, the AGPT CGS, as highlighted in Figure 1, provides an algorithm for falls screening and assessment in CDOA designed specifically for PTs. However, a clear limitation of the AGPT CGS is that it does not identify a gold standard balance test, nor does the AGPT CGS provide a set of balance tests and measures that are considered ideal for specific balance impairments. The APTA (2023) does, however, provides a list of valid and reliable balance tests and measures that can be utilized by PTs for the adult, neurologic, and geriatric populations. Given the multitude of evidence-based balance tests and measures, choosing which valid and reliable test is key to conducting a comprehensive assessment that would result in individualized and appropriate treatment interventions. Although the APTA recommends the AGPT CGS for falls management in CDOA and a list of balance tests and measures for balance assessment, there is limited research exploring if U.S.-Practicing PTs are aware of these evidence-based tools, have access to them, and employ them in clinical practice.

To date, only three studies have been reported exploring the use of balance tests and measures in U.S.-Practicing PTs (McGinnis et al., 2002, 2009; Saliga & Bongiovanni, 2005). Of further concern, the sample reported on is limited to Michigan PTs (Saliga & Bongiovanni, 2005), members of the geriatric section of the APTA (McGinnis et al., 2002), and to 11 PTs in a qualitative study (McGinnis et al., 2009); therefore, the findings cannot be generalized to all U.S.-Practicing PTs. Furthermore, studies which explored barriers associated with the use of balance tests and measures in U.S.-Practicing PTs are limited. To date, two survey studies (McGinnis et al., 2002; Saliga & Bongiovanni, 2009) and one qualitative study (McGinnis et al., 2009) have been conducted. Additionally, these studies included few balance tests and measures

in their exploration. First, McGinnis et al. (2002) included the BBS, the Functional Reach, and the Tinetti tests used by members of the geriatric section of the APTA (McGinnis et al., 2002). Second, Saliga and Bongiovanni (2005) included two tests: the single-legged stance test and the push and nudge test utilized by Michigan PTs. Lastly, McGinnis et al. (2009) focused on movement observation in a qualitative study of 11 U.S. PTs. Lastly, to the author's knowledge, there are no studies exploring the utilization of the AGPT CGS in falls management and the APTA balance tests and measures in U.S.-Practicing PTs.

Significance of the Study

Understanding balance assessment practices is the first step in promoting effective evidence-based practice. Informed with the findings of this study, the APTA, educators in PT programs and continuing education courses, should be able to restructure their approach to meet the needs of U.S.-Practicing PTs specific to falls management and balance impairments, thereby empowering PTs to manage falls using the best available evidence and mitigate the financial and traumatic burden associated with falls. Prior to implementing change, it is necessary to recognize the individual and/or organizational constraints in balance assessment practices. Therefore, this study sought to understand the barriers that impacted PTs' clinical decision-making in balance assessment, and whether they occurred at the individual level, the organizational level, or both.

Knowledge-to-Action Framework: A Process Model

To investigate how PTs translate research into clinical practice, we need a classification system that differentiates between the different categories of theories, models, and frameworks described by Nilsen (2015), which inform clinical practice. Nilsen's five categories of theoretical approaches are Process models, Determinant frameworks, Classic theories, Implementation theories, and Evaluation frameworks (2015). Process models are defined as a process of

translating research into practice, including the utilization of research and implementation (Nilsen, 2015). The purpose of the process models is to describe and/or guide the process of translating research into practice. In the process models, Nilsen stated that both the terms "model" and "framework" are utilized, with the first being the most common. In this study, the PI utilized Graham et al.'s (2006) knowledge-to-action framework (KTAF), which is an example of a process model.

As autonomous practitioners with direct access privileges, it is imperative that PTs be aware of and able to integrate evidence-based tools such as (a) the AGPT CGS, (b) the balance tests and measures recommended by the APTA, and (c) components of balance into clinical practice. How can PTs keep abreast of ever-advancing knowledge and integrate evidence-based tools into clinical practice? In this study, the PI utilized the KTAF as a lens to understand how stakeholders like PTs can uptake and apply advances in science and knowledge in clinical practice.

Graham et al. (2006) offered a conceptual framework to guide the knowledge-to-action process, the KTAF, which is depicted in Figure 3. The KTAF has two phases: knowledge creation and knowledge-to-action. The knowledge creation process is symbolized by the inverted triangle and the knowledge-to-action process is symbolized by the cyclical arrows. The PI chose the KTAF specifically to utilize the knowledge-tools component from the knowledge creation phase and the assess-barriers-to-knowledge-use component from the knowledge-to-action phase to guide the study. Each phase and their components will be elaborated further below.

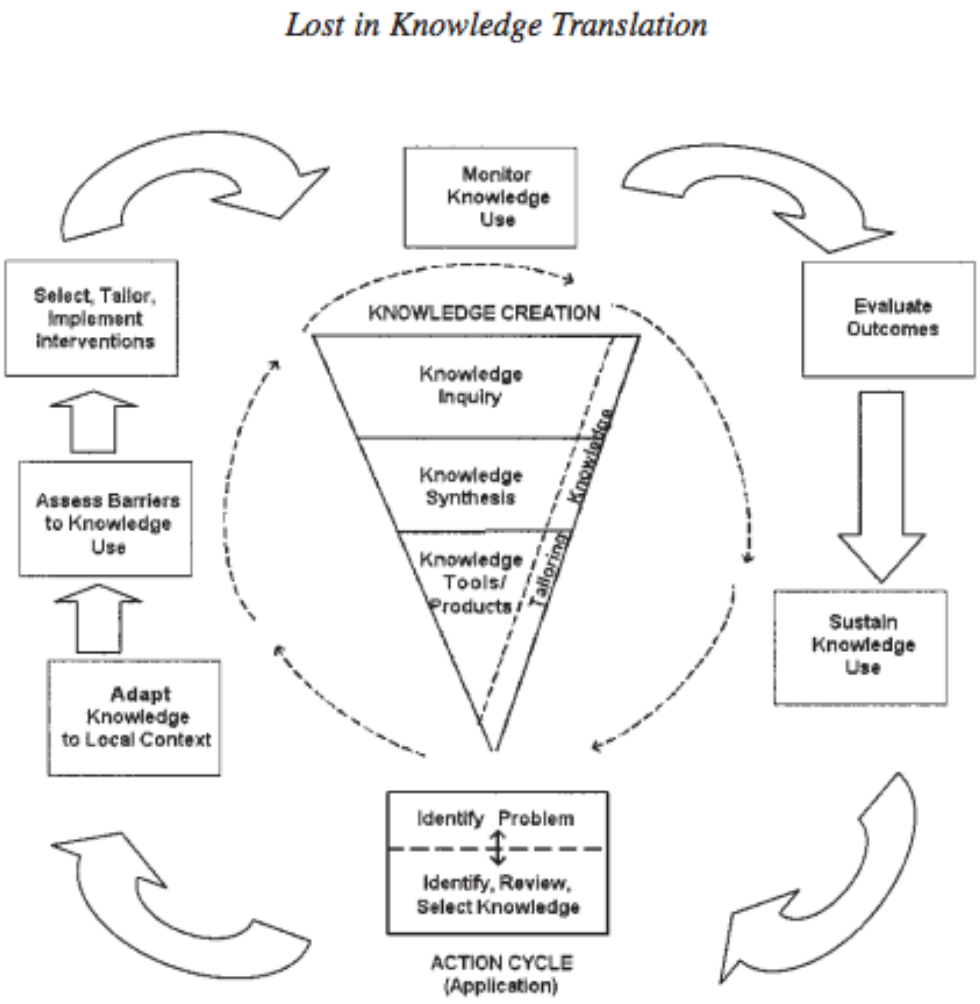
The knowledge creation phase has three components as depicted by the inverted triangle. Knowledge inquiry is the first piece of the inverted triangle. Graham et al. (2006) referred to this stage as the primary studies, or information that may or may not be accessible. Knowledge

synthesis is the second piece of the inverted triangle. Graham et al. (2006) referred to this stage as systematic reviews or meta-analysis. Knowledge tools or products are the third and last piece of the inverted triangle. Graham et al. (2006) referred to knowledge tools as the most refined units of knowledge. CPGs, decision aids and rules, and care pathways are examples of knowledge tools. The purpose of these tools is to provide concise, clear and user-friendly knowledge to facilitate the stakeholder's uptake and application of knowledge. In this study, the PI specifically referred to the AGPT CGS (Figure 1) and the APTA balance tests and measures (Figure 2) as the knowledge tools of interest, within the knowledge creation phase.

In the action phase, the focus is on the uptake of knowledge. In this phase, the PI utilized specifically the component of "assess barriers to knowledge use" as depicted on the second rectangular box on Figure 3. Hence, the PI also explored barriers associated with the application of the APTA balance tests and measures and the AGPT CGS. Based upon barriers previously noted in Canadian physiotherapists (Sibley et al., 2013b), Michigan PTs (Saliga & Bongiovanni, 2005), and members of the geriatric section of the APTA (McGinnis et al., 2002), barriers such as lack of time, lack of knowledge, lack of appropriate tools, and perceived usefulness of tools were expected in this study. However, given the limitations of these prior studies, generalizability of these findings cannot be made to a broad sample of U.S.-Practicing PTs. Therefore, further exploration of potential barriers impacting knowledge use, specifically with the AGPT CGS and balance test and measures in a broad sample of PTs practicing in the U.S., is warranted.

Figure 3

Knowledge-to-Action Framework



Note. Figure three was taken from journal article (open access), "Lost in knowledge translation: Time for a map?" by Graham et al. (2006).

The KTAF has been utilized in the field of rehabilitation science, specifically in PT practice, when assessing balance and gait (Moore et al., 2022; Sibley et al., 2015a). Guided by the KTAF using a step-by-step process, Sibley et al. (2015a) investigated the utilization of the systems framework for balance assessment used by Ontario physiotherapists in clinical practice.

Sibley et al. (2013a) also explored barriers that impacted balance assessment specifically the reactive component of balance of Ontario physiotherapists.

Variables

According to Creswell (2018), predictor variables "are variables that are used to predict the outcome of interest in survey method studies" (p. 51). The predictor variables are similar to independent variables because they affect the outcomes in the study. However, researchers are not able to manipulate predictor variables. As cited by Creswell (2018), outcome variables "are considered outcomes or results of predictor variables in survey studies" (p.51). They are similar to dependent variables.

In this study, the predictor variables (independent variables) are clinical specialization, patient population, and degree status in physical therapy. The outcome variable (dependent variable) is to measure the construct of balance practices with regards to balance tests and measures and balance components based on the systems framework measured by U.S.-Practicing PTs.

Purpose Statement

This mixed-method study addressed the balance assessment practices of U.S.- Practicing PTs; specifically, this study addressed the utilization of American Physical Therapy Association balance tests and measures and the Academy of Geriatric Physical Therapy (AGPT) Clinical Guidance Statement (CGS) in falls management.

Research Questions and Hypothesis Testing

Central RQ1: What are the *balance assessment practices* of U.S.-Practicing PTs?

Research Sub-questions

RQ1a. What are the ***balance tests and measures*** *used* by U.S.-Practicing PTs?

RQ1b. What are the ***awareness and utilization*** of the Academy of Geriatric Physical Therapy (AGPT) Falls Clinical Guidance Statement (CGS), *measured* by U.S.-Practicing PTs?

RQ1c. What are the ***awareness and utilization*** of the American Physical Therapy (APTA) balance tests and measures, *measured* by U.S.-Practicing PTs?

RQ1d. What are the ***balance components, based on the systems framework,*** *measured* by U.S.-Practicing PTs?

Central RQ2: What is the relationship between the 3 independent variables (***clinical specializations (categorical), patient population (categorical), and degree status (categorical)*** and the dependent variable, ***balance components*** *(*yes ≥ OR =60% or more assess components of balance, no ≤ 60% assessment of components of balance) *assessed by U.S.-Practicing PTs*?

RQ2a. What is the relationship between ***patient population*** and the ***balance components*** assessed by U.S-Practicing PTs?

H2a Ho (null hypothesis). There is no relationship between ***patient population*** and the ***balance components*** assessed by U.S.-Practicing PTs.

H2a Ha (alternative hypothesis). There is a relationship between ***patient population*** and the ***balance components*** assessed by U.S.-Practicing PTs.

RQ2b. What is the relationship between ***clinical specializations*** and the ***balance components*** *assessed by U.S.-Practicing PTs*?

H2b Ho (null hypothesis). There is no relationship between ***clinical specializations*** and the ***balance components*** assessed by U.S.-Practicing PTs.

H2b Ha (alternative hypothesis). There is a relationship between ***clinical specializations*** and *the* ***balance components*** assessed by U.S.-Practicing PTs.

RQ2c. What is the relationship between ***degree status*** and the ***balance components*** assessed

by U.S.-Practicing PTs?

H2c Ho (null hypothesis). There is no relationship between ***degree status*** and the ***balance components*** assessed by U.S.-Practicing PTs.

H2b Ha (alternative hypothesis). There is a relationship between ***degree status*** and the ***balance components*** assessed by U.S.-Practicing PTs.

Central RQ3. What are the ***prevalent barriers*** in balance assessment practices reported by U.S.-Practicing PTs?

Central RQ4. What are the ***perceived barriers*** to using the AGPT CGS by U.S.-Practicing PTs?

Research Sub-questions

RQ4a. What are the ***perceived barriers*** to using the AGPT CGS by U.S.-Practicing PTs with APTA membership*?*

RQ4b. What are the ***perceived barriers*** to using AGPT CGS by U.S.-Practicing PTs who do not possess APTA membership?

RQ4c. Are the ***perceived barriers*** to using the AGPT CGS by U.S.-Practicing PTs different amongst APTA members and non-members?

Central RQ5. What are the ***perceived barriers*** to using APTA balance tests and measures by U.S.-Practicing PTs?

Research Sub-questions

RQ5a. What are the ***perceived barriers*** to using APTA balance tests and measures by U.S.-

Practicing PTs with APTA *memberships*?

RQ5b. What are the ***perceived barriers*** to using APTA balance tests and measures by U.S.-Practicing PTs who do not possess APTA *membership*?

RQ5c. Are the ***perceived barriers*** to using the APTA balance tests and measures by U.S.-Practicing PTs different amongst APTA members and non-members?

II. Review of Literature

This chapter defines balance and the components of balance (Sibley et al., 2015b) to assess balance in the most comprehensive approach. Furthermore, studies that explored balance assessment practices in the U.S. and Canada will be discussed; studies that explored barriers in balance assessment practices and application of EBP, and CPGs will also be discussed. This chapter will establish the known, deficiencies in the literature, and suggestions for the proposed study.

Operational Definition of Balance

In the literature, two types of balance are described: static balance and dynamic balance. Static balance control is when the center of mass (COM) moves towards an aware or unaware perceived stability limit; a postural response is evoked so that the COM returns to a stable position. Static balance occurs in simple tasks, such as sitting or standing (Woollacott & Shumway-Cook, 1996). When an external threat is applied, the capability of the person to return to a stable position is described as dynamic balance. An example of dynamic reactive balance would be seen in an older adult who sways backward on a moving bus and is able to maintain upright standing. The muscles would need to be activated to reinstate the COM to a stable position (Woollacott & Shumway-Cook, 1996).

Balance Tests and Measures

PTs use a variety of tools to assess balance. According to Guide to Physical Therapist Practice (APTA, 2023), balance tools include video graphic assessments, nerve conduction studies, fine wire or surface electromyography, dizziness inventories, dynamic posturography, fall scales, motor impairment tests, photographic assessments, postural control test, movement

observation, and balance tests and measures. As discussed in Chapter 1, while the APTA provides a list of balance tests and measures, there is a lack of consensus specific to universal balance tests and measures PTs should employ when performing a balance assessment. In a scoping review, Sibley et al. (2015b) recommended the systems framework, which is an ideal framework to assess balance.

Components of Balance, a Systems Framework for Balance Assessment

The systems framework for balance assessment consists of the following components: postural alignment, static stability, dynamic stability, reactive control, functional tasks, motor systems, sensory systems, and cognitive systems (Sibley et al., 2015b). The systems framework for balance assessment guides PTs in identifying which component is affected so that an individualized and appropriate balance exercise protocol can be designed for fall prevention. The researchers suggested that a comprehensive balance assessment can include the BESTtest, which assesses all the components of balance, or any of the following tests: the Clinical Gait and Balance Scale, Fullerton Advanced Balance Scale, Mini-BestTest, and Unified Balance Scale, all of which includes eight out of the nine components (Sibley et al., 2015b).

Studies Exploring Components of Balance

To date, the PI has not found any studies reporting the practices of PTs in the U.S specific to components of balance assessed. However, three studies exploring Canadian physiotherapists' assessment of all balance components have been reported (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011). In a cross-sectional survey of Ontario physiotherapists, Sibley et al. (2011) found that 80% of study participants assessed postural alignment, static stability, dynamic stability, and motor system. In a cross-sectional survey of Saskatchewan physiotherapists, Oates et al. (2017) found that 90% of study participants assessed static stability,

89% assessed motor system, 83% assessed dynamic stability, 53% assessed anticipatory control, 47% assessed verticality, and 43% assessed stability limits. In a retrospective chart review of Ontario physiotherapists that practiced in an in-patient setting, Gervais et al. (2014) found that 70% of study participants assessed components of balance, such as biomechanical constraints, anticipatory movement strategies, orientation in space, and control of dynamics.

While the majority of Canadian physiotherapists reported assessing the major components of balance (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011), some components of balance were less frequently assessed. Sibley et al. (2011) found that study participants did not consistently evaluate all components of balance in all patients. Specifically, sensory impairment (59.6%), cognitive impairment (55%), and reactive control (41%) were the three balance components least assessed. Furthermore, Sibley et al. (2011) discussed that only 10% of study participants used the POMA, the BESTest, and the push and release test; all of which measure the reactive control of balance, and thus explains the lowest rating in assessing this specific component. In comparison, Oates et al. (2017) found that the three balance components least assessed by Saskatchewan physiotherapists were reactive postural control (38%), cognitive influences (25%), and sensory integration (24%). This finding is also in line with a retrospective chart review of Ontario physiotherapists in an in-patient setting, in which Gervais et al. (2014) found that reactive movement strategies were only assessed 2% of the time.

In summary, while Canadian physiotherapists assessed most balance components, sensory integration, cognitive impairments, and reactive balance components of balance were least assessed (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011). To the PI's knowledge, there are no current studies exploring PTs' assessment of all balance components

based on the systems framework in the US. Therefore, a study must be conducted for further exploration in a broad sample of U.S.-Practicing PTs.

Balance Assessment Practices and Their Associated Barriers for U.S.-Practicing PTs

In the U.S., three studies (McGinnis et al., 2002, 2009; Saliga & Bongiovanni, 2005) exploring balance assessment practices, and the barriers that influenced PTs' balance assessment practices have been reported in the literature.

Saliga and Bongiovanni (2005), in the first quantitative study in the U.S., investigated standing balance tests of 79 Michigan PTs. In this study, the researchers utilized a survey instrument, which included demographic information, a list of standing balance tests, and reasons for test selection. The majority of the study participants used the one-legged stance test (Roberts & Gill, 2016) and the push and nudge test (Jacobs et al., 2006). The lack of knowledge of balance tests and the convenience of test administration were factors for choosing a balance tool. Several limitations were noted in this study and must be considered. First, the study was limited to only Michigan PTs; therefore, the results of the study are not representative of all U.S.-Practicing PTs. Second, the study did not describe the participants' degree status (bachelor's versus master's and Doctor of Physical Therapy). Given that the study was published in 2005, many of the study participants may have graduated with bachelor's and master's degrees. One might argue that the validity of the study findings may not apply to U.S.- Practicing PTs who hold doctoral degrees as it is expected that practitioners with advance degree will have higher levels of knowledge and skills upon entry to the profession (Mathur, 2011). Thus, the participants in the study, who have bachelor's and master's degrees, may have lesser exposure to EBP. Additionally, a priori analysis was not conducted to determine the sample size. A power of analysis, such as G* power, can estimate the target sample size and detect a significant

association between variables of interest (Creswell, 2018). For instance, if a researcher investigates the relationship between the types of degrees and the balance components in a broad sample of U.S.-Practicing PTs, a priori analysis must be performed. A priori analysis can also mitigate the result of an underpowered study (Farrokhyar et al., 2013). If the study is underpowered (a small sample size), a true significant difference would not be detected, resulting in a false-negative result. Lastly, the study had limited standing balance tests such as the single-legged test and the push and nudge test and did not include the APTA-recommended balance tests and measures.

