

**Physical Therapists' Knowledge of Relationship Between Fall Risk, Cognition, and
Hearing**

By

Elizabeth Phillips

Speech, Language and Hearing Sciences, University of Colorado at Boulder

Defense Date- March 22nd, 2023

Kathryn Arehart, Speech, Language and Hearing Sciences (Thesis Advisor)

Allison Hilger, Speech, Language and Hearing Sciences

Tammy Maldonado, Integrative Physiology

Introduction:

Fall risk and additional factors

As the population ages, chronic illnesses and impairments common among geriatric groups will become more prevalent. In 2030, cognitive impairment and age-related hearing loss are predicted to be included in the top ten causes of total disability in high income countries, including the United States (Pichora-Fuller et al., 2015). Falls are a frequent cause of injury and mortality amongst people 65 or older (Tinetti, 1994), and identifying comorbidities that increase risk for falls, and potential preventative measures has been a subject of research for over 40 years (Tinetti, 1994). Cognition and hearing impairments are comorbidities whose effects on fall risk have been a popular topic in research in recent years; hearing has been the lesser researched of the two topics (Campos, 2018; Pichora-Fuller, 2015). Sakurai et al. (2022) explored the relationship between falls, age-related hearing loss, cognition, and gait through a cohort. Participants in the study were older adults, often community dwelling, willing to complete four areas of assessment including audiometric, gait, and global cognition assessments, complete daily activities of living, and walking 400 meters unassisted. The authors reported that a decline in one area can impact another. For example, age-related hearing loss is associated with declines in cognitive function, and increases in fall risk (Sakurai et al., 2022). A poor gait is associated with an increase in fall risk and a decline in cognition. A decline in one mechanism can exacerbate the declines in another (Sakurai et al., 2022). Ultimately, increases in falls and/or declines in hearing, cognition and/or gait can be detrimental to the independence of an individual, making people less active and social, and impacting the quality of life. When there are multiple issues, the negative effect on independence is compounded, making individuals

more homebound, which often leads to a greater decline in cognition, hearing, and an increased risk of falls.

Physical therapists are concerned with diagnosing and treating impairments associated with the function and movement of the human body which impact performance, quality of life, and the overall human experience (American Physical Therapy Association, 2017). Because of the associated risk of injury and limitation of function, fall risk assessment and prevention are relevant to physical therapy and geriatric care (Blackwood & Martin, 2017). Part of fall mitigation is being aware of factors and relationships that significantly increase the risk of falls. As has been previously studied, there is a relationship between cognition, hearing, and falls (Sakurai et al., 2022). Physical therapists spend more time with patients than physicians- usually patients have appointments multiple times over a few weeks, and for longer periods of time. This may put physical therapists in a position to screen for cognition and be a referral point for cognitive and hearing assessments. Addressing issues that compound fall risk could ultimately reduce chances of falling and make patients more resilient to declines in independence.

Association of cognition and fall risk

Previous research has shown that cognitive impairments significantly increase risk of falls. For example, Chua et al. (2022) found subjects who were cognitively impaired, also performed poorly on sensory organization tests (SOT) of a computerized dynamic posturography (CDP), which evaluates postural stability. Postural stability in the midst of multiple visual and proprioceptive input tests the brain's ability to maintain balance. The inability to stay balanced will lead to a fall. The results of Chua et al. (2022) support the idea that the brain may be shifting

attention away from posture, and towards sensory information. The brain's limited resources, as a result of cognitive impairment, are being strained. Mirelman et al. (2012) assessed executive function- which is another domain of cognitive function associated with staying focused despite many distractions, planning ahead, and the ability to follow multi step directions- as an indicator of cognitive ability. Researchers correlated executive function to fall risk. The study initially assessed participants' executive function and dual tasking ability, the ability to perform an additional attention demanding task while walking. Over a five year period, researchers counted the number of falls of each participant. Researchers found that executive function performance and dual tasking ability could predict an increased risk for falls. The evidence suggests that patients with a lower cognitive ability will be less adept in multitasking, and may struggle to walk in real world environments that include various distractions, leading to more falls (Mirelman et al., 2012). In a review of the correlation between gait and cognition, it was found that cognitive decline can predict a decline in gait, and vice versa. Studies have also shown that patients with cognitive decline are twice as likely to fall, and are more likely to enter institutional care (Montero-Odasso et al., 2012).