Similarly to the first U.S. survey on balance assessment, McGinnis et al. (2002) administered a survey to explore balance assessment used by members of the geriatric section of the APTA. The sample was robust with 419 participants, with a 50% return rate. The study participants had more than 20 years of experience, with the majority of them holding a bachelor's degree. Factors associated with test selection were accessibility, equipment use, and perceived utility of a tool. Although the study was robust with a large sample size, it does have limitations. First, the sampling was limited to the members of the geriatric section of the APTA; consequently, the validity of the study cannot be applied to non-members. Likewise, the results cannot be applied to younger PTs with less than 20 years of experience and PTs that have doctoral degrees. The study participants used the Tinetti (Panella et al., 2008), the Berg Balance Scale (BBS, Downs et al., 2013), and the Functional Reach tests (Duncan et al., 1990), all of which are traditionally geared to geriatric settings. Therefore, PTs that work in non-geriatric settings maybe less likely to use these tests. Lastly, the APTA balance tests and measures were not included in this study.

While McGinnis et al. 's earlier work (2002) utilized a survey to explore balance

assessment used by members of the geriatric section of the APTA, her latter qualitative study (McGinnis et al., 2009) focused extensively on factors impacting clinical decision-making associated with balance assessment. The study employed 5 inpatient and 6 outpatient PTs with bachelor's and master's degrees. McGinnis et al. (2009) found that PTs do not rely extensively on EBP or use valid and reliable balance tests and measures. Rather PTs engaged in a complex clinical decision-making process when assessing balance. PTs used practical knowledge and clinical experience more so than EBP (McGinnis et al., 2009). Movement observation is an example of practical knowledge, and it is a central theme found in the study. PTs used movement observation to assess balance by comparing normal versus atypical movement. Movement observation is a consistent finding of Ontario (Sibley et al., 2011) and Saskatchewan (Oates et al., 2017) physiotherapists. McGinnis et al. (2009) also found other factors that were associated with clinical decision-making in balance assessment. Although lack of time and resources were barriers in balance assessment, PTs used balance tests and measures for the purposes of documentation and reimbursement. While the qualitative work of McGinnis et al. (2009) was the first study to extensively examine factors associated with clinical decision-making in assessing balance, generalizability of the study findings is limited. The sample was limited to PTs with bachelor's and master's degrees.

In summary, limited information does exist regarding balance assessment practices, utilization of APTA balance tests and measures and the AGPT CGS amongst U.S.-Practicing PTs. However, several studies addressing balance assessments used by Canadian physiotherapists have been published and provide insight as we seek to further explore balance assessment practices.

Balance Assessment Practices and Their Associated Barriers for Canadian

Physiotherapists

Five studies were found exploring balance assessment practices used by Canadian physiotherapists (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011 & 2013a, 2013b). Both Sibley et al. (2011) and Oates et al. (2017) conducted surveys of Ontario and Saskatchewan physiotherapists. Subsequently, Sibley et al. (2013a, 2013b) conducted two additional surveys expanding upon the results of her previous work in 2011. One survey was based on reactive balance used by Ontario physiotherapists (Sibley et al., 2013a). The other survey focused on perceived usefulness of eight validated balance tools, barriers associated with improving standing, and reactive balance assessments of Ontario physiotherapists (Sibley et al., 2013b). While Sibley et al. (2011 & 2013a, 2013b) and Oates et al. (2017) utilized surveys to explore balance assessments used by Canadian physiotherapists, Gervais et al. (2014) conducted a retrospective chart review of Ontario physiotherapists working in a hospital setting to explore balance assessments used.

In the first Canadian study, Sibley et al. (2011) developed a survey questionnaire to explore balance assessments used by 369 Ontario physiotherapists. The study participants worked in various settings including orthopedics, geriatrics, neurology, and general rehabilitation. In the study, there were two dependent variables: the balance components assessed based on the systems framework and the balance tests and measures used by study participants. Components of balance based on the Systems Framework was the first dependent variable measured (Sibley et al., 2015b). Not surprisingly, more than 80% of study participants assessed postural alignment, static stability, dynamic stability, and motor system. However, the reactive component of balance was the least assessed; only 41% of study participants assessed it. This was a concerning finding as the researchers noted that the reactive component of balance is

related to avoidance of falls.

The second dependent variable was the balance tests and measures used by study participants. The single-leg test (Roberts & Gill, 2016), the BBS (Downs et al., 2013), and the Timed Up & Go test (Podsiadlo & Richardson, 1991) were the predominant balance tests and measures used. Additionally, study participants used movement observation as a primary means to perform balance assessment, which is a finding consistent with that of Saskatchewan physiotherapists in Oates et al.'s study (2017) and McGinnis et al.'s (2009) qualitative study of U.S.- practicing PTs. Sibley et al.'s (2011) study had several strengths. First, the study was robust with a large sample size and a high return rate of more than 40%. Second, this was the first study to conduct balance assessment using the systems framework for balance assessment on Ontario physiotherapists. Although the study had a large sample size, the sample was limited to Ontario physiotherapist. Therefore, the results of the study should be interpreted with caution.

Similarly, Oates et al. (2017) also developed a survey questionnaire to explore balance assessments used by 72 Saskatchewan physiotherapists. Study participants practiced in many areas including orthopedics, geriatrics, vestibular, cardiac, and neurology. Parallel to Sibley et al.'s (2011) work, the systems framework for balance assessment was also employed. The dependent variables were the balance components measured based on the systems framework and the balance tests and measures used by the study participants. The BBS (Downs et al., 2013), the single-leg test (Roberts & Gill, 2016), and the tandem standing/walking (Franchignoni et al., 1998) test were identified as predominant tests and measures. Furthermore, study participants used movement observation to assess balance, which again is consistent with U.S.-Practicing PTs (McGinnis et al., 2009) and Ontario physiotherapists (Sibley et al., 2011).

The second dependent variable was the components of balance measured based on the systems framework. Of the study participants, 90% assessed static stability, 89% assessed motor system, 83% assessed dynamic stability, 53% assessed anticipatory control, 47% assessed verticality and 43% assessed stability limits. Reactive balance was the least-assessed balance component; this finding is parallel to Sibley et al. (2011) and Gervais et al.'s (2014) studies of Ontario physiotherapists. While Oates et al.'s (2017) survey utilized the systems framework for balance assessment and included numerous valid balance tests and measures, several limitations of the study must be noted. First, the survey was conducted only on Saskatchewan physiotherapists; therefore, the results of the study cannot be generalized to other physiotherapists. Second, the study did not explore barriers associated with physiotherapists' selection of balance tests and measures.

The third Canadian study, Sibley et al. (2013a), reported on the reactive component of balance employed by physiotherapists and barriers associated with balance assessment. Of 273 Ontario physiotherapists who participated in the survey, 79.1% assessed reactive control in a non-standardized approach; 43% of physiotherapists evaluated reactive control via external perturbation and 18% via movement observation. Only 15% of physiotherapists measured reactive balance in the standardized approach. Additionally, the researchers reported a correlation between the age of physiotherapists and patient population, with physiotherapists over 60 years of age that worked with the neurological population were more likely to assess the reactive component of balance. Given that only Ontario physiotherapists were surveyed, generalizability of the findings across all Canadian PTs and PTs in general is limited.

In the fourth Canadian study, Sibley et al. (2013b) investigated the construct of satisfaction associated with current balance practices, specifically standing balance tests, and barriers associated with balance assessment amongst 369 Ontario physiotherapists.

Physiotherapists with primarily bachelor's degrees made up 70% of Sibley et al.'s study sample (2013b). Most study participants practiced in orthopedics with a few in neurological, general rehabilitation, and geriatric settings. Physiotherapists' satisfaction with eight validated balance tools was explored: Balance Evaluation Systems Test (BESTest) (Horak et al., 2009), BBS (Downs et al., 2013), Clinical Test of Sensory Integration (CTSIB) (Di Fabio & Anacker, 1996), Community Balance and Mobility Scale (CB&M) (Liu-Ambrose et al., 2006), Performance Oriented Mobility Assessment (POMA) (Faber et al., 2006), Push and Release Test (Jacobs et al., 2006), Single Leg Stance Test (Roberts & Gill, 2016), and the Timed Up & Go (Podsiadlo & Richardson, 1991). Amongst these tests and measures, the three most commonly identified as useful were the Single Leg Stance, the BBS, and the Timed Up & Go test. Of study participants, 70% noted that the BBS and the Single Leg Stance tests were useful in clinical decision-making and assessing patient's status over time. On the other hand, 56.9% of study participants found that the TUG test was useful in clinical decision-making and 62.9% of study participants found it helpful in assessing patient's status over time. The perceived utility of a tool as a factor in balance assessment is aligned with McGinnis et al.'s (2002) qualitative study of the members of the geriatric section of the APTA. Furthermore, Sibley et al. (2013b) also investigated the study participants' willingness to improve standing balance tests. Of study participants, 79% wanted to improve the assessment of standing balance; the researchers postulated that this was not an unexpected finding, as 46% of study participants felt that the current balance assessment tools did not meet their needs. This study also explored the barriers associated with balance assessment. Lack of knowledge, lack of time, inappropriate tools for specific population, and unavailability of tools were the barriers that impacted the participants' willingness to improve the assessment of reactive component of balance. While this was the first study to investigate

physiotherapists' satisfaction with validated standing balance tests, the study was limited in its sample of Ontario physiotherapists; therefore, generalizability of findings outside of Ontario physiotherapists and PTs in general is limited.

While most Canadian studies (Oates et al., 2017; Sibley et al., 2011, 2013a, 2013b) utilized surveys to explore balance assessments used, Gervais et al. (2014) explored which balance tests and measures were utilized by Ontario physiotherapists through a retrospective chart review. The charts of 250 patients with a diagnosis of balance impairment related to stroke, lower limb amputation, deconditioning, cardiac surgery, and/or musculoskeletal conditions were reviewed. While Gervais et al. (2014) found that the Timed Up & Go Test and the BBS were predominant tests and measures used in the hospital setting, the single leg stance test was the least-utilized tool. While conducting a retrospective chart review is an objective way to understand balance assessment used in a hospital PT setting, again, generalizability cannot be applied to other practice areas.

Summary

The majority of the studies utilized surveys to explore balance assessment practices except for two studies: McGinnis et al.'s (2009) qualitative study of 11 U.S. practicing PTs and Gervais et al.'s (2014) retrospective chart review of Ontario physiotherapists. U.S. PTs and Canadian physiotherapists utilized movement observation (McGinnis et al., 2009; Oates et al., 2017; Sibley et al., 2011), Single Leg Stance test in orthopedic settings (Oates et al., 2017; Saliga & Bongiovanni, 2005; Sibley et al., 2011), the Timed Up & Go test (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011), and the BBS in the geriatric population and inpatient settings (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011) as primary balance tests and measures in PT practice. Only Canadian studies have investigated the components of balance

based on the systems framework. Canadian physiotherapists reported assessing most components of balance (Gervais et al., 2014; Oates et al., 2017; Sibley et al., 2011) with reactive balance being the component of balance least assessed (Gervais et al., 2014; Oates et al., 2017; Sibley et al. 2011). Presently, in the U.S. literature, there are no studies exploring the components of balance based on the systems framework.

Upon exploring barriers associated with balance assessment practices, it is not surprising that lack of knowledge, lack of time, lack of availability and access to tools, organizational culture, and the perceived utility of a balance tool were found as the barriers that impacted PTs' clinical decision-making in balance assessment. These findings were consistent in U.S. PTs (McGinnis et al., 2002; 2009; Saliga & Bongiovanni, 2005) and Canadian physiotherapists (Gervais et al., 2014; Sibley et al., 2013b).

The Deficiencies in the Current Literature

In the current literature, several limitations exist in those studies exploring balance assessment practices in U.S. PTs. First, U.S. studies have not included a broad sample of U.S.-Practicing PTs. To date, only Michigan PTs (Saliga & Bongiovanni, 2005), members of the geriatric section of the APTA (McGinnis et al., 2002), 11 U.S. PTs in a qualitative study (McGinnis et al., 2009), Ontario (Gervais et al., 2014; Sibley et al., 2011), and Saskatchewan physiotherapists (Oates et al., 2017) have been studied. Second, to date, there are no studies quantitatively reporting balance assessment practices of the U.S.-Practicing PTs using the systems framework for balance assessment. Nonetheless, the systems framework for balance assessment was utilized to explore balance assessment practices in Canadian physiotherapists. The systems framework offers a multisystem and comprehensive balance assessment (Oates et al., 2017; Sibley et al., 2011, 2015b). PTs should assess all components of balance to determine

which component of balance is affected and to provide the most appropriate intervention in balance impairments and falls prevention (Sibley et al., 2015b). While there were studies in the U.S. exploring balance assessment practices in PT practice (McGinnis et al., 2002, 2009; Saliga & Bongiovanni, 2005), the researchers were unable to explore all balance components based on the systems framework. A cross-sectional survey conducted by Saliga and Bongiovanni (2005) found that study participants mainly used the single-legged stance and the push and nudge test. However, these latter tests do not measure all components of balance. Another limitation in the U.S. literature is the inclusion of reliable and valid balance tests and measures, such as those identified by the APTA balance tests and measures (Figure 2). While Canadian studies (Oates et al., 2017) included reliable and valid balance tests and measures, they are different from the APTA balance tests and measures.

To address the limitations noted above in the current literature, future studies should:

- utilize a theoretical framework to guide research
- utilize a sample of both APTA and non-APTA members
- utilize PTs with doctoral degrees and compare to PTs with bachelor's and master's degrees
- explore balance tests and measures recommended by the APTA
- explore AGPT CGS for the CDOA recommended by the APTA
- explore all components of balance based on the systems framework
- explore barriers that impact PTs' clinical decision-making in balance assessment practices
- explore barriers that impact PTs' clinical decision-making in use of the AGPT CGS

- conduct a mixed-method design on a broad sample of U.S.- practicing PTs

A proposed study could employ a mixed-method design by combining the surveys used by Sibley et al. (2011) and Oates et al. (2017) and build upon the qualitative work of McGinnis et al. (2009). The previous work of Sibley et al. (2011) is robust with large sampling and high return rate, and both Sibley et al. (2011) and Oates et al. (2017) utilized the systems framework for balance assessment. The qualitative work of McGinnis et al. (2009) is also essential, as it will contribute to the factors associated with PTs' clinical decision-making in balance assessment.

Barriers Associated with Balance Assessment

PTs should engage in EBP to provide the highest level of care and safe and effective interventions, and to increase patient satisfaction and healthcare outcomes. However, there are barriers when implementing EBP in balance assessment practices. In this section, a literature review on barriers (Gervais et al., 2014; McGinnis, 2002, 2009; Saliga & Bongiovanni, 2005; Sibley et al., 2013b) that negatively impacted balance assessment practices of U.S. PTs and Canadian physiotherapists will be presented. Additionally, barriers in the application of CPGs and EBP used by Swedish PTs (Berhadsson et al., 2014), Canadian physiotherapists (Cote et al., 2009), Dutch PTs (Van Bodegom-Vos et al., 2012; Van der Wees et al. 2013), and U.S. PTs (Jette et al., 2003) will be covered.

The top five factors that influenced the utilization of balance assessment practices were lack of time (McGinnis et al., 2009; Sibley et al., 2013b), lack of knowledge (Saliga & Bongiovanni, 2005; Sibley et al., 2013b), lack of availability and of access to balance tools (Gervais, et al., 2014; McGinnis, 2002, 2009; Saliga & Bongiovanni, 2005 & Sibley et al, 2013b), perceived usefulness of tools (McGinnis, 2002, 2009; Sibley et al., 2013b), and organizational culture (Gervais et al., 2014; Saliga & Bongiovanni, 2005). Each of the barriers is

further explored in the following sections.

Lack of Time

Amidst assessing and treating patients with balance impairments, PTs must demonstrate the ability to effectively multitask, as they are required to document patient status, communicate with physicians and other health care providers, and engage in administrative functions. The demands associated with multitasking negatively impact PTs' time to incorporate EBP, such as the APTA falls CGS (Figure 1) and the APTA balance tests and measures (Figure 2) when assessing and treating patients with balance impairments.

In a cross-sectional survey, Sibley et al. (2013b) reported that 61.8% of 369 Ontario physiotherapists noted that lack of time was one of the challenges associated with improving their balance assessment practices, in particular, the use of standing balance tools. Similarly, Bernhadson et al. (2014) found that 68% of 419 PTs in Western Sweden in a cross-sectional survey reported that the most significant barrier in the application of CPG is lack of time. This finding is also consistent with Jette et al.'s (2003) cross-sectional survey of 488 PTs who are members of the APTA. Jette et al. (2003) found that 46% of the study participants indicated that lack of time was the primary barrier in the implementation of evidence into practice. In conclusion, time is a consistent factor in the utilization of EBP of the members of the geriatric section of the APTA (Jette et al., 2003), in the application of CPGs of Western Swedish PTs (Berhadsson et al., 2014), and Ontario physiotherapists (Sibley et al., 2013b).

Lack of Knowledge

PTs should be aware of and be knowledgeable of current evidence-based tools such as the AGPT CGS for CDOA (Figure 1) and tests and measures recommended on the APTA website (Figure 2) for best practices in balance and falls assessments.

In a cross-sectional survey of 319 Ontario physiotherapists, Sibley et al. (2013b) found that 44% of study participants reported lack of knowledge as a barrier associated with improving standing balance tools. The researchers postulated that the lack of knowledge could have contributed to the low assessment of the reactive component of balance. As such, there was a lower utilization of the BestTest, POMA, and CTSIB tests which measure the reactive component of balance. Lack of knowledge was also found to negatively impact the use of standing balance assessments by 92 Michigan PTs (Saliva & Bongiovanni, 2005). In this cross-sectional survey, Saliga and Bongiovanni (2005) found that the lack of knowledge and the lack of awareness in test administration were barriers in PTs' selection of balance tests.

Availability and Access to Tools

In two survey studies (McGinnis, 2002; Saliga & Bongiovanni, 2005) that were reviewed, PTs consistently reported that balance assessment tools were chosen based upon their availability and ease of access. It is concerning that Saliga and Bongiovanni (2005) found that the majority of 92 Michigan PTs used tests that do not have established validity and reliability. Rather, the study participants chose balance tests based on ease and convenience. Likewise, McGinnis et al. (2002) had a similar finding in a cross-sectional survey; of 419 participants who were members of the geriatric section of the APTA, 223 chose a balance test due to its quick accessibility and 181 selected tests that required little equipment. McGinnis et al. (2002) postulated that PTs' selection of balance tests was based upon the ease of administration, utilization of less equipment, and the commotion in a clinical setting.

Perceived Usefulness of Tools

Another factor that was found to impact PTs' assessment of balance was based on perceived usefulness of balance tests and measures (McGinnis et al., 2002, 2009; Sibley et al.,

2013b). PTs used balance tests to inform their clinical decision-making process and detect changes in a patient's progress over time (McGinnis et al., 2002, 2009; Sibley et al., 2013b). In a cross-sectional survey**,** Sibley et al. (2013b) explored the perceptions of eight commonly used standardized tests: Balance Evaluation Systems Test (BestTest), BBS, Clinical Test of Sensory Integration in Balance (CTSIB), Community Balance and Mobility (CB&M) scale, Performance Oriented Mobility (POMA), Push & Release test, Single Leg Stance Test, and the Timed Up & Go used by Ontario physiotherapists. Sibley et al. (2013b) administered a five point Likert questionnaire that explored the study participants' perceived usefulness of tools in terms of their importance, adequacy, comprehensiveness, and ability to meet clinician's needs. Study participants used the Single Leg Stance, the BBS, and the Timed Up & Go tests because of their perceived usefulness in terms of clinical decision-making and assessment of patient's progress over time. Of the 369 study participants, 70% identified the Single Leg Stance, and the BBS as useful tests and measures. Of the study participants, 56.9% noted that the TUGS test was useful in their clinical decision-making, while 62.9% perceived that it was useful for evaluating patients' change overtime. In McGinnis et al.'s (2002) cross-sectional survey of 419 PTs who were members of the geriatric section of the APTA, the top three most used objective balance tools were identified as the BBS, the Tinetti, and the Timed Up & Go test. Once again, this finding is noted in a subsequent qualitative study of 11 US PTs, in which McGinnis et. al (2009) found that one of the factors that influenced PTs' use of balance assessment was the perceived usefulness of a tool. PTs used balance tools for documentation and reimbursement purposes.

Organizational Culture

Interestingly, while PTs are autonomous practitioners, organizational culture has been noted as one of the determinants of PTs' utilization of balance assessment. Specifically, whether

the place of employment has the resources for PTs to administer certain balance tests, or such balance tests were listed on the initial evaluation form has been noted to impact their utility. In a cross-sectional survey of 92 Michigan PTs, Saliga and Bongiovanni (2005) found that study participants noted that they do not use a specific test if their workplace does not utilize the tool or if it is unlisted on the organization's evaluation form. This finding is aligned with a retrospective chart review of 250 patients assessed by Ontario physiotherapists that practiced in an in-patient setting (Gervais et al., 2014). Notably, Gervais et al. (2014) found the study participants mostly used the Timed Up & Go test and the BBS, both of which were listed on the organization's physical therapy evaluation and discharge forms (Gervais et al. 2014).

Other Factors Associated with Balance Assessment

In McGinnis et al.'s (2009) qualitative study, a more in-depth exploration, associated with balance assessments of how and why, was performed on 11 PTs in an in-patient and outpatient setting in the U.S. The researchers found that U.S. PTs assessed balance by relying on clinical experience rather than the literature for balance tools. PTs gained practical knowledge through academic education, interaction with colleagues, and clinical experience. Furthermore, a patient's diagnosis and medical history were determinants in balance assessment.

In summary, a multifactorial dynamic was found in cross-sectional surveys of Canadian physiotherapists (Gervais et al., 2014; Sibley et al., 2013b) and U.S. PTs (McGinnis et al., 2002; Saliga & Bongiovanni, 2005). With lack of time being a primary barrier, lack of knowledge, lack of access and availability of tools, PTs' perceptions of tools, and organizational culture further impacted PTs' balance assessment practices. McGinnis et al. (2009) conducted a more in-depth exploration through a qualitative study. Reliance on PT's clinical experience, practical knowledge, interaction with colleagues, and patient's presentation impacted their balance

assessment practices and utilization of balance tools (McGinnis et al., 2009).

Barriers to the Application of CPGs and EBP in PT Practice

As discussed in Chapter 1, guided by the KTAF (Graham et al., 2006), understanding the barriers that hinder the uptake of evidence-based tools such as CPGs into clinical practice, is a precursor to integration and implementation into PT practice. Adherence to CPGs is essential in PT practice to improve healthcare outcomes and reduce cost (Fritz et al., 2007).

In the beginning of Chapter 2, barriers in balance assessment practices of Canadian physiotherapists (Gervais et al., 2014; Sibley et al., 2013b) and U.S. PTs (McGinnis et al., 2002, 2009; Saliga & Bongiovanni, 2005) were discussed. In this section, the barriers in the implementation of CPGs used by Swedish PTs (Bernhardsson et al., 2014), Dutch PTs (Van Bodegom-Vos et al., 2014; Van der Wees et al., 2013), and EBP in U.S. PTs (Jette et al., 2003) will be discussed further. Additionally, several studies that explored the implementation of CPGs in specific diagnoses, such as rheumatoid arthritis (RA) of Dutch generalist and specialist PTs (Van Bodegom-Vos et al., 2012), chronic obstructive pulmonary disease (COPD) of Dutch chest PTs (Van der Wees et al., 2013), and low back pain of Canadian physiotherapists (Cote et al., 2009) will be elaborated further.

Berhardsson et al. (2014) conducted a cross-sectional survey used by 419 Swedish PTs that practiced in primary care setting. The survey was based on their attitudes and barriers associated with CPGs. While Berhardsson et al. (2014) found that 96% of study participants felt that CPGs were important and 83% believed that CPGs were useful in clinical decision-making, but only 47% of the study participants reported use of CPGs “frequently” or “very frequently”. Therefore, less than half of study participants reported use of CPGs because of their accessibility.

Only 13% of study participants knew where to find CPGs on the internet and 9% of study participants had access to CPGs in their places of employment. A precursor to guideline usage was the awareness of CPGs. This finding is consistent in a qualitative study of 24 Dutch PTs (Van Bodegom-Vos et al., 2012). The top four barriers reported in the application of CPGs were lack of time (reported by 68%), accessibility of CPGs (45%), generalizability and lack of specificity of CPGs (40%), and CPGs took too long to read (38%). The first three barriers are also consistent in a qualitative study of 24 Dutch PTs in implementing CPGs in patients with RA (Van Bodegom-Vos et al., 2012). Van Bodegom-Vos et al. (2012) reported that both general and specialist PTs reported that lack of time, lack of access to tools, and the inability to apply CPGs to their patient's preferences were hindrances to the use of CPGs. Additionally, the researchers reported that study participants with less than five years of work experience and a postgraduate degree were most likely to use CPGs. The two determinants in CPGs' application were the study participants' perceptions of applying CPGs into clinical practice and their patient's treatment preferences; the latter is a similar finding in a qualitative study of 24 Dutch PTs (Van Bodegom-Vos et al., 2012).

Van Bodegom-Vos et al. (2012) conducted a qualitative study regarding barriers in implementing CPGs in treatment of patients with rheumatoid arthritis (RA) used by 13 generalist and 11 specialist Dutch PTs. Specialist PTs were defined as having specific expertise in the management of RA via an organization called Fryanet Leiden and Arthritis Network Amsterdam. Lack of time was a common barrier reported by both general and specialist PTs. Van Bodegom-Vos et al. (2012) further categorized barriers as (a) internal barriers, which refer to cognitive and/or affective barriers, and (b) external barriers, which refer to organizational, social, and political influences.

The second internal barrier is an affective barrier, which refers to the negative attitude towards the CPG. The following implies negative attitude:

(1) Lack of agreement with the CPG. Both the generalist and specialist PTs, to a lesser degree, felt that the guideline do not fit with their practical learning methods.

(2) Lack of agreement with the RA guideline. Both the generalist and specialist PTs felt that the guideline was based on expert opinions rather than EBP. The generalist PTs also felt that each patient was unique and had different characteristics; hence, the CPG did not serve their patients individually.

(3) Low self-efficacy. Both the generalist and specialist PTs lacked familiarity with the measurement instruments recommended by the CPG, exposure, and clinical experience.

(4) Lack of motivation. The generalist PTs were not motivated due to their lack of experience working with RA patients, and the specialist PTs were disinterested because they had prior experiences and strategies that worked for them.

(5) Poor outcome expectancy. Both the generalist and specialist PTs displayed a negative attitude by perceiving that adhering to the CPG will not improve patient outcomes.

Conversely, external barriers refer to patient's treatment preferences, CPGs, and environmental factors, which include political and social factors. These external barriers refer to:

(1) Patient factors. Both the generalist and specialist PTs, to a lesser extent, felt that the management of RA patients in the CPG was different from their patient's expectations or preferences.

(2) Guideline factors. Both the generalist and specialist PTs felt that the guideline did not fit with their practical learning methods.

(3) Environmental factors. Environmental factors include organizational, political, and social issues. As far as organizational issues, generalist and specialist PTs felt that the organization did not permit enough time to perform all diagnostic tests for patients with RA. Lack of training in the facility, lack of access to measurement instruments, and lack of integration of diagnostic tests in health records were also organizational factors. In terms of political issues, both the generalist and specialist PTs felt that involvement of insurance companies, such as making the CPG mandatory, was a motivating factor for adopting CPG. Social issues refer to a lack of collegial discussion regarding CPG. Collegial involvement, as a motivating factor, for the adoption of CPG is also a similar finding in Dutch chest PTs (Van der Wees et al., 2013). Specialist PTs further added that their lack of role and responsibilities among the medical community in diagnosing and treating patients with RA was a social hindrance.

In another qualitative study, Cote et al. (2009) explored the barriers in the Implementation of the Clinic on Low back Pain in Interdisciplinary Practice (CLIP) CPG of 16 Canadian physiotherapists who evaluated and treated patients with LBP. The four major themes were general understanding of the CLIP CPG content, compatibility between the CLIP CPGs and physiotherapists' clinical practices, relevance of the CLIP CPG, and overall agreement with the CLIP CPG.

The understanding of the CLIP CPG was a precursor to integrating CPG into clinical practice. The study participants found that the CLIP CPG was easy to read and understand. However, some of them had difficulty with understanding the levels of evidence to support the recommendation of CPG, recognizing the algorithm in the CLIP CPG, applying the CPG

recommendation to their patients, and using the tools that were recommended by the CLIP guideline. Understanding the levels of evidence and applying the CPG to their patient's characteristics or treatment preferences were similar findings in the application of RA CPG of Dutch PTs (Van Bodegom-Vos et al., 2012). A second barrier noted was the compatibility between the CLIP CPG and the physiotherapists' former knowledge and practices. The study participants felt that the CLIP guideline focused extensively on the psychosocial factors of LBP and did not take into account the biomechanical factors for LBP. The researchers postulated that study participants were more adoptable if the recommendations of the CLIP guideline reinforced the study participants' current practices. The CLIP CPG recommended that physiotherapists should address the psychosocial components of LBP and the use of questionnaires. Given that these recommendations are relatively new, the participants felt reluctant following them. Additionally, the participants felt that the CLIP guideline was too "generic" and did not allow for management and flexibility of interventions specific to their patient's needs. The third barrier was the relevance of the CLIP CPG. The study participants had different opinions regarding the usage of the questionnaires on the CLIP. As such, the CLIP CPG was designed to evaluate, diagnose, and establish a prognosis for patients with LBP. However, the researchers postulated that physiotherapists were pressured by their colleagues, patients, and other healthcare personnel towards guideline adherence. For example, some of the study participants did not feel comfortable using the psychosocial questionnaire to formally assess this component of LBP as it can affect the patient-therapist relationship. The patient's characteristics such as payor status affected the relevance of the CPG. Study participants felt those clients who paid in full or partially have perceived expectations, such as personalized and manual interventions. The study

participants felt that the CLIP CPG was designed for patients that have an unfavorable diagnosis, long-term disability, and severe psychosocial barriers. The usage of different tools and patient's characteristics as barriers in implementing CPG were consistent findings of Dutch physiotherapists (Van Bodegom-Vos et al. (2012) in a qualitative study. The fourth and last barrier was the agreement with the recommendations of the CLIP CPG. In general, study participants agreed with the CLIP CPG recommendations, such as the classification of LBP, re-evaluation of patient's progress, encouragement of active lifestyle, and referral of other services when maximal potential is reached. However, the study participants did not agree to newer recommendations, such as evaluating patient's prognosis and screening for barriers for return to usual activities.

In a cross-sectional survey of 246 Dutch chest PTs, Van der Wees et al. (2013) developed a questionnaire to identify perceived barriers and facilitators for implementing COPD CPG. Van der Wees et al. (2013) identified five factors: attitude towards using measurement instruments, knowledge and skills of a PT, applicability of the COPD guideline, time and financial constraints, and patients' characteristics. Van der Wees et al. (2013) found that the main barriers were time and money. Of study participants, 41% felt that they should charge a higher fee when using the CPG. Of study participants, 80% took into account patient characteristics. Of study participants, 83% reported having the knowledge to apply the COPD CPG. Support from other health care practitioners was also a factor in implementing the COPD CPG. Of study participants, 43% felt more supported by chest physicians versus 28% by general practitioners. Van der Wees et al. (2013) found favorable attitudes towards use of measurement tools. Of study participants, 90% supported measurement tools for diagnostic purposes and 91% deemed measurement tools were important in clinical decision-making. Of study participants, 96%

reported that access to measurement instruments was a facilitator in COPD CPG. All of these five factors with the exception of financial constraints were also identified as determinants in implementing RA CPG used by 24 Dutch PTs (Van Bodegom- Vos et al., 2012).

Currently, the APTA recommends 19 CPGs for physical therapy practice (APTA, 2023). There are no CPGs specific to balance assessment; however, there is a CGS specific for CDOA associated with falls management and prevention, as discussed in Chapter 1. To the author's knowledge, there is currently no study that has investigated the barriers in implementing CPGs in balance assessment practices in the U.S. However, in a cross-sectional survey, Jette et al. (2003) explored 488 PTs with APTA memberships regarding their knowledge, attitudes, and behaviors in implementing EBP. Jette et al. (2003) found favorable attitudes of study participants towards EBP. Jette et al. (2003) found that 90% of study participants either agreed or strongly agreed that EBP was necessary. Of study participants, 82% considered the literature as useful tools for clinical practice. Of study participants, 89% felt that EBP improved the quality of patient care, and 72% of study participants felt that EBP improved clinical decision-making skills. Jette et al. (2003) found an association between the years of experience and the attitudes towards EBP. Study participants with less than five years of experience were 4.6 times more likely to agree that EBP was necessary and 2.6 times more likely to agree that EBP improved the quality of care ($r = .80$). This finding is in line with a cross-sectional survey of 419 Swedish PTs (Berhardsson et al., 2014). Study participants with less than five years of experience were more likely to use CPG. Furthermore, Jette et al. (2003) found that study participants had favorable access to EBP and CPG. Ninety-six percent of study participants had access to professional journals; of which, 86% of study participants reported access to CPGs pertaining to their practice areas and 75% of study participants had access to online CPGs. Jette et al. (2003) found a

relationship between the likelihood of using EBP and access to online databases; study participants who had access to online databases at home were 3.2 times more to implement EBP. This finding of favorable access to online databases and CPGs in PTs with APTA memberships contradicted the findings of a cross-sectional survey of Swedish physiotherapists (Berhardsson et al., 2014). Berhardsson et al. (2014) reported that only 13% of the study participants knew how to access CPGs online, and only 9% had access in their places of employment. Jette et al. (2003) reported that the top three barriers in implementing EBP were lack of time, lack of generalizability of research findings to their specific patient population, and the inability to apply findings to their patient's characteristics, preferences or treatment expectations.

Summary

Table 2 visually depicts the barriers associated with balance assessment practices, the application of CPGs, and EBP. The symbol X is marked on the specific barrier (ie. lack of time, lack of knowledge). In reviewing the barriers in balance assessment practices, application of EBPs and CPGs, consistent results were found in principal barriers. The top three barriers were: (a) Lack of time is a primary barrier in implementing CPGs reported by Swedish (Berhardsson et al., 2014) and Dutch PTs (Van Bodegom-Vos et al., 2012; Van der Wees et al., 2013), and the application of EBP, noted by U.S. PTs (Jette et al., 2003), (b) Lack of guideline agreement as PTs did not agree with the CPGs' recommendations due to their lack of knowledge and the unavailability of tools or questionnaires in qualitative studies of Dutch PTs (Van Bodegom-Vos et al., 2012; Van der Wees et al., 2013), Canadian physiotherapists (Cote et al., 2009), and a cross-sectional survey of Swedish PTs (Berhadsson et al., 2014), and (c) lack of patient's preference is a hindrance in the implementation of CPGs, which is a common finding in Dutch, Canadian, and U.S. PTs (Cote et al., 2009; Jette et al., 2003; Van Bodegom-Vos et al., 2012; Van

der Wees et al., 2013;). The recommendations in the CPGs were not aligned with the patient's characteristics, preferences or treatment expectations.

Furthermore, other barriers that were not as common have been reported in three qualitative studies: LBP (Cote et al., 2009), RA (Van Bodegom-Vos et al., 2012) and COPD (Van der Wees et al., 2013) CPGs. These included: (a) PT's persistence in relying on their older habits or their current practice methods unmatched with the recommendations of CPGs (Van Bodegom-Vos et al., 2012), (b) guideline factors such as PT's lack of access to tools recommended by CPGs (Bernhardsson et al., 2014; Cote et al., 2009; Van Bodegom-Vos et al., 2012; Van der Wees et al., 2013), and (c) environmental factors, such as lack of insurance mandate (Van Bodegom-Vos et al., 2012), lack of collegial involvement (Van Bodegom-Vos et al., 2012; Van der Wees et al., 2013), and financial constraints (Van der Wees et al., 2013).

Table 2

Barriers in Balance Assessment Practices, Application of EBP, and CPGs

Sample/ population	time	knowledge	attitude/ motivation	Access/ use of tools	patient Preferences / characteristics	guideline agreement	organizational support	$	collegial interaction	other
Swedish PTs (Berhadsson et al., 2014)	X		X	X		X				
Dutch PTs (Vanderwees et al., 2013)	X	X	X		X	X		X		
Ontario physiotherapists (Gervais et al., 2013)							x			
Ontario physiotherapists (Sibley et al., 2013a)				X						
Ontario physiotherapists (Sibley et al., 2013b)	X	X								
Dutch PTs (Van Bodegom-Vos et al., 2012)	X	X	X	X	X	X	X	X	X	X
Canadian physiotherapists (Cote et al., 2009)		X			X	X				
11 US PTs (McGinnis, 2009)				X	X					X
Michigan PTs (Saliga and Bongiovanni, 2005)		X		X			X			
Members of geriatric section of APTA (McGinnis, 2002)				X						

Note. Barriers in balance assessment practices are highlighted in blue. Barriers in the application of EBPs and CPGs are highlighted in black.

In summary, prior to implementing change researchers, third party payers, and PTs practicing in the U.S. should understand the barriers in balance assessment practices and the implementation of EBP and CPGs. As noted above, barriers can occur at the individual level and/or organizational level.

Chapter III. Methods

The study employed a mixed-methods design in which both open-ended data in qualitative cases and closed-ended data in quantitative cases were collected (Creswell, 2018). This method was employed to develop a stronger understanding of the research problem or questions and to minimize the limitations of each methodology (Creswell, 2018). Furthermore, Kumar (2019) stated that the mixed-methods approach combines the strengths of a quantitative and a qualitative study, which results in improving the depth and accuracy of the findings. Specifically, the study employed an embedded mixed-methods design in which "a mixed-methods design is formed by embedding a secondary (or supportive) method within a primary quantitative or qualitative design" (Creswell & Clark, 2018, p. 227). Therefore, in this study, a partial qualitative (qual) strand was embedded in a primary quantitative (QUAN) design. In the study, central research questions two and three were answered quantitatively, central research questions four and five were answered qualitatively, and central research question one was answered quantitatively and qualitatively.

Quantitative Phase

The quantitative design was descriptive, cross-sectional, exploratory, correlational, and non-experimental. Cross-sectional design entailed data collection occurring at one point in time (Creswell, 2018); hence, the study participants completed both Part A and Part B of the Assessment of Balance Practices and Associated Barriers (ABPAB) survey, which contained quantitative questions. Part A contained the Saskatchewan Physiotherapists' Balance Assessment Survey (SPBAPS), and Part B contained PI's self-developed, closed-ended questions associated with themes from literature on barriers in balance assessment practices, CPGs, and the utilization of the APTA balance tests and measures. Descriptive research involves observing and describing

the behavior of a subject without influencing it in any way. In the study, the demographic characteristics of a broad sample of U.S.-Practicing PTs were collected and summarized. Demographic characteristics included age, degree status, gender, specialty practice, practice settings, and clinical specializations. Exploratory research was conducted to examine a phenomenon of interest, in this case balance assessment practices (Portney & Watkins, 2009). Furthermore, a correlational design was used to explore if a relationship existed between clinical specializations, patient population, and degree status (independent variables), and components of balance measured by U.S.-Practicing PTs (dependent variable). The study was also non-experimental in nature as there was no manipulation of variables.

Qualitative Phase

In reference to Saldana (2016), the PI analyzed open-ended survey responses via coding in a qualitative inquiry. In this study, the PI created three self-developed, open-ended statements to answer research questions four and five. These questions addressed the barriers associated with balance assessment practices, specifically with barriers to the AGPT CGS in falls management for CDOA and the APTA balance tests and measures.

The Instrument: Assessment of Balance Practices and Associated Barriers of U.S.-Practicing PTs

All participants were asked to complete a one-time web-based Qualtrics survey with two parts: Part A and Part B. Part A, which was a primarily quantitative section, contained structured closed-ended questions, and Part B, which was a primarily quantitative section with a supportive qualitative strand, contained a combination of closed-ended and open-ended questions.