To avoid the reliance on others and promote independent living, a goal for patients with cognitive decline should be strengthening motor skills. This is an attempt at decreasing the number of factors that limit a patient's independence. In Longhorn et al. (2020) researchers focused on assessing cognition, balance and gait before and after a one-month physical therapy prescription. Researchers found that for patients with dementia, and dementia with Lewy bodies, improvements were made in two of the three focus areas. All three focus areas were improved in patients with Alzheimer's and mild cognitive impairment. Physical therapy introduces patients to

a movement specialist who utilizes exercise and rehabilitation to target functional mobility. Physical improvements, that reduce risk for falls, can be seen over a short period of time through physical therapy, even for patients with cognitive impairments. Both falls and cognitive decline are common geriatric issues, and the influence of cognition on falling should influence human movement treatment.

Comfort and knowledge with cognitive screening

Evidence shows there is a significant correlation between cognitive function and the risk of falls, so it seems pertinent that physical therapists are able to screen for cognition when considering fall prevention within a geriatric population. However, it was found that 71.8% of physical therapy outpatient clinics were not screening for cognition (Blackwood & Martin, 2017), where the majority of physical therapists work (Physical therapist demographics and statistics, 2022). Oftentimes, physical therapy outpatient clinics are an entry point for people seeking rehabilitation or therapy for human movements, as discussed by Blackwood & Martin (2017). It is important that physical therapists, in any work environment, are comfortable and able to screen for cognition as a baseline assessment before making referrals if necessary. As expected, home care facilities were screening for cognition more often, and yet they only make up 20% of therapists. Therapists who spent a larger portion of their daily schedule working with a geriatric population were more likely to screen for cognition (Blackwood & Martin, 2017). The most common cognitive screening tools used were the Alert and Oriented X 3-4, and the Mini-Mental State Exam (MMSE). Other screening tools listed in the survey were the Mini-Cog (Carolan Doerflinger, 2013), Saint Louis University Mental Status Exam (SLUMS), and Montreal Cognitive Assessment (MoCA). Picking an appropriate screening tool is important, as each

screening tool has different strengths and abilities to identify specific cognitive impairments (Bachinskaya & Muller, 2016). When homecare therapists were surveyed on their skills to effectively screen for cognitive impairments, 17% did not feel they had adequate skills and 30% of therapists responded with a neutral position. This may indicate that up to 47% of homecare specialists do not feel fully satisfied with their skills to screen for cognition (Miles et al., 2019). Still, a large majority of these therapists agreed that cognitive function was linked to exercise and falls, and that screening for cognition fell within the role of a physical therapist.

Physical therapists agreed they were willing to learn more about cognitive impairments, like dementia (Miles et al., 2019). Studies have shown that practitioners make decisions based on their education and experience. Physical therapists with greater education and knowledge about the geriatric population feel more adequate in treating conditions associated with cognitive decline and impairment (Staples & Killian, 2012). Education is important for therapists to provide the best care, and based on past studies, it appears that physical therapists are not receiving the training necessary to deal with the effects of cognitive impairment on the rehabilitative process or prevention of injury. Some of the limitations of these studies have been small response rates to surveys (Staples & Killian, 2012), not asking about which cognitive screening tools are used in the field (Miles et al., 2019), and survey responses limited to the state of Michigan (Blackwood & Martin, 2017).