Part A

The SPBAPS, which was adapted from the study by Oates et al. (2017), contained 15 survey items. Oates et al. (2017) granted permission via email allowing the PI to utilize the SPBAPS tool (Appendix A). The purpose of the SPBAPS was to measure the balance tests and

measures used and the components of balance assessed by U.S.-Practicing PTs. The SPBAPS was based on a 6-point Likert scale, which included both numeric and descriptive anchors: most of the time (> 80%), frequently (60% – 79%), sometimes (4l% – 59%), occasionally (21% – 40%), rarely (< 20%), and never (0%). The SPBAPS was utilized by 72 Saskatchewan physiotherapists (Oates et al., 2017). Oates et al. (2017) conducted pilot testing with four physiotherapists to ensure readability and comprehension of the survey. The SPBAPS had face and content validity; however, the SPBAPS (Oates et al., 2017; Sibley et al., 2011) had unknown reliability. In Part A of the ABPAB survey, item 9 referred to the components of balance assessed based on the Systems Framework, and item 10 referred to the balance tests and measures used which answered research question 1. Item 13 referred to degree status as an independent variable and item 8 referred to patient population as an independent variable. These items enabled the PI to answer research question 2 as we explored how these independent variables (items 8 and 13) related to item 9, which referred to components of balance, a dependent variable.

Part B

Part B contained a primary quantitative portion and an embedded supportive qualitative strand developed by the PI. The nine structured closed-ended questions referred to the quantitative portion and the three open-ended questions referred to the qualitative strand. The purpose of Part B was to measure the APTA balance tests and measures (item 16) and barriers in balance assessment practices from themes from literature (item 17). Items 20 and 21, which were closed-ended questions, referred to the awareness and usage of the AGPT CGS. Items 23 and 24, which were closed-ended questions, referred to the awareness and usage of the APTA balance tests and measures. The three open-ended survey statements were developed to delve into a

deeper understanding of the balance assessment practices of U.S.-Practicing PTs; they were as follows: (a) Please describe how you assess balance in your clinical practice (item #18), (b) Please describe the barriers that you encounter when utilizing the AGPT CGS in managing falls for CDOA (item #22), and (c) Please describe the barriers that you encounter when utilizing the APTA balance tests and measures (item #25). A Delphi process was conducted to obtain face and content validity of Part B of the survey.

Delphi Process and Assessment of Validity

The Delphi process employed in this study was described as a group facilitation technique, and its purpose was to obtain consensus on the opinions of panelists or experts through a series of rounds (Hasson et al., 2000). The Delphi process took multi-stages (Hasson et al., 2000) in which the PI sent a letter of solicitation to the Delphi panelists to seek feedback on the survey's questions and statements. Subsequently, the survey was returned to the PI with feedback from the Delphi panelists. Upon receiving the feedback, the PI reviewed the comments of the expert panelists, incorporated the feedback provided, revised the survey, and sent a revised survey back to the panelists for the next round. This process was repeated several times (Hasson et al., 2000) until an 80% consensus was achieved on all of the survey questions and statements (Keeney et al., 2006). Once the consensus was achieved, the Delphi process was completed and the survey was considered to have obtained validity (Falzarano & Zipp, 2013). In the study, the Delphi process was conducted to obtain face and content validity on Part B of the ABPAB survey. Face validity is defined as the instrument or the tool is supposed to measure what it is intended to measure (Alreck & Settle, 2004). Content validity is defined as when a researcher determines that the questions or items in the survey have been included in all the areas of the study (Kumar, 2019). To obtain face and content validity, the Delphi panelists were invited through a solicitation letter and were instructed to provide feedback on the nine PI self-

developed closed-ended questions and the three open-ended questions based on three criteria: (a) the clarity of each question, (b) the appropriateness of the individual questions as it related to the overall survey, and (c) the order of the presentation of each question (Falzarano & Zipp, 2013). This was done when the PI provided a worksheet with a shaded grey area under each research question to the panelists. The Delphi panelists were chosen based on expertise and knowledge of the topic area. The Delphi panel consisted of two PTs with expertise in assessing and treating patients with balance impairments, and three researchers with PhDs with expertise in survey design. In the first round, five out of the 10 PI self-developed questions achieved 80% consensus. Therefore, in the second round, the PI sent the remaining five questions that did not receive 80% consensus and needed further corrections and revisions. In the third and final round, the PI sent the remaining two questions that did not receive 80% consensus and needed further corrections and revisions. Once round two and three were completed, all the remaining five questions reached 80% consensus and therefore, the Delphi process was said to be completed and obtained face and content validity.

Analysis of Quantitative Data

Statistical analysis using SPSS software version 28 was initiated to analyze the quantitative data as shown on Table 3. The quantitative data consisted of the demographic information (questions 6, 8, 11 and 13), and balance tests and measures (questions 10 and 16), and components of balance assessed (question 9) which were described in descriptive and numerical anchors. To answer research question 1, descriptive statistics, using frequencies and percentages, were used to express the balance tests and measures (question 10 and 16), and the components of balance (question 9) used by U.S.-Practicing PTs. To answer research question 2, a Chi square test was used to test the relationship between: patient population (question 8),

degree status (question 3), clinical specializations (question 26b) as categorical independent variables, and balance components (yes ≥ or = 60% or more assess components of balance, no ≤ 60% assessment of components of balance) as categorical dependent variables. To answer research question 3, descriptive statistics using frequencies and percentages were used to demonstrate the top three barriers in balance assessment practices (question 16).

Table 3

Analysis of Quantitative Data

Data Analysis: QUANTITATIVE

Variable	Research question	Corresponding Survey items	Data analysis
Balance tests and measures used (dependent)	RQ1a. What are the balance tests and measures used by U.S.-Practicing PTs?	10 , 16	SPSS, Descriptive statistics expressed in % and frequency
Components of balance assessed (dependent)	RQ1b. What are balance components based on the systems framework measured by U.S.-Practicing PTs?	9	SPSS , Descriptive statistics expressed in % and frequency
Degree status (independent, categorical)	RQ2a. What is the relationship between *degree status and components of balance assessed* by U.S.-Practicing PTs (yes =/ > 60% or more assess components of balance, no < 60% assessment of components of balance)?	9,13	Chi square test
Clinical specializations (independent, categorical)	RQ2b. What is the relationship between *the clinical specializations and components of balance assessed* by U.S.-Practicing PTs (yes = / > 60% or more assess components of balance, no < 60% assessment of components of balance)?	26b, 9	Chi square test
Practice settings (independent, categorical)	RQ2c. What is the relationship between the *practice settings and components of balance assessed* by U.S.-Practicing PTs (yes = / > 60% or more assess components of balance, no < 60% assessment of components of balance)?	6,9	Chi square test

Note. Chi square test and descriptive statistics were used to analyze quantitative data to answer research questions one and two.

Analysis of Qualitative Data

The PI analyzed open-ended survey responses via coding in a qualitative inquiry (Saldana, 2016). Creswell (2018) further stated that qualitative inquiry could be analyzed via

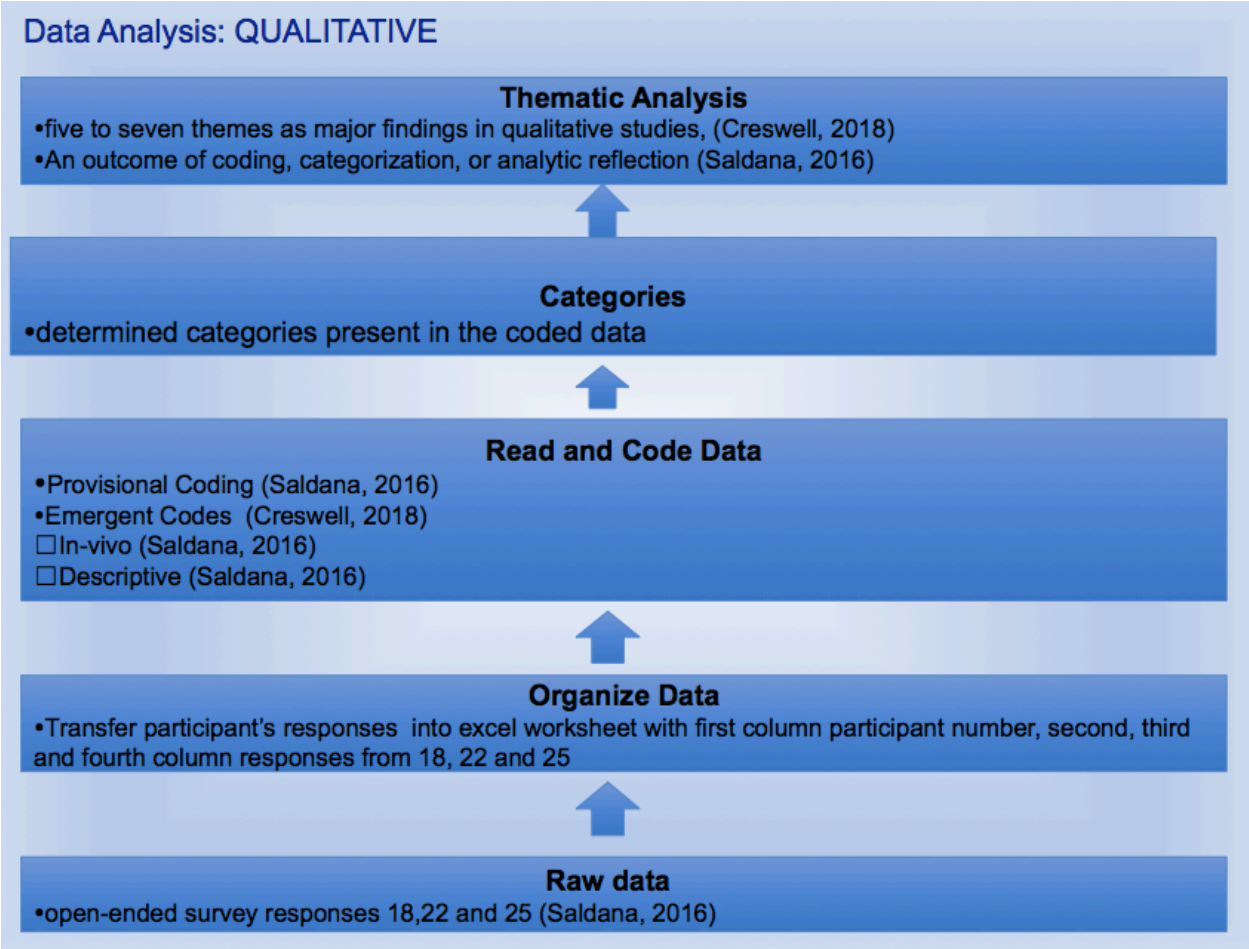
inductive approach, in which the PI interpreted the raw data into codes, categories, and themes. The analysis of qualitative data displayed in Figure 6 was as follows: Raw data, which was the open-ended survey responses from questions 18, 22, and 25 of ABPAB survey were analyzed. The PI then organized the data by transferring the study participants' responses into an Excel worksheet with column one labeled as the participant number. Subsequently, the PI recorded the survey responses from questions 2, 18, and 22 in the second, third and fourth columns of the Excel worksheet.

The PI manually read and coded the data concurrently via provisional and emergent codes. Provisional code defined as a "predetermined start list of codes" (Saldana, 2016, p. 168) was based on literature review. Emergent codes were newer codes that developed. Emergent codes were determined via in-vivo coding, which was defined as putting a participant's words in direct quotations (Saldana, 2016), and descriptive coding, which was defined as labeling data to summarize in a word or short phrase (Saldana, 2016). Following coding, the PI processed the codes by categorization, a process of coding in which data was bracketed through chunks (Crewswell, 2018). The PI categorized the codes by chunking the barriers into individual versus organizational barriers.

Intercoder agreement (Creswell, 2018) was utilized to ensure reliability in the coding process. In the study, the PI's dissertation chair served to review the transcripts and the codebook until 80% agreement was achieved on the codes, categories, and themes.

Figure 4

Analysis of Qualitative Data



Note. Inductive Approach (bottom up) was used to analyze qualitative data from raw data, to coding, to categories to thematic analysis (Creswell, 2018).

Sampling

In order to be included in the proposed study, participants had to meet the following criteria: be a practicing PT; be a licensed PT; be a PT who treats patients with balance and/or mobility impairments; be 21 years of age or older; have access to the web or email; and be proficient in reading and writing. Participants were excluded if they did not meet the inclusion criteria. Table 4 shows the inclusion and exclusion criteria.

Table 4

Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
Practicing PT	Non-practicing PT
Licensed PT	Unlicensed PT
21 years of age or older	20 years of age or younger
PT who treats patients with balance and/or mobility impairments	PT who does not treat patients with balance and/or mobility impairments
Access to web or email	No access to web or email
Proficient in reading and writing English	Not proficient with reading and writing English
	Physical Therapist Assistant

Non-randomized sampling, which included purposive, convenience, and snowball sampling, was utilized in the study. Convenience sampling was defined as the selection of conveniently available cases (Dixon et al., 2019). Since the sample was specifically targeted towards U.S.-Practicing PTs, study participants were solicited through nationwide organizations, such as Kessler Rehabilitation centers, APTA state and specialty chapters. Purposive sampling, which was defined as the careful and informed selection of typical cases that represent a certain population (Dixon et al., 2019), was used through Facebook closed physical therapy groups. Snowball sampling (Dixon et al., 2019) defined as a chain referral via word of mouth, was also used.

A G Power of Analysis

The sample size was obtained via a priori G*Power of Analysis software. The sample size was represented by n. To analyze the relationship between the variables of interest, the power of analysis estimated the target sample size (Creswell, 2018). Additionally, a power of

analysis was used to avoid the probability of making a type II error, which is failing to reject the null when it is false, called beta. A G power of analysis, using the statistical test, chi square, was used to test the association between two variables measured by categories (Creswell, 2018). In the study, the three variables tested were patient population, degree status, and clinical specializations as three independent categorical variables, and components of balance (yes > or = 60% or more assess components of balance, no < 60% assessment of components of balance) as dependent categorical variable assessed by U.S.-Practicing PTs. To calculate the sample size for the proposed study, A Priori G* power of analysis for chi square goodness of fit with the effect size was .3, which is a medium effect size (Cohen, 1992), and power of .8, which, according to George and Mallery (2011) is considered an acceptable power that resulted in 143 U.S.-Practicing PTs. In the social sciences, a 10-15% attrition rate is acceptable (DeLuca, 2018). Attrition of 15% was added to 143, which resulted in an n = 164.

Recruitment Process

Upon approval of the Seton Hall University IRB, the recruitment process was initiated. Since the target sample was aimed towards a broad sample of U.S.-Practicing PTs, a letter of solicitation, which contained the Qualtrics survey link, was sent through the following nationwide organizations: Kessler Rehabilitation, Select Medical Corporation email distribution lists, and the American Physical Therapy Association (APTA) section, state, and APTA specialty chapters. Additionally, a letter of solicitation was also sent to social media such as Facebook physical therapy closed groups via messaging. Any U.S.-Practicing PTs meeting the inclusion criteria listed in the letter of solicitation were eligible to participate in the onetime-Qualtrics online survey. The letter of solicitation and recruitment letter contained a link to Qualtrics and

upon clicking, the study participants completed both parts of the ABPAB. Upon submission of the survey, the study participants voluntarily consented to participate.

Chapter IV. Results

Study Participants

For the purpose of this dissertation, when we use the phrase "U.S.-Practicing PTs," we are referring to the U.S.-Practicing PTs in the sample of this study and we do not generalize the results of the study to all of the U.S.-Practicing PTs in the U.S.

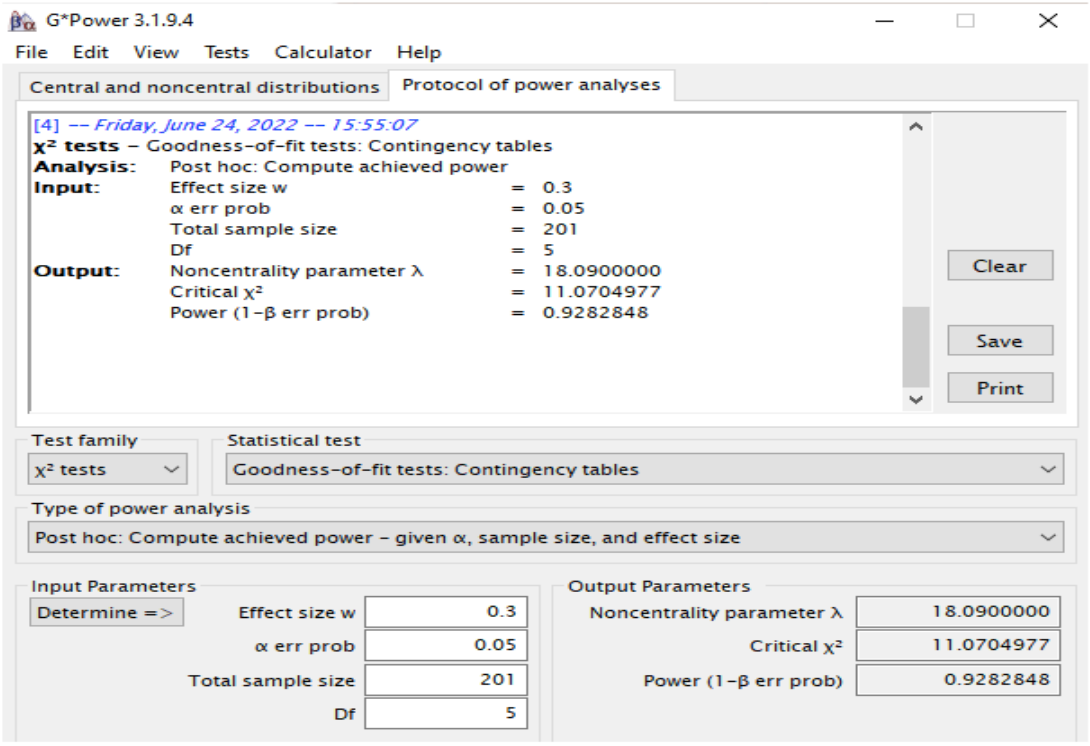
Three hundred and four U.S.-Practicing PTs completed the ABPAB survey. Of the 304 study participants, 201 responses who had 80% completion rate (Survey Monkey, 2022) were included for data analysis. According to Survey Monkey (2022), 30 questions would yield 85% completion rate; however, matrix questions and open-ended questions could reduce the completion rate. In our study, we had 27 open-ended questions, three lengthy matrixes, and three open-ended questions; therefore, we only included those participants that completed the survey at 80% completion rate. As mentioned in the methodology section, a priori analysis required a minimum sample size of 164 participants. Since we had 201 participants, our sample exceeded the minimum number required, and thus, we reached the desired power (Creswell, 2018).

Post HOC G* Power Analysis

Figure 5 represents a post hoc G* power analysis; this was performed using G* power software to determine if our study was sufficiently powered (Cohen, 1992; Deluca, 2018). The purpose of post hoc analysis is to control for the probability of making a type II error. A type II error is when the investigator declares no differences or associations when, in fact, there was (Shreffler & Huecker, 2023). When a study is sufficiently powered there is a lower chance of making a type II error and the chance of missing a difference or association. Additionally, Cohen stated that a power of .8 is considered a good statistical power. In our study, the current power was 92.8%, and thus, we had a 7.2% chance of missing a difference or association.

Figure 5

Post HOC G Power Analysis*



Note. A post hoc analysis was conducted after the completion of the study. The sample size was 201, which yielded a statistical power of 92.8%.

Quantitative Results

We used SPSS version 28 using frequencies and percentages to analyze demographic information from the ABPAB survey. Pies and bar charts were used to exemplify the characteristics of the sample. Of the 213 study participants, 94.4% (201) reported assessing and treating patients with balance and mobility impairments. Study participants reported on average 16 to 18 years of experience (SD = +/- 10.84 years) in assessing and treating patients with balance and mobility impairments. Hence, our sample were more experienced PTs.