Association of cognition and hearing

Hearing loss is present in one-third of patients 65 and older (Stevens et al., 2019). Evidence has shown that cognitive impairment is more prevalent among adults with hearing loss, and that cognitive decline progresses faster in patients with hearing loss. For each 25 dB loss in hearing, researchers have calculated that it increases cognitive age by 7 years (Pichora-Fuller et al., 2015). When adults have impaired cognition, the ability to process multiple sensory inputs- visual, auditory, proprioceptive, musculoskeletal- becomes increasingly challenging, and increases cognitive load (Campos, 2018; Pichora-Fuller, 2015). As a compensatory mechanism, those with cognitive impairment will use more top-down, or memory based, inferences about the sensory information they are receiving. This may cause them to miss some key sensory information, and will make listening more difficult. There can be individual differences on the allocation of cognitive resources, so with an increase of input, some tasks may be more difficult (Pichora-Fuller et al., 2015). This becomes relevant as when people are navigating real world environments, there is visual, auditory, proprioceptive, and musculoskeletal information that must be understood to stay balanced. When some sensory information is prioritized over others, this could lead to issues, making independent navigation more difficult. For example, when auditory signals are demanding greater cognitive effort, there is decreased cognitive load to sustain motor skills necessary to remain balanced, and prevent a fall.

Association of hearing and fall risk

Hearing provides sensory information that plays a role in maintaining balance, and is used in self-navigation of an environment (Campos et al., 2018). For example, stationary auditory input can help create postural stability. When moving, auditory input provides information about the

changing environment. As one moves through a space, multiple sound characteristics change as one moves away or towards a sound source, including pitch, loudness, and angle of the sound source. The brain integrates information from both ears about these sound characteristics. High frequency sounds are refracted by the head and the environment, and are necessary for sound localization. These all indicate to the listener distance from a sound source. The changing sound information helps the listener understand that they are moving, which can also create a stabilizing effect. Ultimately the listener is able to create a perceived environment through sounds, which is similar to the physical environment (Campos et al., 2018). High frequency hearing loss, which is especially prevalent in older adults, impacts the ability to use important acoustic cues used in sound localization (Campos et al., 2018). With high frequency hearing loss, loudness and timing differences become more difficult to distinguish, causing people to miss auditory signals in their environment.

Additionally, difficulty hearing may mean that a greater cognitive load is required for understanding auditory input. Multisensory inputs allow us to understand our environment better, making it easier to navigate. However, when one sense is not providing appropriate input, the lack or incongruous information being received by multiple sensory inputs can make self-navigation of the environment more challenging (Campos et al., 2018). For example, with hearing loss, auditory information perceived may be distorted due to the hearing loss, and will create challenges when integrating with other senses like visual, proprioceptive or musculoskeletal. Without the ability to effectively hear, older people may not be able to detect changes in their environment through their auditory system, which could affect their mobility (Campos et al., 2018). It was reported that adults with hearing loss reported a significantly

greater odds of falling, and that with every 10 dB increase in hearing loss, the odds of falling increased by 1.9 times (Lin & Ferrucci, 2012). Missed auditory cues can alert people to environmental changes, leading them to make postural adjustments, and remain oriented in space.

Comfort and knowledge with hearing loss

Patients with hearing loss report visiting health care providers more often than their peers, and report negative impacts to quality of life and communication due to their hearing loss (Stevens et al., 2019). Patients with hearing loss report worse quality of care and communication with healthcare providers in comparison to peers (Chang et al., 2019). Physical therapists may have the unique challenge of dealing with multiple impairments, like hearing and motor deficits. Navigating these challenges requires knowledge of effective communication strategies to overcome deficits and create treatment outcomes which promote quality of life. Effective communication involves being aware of patients' hearing loss, and speaking in a manner that allows patients to both hear and understand spoken information. It also involves creating an atmosphere where the patient feels respected and willing to ask for further clarification. Patient's need to comprehend spoken language from healthcare providers. The necessary confidence for patients to follow treatment instructions or engage with health care professionals is promoted by comprehension (Chang et al., 2019). In a survey of patients' with hearing loss, the most difficulty understanding providers occurred when patients' names are called in a waiting room and when the providers turn away from patients when talking (Stevens et al., 2019). Furthermore, there are other circumstances that create difficult listening situations for patients with hearing loss. In clinic and hospital settings, there are other healthcare providers speaking to

patients and movement of equipment, which creates noise in the environment. Background noise can distract patients or reduce the perception of sound from the desired auditory signal- their name or specific instructions from their provider. Noise and poor communication strategies can impact comprehension, and therefore the independence of patients and quality of care received.