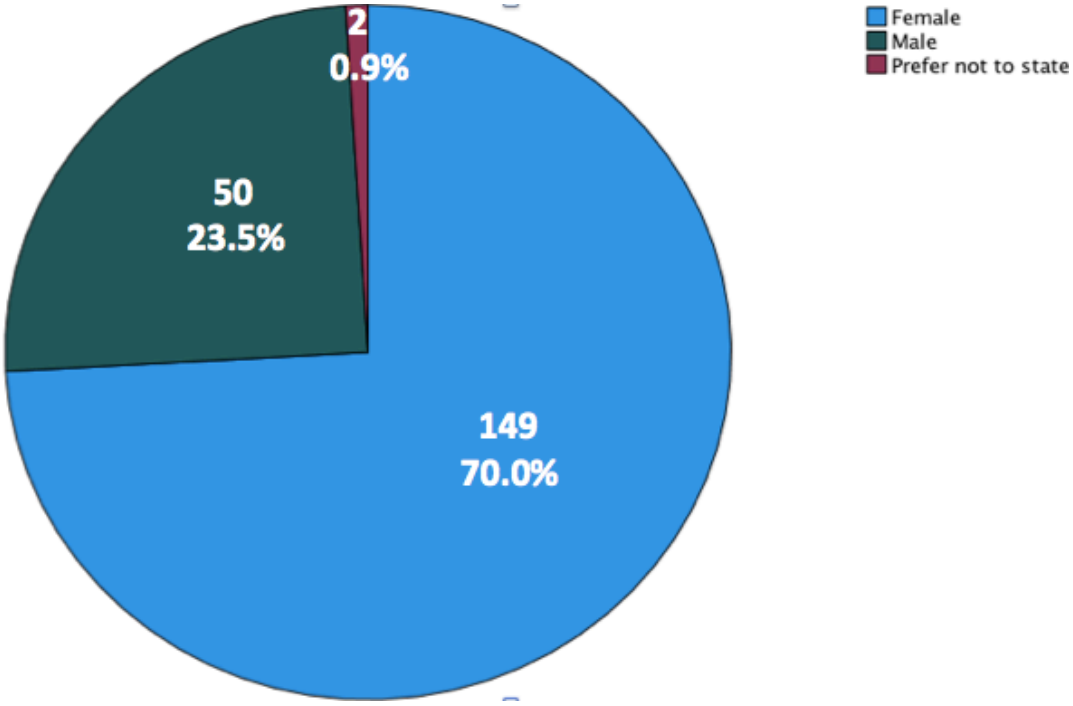
Participants' Gender

Figure 6 represents the study participants' gender. Of the 201 study participants, 70%

(149) identified themselves as females, 23.5% (50) identified themselves as males, .9% (2) did not identify themselves, and 5.6% were missing data. In our study, the majority of the participants were females. The APTA (2019) data work analysis reported that 65% of PTs are females and 35% of PTs are males; this was similar to our sample.

Figure 6

Participants' Gender



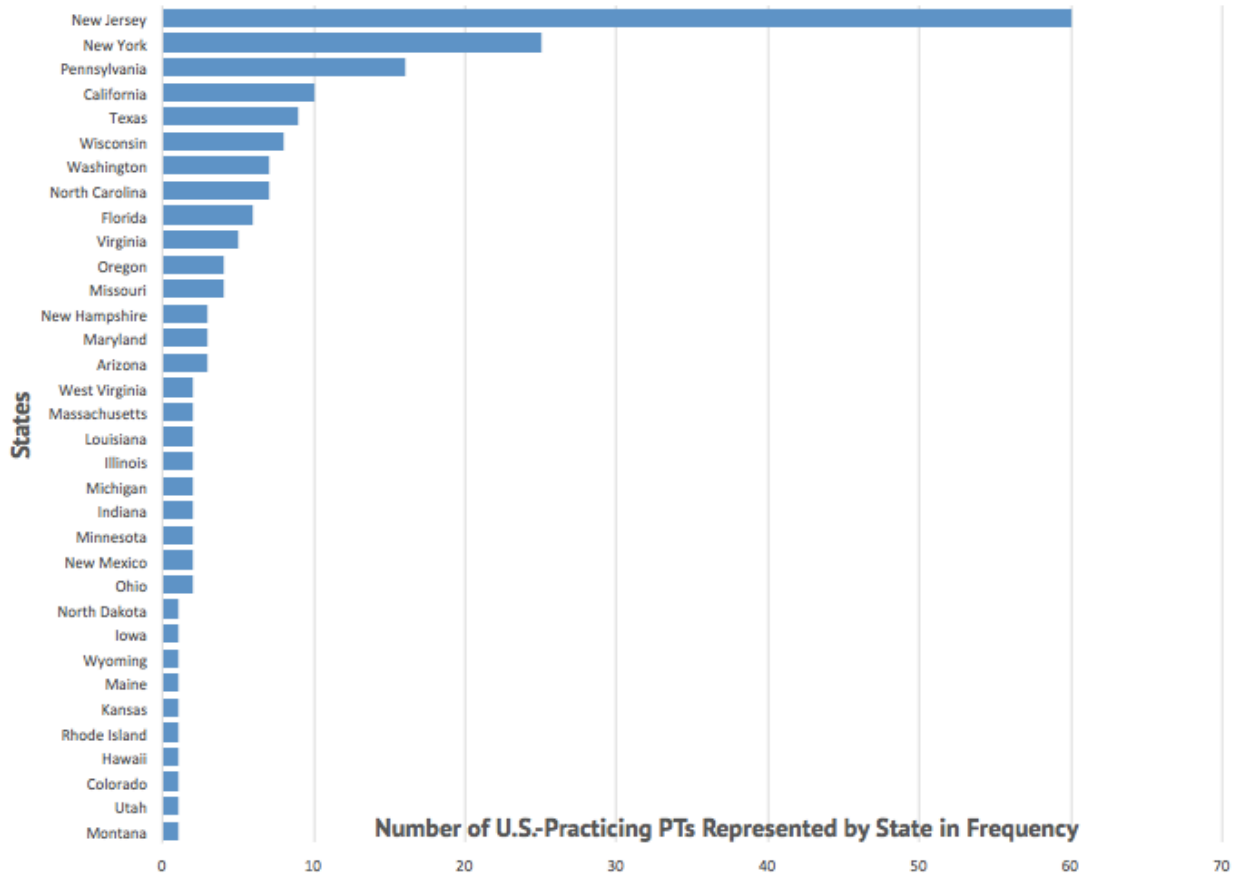
Representation of U.S.-Practicing PTs in Various States

Figure 7 represents the number of U.S.-Practicing PTs representing different states. Our study had the highest participation from the following five states: (a) 30% (60) from New Jersey, (b) 12% (25) from New York, (c) 7% (12) from Pennsylvania, (d) 4.9% (10) from California, and (e) 4.4% (9) from Texas. However, we also had 38.8% (78) representation from 30 other states, and thus, our study encompassed a broad range of PTs practicing in a variety of U.S.

states.

Figure 7

Representation of U.S.-Practicing PTs in Various States

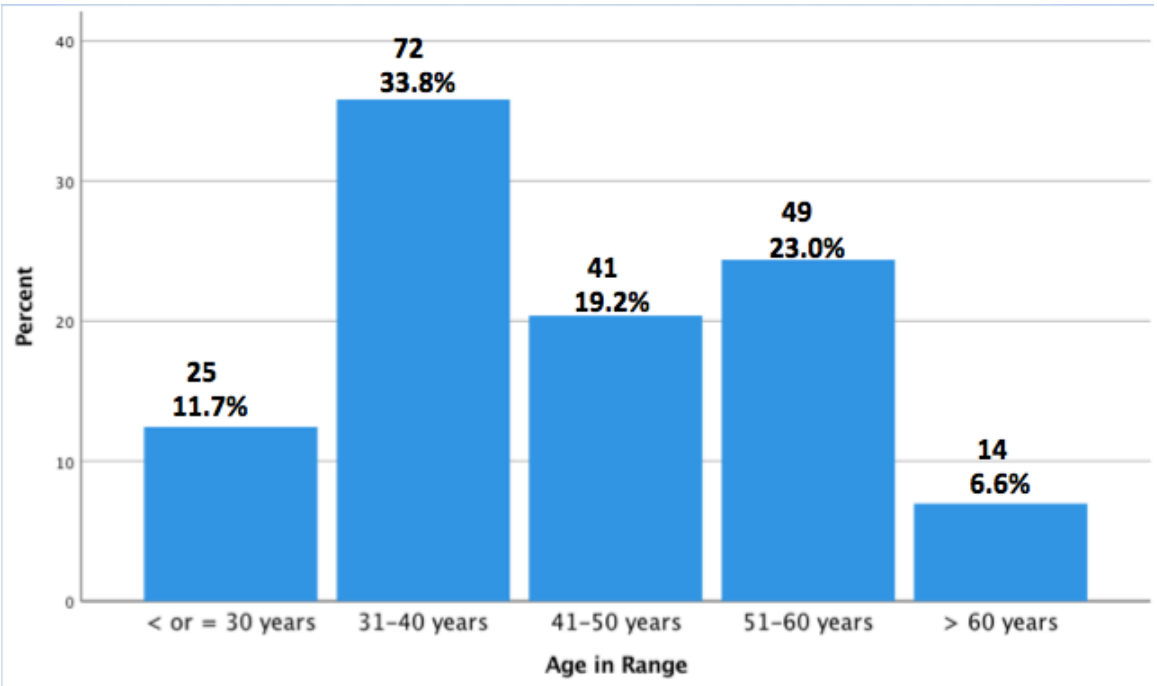


Participants' Age Range

Figure 8 represents study participants' age range. Of the study participants, 33.8% (72) fell between the ages of 31-40 years, 23% (49) fell between the ages of 51-60 years, and 19.2% (41) fell between the ages of 41-50 years. However, our study also had younger and older PTs; of the study participants, 11.7% (25) reported being less than 30 years of age and 6.6% (14) reported being more than 60 years of age.

Figure 8

Participants' Age Range

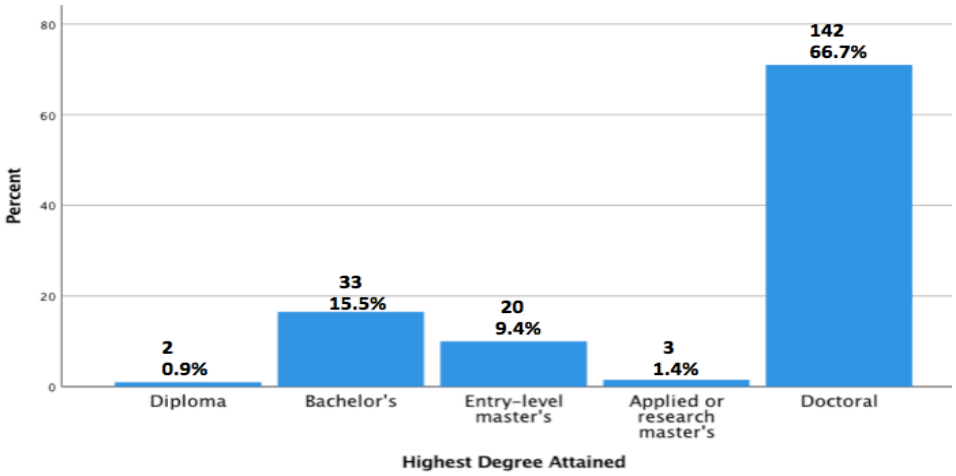


Participants' Degree Status

Figure 9 represents the participants' degree status. Of the study participants, 66.7% (142) had doctoral degrees, 15.5% (33) had bachelor's degrees, 9.4% (20) had entry-level master's, 1.4% (3) had applied or research master's, and .9% (2) had a diploma. Hence, the majority of our sample were highly educated.

Figure 9

Participants' Degree Status

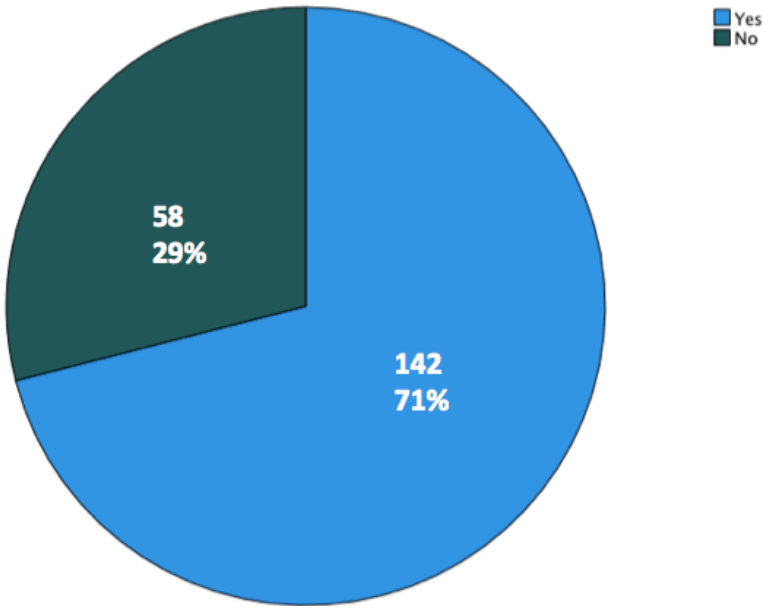


Membership in the APTA

Figure 10 represents participants' membership in the APTA. Of the study participants, 71% (142) were members of the APTA and 29% (59) were non-members of the APTA. Hence, the majority of our sample belonged to the APTA.

Figure 10

Participants' Membership in the APTA

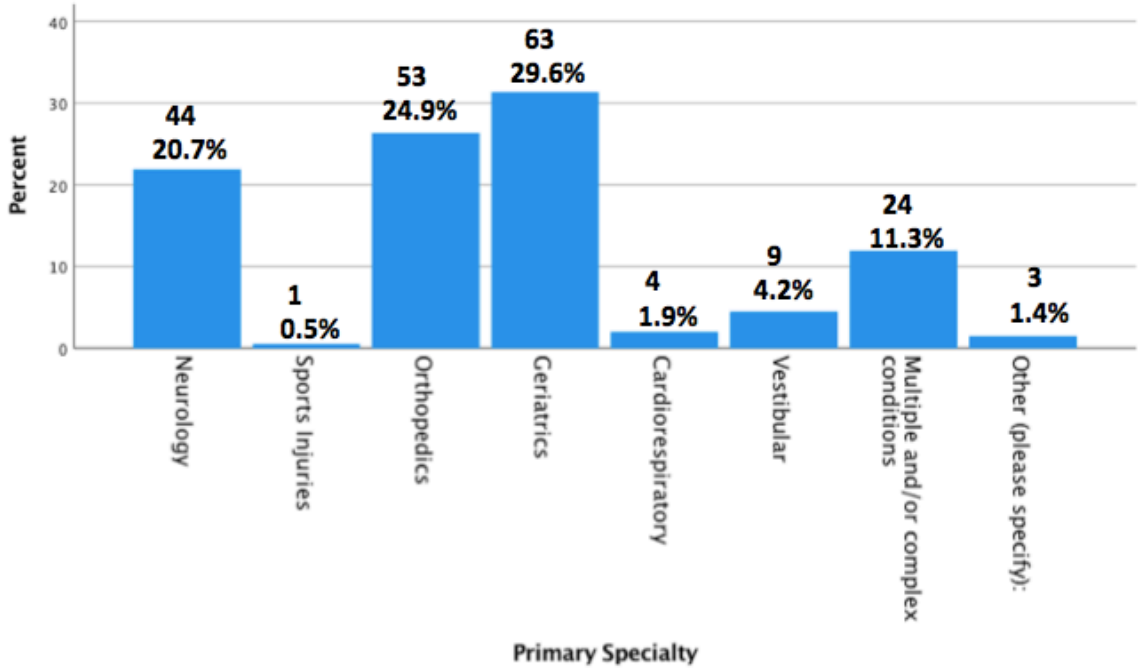


Participants' Primary Specialty Practice

Figure 11 represents participants' primary specialty practice. The top three patient populations treated by study participants were: (a) 29.6% (63) geriatrics, (b) 24.9% (63) orthopedics, and (c) 20.7% (44) neurology. However, there was also representation in U.S.-Practicing PTs that worked with (a) multiple conditions, 11.3% (24); (b) vestibular, 4.2% (9); (c) cardiorespiratory, 1.9% (4); (d) others, 1.4% (3); and (e) sports, 0.5% (1).

Figure 11

Participants' Primary Specialty Practice

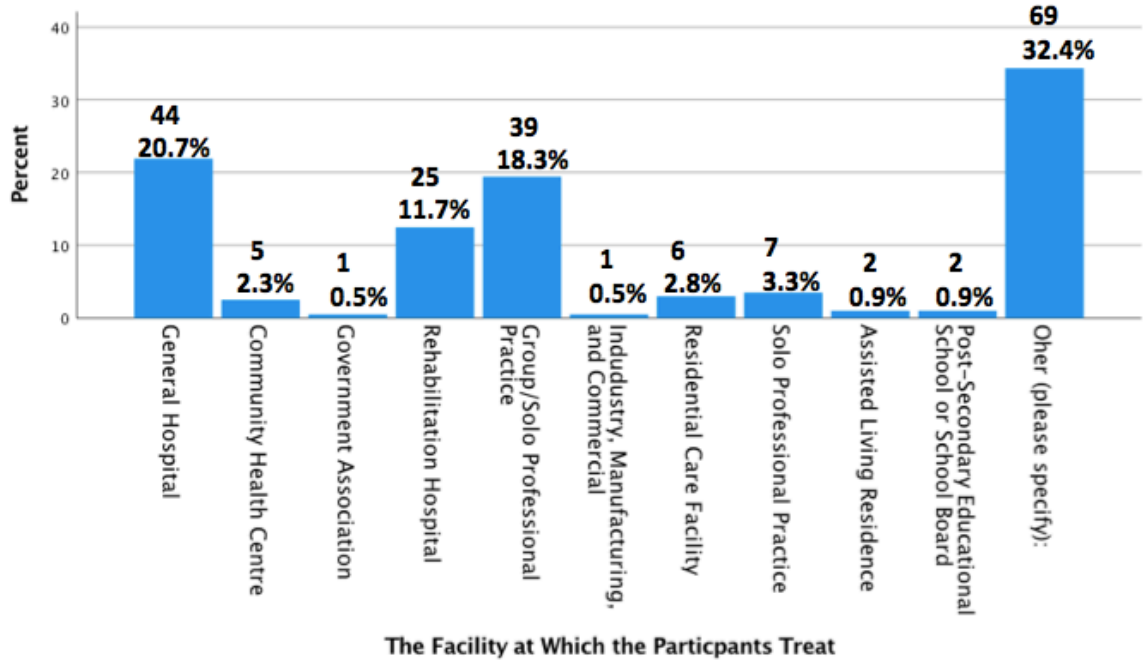


Settings With the Greatest Number of Adults with Balance and Mobility Impairments Seen

Figure 12 represents the settings with the greatest number of adults with balance and mobility impairments seen. Study participants reported that these four settings were the most common for their work: (a) general hospital, 20.7% (44); (b) rehabilitation hospital, 11.7% (25); (c) group professional practice, 18.3% (39); and (d) others, 32.4% (69). Others included home health care setting, skilled nursing facility, orthopedics, outpatient neurology, outpatient facility, hospital-based outpatient, and research institutions. A small representation from other settings was also reported in (a) solo professional practice, 3.3% (7); (b) residential care facility, 2.8% (6); (c) community health center, 2.3% (5); (d) assisted living residence, .9% (2); (e) post-secondary educational or school based, .9% (2); and (f) government association 0.5% (1).

Figure 12

Setting with the Greatest Number of Adults with Balance and Mobility Impairments Seen



Clinical Specialization by the American Board of Physical Therapy Specialties

Figure 13 represents clinical specialization by the American Board of Physical Therapy Specialties (ABPTS). Of the study participants, 61% (131) had no clinical specialization, 31% (66) had clinical specialization, and 8% (17) did not identify themselves as specialists or non-specialists. Hence, the majority of U.S.-Practicing PTs in our sample were non-clinical specialists. Of the 31% (66) that identified themselves as clinical specialists, 12% (26) specialized in neurology, 8.5% (18) specialized in orthopedics, and 8.5% (18) specialized in geriatrics. Additionally, less than 2% (4) reported specialty in the following areas: (a) 0.9% (2) in cardiovascular and pulmonary; (b) 0.5% (1) in pediatrics; and (c) 0.5% (1) in sports.

Figure 13

Types of Clinical Specialization

	N	%
Cardiovascular and Pulmonary Clinical Specialist (CPCS)	2	0.9%
Neurologic Clinical Specialist (NCS)	26	12.2%
Pediatric Clinical Specialist (PCS)	1	0.5%
Orthopaedics Clinical Specialist (OCS)	18	8.5%
Sports Clinical Specialist (SCS)	1	0.5%
Geriatric Clinical Specialist (GCS)	17	8.0%
Missing System	148	69.5%

Quantitative Research Questions

All participants completed a onetime-Qualtrics online survey entitled the ABPAB. Part A contained the SPBAPS, which was adapted from the study by Oates et al. (2017). Part A was primarily a quantitative portion which had closed-ended questions. Part B, which was primarily a quantitative portion with a supportive qualitative portion, contained a combination of close-ended and open-ended questions The three central research quantitative questions were as follows:

Central Research Question I: What are the Balance Assessment Practices of U.S.-Practicing PTs?