In a survey of palliative care workers, it was found that 91% of providers indicated hearing loss impacted service, and 88% felt hearing loss created situations where communication problems were present. While the majority of palliative care workers reported feeling comfortable communicating with patients with hearing loss, only around 20% had formal training, and a majority continued to use non-recommended strategies of raising their voices and speaking into the patients' ears when communicating with them (Smith et al., 2016). This is important as palliative care providers are dealing with a geriatric population daily, and are more likely to use best practice methods in communicating with patients with hearing loss. Alongside intentional changes to speech, some best practice communication solutions may include using assistive technology that isolates the desired signal, like a pocket talker (Marrone, 2012).

In a study assessing physical therapist communication with patients, the use of nonverbal strategies, including facial expressions and eye contact, were indicators for improved therapeutic outcome (Ambady et al., 2002). When communication was perceived positively by patients, cognitive and physical functioning improved from admission to discharge, over a three month period. Patients were less confused with directions, and had improvements in daily living activities. With appropriate communication strategies, patients can receive beneficial treatment which will improve their quality of life. Educating physical therapists on appropriate

communication strategies, especially with geriatric or hearing impaired patients, can increase the success of rehabilitation interventions. Currently, there is limited research on communication strategies physical therapists use when communicating with patients with hearing loss. While there has been a very small amount of research looking at nonverbal strategies of physical therapists, there is no research on how physical therapists specifically change intonation, rate, and volume to better communicate. There is also no information about how physical therapists believe hearing impairments may impact treatment.

The aim of this thesis is to characterize the perspectives of physical therapists regarding the role cognition and hearing play in physical therapy services. Our study also addresses the impact of hearing on provider-patient communication by exploring intentional changes physical therapists make to better communicate with patients with hearing loss. The results of this study will provide insights into what physical therapists know and are comfortable with regarding cognition and hearing loss. This, in turn, will provide insights into what changes in education and training may be needed to address existing gaps that physical therapists may have related to aging impairments.

Methods:

Survey Development

To assess physical therapists' current practices and knowledge of fall risk, cognition and hearing, a 32-question survey was developed. This survey was modeled off previous attitudinal studies sent to physical therapists (Blackwood, 2017; Miles, 2019), home care specialists and audiologists (Rossi-Katz & Arehart, 2011). There were five sections in the survey addressing (a)

demographics, (b) fall risk assessment procedures, (c) cognitive screening procedures and beliefs regarding cognitive impairment, (d) hearing loss considerations and beliefs regarding hearing impairment, (e) continuing education. Based on limitations of previous studies (Blackwood, 2017; Miles, 2019), it was important to ask about specific tools used to assess fall risk and screen for cognition, to get a clearer picture of current practices. The survey was also open to all physical therapists across the United States. To the best of our knowledge, this is the first survey that specifically asks about attitudes of physical therapists towards hearing loss, and intentional changes physical therapists make to verbal communication with patients with hearing loss.

The survey was then reviewed for clarity and wording by professionals in physical therapy including an outpatient physical therapist and a home-care physical therapy assistant to clarify wording and assess survey time. After final revisions, the survey was made available to physical therapists, and was accessed online through a Qualtrics survey link. **Table 1** categorizes each of the survey questions according to different topics. **Table 1** also provides a previous survey the question was modeled from or inspired by, and reason for inclusion in the survey. The questions were designed to see if education, experience or a combination of both made physical therapists more comfortable with treating patients with cognitive or hearing impairments. The questions were also created to find out more about practices and tools currently being used to assess fall risk, cognitive screening, and hearing loss. For a full list of questions see **Appendix 1**.

Participants

To be included in the survey, participants had to be older than 18, and be a licensed physical therapist with at least a bachelor's, master's, or doctorate degree. Participants were not limited by state or place of employment. Information about the survey and the Qualtrics survey link was posted to various physical therapy Facebook group pages that were focused on physical therapy, home health, geriatrics, or neurological care. The survey was also emailed to physical therapists associated with the University of Colorado, APTA Geriatrics and professors of physical therapy at other universities. Upon opening the survey, a consent prompt and information about the study were presented to the participants. The participants then had the choice to continue the survey or exit; continuing the survey signified consent with participation in the survey. There was no obligation to complete the survey, and no extra benefit to the participants for completing the survey. Approval for this study was obtained through the Institutional Review Board (IRB) of the University of Colorado Boulder.

Table 1: The survey is broken down into five main sections- demographics, fall risk assessment, cognition, hearing and continuing education. In the table below the cognition and hearing sections are broken down into current practices and beliefs. More specifics for inclusion of different survey questions is stated. Many questions were inspired by previous studies, which are cited below.

Question Number	Survey Section	Source(s)	Reason for Inclusion
1, 2, 3, 4, 5, 6, 7	Demographics	(Blackwood, 2017; Miles, 2019)	Information about career, education, place of employment, appointment time, and time with geriatric patients
8, 9, 10, 11	Fall risk assessment	(Blackwood, 2017; Miles, 2019)	Factors associated with falls, fall risk assessment tool used
12, 14, 15, 16	Cognition screening in practice	(Miles et al., 2019)	Context screening tools are used, type of screening tools used, education about cognitive screening tools
13, 17, 18, 19, 20	Beliefs and comfort with cognitive impairment	(Miles et al., 2019)	Scope of practice of physical therapists, administration of cognitive screening, comfort treating patients with cognitive impairment, association between cognition and falls
21, 22, 23, 24	Hearing loss in practice	(Smith, 2016; Rossi-Katz, 2011)	Hearing loss awareness, communication considerations for hearing impaired
25, 26, 27, 28, 29, 30	Beliefs and comfort with hearing impairment	(Smith et al., 2016)	Comfort treating patients with hearing loss, association between cognition and hearing, association between hearing and falls
31, 32	Continuing Education	(Miles et al., 2019)	Opportunities attended and desire for more opportunities

Results:

Participant Characteristics

The survey was attempted by 79 participants, but twelve surveys were discarded due to not meeting participation criteria. Incomplete surveys were not discarded; a total of 67 surveys were used in the analysis, using results and descriptive statistics obtained through Qualtrics.

Completed questions from the incomplete surveys were still used in the analysis. Sample sets for each question vary on the number of respondents that completed the question, and are reported in **Table 2, Table 3, Table 4, Figure 1, and Figure 3.**

The majority of participants indicated they received a doctorate as their highest level of education (**Table 2**). In January 2016, the American Physical Therapy Association required that in order to receive a license, physical therapists must receive a doctorate of physical therapy (DPT). Because of this change, DPTs have fewer years of experience as a licensed physical therapist in comparison to physical therapists with other degrees. While only 32 participants responded to the question about additional certifications related to geriatric health, 75% of respondents had one if not more than one certification. The most common additional certifications were the Geriatric Certified Specialist (GCS), Lee Silverman Voice Treatment-Big (LSVT BIG), and Certified Exercise Expert for Aging Adults (CEEAA). A greater percentage of people obtaining doctorate degrees received specialized certifications related to geriatric health when compared to bachelor's and master's degrees.

Respondents worked in a variety of different settings, with the two largest groups of respondents working in outpatient clinics (45%) and home care (14%). Most physical therapists (86%) reported seeing patients for 30 or more minutes during treatment sessions. Physical therapists reported seeing geriatric patients in over half of their caseloads in 74% of the surveys (**Table 2**).