Central research question I had four sub-research questions.

1. What are the balance tests and measures used by U.S.-Practicing PTs? Study participants were asked on item 9, which contained the Canadian tests and measures on Part A, and item 16, which contained the tests and measures located on the APTA website on part B, if they use balance tests and measures in their assessment of balance and mobility using a

six-point Likert scale. The Likert scale includes both numeric and descriptive anchors in an ascending order: no, not familiar with this tool, no, never (0%), yes, rarely (1– 20%), yes, occasionally, (21 – 40%), yes, sometimes (41 – 59%), yes, frequently (60 – 79%), and yes, most of the time (> = 60%). Table 5 represents the balance tests and measures employed by U.S.-Practicing PTs in percentage in an ascending order. The top five balance tests and measures employed by U.S.-Practicing PTs were: movement observation (70.5%), followed by Five Times Sit to Stand (63.4%), followed by Timed-Up &Go test (64.3%), followed by the Single Leg Stance (52.1%), and followed by ankle dorsiflexion range of motion (53.1%).

Table 5

Balance Tests and Measures Employed by U.S.-Practicing PTs

Balance Tests and Measures Employed by U.S.-Practicing PTs
Movement observation (70.5%)
FTSTS(63.4%), TUG(64.3%)
SLS (52.1%), ankle DF (53.1%)
FGA (44.1%), 30secs STS (45%), Tandem standing/walking (44.1%)
BBS (39.5%), BBS for stroke (32.4%), 6MWT (33.3%), Romberg (31%)
DGI (29.5%), 360 degree turn (23%), BBS for PD (22.6%)
miniBest (10.8%), HTT for vestibular hypofunction (14.1%), DixHallpike (18.3%), Activities-Specific Balance Confidence Scale for TBI or MS (17.8%), 2MWT (16.4%), FSST (10.4%), SPWT (16.9%), CTSIB (17.4%), DHI for BPPV(18.3%), POMA (15.1%),
CBMS(5.3%), BestTest (6.1%), FES-1(8.5%), pHSN (6.6%), FIM (7.5%), BESS (1.4%), FRAT (4.2%), X-step Stair Climb Test (1.8%), EMS (3.7%), FAB (8.9%), BBS for SCI (8.9%), CBMS (5.2%), Scott Falls Risk Screen (1%), Push and Release 3.2%, BOOMER (2.8%), Star Excursion Balance Test Functional Reach (4.7%), 5 step test (8.5%), max step length test (2.4%), Falls Risk for Older People (3.3%), GaitRite/Neurocom / EMG (6.6%), Others 10.3% (SPPB, STEADI assessments)

2. What are the awareness and utilization of the Academy of Geriatric Physical Therapy (AGPT) Falls Clinical Guidance Statement (CGS), measured by U.S.-Practicing PTs? Study participants were asked on items 20 and 21 of the ABPAB survey about their awareness and utilization of the AGPT CGS in falls management. Table 6 represents the awareness and Table 7 represents the utilization of the AGPT CGS in falls management. Of the study participants, 35.7% (76) were aware of the AGPT CGS, 58.2% (124) were not aware of the AGPT CGS, and 6.1% (13) were missing data. Of the study participants, 21.6% (46) did not the use the AGPT CGS, and only 14.1% (30) used the AGPT CGS. Therefore, the majority of U.S.-Practicing PTs were not aware of and did not utilize the AGPT CGS.

Table 6

Awareness of the AGPT CGS

		Frequency	Percent
Valid	Yes	76	35.7
	No	124	58.2
	Total	200	93.9
Missing	System	13	6.1
Total		213	100.0

Table 7

Utilization of the AGPT CGS

		Frequency	Percent
Valid	Yes	30	14.1
	No	46	21.6
	Total	76	35.7
Missing	System	137	64.3
Total		213	100.0

3. What are the awareness and utilization of the balance tests and measures found on the APTA website, measured by U.S.-Practicing PTs? Study participants were asked on items 23 and 24 of the APBAP survey about their awareness and utilization of the balance tests and measures found on the APTA website. Table 8 demonstrates the awareness of the APTA balance tests and measures, and Table 9 demonstrates the utilization of the APTA balance tests and measures. Of the study participants, 49.8% (106) were aware of the APTA balance tests and measures, 43.7% (93) were not aware of the APTA balance tests and measures, and 6.6% (14) were missing data. Of the study participants, only 30% (64) utilized the APTA balance tests and measures, 19.7% (42) did not utilize the APTA balance tests and measures, and 49.8% (106) were missing data.

Table 8

Awareness of the APTA Balance Tests and Measures

		Frequency	Percent
Valid	Yes	106	49.8
	No	93	43.7
	Total	199	93.4
Missing	System	14	6.6
Total		213	100.0

Table 9

Utilization of the APTA Balance Tests and Measures

		Frequency	Percent
Valid	Yes	64	30.0
	No	42	19.7
	Total	106	49.8
Missing	System	107	50.2
Total		213	100.0

4. What are the balance components, based on the systems framework, measured by U.S.-Practicing PTs? On a seven point Likert scale, study participants were asked on

item 10 if they incorporate any of the components of balance in their balance assessment. The Likert scale includes both numeric and descriptive anchors in an ascending order: no, N/A to my clients, no, never (0%), yes, rarely (1 – 20%), yes, occasionally, (21 – 40%), yes, sometimes (41 – 59%), yes, frequently (60 – 79%), and yes, most of the time (> = 60%). Table 10 represents the balance components, based on the systems framework, measured by U.S.-Practicing PTs. Over 80% of U.S-Practicing PTs assessed motor system, static, and dynamic stability. Of the study participants, 84.5% assessed motor system, 82.1% assessed static stability, and 80.3% assessed dynamic stability. However, the remaining six out of the nine components of balance were assessed less than 54% of the time.

Table 10

Components of Balance Assessed by U.S.-Practicing PTs

Components of Balance Assessed	No-> Yes, sometimes (0-59%)	Yes, frequently (60-79%)	Yes, most of the time (Yes, > or = 80%)	Total (> or = 60%) in frequency and percentages
Motor system	20/ 9.4%	56/ 26.3%	124 /58.2%	180 / **84.5%**
Static Stability	25/ 11.7%	64 / 30.0%	111 / 52.1%	175 / **82.1%**
Dynamic Stability	30/ 14%	67 / 31.5%	104 / 48.8 %	171 / **80.3%**
Anticipatory Postural Control	84 / 39. 3%	55 / 25.8%	60/28.2%	115 / 54%
Reactive Postural Control	95 / 44.5%	61/ 28.6%	45 / 21.1%	106 / 49.7%
Functional Stability	97/45.6%	48/22.5%	56/26.3%	104/48.8%
Sensory Integration	94 / 44.2%	59 / 27.7 %	45 /21.1%	104 / 48.8%
Cognitive Influences	112 / 52.5%	51/ 23.9	38 /17.8	89 / 41.7%
Verticality	112/ 60.6%	43 / 20.2 %	45 / 21.1%	88 / 41. 3%

Central Research Question II and Hypothesis Testing: What is the Relationship Between the Three Independent Variables (Patient Population, Degree Status, and Clinical Specializations) and the Dependent Variable, Balance Assessment Practices of U.S.-Practicing PTs?

Hypothesis testing was conducted for central research question two, which had three sub-research questions to understand the relationship between the dependent variable, components of balance, and the three independent variables (patient population, degree status, and clinical specializations). Chi square test was utilized, using cross tabulation, to examine two categorical variables: components of balance and the three independent variables (patient population, degree status, and clinical specializations) in relation to the p-value. A p-value of less than .05 indicates a significant relationship between the dependent variable, components of balance, and the three independent variables (patient population, degree status, and clinical specializations); a rejection of the null hypothesis was noted on Tables 11, 12, and 13, which is depicted by a red circle. The dependent variable, the components of balance, is a categorical variable with two selections: (a) yes, which means equal to or more than 60% assessment of balance; and (b) no, which means less than 60% assessment of balance. The column was collapsed to include participants that only assessed balance more than 60% as conducted in a previous study (Sibley et al., 2011). These are the three sub-research questions:

1. What is the relationship between degree status and components of balance assessed by U.S.-Practicing PTs? Table 11 represents the relationship between components of balance assessed and degree status by U.S.-Practicing PTs. There is no statistically significant difference in the degree status and the majority of components of balance as depicted by the p-value on Table 15; however, as depicted by the red circle on Table 15, the p-values for the

cognitive influence and the anticipatory control components of balance were .032 and .031 respectively. Therefore, we rejected the null hypothesis.

Table 11

Relationship Between Components of Balance Assessed and Degree Status

Components of Balance Assessed	Diploma	Bachelors	Entry-Level Masters	Applied or Research Masters	Doctoral	P value from Chi- square	Reject or Fail to Reject
Functional Stability	1/ 200= <1%	24/200= 12%	10/200= 5%	2/200= 1%	66/200= 33%	.252	Fail to Reject
Motor System	2/199= <1%	30/199= 15%	16/199= 8%	2/199= 1%	129/199= 65%	.543	Fail to Reject
Static Stability	0/199= 0%	31/199= 15%	18/199= 9%	3/199= 1%	122/199= 61%	.162	Fail to Reject
Verticality	0/199= 0%	20/199= 10%	7/199= 3%	2/199= 1%	58/199= 29%	.474	Fail to Reject
Dynamic Stability	2/200= 1%	30/200= 15%	16/200= 8%	3/200= 1%	119/200= 60%	.677	Fail to Reject
Sensory Integration	0/197= 0%	18/197= 9%	12/197= 6%	2/197= 1%	71/197= 36%	.630	Fail to Reject
Reactive Control	0/200= 0%	19/200= 9%	10/200= 5%	2/200= 1%	74/200= 37%	.781	Fail to Reject
Cognitive Influences	0/200= 0%	13/200= 6%	5/200= 2%	3/200= 1%	67/200= 33%	**.034 ★**	Reject
Anticipatory Control	0/198= 0%	19/198= 9%	11/198= 5%	1/198= <1%	83/198= 42%	**.031 ★**	Reject

2. What is the relationship between the patient population and components of balance assessed by U.S.-Practicing PTs? There is no statistically significant difference in the practice settings and the four out of nine components of balance as depicted by the p-value on Table 12. However, as indicated by the red circle, there is a significant difference in the patient population and the remaining five out of nine components of balance: (a) anticipatory control, (b) motor system, (c) dynamic stability, (d) sensory integration, and (e) cognitive

influence as depicted in the p-value of less than .05; therefore, we rejected the null hypothesis.

Table 12

Relationship Between Components of Balance Assessed and Patient Population

Components of Balance Assessed	Neuro	Sports	Ortho	Geriatrics	Cardio	Vestibular	Multiple/ other	Chi square P-value	Reject or Fail to Reject
Functional Stability	21/201= 10%	0/201= 0%	24/201= 12%	42/201= 21%	2/20= <1.5%	3/201= 1.5%	11/201= 5.4%	.423	Fail to Reject
Static Stability	36/20= 18%	1/200 = <. 05%	45/20= 23%	57/200= 29%	4/200= 2%	8/200= 4%	22/200= 11%	.687	Fail to Reject
Verticality	18/20= 9%	0/200= 0%	18/20= 9%	34/200= 17%	3/200= <2%	4/200= 2%	11/200= 6%	.562	Fail to Reject
Reactive Control	29/20= 14%	0/1= 0%	16/20= 8%	45/201= 22%	2/201= <1%	4/201= <2%	9/201= 4%	.186	Fail to Reject
Anticipatory Postural Control	34/199= 17%	0/1= 0%	20/199= 10%	45/199= 23%	2/199= 1%	4/199= 2%	9/199= 5%	**.023 ★**	Reject
Motor System	38/200= 19%	0/1= 0%	47/200= 24%	58/200= 29%	4/200= 2%	9/200= 5%	22/200= 11%	**.001 ★**	Reject
Dynamic Stability	41/201= 20%	1/201= 5%	35/201= 17%	57/201= 28%	3/201= 1.5%	9/201= 4%	22/201= 1%	**.003★**	Reject
Sensory Integration	31/198= 16%	0/198= 0%	16/198= 8%	36/198= 18%	1/198= .5%	8/198= 4%	11/198= 6%	**.002 ★**	Reject
Cognitive Influences	28/201= 14%	0/201= 0%	5/201= 2%	35/201= 17%	3/201= 1.4%	4/201= 2%	12/201= 6%	**.0005 ★**	Reject

3. What is the relationship between the clinical specializations and components of balance assessed by U.S.-Practicing PTs? There is no statistically significant difference in the clinical specializations and four out of the nine components of balance as depicted by the p-value; however, as indicated by the red circle on Table 13, there is a significant difference in the clinical specializations and the remaining five out of nine components of balance: (a) anticipatory control, (b) dynamic stability, (c) sensory integration, (d) cognitive influence,

and (e) reactive control as depicted by the p-value of less than .05 respectively. Therefore, we rejected the null hypothesis.

Table 13

Relationship Between Components of Balance Assessed and Clinical Specializations

Components of Balance Assessed	CPCS	NCS	PCS	OCS	SCS	GCS	Non-Specialist	Chi-square Value	Reject or Fail to Reject
Functional Stability	0/201= 0%	9/201= 4%	0/201= 0%	9/201= 4%	1/201= .5%	13/201= 6%	71/201= 35%	.431	Fail to Reject
Motor system	2/200= 1%	21/200= 10%	1/200= .5%	16/200= 8%	1/200= .5%	17/200= 9%	118/200= 59%	.991	Fail to Reject
Static Stability	2/200= 1%	20/200= 10%	1/200= .5%	15/200= 8%	0/200= 0%	14/200= 7%	119/200= 60%	.140	Fail to Reject
Verticality	1/200= .5%	8/200= 4%	0/200= 0%	5/200= 3%	0/200= 0%	10/200= 5%	62/200= 31%	.669	Fail to Reject
Anticipatory Control	1/199= .5%	16/199= 8%	0/199= 0%	6/199= 3%	0/199= 0%	13/199= 7%	78/199= 39%	**.0025 ★**	Reject
Dynamic Stability	2/201= <1%	23/201= 11%	1/201= .5%	15/201= 7%	0/201= 0%	`17/201= 8%	109/201= 54%	**.0005★**	Reject
Sensory Integration	0/198= 0%	20/198= 10%	0/198= 0%	8/198= 4%	0/198= 0%	11/198= 5%	63/198= 32%	**.0005★**	Reject
Cognitive Influences	1/201= 5%	15/201= 7%	1/201= 5%	0/201= 0%	0/201= 0%	14/201= 7%	57/201= 28%	**.0005★**	Reject
Reactive Control	1/201= 5%	13/201= 6%	0/201= 0%	3/201= 1%	0/201= 0%	12/201= 6%	75/201= 37%	**.047★**	Reject

Central Research Question III. What are the Prevalent Barriers in Balance Assessment Practices Reported by U.S.-Practicing PTs? Participants were asked on item 17 to indicate the three most influential barriers that impact their decision of which balance tests and measures to utilize. Table 14 represents the prevalent barriers in balance assessment practices reported by U.S.-Practicing PTs. Study participants reported that the barriers which impacted their clinical decision-making in balance assessment practices were: (a) lack of time to administer test, (78.4%, frequency = 167); (b) lack of knowledge or familiarity of balance test,

(62%, frequency = 132); (c) balance tests not appropriate for population, (34.3%, frequency = 73); (d) organization does not provide tools, (19.2%, frequency = 41); (e) balance tests not listed on the initial evaluation form, (17.8%, frequency = 38); (f) I have my own way of assessing balance, (17.4%, frequency = 38); (g) lack of insurance mandate, (10.3%, frequency = 22); (h) lack of collegial support, (10.3%, frequency = 22); (i) lack of motivation, (9.9%, frequency = 21); (j) lack of financial incentive, (4.2%, frequency = 9); (k) lack of access to computers at work, (2.8%, frequency = 6); and (l) lack of internet access (2.5%, frequency = 1).

Table 14

Barriers in Balance Assessment Practices

Barriers in Balance Assessment Practices	Frequency	Percentage
Lack of time to administer test	**167**	**78.4%**
Lack of knowledge or familiarity of balance test	**132**	**62%**
Balance tests not appropriate for population	**73**	**34.3%**
Organization does not provide tools	41	19.2%
Balance tests not listed on the initial eval form	38	17.8%
I have my own way of assessing balance	37	17.4%
Lack of insurance mandate	22	10.3%
Lack of collegial support	22	10.3%
Lack of motivation	21	9.9%
Lack of financial incentive	9	4.2%
Lack of access to computers at work	6	2.8%
Lack of internet access	1	0.5%

Qualitative Results

Our study had three qualitative central research questions that focused on the balance assessment practices, barriers associated with the barriers in the utilization of the AGPT CGS in falls management for the CDOA, and the barriers on balance tests and measures found on the

APTA website. These are the three central qualitative questions:

1. What are the balance assessment practices of U.S.-Practicing PTs? Study participants were given the opportunity to describe their balance assessment practices which was aligned with survey question 18 on the APBAP. Table 15 represents the balance assessment practices of U.S.-Practicing PTs. Responses were placed into in-vivo codes, categories, and thematic analysis. In-vivo codes, defined as the participants' direct phrases or words (Saldana, 2016), were incorporated followed by categories. Categories, defined as the process of coding data and bracketing them as chunks (Creswell, 2013), were divided as either PT assessed balance using a standardized tool as an objective measure, or a patient reported outcome, and general observation or movement analysis. The thematic analysis, defined as the outcome of categorization, (Saldana, 2016) was the overall responses to this research question based on the categories that we found. We discovered that balance was generally assessed using a multifaceted approach, which included standardized tool, movement observation, and general observation including gait. More importantly, we found that there was no consensus on a universal balance tests and measures. However, we found that some tests and measures were preferred over others.

Table 15

Balance Assessment Practices of U.S.-Practicing PTs

In-Vivo Codes	Categories	Thematic Analysis
"TUG, Tinetti, Berg" **(P15)** "SLS, TUG, rhomberg" **(P20)** "single leg stance, Tandem, stance, Berg, Sit to stand 5 times, TUG" **(P48)** "I use the standard assessments recommended by the Academies of Geriatrics and Neurological PT" **(P114)** "TUG, 30-sec STS, BBS, DGI, CTSIB, Rhomberg's, SLS, ABC and Tinetti POMA" **(P121)** "Usually with TUG, BERG, 30CST and/or 6MWT" **(P186)** "Kansas University balance for all patients" **(P194)** Academy of neuro PT core outcome measures **(P172)** Rom of LEs. Berg. Timed get up and go" **(P7)**	Standardized Tool as Objective Measure	**Balance is generally assessed using a multifaced approach which includes standardized tool, and observation of functional tasks movement including gait.**
"I usually do a combination of patient reported outcomes" **(P5)** "Fall risk Questionnaire" **(P10)** "Depending on patients gait into clinic - if pt amb into clinic with AD I will start with FTSTS, TUG, and finish with Berg if able. If patient amb (I) into clinic, I will perform SLB on solid ground and uneven surface" **(P5)**	Standardized Tool as Patient Reported Outcome	
"eyes open/closed, feet together, tandem, gait" **(P30)** "Gait, observation, recovery strategy, static balance scenarios **(P43)** "I usually screen sitting/standing and dynamic/static functional balance **(p94)** "observation, SLS, tandem" **(P47)** "Visual observation during normal activities of daily living" **(P102)** "functional observation" **(P146)** "general observation" **(P157)**	General Observation	
"observation. Gait." **(P7)** "I assess based off of what i see" **(P42)** "Gait, observation" **(P43)** "movement analysis" **(P169)**	Movement Analysis	

2. What are the perceived barriers to using the AGPT CGS by U.S.-Practicing PTs?

Participants were given the opportunity to describe the barriers when they utilize the AGPT CGS in falls management for the CDOA; this was aligned with survey question 22 on the ABPAB. Table 16 represents the barriers associated with the utilization of the AGPT CGS in falls management for the CDOA. We analyzed the data via in-vivo coding, categories, and thematic analysis. Four themes associated with the utilization of the AGPT CGS for CDOA were identified: (a) patient presentation, (b) lack of time, (c) lack of collegial/organizational support, and (d) space/scheduling conflict.

Table 16

Barriers in Utilization of the AGPT CGS for the CDOA

In –Vivo Codes	Categories	Thematic Analysis
"Greatest challenge is the level of patient's I see. Majority of our admission are at time so they are unable to complete standing or walking non-amb component of test, or have a significant cognitive components" **(P9,M)** "executive function and memory changes" **(P141, M)** "My population is not at the level completing the tests at this time" **(P163, M)** "Patient ability" **(P191, M)** "more involved dementia need simple and shorter duration test methods to attain meaningful data" **(P193,M)** "Many of my patients are very low functioning" **(P194,M)** "Patient desire" **(P149, M)**	Patient Status	**Barriers impacting the use of AGPT CGS to manage falls are generally non modifiable such as time, patient status, space. However, promoting organizational support via knowledge translation is modifiable.**
"We sometimes don't have enough time to do all recommended assessments" **(P121,M)** "I choose my functional outcome measure used at eval based upon amount of time I have with patient." **(P127, M)** "Cannot always find the time within a session to check it" **(P202, M)**	PT barrier	
"Support from colleagues is a big barrier for implementing balance measures across the board. I am trying to get my department to use STEADI with our patients. There is a lot of push back" **(P135)** "Difficulty getting clinic to get on board and support" **(P181, M)**	Organizational Barrier	
"Certain home environment are no conducive to test such as 6MWT, DGI due to limited environment area to test" **(P127, M)** "the environment and variability limit the utilization of most outcome measure" **(P161, M)** "Difficulty in scheduling patients needing extra attention due to falls risk as one on one treatment time" **(P45, M)**	Organizational Barrier	

3. What are the perceived barriers to using the APTA balance tests and measures by U.S.-Practicing PTs? Participants were given the opportunity to describe the barriers when they use the balance tests and measures found on the APTA website; this was aligned with survey question 25 on the ABPAB. Table 17 represents the barriers associated with the utilization of the balance tests and measures found on the APTA website. We analyzed the data via in-vivo coding, categories, and thematic analysis. Five themes associated with the utilization of the balance tests and measures found on the APTA website were identified: (a) lack of access to tools, (b) patient status, (c) lack of time, (d) non-membership, and surprisingly (e) no barrier.

Table 17

Barriers in the Utilization of the Balance Tests and Measures Found on the APTA Website

In-Vivo Codes	Categories	Thematic Analysis
"occasionally, trouble accessing the site due to internet issues or page not loading appropriately" **(P34, M).** "I can find the info elsewhere a little faster, ie no login and searching under menus" **(P90, M)** "sometimes hard to navigate to these due to internet access in the community" **(P121, M)** "Sometimes finding them is hard and it is easier to use Shirley Ryan" **(P202,M)**	Organizational Barrier	**Overall, barriers encounter included time, patient status, and PT not being an APTA member.**
"only barriers are severity of the admissions especially if they are not able to stand and walk at time of initial eval. Can only perform sitting balance components" **(P9, M)** "Patient population - cognitive impairment, psych instability" **(P18, M)** "Patient applicability" **(P142, M)**	Patient Barrier	
"Time" **(P 142 M, 146M)** "Time is also an issue when trying to see >10 patients a day" **(P168, M)** "Time, perhaps" **(P177, M)**	PT Barrier	
"I do not perceive significant barriers to use of the tests most appropriate to the patient" **(P76, M)** "no barriers - I choose the ones most suited to my patients" **(P194, M)** "None- aware of but don't really use day to day" **(P164, M)** "None" **(P80, M, P181, M, P191, M)**	PT Barrier	
"Not a member" **(P42NM)**	PT Barrier	

Chapter V. Discussion and Conclusion

Our exploratory mixed-methods study had two purposes. First, our study addressed the balance assessment practices of U.S.-Practicing PTs; specifically, the utilization of the AGPT CGS for the CDOA and the balance tests and measures found on the APTA website. Based on the data collected from our study, the majority of U.S.-Practicing PTs used movement observation as the preferred balance measurement. This was followed by the Five Times Sit to Stand and the Timed Up & Go tests, which are quick and time-based functional measures. The utilization of movement observation as the primary means to assess balance by U.S.-Practicing PTs is of concern given the diverse array of balance tests and measures recommended by the APTA with robust validity and reliability. Provided that only 6% of U.S.-Practicing PTs in this study reported using the BestTest and 8.9% the Fullerton Advance Balance Scale, both of which assess many components of balance, concern is warranted that U.S.-Practicing PTs who completed this survey are not effectively utilizing a multisystem and comprehensive balance assessment to guide their balance assessment practices. The absence of securing valid and reliable multisystem assessment can lead to ineffective or inappropriate targeted exercise prescriptions to address balance impairments and ultimately falls prevention. Secondly, we explored U.S.-Practicing PTs' perceptions of the barriers associated with employing valid and reliable balance assessment practices, specifically the awareness and the utilization of the AGPT CGS for the CDOA, and the balance tests and measures found on the APTA website. In our quantitative findings, we found that the top three barriers associated with balance assessment practices were lack of time, lack of knowledge, and that balance tools were identified as not appropriate for the population. In our qualitative findings associated with the barriers to the utilization of the AGPT CGS for the CDOA, we found lack of time and patient status as the

primary themes, which further support our quantitative findings. The lack of time as a top barrier in balance assessment practices could explain why U.S.-Practicing PTs are using quick and time-based functional balance measurements. In our exploration associated with the barriers in utilizing balance tests and measures, specifically listed as recommended on the APTA website, the common themes that emerged were again lack of time and patient status, which again support our quantitative findings. Surprisingly, while the lack of access to computers and the internet emerged as predominant themes in our qualitative findings, the lack of access to tools was only noted by 3.2% of U.S.-Practicing PTs in our quantitative findings. This leads us to question this discrepancy and suggest that further exploration is warranted.

Upon reflecting on the KTAF that guided our study, we asked, (a) "Are U.S.-Practicing PTs translating evidence-based tools into clinical practice?", and (b) "what are the barriers that impact U.S.-Practicing PTs' selection of balance tests and measures?" We can infer that the lens was an effective theory to view the problem. The following insights can be drawn based upon this study sample:

(1) The majority of U.S.-Practicing PTs are not aware and do not use the AGPT CGS.
(2) In comparison to the APGT CGS, more U.S.-practicing PTs are aware and use the balance tests and measures found on the APTA website.
(3) Over 80% of U.S-Practicing PTs assess motor system, static, and dynamic stability; however, the remaining 6/9 components are assessed less than 54% of the time.
(4) Over 70% of U.S.-Practicing PTs utilize movement observation and over 60% use Five Times Sit to Stand and Timed-Up & Go tests as primary balance tests and measures.

(5) The top three prevalent barriers in balance assessment practices are lack of time, lack of knowledge, and balance tests not appropriate for populations.

Previous Study Findings and How They Align With Our Current Study

In this section, we discuss quantitative and qualitative findings and how these results compared to those in Ontario, Saskatchewan, Netherlands, Michigan, and other U.S. locales.

Components of Balance Assessed the Most and the Least

One of our quantitative research sub-questions focused on the balance assessment practices, specifically the utilization of the components of balance based on the systems framework. Our finding associated with the components of balance assessed is aligned with Saskatchewan (Oates et al., 2017) and Ontario physiotherapists (Sibley et al., 2011). Similar to U.S.-Practicing PTs in our study, both Saskatchewan (Oates et al., 2017) and Ontario physiotherapists (Sibley et al., 2011) assessed motor, dynamic, and static stability components of balance over 80% of the time. However, our finding associated with the least assessed component of balance is inconsistent with previous literature. While we discovered that U.S.-Practicing PTs least assessed the cognitive and vertical components of balance, Ontario physiotherapists (Sibley et al., 2011) least assessed the reactive control component of balance. Additionally, while Saskatchewan physiotherapists reported least assessment of cognitive components of balance, a similar finding in our study, Saskatchewan physiotherapists also reported least assessment of sensory integration and reactive control components.

Balance Tests and Measures

Our second quantitative research sub-question focused on the balance tests and measures utilized by U.S.-Practicing PTs. U.S.-Practicing PTs used movement observation as the primary means to assess balance; this finding is consistent with Saskatchewan physiotherapists (Oates et

al., 2017) and in the qualitative study of U.S.-Practicing PTs (McGinnis et al., 2009). U.S.-Practicing PTs also used Single Leg Stance as a prominent test to assess balance; this finding is also aligned with Ontario physiotherapists (Sibley et al., 2011), Michigan PTs (Saliga & Bongiovanni, 2005), and members of the geriatric section of the APTA (McGinnis et al., 2009). Interestingly, 78.4% of participants in our study reported that lack of time is the top barrier in PTs' selection of balance tests and measure; therefore, this could explain why the majority of participants in our study chose quick balance tests such as the Single Leg Stance. Using Single Leg Stance as a primary test to measure balance is concerning, as this specific test does not measure all the components of balance, unlike the BestTest or the Fullerton Advanced Balance Scale, both of which assess many components of balance (Sibley et al., 2015b).

Balance Tests and Measures as Related to Areas of Practice

In our study, we found that PTs' selection of balance tests and measures is associated with practice settings. While PTs that practiced in the neurological setting reported using the Five Times Sit to Stand and the Functional Gait Assessment, PTs that practiced in the orthopedic settings reported utilization of the Single Leg Stance, which is a similar finding to that of Saskatchewan and Ontario physiotherapists (Oates e al., 2017; Sibley et al., 2011) and of Michigan PTs (Saliga & Bongiovanni, 2005). PTs that practiced in the geriatrics settings tended to use the Five Times Sit to Stand and the Timed Up & Go Test; the utilization of the Timed Up & Go Test in this setting is consistent with that of Ontario physiotherapists (Gervais et al., 2014; Sibley et al., 2011).

Barriers in Balance Assessment Practices

Our three central qualitative research questions focused on barriers to balance assessment practices, barriers associated with the utilization of the AGPT CGS for the CDOA, and the

balance tests and measures found on the APTA website. Our quantitative findings identified that U.S.-Practicing PTs reported that lack of time, lack of knowledge, and that balance tests were not appropriate for specific populations as the top three barriers in balance assessment practices. In this section, we elaborate on the barriers in balance assessment practices and how they aligned with previous literature.

Lack of time as a barrier in implementing CPGs has been well documented in several qualitative studies of Swedish (Bernhardsson et al., 2014) and Dutch PTs (Van Bodegom-Vos et al., 2012; Van der Wees et al., 2013). A similar time barrier in applying EBP has been noted in a quantitative study of U.S. PTs (Jette et al., 2003). Lack of knowledge as a barrier in the application of CPGs has been cited in a quantitative study of Michigan PTs (Saliga & Bongiovanni, 2005) and two qualitative studies of Canadian (Cote et al., 2009) and Dutch physiotherapists (Van Bodegom-Vos et al., 2012; Van der Wees et al., 2013). Our current findings about balance tests not appropriate for specific populations as a barrier is similar to the qualitative study of U.S.-Practicing PTs (McGinnis et al., 2009), Canadian physiotherapists (Cote et al., 2009) and Dutch physiotherapists (Van Bodegom-Vos et al., 2012). To elaborate on the balance tests identified as inappropriate for specific populations, McGinnis et al. (2009) reported that the patient's age, diagnosis, and medical history were cited as factors in U.S. PTs' clinical-decision making in balance tests and measures. Van Bodegom-Vos et al. (2012) found in a qualitative study of 13 generalist and 11 specialist Dutch PTs that the management of RA patients in the CPG was different from their patients' expectations and preferences. Cote et al. (2009) found in a qualitative study of Canadian physiotherapists that LBP CPG did not allow for management and flexibility of interventions specific to their patients' needs.

Significance of the Study

The first step in promoting effective evidence-based practices is recognizing that the current balance assessment practices of U.S.-Practicing PTs are not multisystem in nature. The lack of comprehensive assessment in balance can lead to ineffective exercise prescriptions. Informed by the findings of our study, we hope to inspire APTA leaders, PT educators and continuing education presenters to reorganize learning experiences to meet the needs of U.S.-Practicing PTs to employ a multisystem approach to fall management and balance impairments. PTs should acknowledge non-modifiable barriers such as lack of time and patient status so that they can begin to more effectively address those that can be modified. As healthcare professionals, PTs should be aware of and address modifiable barriers that impact our clinical decision-making, whether they occur at the therapist level, the patient level, the organizational level and/or the professional level. Ensuring knowledge translation specific to balance impairments and falls management practices in PT is needed to promote continued best practices moving forward.

Study Limitations

Our mixed-methods study had several limitations. Our study used a convenience sample of volunteers from a leading rehabilitation company and a purposive sample of U.S.-Practicing PTs who belonged to a national PT organization; thus, sampling bias may have happened. The majority of the participants in our study belonged to the APTA organization and had doctoral degrees; therefore, the results are less generalizable to participants with different demographics from our sample. Social desirability bias may have occurred, as 70% of our participants belonged to the APTA organization, and it is plausible that these PTs are more involved in the profession and apt towards EBP practices which employ valid and reliable balance assessment tools. We were not able to compare and contrast the barriers to the utilization of the AGPT CGS

for the CDOA and the balance tests and measures found on the APTA website in APTA members versus non-members. Study participants who answered the barriers to the AGPT CGS for the CDOA identified themselves as APTA members. Although we had a large representation of PTs practicing in various states, we had no representation from 15 states, and 30% of our participants were from the state of NJ; thus, our results cannot be generalized to all PTs practicing in all U.S. states. The length of our survey was also a limitation; our survey had two parts requiring 15-20 minutes to complete. Therefore, this could have led to survey fatigue, imprecise reporting, incomplete surveys (Alreck & Settle, 2004), and could have caused survey abandonment, impacting the representation of the sample (Mora, 2011). Although we had 301 responses, we included only 201 participants who had completed the survey resulting in a survey completion rate of at least 80%. Lastly, our approach was primarily quantitative with a supportive qualitative portion using three open-ended statements. Some of the responses to the qualitative statements were limited to two- or three-word phrases; thus, the data collected would be limited in comparison to an interview format, where a researcher can probe the questions resulting in richer and more in-depth replies.

Future Recommendations

We would like to make further recommendations to expand on this line of research. First, a survey exploring balance tests and measures covered in PT academic programs and used in clinical educational experiences can inform PT program leaders about PTs' perceptions on balance assessment tools upon completion of entry-level education. Second, a qualitative study using interviews can be conducted to further probe and expand on the themes developed from this study in APTA members and APTA non-members, clinical specialists and non-clinical specialists, and in-patient and outpatient PTs. Lastly, a study exploring preferred balance tests

and measures used by U.S.-Practicing PTs based on patient acuity for either low level or high level populations could be explored.

Conclusion

Based on the data collected in our study, it appears that the majority of U.S.-Practicing PTs used movement observation as the prominent tool for balance assessment, followed by Five Times Sit to Stand and the Timed Up & Go tests, which are quick and time-based functional tasks. Second, the majority of U.S.-Practicing PTs did not assess all components of balance based on the Systems Framework for balance assessment. Our quantitative and qualitative findings show that barriers in balance assessment practices can be non-modifiable, occurring at the patient level and/or modifiable occurring either at the PT level, the organization or at the professional level. Therefore, considering the results of our mixed methods study, academicians, educators in continuing education courses, and the APTA should stay abreast of evidence-based practices to meet the needs of U.S.-Practicing PTs in balance assessment practices and falls prevention.

References

Aharonoff, G. B., Dennis, M. G., Elshinawy, A., Zuckerman, J. D., & Koval, K. J. (2003). Circumstances of falls causing hip fractures in the elderly. *Journal of Orthopaedic Trauma*, *17*(8), S22–S26. DOI: 10.1097/00005131-200309001-00006

Alreck, P. L., & Settle, R. B. (2004). *The Survey research handbook* (3rd ed.). McGraw-Hill Irwin.

Ambrose, A. F., Paul, G., & Hausdorff, J. M. (2013). Risk factors for falls among older adults: A review of the literature. *Maturitas*, *75*(1), 51–61. DOI: 10.1016/j.maturitas.2013.02.009

American Physical Therapy Association. (2023). *Guide to physical therapist practice 4.0*. Retrieved April 12, 2023, from http://guidetoptpractice.apta.org/

American Physical Therapy Association (2023). *Clinical practical guidelines developed by APTA*. Retrieved April 19, 2023, from https://www.apta.org/patient-care/evidence-based-practice-resources/cpgs/cpg-development/published-cpgs

American Physical Therapy Association (2023). *Evidence-based practice resources.* Retrieved April 11, 2023, from https://www.apta.org/patient-care/evidence-based-practice-resources

American Physical Therapy Association (2023). *Levels of patient access to physical therapists services in the U.S.* Retrieved April 11, 2023, from https://www.apta.org/advocacy/issues/direct-access-advocacy/direct-access-by-state

American Physical Therapy Association (2023). *Test and measures.* Retrieved April 11, 2023, from https://www.apta.org/patient-care/evidence-based-practice-resources/test-measures

Avin, K. G., Hanke, T. A., Kirk-Sanchez, N., McDonough, C. M., Shubert, E., Hardage, J., & Hartley, G. (2015). Management of falls in community-dwelling older adults: Clinical guidance statement from the Academy of Geriatric Physical Therapy of the American Physical Therapy Association. *Physical Therapy*, *95*(6), 815–834. https://doi.org/10.2522/ptj.20140415

Berhardsson, S., Johansson, K., Nilser, P., Öberg, B., & Larsson, M. H. (2014). Determinants of guideline use in primary care physical therapy: A cross-sectional survey of attitudes, knowledge, and behavior. *Physical Therapy*, *94*(3), 343–354. https://doi.org/10.2522/ptj.20130147

Burns, E., & Kakara, R. (2018). Deaths from falls among persons aged ≥ 65 years—United States, 2007–2016. *Morbidity and Mortality Weekly Report*, *67*(18), 509. http://dx.doi.org/10.15585/mmwr.mm6718a1

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. (2021, August 6). *Important facts about falls*. U.S. Department of Health & Human Services. https://www.cdc.gov/falls/facts.html

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. (2020). *Leading causes of death visualization tool.* Retrieved April 12, 2023, https://wisqars.cdc.gov/data/lcd/home

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control (2021, July 26). *STEADI-Older adult fall prevention.* Retrieved April 12, 2023, from https://www.cdc.gov/steadi/index.html

Centers for Disease Control and Prevention (2017, September 22). *Take a stand on falls.* Retrieved April 12, 2023 from https://www.cdc.gov/features/older-adult-falls/index.html

Cohen, J. (1992). Quantitative methods in psychology - A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Côté, A. M., Durand, M. J., Tousignant, M., & Poitras, S. (2009). Physiotherapists and use of low back pain guidelines: A qualitative study of the barriers and facilitators. *Journal of Occupational Rehabilitation*, *19*(1), 94–105. DOI:10.1007/s10926-009-9167-2

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.

Creswell, J. W. (2018). *Research design: qualitative, quantitative, and mixed method approaches* (5th ed.). SAGE Publications.

DeLuca, D. (2018). Personal study notes for GMHS-7500: Stats1. (Unpublished manuscript). Department of Interprofessional Health Sciences and Health Administration, Seton Hall

University.

Denninger, T. R., Cook, C. E., Chapman, C. G., McHenry, T., & Thigpen, C. A. (2018). The influence of patient choice of first provider on costs and outcomes: Analysis from a physical therapy patient registry. *Journal of Orthopaedic & Sports Physical Therapy*, *48*(2), 63–71. https://www.jospt.org/doi/10.2519/jospt.2018.7423

Di Fabio, R. P., & Anacker, S. L. (1996). Identifying fallers in community living elders using a clinical test of sensory interaction for balance. *European Journal of Physical Medicine & Rehabilitation*, *6*(2), 61–66.

Dixon J., Singleton, R., & Straits, B. (2019). *The process of social research* (2ed.). Oxford University Press.

Dow, B., Meyer, C., Moore, K. J., & Hill, K. D. (2013). The impact of care recipient falls on caregivers. *Australian Health Review*, *37*(2), 152–157. https://doi.org/10.1071/AH12168

Downs, S., Marquez, J., & Chiarelli, P. (2013). The Berg Balance Scale has high intra-and inter-rater reliability but absolute reliability varies across the scale: A systematic review. *Journal of Physiotherapy*, *59*(2), 93–99. DOI: 10.1016/S1836-9553(13)70161-9

Duncan, P. W., Weiner, D. K., Chandler, J., & Studenski, S. (1990). Functional reach: A new clinical measure of balance. *Journal of Gerontology*, *45*(6), M192–M197. https://doi.org/10.1093/geronj/45.6.M192

Farrokhyar, F., Reddy, D., Poolman, R. W., & Bhandari, M. (2013). Practical tips for surgical research: Why perform a priori sample size calculation? *Canadian Journal of Surgery*, *56*(3), 207. https://doi.org/10.1503/cjs.018012

Faber, M. J., Bosscher, R. J., & van Wieringen, P. C. (2006). Clinimetric properties of the Performance-Oriented Mobility Assessment. *Physical Therapy*, *86*(7), 944–954. https://doi.org/10.1093/ptj/86.7.944

Falzarano, M., & Zipp, G.P. (2013). Seeking consensus through the use of the delphi technique in health sciences research. *Journal of Allied Health*, *42*(2), 99.

Finn, L. M., Stout, J. R., Topolosky, L. A., Weldon, T. L., Whysong, C. L., Borello France, D., & Perry, S. B. (2000). Analysis of clinically used balance measures. *Neurology Report*, *24*, 180–181.

Franchignoni, F., Tesio, L., Martino, M. T., & Ricupero, C. (1998). Reliability of four simple, quantitative tests of balance and mobility in healthy elderly females. *Aging Clinical and Experimental Research*, *10*(1), 26–31. https://doi.org/10.1007/BF03339630

Florence, C. S., Bergen, G., Atherly, A., Burns, E., Stevens, J., & Drake, C. (2018). Medical costs of fatal and nonfatal falls in older adults. *Journal of the American Geriatrics Society*, *66*(4), 693–698. https://doi.org/10.1111/jgs.15304

Fritz, J. M., Cleland, J. A., & Brennan, G. P. (2007). Does adherence to the guideline recommendation for active treatments improve the quality of care for patients with acute low back pain delivered by physical therapists? *Medical Care*, *45*(10), 973–980. https://doi.org/10.1097/MLR.0b013e318070c6cd

Gelbard, R., Inaba, K., Okoye, O. T., Morrell, M., Saadi, Z., Lam, L., Talying, P. & Demetriades, D. (2014). Falls in the elderly: A modern look at an old problem. *The American Journal of Surgery*, *208*(2), 249–253. https://doi.org/10.1016/j.amjsurg.2013.12.034

Gervais, T., Burling, N., Krull, J., Lugg, C., Lung, M., Straus, S., Jaglal, S., & Sibley, K. M. (2014). Understanding approaches to balance assessment in physical therapy practice for elderly inpatients of a rehabilitation hospital. *Physiotherapy Canada*, *66*(1), 6–14. https://doi.org/10.3138/ptc.2012-57

George, D., & Mallery, P. (2011). SPSS for windows step by step: A simple guide and reference. 18.0 update (11th ed.). Boston: Allyn & Bacon.

Godi, M., Franchignoni, F., Caligari, M., Giordano, A., Turcato, A. M., & Nardone, A. (2013). Comparison of reliability, validity, and responsiveness of the mini-BESTest and Berg Balance Scale in patients with balance disorders. *Physical Therapy*, *93*(2), 158–167. https://doi.org/10.2522/ptj.20120171

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *Journal of Continuing Education in the Health Professions*, *26*(1), 13–24. https://doi.org/10.1002/chp.47

Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. *Journal of Advanced Nursing*, *32*(4), 1008–1015. https://doi.org/10.1046/j.1365-2648.2000.t01-1-01567.x

Heinrich, S., Rapp, K., Rissmann, U., Becker, C., & König, H. H. (2010). Cost of falls in old age: A systematic review. *Osteoporosis International*, *21*(6), 891–902. DOI:10.1007/s00198-009-1100-1

Hernandez, D., & Rose, D. J. (2008). Predicting which older adults will or will not fall using the Fullerton Advanced Balance scale. *Archives of Physical Medicine and Rehabilitation*, *89*(12), 2309–2315. https://doi.org/10.1016/j.apmr.2008.05.020

Horak, F. B., Wrisley, D. M., & Frank, J. (2009). The balance evaluation systems test (BESTest) to differentiate balance deficits. *Physical Therapy*, *89*(5), 484–498. https://doi.org/10.2522/ptj.20080071

IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp

Jacobs, J. V., Horak, F. B., Van Tran, K., & Nutt, J. G. (2006). An alternative clinical postural stability test for patients with Parkinson's disease. *Journal of Neurology*, *253*(11), 1404–1413. doi: 10.1007/s00415-006-0224-x

Jette, D. U., Bacon, K., Batty, C., Carlson, M., Ferland, A., Hemingway, R. D., & Volk, D. (2003). Evidence-based practice: Beliefs, attitudes, knowledge, and behaviors of physical therapists. *Physical Therapy, 83*(9), 786–805. https://doi.org/10.1093/ptj/83.9.786

Keeney, S., Hasson, F., & McKenna, H. (2006). Consulting the oracle: ten lessons from using the Delphi technique in nursing research. *Journal of Advanced Nursing*, *53*(2), 205–212. https://doi.org/10.1111/j.1365-2648.2006.03716.x

Kumar, R. (2019). Research methodology: A step-by-step guide for beginners (vol. 4). Sage Publications Limited.

La Porta, F., Franceschini, M., Caselli, S., Susassi, S., Cavallini, P., & Tennant, A. (2011). Unified Balance Scale: classic psychometric and clinical properties. *Journal of Rehabilitation Medicine*, *43*(5), 445–453. DOI:10.2340/16501977-0800

Lesser, A., Israni, J., Kent, T., & Ko, K. J. (2018). Association between physical therapy in the emergency department and emergency department revisits for older adult fallers: A nationally representative analysis. *Journal of the American Geriatrics Society*, *66*(11), 2205–2212. https://doi.org/10.1111/jgs.15469

Liu-Ambrose, T., Khan, K. M., Donaldson, M. G., Eng, J. J., Lord, S. R., & McKay, H. A. (2006). Falls-related self-efficacy is independently associated with balance and mobility in older women with low bone mass. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *61*(8), 832-838. https://doi.org/10.1093/gerona/61.8.832

Mathur, S. (2011). Doctorate in physical therapy: Is it time for conversation? *Physiotherapy Canada*, *63*(2), 140–142. https://doi.org/10.3138/physio.63.2.140

Mora, M (May 2011). *Why we need to avoid long surveys?* Retrieved, April 21, 2023 from https://www.relevantinsights.com/articles/long-surveys/

McGinnis, P. Q., Bonstead, K., & Gorden, J. (2002). Balance assessment methods utilized by

members of the section on geriatrics. *Journal of Geriatric Physical Therapy*, *25*(3), 27–28.

McGinnis, P. Q., Hack, L. M., Nixon-Cave, K., & Michlovitz, S. L. (2009). Factors that influence the clinical decision making of physical therapists in choosing a balance assessment approach. *Physical Therapy*, *89*(3), 233–247. https://doi.org/10.2522/ptj.20080131

Moore, J. L., Virva, R., Henderson, C., Lenca, L., Butzer, J. F., Lovell, L., Roth, E., Graham I.D., & Hornby, T. G. (2022). Applying the knowledge-to-action framework to implement gait and balance assessments in inpatient stroke rehabilitation. *Archives of Physical Medicine and Rehabilitation*, *103*(7), S230–S245. https://doi.org/10.1016/j.apmr.2020.10.133

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science*, *10*(1), 53. doi.org/10.1186/s13012-015-0242-0

National Institute for Health and Care Excellence (2013, June 12). *Falls in older people: Assessing risk and prevention, clinical guideline (CG161)*. Retrieved April 9, 2022, from https://www.nice.org.uk/guidance/cg161

Oates, A., Arnold, C., Walker-Johnston, J., Van Ooteghem, K., Oliver, A., Yausie, J., Loucks, N., Bailey, K., Lemieux, J., & Sibley, K. M. (2017). Balance assessment practices of Saskatchewan physiotherapists: A brief report of survey findings. *Physiotherapy Canada*, *69*(3), 217–225. https://doi.org/10.3138/ptc.2016-47

Panella, L., Tinelli, C., Buizza, A., Lombardi, R., & Gandolfi, R. (2008). Towards objective

evaluation of balance in the elderly: Validity and reliability of a measurement instrument applied to the Tinetti test. *International Journal of Rehabilitation Research*, *31*(1), 65–72. DOI: 10.1097/MRR.0b013e3282f28f38

Parkkari, J., Kannus, P., Palvanen, M., Natri, A., Vainio, J., Aho, H., Vuori, I., & Järvinen, M. (1999). Majority of hip fractures occur as a result of a fall and impact on the greater trochanter of the femur: A prospective controlled hip fracture study with 206 consecutive patients. *Calcified Tissue International*, *65*(3), 183–187. https://doi.org/10.1007/s002239900679

Podsiadlo, D., & Richardson, S. (1991). The timed "Up & Go": A test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society*, *39*(2), 142–148. https://doi.org/10.1111/j.1532-5415.1991.tb01616.x

Portney, L.G. and Watkins, M.P. (2009) *Foundations of clinical research: Applications to practice*. (3rd Edition). Pearson Education, Inc., New Jersey.

Roberts, C. H., & Gill, M. N. W. (2016). Normative values for the unipedal stance test with eyes open and closed. *Journal of Geriatric Physical Therapy*, *30*(1), 07. DOI: 10.1519/00139143-200704000-00003

Saldana, J. (2016). *The coding manual for qualitative researchers.* Sage Publications Inc.

Saliga S., & Bongiovanni, C. (2005). Standing balance tests used by employed physical therapists in Michigan: A pilot study. *Journal of Geriatric Physical Therapy*, *28*(3), 123–

124.

Sattin, R. W. (1992). Falls among older persons: A public health perspective. *Annual Review of Public Health*, *13*(1), 489–508.

Shreffler, J., & Huecker, M. R. (2023). Type I and Type II Errors and Statistical Power. In *StatPearls*. StatPearls Publishing.

Schreiber, J., & Stern, P. (2005). A review of the literature on evidence-based practice in physical therapy. *Internet Journal of Allied Health Sciences and Practice*, *3*(4), 9. DOI:10.46743/1540-580X/2005.1089

Shumway-Cook, A., Brauer, S., & Woollacott, M. (2000). Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. *Physical Therapy*, *80*(9), 896–903. https://doi.org/10.1093/ptj/80.9.896

Sibley, K. M., Straus, S. E., Inness, E. L., Salbach, N. M., & Jaglal, S. B. (2011). Balance assessment practices and use of standardized balance measures among Ontario physical therapists. *Physical Therapy*, *91*(11), 1583–1591. https://doi.org/10.2522/ptj.20110063

Sibley, K. M., Inness, E. L., Straus, S. E., Salbach, N. M., & Jaglal, S. B. (2013a). Clinical assessment of reactive postural control among physiotherapists in Ontario, Canada. *Gait & Posture*, *38*(4), 1026–1031. https://doi.org/10.1016/j.gaitpost.2013.05.016

Sibley, K. M., Straus, S. E., Inness, E. L., Salbach, N. M., & Jaglal, S. B. (2013b). Clinical balance assessment: Perceptions of commonly-used standardized measures and current practices among physiotherapists in Ontario, Canada. *Implementation*

Science, *8*(1), 33.DOI:10.1186/1748-5908-8-33

Sibley, K. M., & Salbach, N. M. (2015a). Applying knowledge translation theory to physical therapy research and practice in balance and gait assessment: Case report. *Physical Therapy*, *95*(4), 579–587. https://doi.org/10.2522/ptj.20130486

Sibley, K. M., Beauchamp, M. K., Van Ooteghem, K., Straus, S. E., & Jaglal, S. B. (2015b). Using the systems framework for postural control to analyze the components of balance evaluated in standardized balance measures: A scoping review. *Archives of Physical Medicine and Rehabilitation*, *96*(1), 122–132. doi: 10.1016/j.apmr.2014.06.021.

Survey Monkey. (2022, March). *Tips for increasing survey completion rate.* https://www.surveymonkey.com/mp/tips-increasing-survey-completion-rates/

Tinetti, M. E., Speechley, M., & Ginter, S. F. (1988). Risk factors for falls among elderly persons living in the community. *New England Journal of Medicine, 319*(26), 1701–1707. https://doi.org/10.1056/NEJM198812293192604

Thomas, M., Jankovic, J., Suteerawattananon, M., Wankadia, S., Caroline, K. S., Vuong, K. D., & Protas, E. (2004). Clinical gait and balance scale (GABS): Validation and utilization. *Journal of the Neurological Sciences*, *217*(1), 89–99. 10.1016/j.jns.2003.09.005

Woollacott, M. H., & Shumway-Cook, A. (1996). Concepts and methods for assessing postural instability. *Journal of Aging and Physical Activity*, *4*(3), 214–233.

Van Bodegom-Vos, L., Verhoef, J., Dickmann, M., Kleijn, M., Van Vliet, I., Hurkmans, E., Van der Wees, P., & Vliet Vlieland, T. (2012). A qualitative study of barriers to the implementation of a rheumatoid arthritis guideline among generalist and specialist physical therapists. *Physical Therapy*, *92*(10), 1292–1305. https://doi.org/10.2522/ptj.20110097

Van der Wees, P. J., Zagers, C. A., De Die, S. E., Hendriks, E. J., Nijhuis-van der Sanden, M. W., & De Bie, R. A. (2013). Developing a questionnaire to identify perceived barriers for implementing the Dutch physical therapy COPD clinical practice guideline. *BMC Health Services Research*, *13*(1), 159. doi: 10.1186/1472-6963-13-159.

Appendices

Appendix A: Permission to Use Saskatchewan Physiotherapists' Balance Assessment Practices Survey (Oates et al., 2017)

From: Oates, Alison <alison.oates@usask.ca>
Sent: Friday, June 19, 2020 9:23 AM
To: Franceah Palencia-Quijano <franceah.palenciaquijano@student.shu.edu>
Cc: Kathryn Sibley <Kathryn.Sibley@umanitoba.ca>
Subject: RE: permission for survey use

Hi Franceah,

Thanks for the clarification. Here is our response:

On behalf of my colleague Dr. Sibley and the co-authors of the manuscript Oates, et al., 2017. Balance assessment practices of Saskatchewan physiotherapists: a brief report of survey findings. *Physiotherapy Canada*, *69*(3), pp.217-225, I give permission for Franceah Palencia-Quijano to use the survey created and used in the previously mentioned reference in her doctoral research at Seton Hall University, USA. The survey can be uploaded to an on-line survey platform such as Survey Monkey , Qualtrics but a citation must be referenced.

Please let me know if you need anything further. Good luck with your work! We look forward to seeing your results in publication.

Take care,
Alison

Appendix B: Seton Hall University Institutional Review Board Approval Letter

February 8th, 2022

Franceah Palencia Quijano
Seton Hall University

Re: 2022-298

Dear Franceah,

At its January meeting, the Research Ethics Committee of the Seton Hall University Institutional Review Board reviewed and approved your research proposal entitled, "Exploring Balance Assessment Practices and Utilization of Academy of Geriatric Physical Therapy Clinical Guidance Statement in Fall Management by U.S.-Practicing Physical Therapists: A Mixed Methods Approach" submitted. This memo serves as official notice of the aforementioned study's approval. Enclosed for your records are the stamped original Consent Form and recruitment flyer. You can make copies of these forms for your use.

The Institutional Review Board approval of your research is valid for a one-year period from the date of this letter. During this time, any changes to the research protocol, informed consent form or study team must be reviewed and approved by the IRB prior to their implementation.

You will receive a communication from the Institutional Review Board at least 1 month prior to your expiration date requesting that you submit an Annual Progress Report to keep the study active, or a Final Review of Human Subjects Research form to close the study. In all future correspondence with the Institutional Review Board, please reference the ID# listed above.

Thank you for your cooperation.

Sincerely,

Mara C. Podvey, PhD, OTR
Associate Professor
Co-Chair, Institutional Review Board

Phyllis Hansell, EdD, RN, DNAP, FAAN
Professor
Co-Chair, Institutional Review Board

Office of the Institutional Review Board
Presidents Hall · 400 South Orange Avenue · South Orange, New Jersey 07079 · Tel: 973.275.4654 · Fax 973.275.2978 ·
www.shu.edu

WHAT GREAT MINDS CAN DO

Letter of Solicitation

Exploring Balance Assessment Practices and Utilization of Academy of Geriatric Physical Therapy Falls Clinical Guidance Statement by U.S.-Practicing Physical Therapists:

A mixed methods approach

Affiliation: My name is Franceah Palencia-Quijano and I am a doctoral student at Seton Hall University in the Department of Interprofessional Health Sciences and Health Administration. I am conducting this research study in partial fulfillment of my dissertation requirement for the PhD in Health Sciences degree. I am studying U.S.-practicing physical therapists (PTs)' balance assessment practices and utilization of Academy of Geriatric Physical Therapy (AGPT) Falls Clinical Guidance Statement (CGS) in their management of falls.

Purpose of the study: This mixed method study will explore the balance assessment practices of U.S.-practicing PTs, specifically, addressing the utilization of American Physical Therapy Association (APTA) balance tests and measures and the Academy of the Geriatric Physical Therapy (AGPT) Clinical Guidance Statement (CGS) in the management of falls.

Procedure: You will be asked to complete a one-time web-based Qualtrics online survey entitled Assessment of Balance Practices and Associated Barriers of U.S.-practicing PTs**.** The survey has two parts and will take anywhere from 15-20 minutes.

> **Part A** includes demographic questions and the Saskatchewan Physiotherapists' Balance Assessment Practice Survey (SPBAPS). I have received permission from Oates et al. (2017) and her colleagues to utilize this survey which was reported on in the manuscript "Balance assessment practices of Saskatchewan physiotherapists: a brief report of survey findings." Physiotherapy Canada, 69(3), pp.217-225.
>
> **Part B** includes questions that address the balance tests and measures listed on the APTA website, the Academy of the Geriatric Physical Therapy (AGPT) Clinical Guidance Statement (CGS) and the barriers associated with balance assessment practices.

Voluntary Participation: Your participation in the research study is voluntary. You may decide at any time not to participate in this study. If you decide not to participate or you withdraw, you will not be penalized.

Anonymity: You will not be asked to provide your name if you agree to join in this study. You will not be identified by name or description in any reports or publications about the study.

Privacy and Confidentiality: Protection and confidentiality will be maintained throughout the duration of the research project. No personally identifying information will be collected from participants. However, upon completion of the study, any paper data will be kept in a locked filing cabinet in the Principal Investigator's home for three years after which time data will be destroyed. Similarly, electronic data will be stored on a USB memory key with access to the file protected by use of password only known to the principal investigator. The memory key will also remain in a secured filing cabinet for three years, upon which time the data will be destroyed.

Risks of Participation: There is no anticipated risk factor or discomfort that is projected in this research study.

Benefit of Participation: There are no intended or anticipated direct benefits to you by partaking in this study. However, the results of this study will assist clinicians like the primary investigator (PI), researchers and clinical professors explore the balance assessment practices of U.S.-practicing PTs, specifically the APTA balance test and measures and the AGPT CGS in falls management.

So if you are:(1) US-practicing PT (2) licensed PT (3) 21 years of age or older (4) have access to web-based or email and (5) proficient in reading and writing, you are eligible to participate.

Ways to Participate!

The electronic survey is available through a Qualtrics survey link:

https://shu.co1.qualtrics.com/jfe/form/SV_bPnCrt7mNqOBtl2

Please click the link above. By accessing and completing the survey, you are acknowledging your informed consent to participate in the study. Once you have completed the survey, please do not take it again.

Contact Information At any time, you have the right to ask questions regarding this study. If you have any questions regarding this study or your right as a study participant, please contact the (PI), Franceah Palencia-Quijano at franceah.palenciaquijano@student.shu.edu or through the office of Dr. Genevieve Zipp, Dissertation Chair in the Department of Interprofessional Health Sciences & Health Administration in the Seton Hall University School of Health and Medical Sciences at (973) 275-2076. Additionally, Michael LaFountaine, Chair of the Institutional Review Board, in the office of IRB at Seton Hall University may be reached at (973) 313-6314.

If you know of anyone who might be qualified to take this survey,

please forward this letter of solicitation to them.

Thank you,

Franceah Palencia-Quijano PT, DPT, OCS

Student-PhD in Health Sciences, School of Health and Medical Sciences

Seton Hall University