Table 2: Participant characteristics of respondents by highest degree obtained. The data obtained came from questions 1-7 in the survey. Values are of the whole group listed as %, and as an actual number (n=).

Responses	Bachelor (n=10)	Masters (n=6)	Doctorate (n=51)
Question 1 (n=67): Which of the following best describes your job title?			
Physical therapist (PT)	14.9% (10)	7.5% (5)	11.9% (8)
Physical Therapist (DPT)	0% (0)	0% (0)	64.2% (43)
Physical Therapy Assistant	0% (0)	1.5% (1)	0% (0)
Question 3 (n=32): What specialization certifications do you have related to geriatric health?			
Geriatric Certified Specialist (GCS)	0% (0)	3.1% (1)	15.6% (5)
Certification as an Exercise Expert for Aging Adults (CEEAA)	0% (0)	0% (0)	9.4% (3)
Lee Silverman Voice Treatment (LVST LOUD)	0% (0)	0% (0)	6.3% (2)
Certificate OASIS Specialist- Clinical	0% (0)	0% (0)	6.3% (2)
Other	15.6% (5)	6.3% (2)	37.5% (12)

Question 4 (n=66): Which of the following best describes your place of employment?			
Acute Care	3% (2)	0% (0)	6.1% (4)
Subacute Care	0% (0)	0% (0)	6.1% (4)
Sports Medicine Facility	0% (0)	1.5% (1)	6.1% (4)
Outpatient	7.6% (5)	4.5% (3)	33.3% (22)
Home Care	3% (2)	1.5% (1)	9.1% (6)
Academic Institute	0% (0)	0% (0)	6.1% (4)
Skilled Nursing/Long Term Care Facility	1.5% (1)	1.5% (1)	4.5% (3)
Other	0% (0)	0% (0)	4.5% (3)
Question 5 (n=63): How many years have you been a licensed specialist?			
0-5	1.6% (1)	0% (0)	34.9% (22)
6-10	0% (0)	0% (0)	12.7% (8)
11-15	0% (0)	1.6% (1)	11.1% (7)
>15	12.7% (8)	7.9% (5)	17.5% (11)
Question 6 (n=66): What is the average appointment time allotted for an individual patient each day?			
0-15 min	0% (0)	0% (0)	3% (2)
16-30 min	4.5% (3)	0% (0)	6.1% (4)
31-45 min	1.5% (1)	1.5% (1)	39.4% (26)
46-60 min	7.6% (5)	7.6% (5)	22.7% (15)

>61 min	1.5% (1)	0% (0)	4.5% (3)
Question 7 (n=65): What percentage of patients do you see on a monthly basis that are over the age of 65?			
0-10%	0% (0)	1.5% (1)	3.6% (3)
11-20%	1.5% (1)	0% (0)	1.5% (1)
21-30%	0% (0)	1.5% (1)	1.5% (1)
31-40%	0% (0)	0% (0)	7.7% (5)
41-50%	3.1% (2)	0% (0)	3.1% (2)
51-60%	3.1% (2)	0% (0)	12.3% (8)
61-70%	0% (0)	1.5% (1)	12.3% (8)
71-80%	1.5% (1)	0% (0)	9.2% (6)
81-90%	1.5% (1)	0% (0)	7.7% (5)
91-100%	4.6% (3)	4.6% (3)	15.4% (10)

Fall Risk Factors Assessed in Screenings

There are many health factors that play into fall risk. Physical therapists were asked to identify which factors they consider to be associated with walking and balance issues (**Figure 1**).

Musculoskeletal, proprioceptive, vestibular, vision and cognition were selected by over 95% of respondents. Cardiac, age and hearing were other factors listed, and selected by over half of respondents. Hearing was the least selected factor, being selected by 65% of respondents. Most research has been focused on musculoskeletal, proprioceptive, vestibular, cardiac, vision, and

cognition as related factors to falls. Hearing has only more recently been a researched factor, and has been shown to be related to poor mobility (Campos et al., 2018).

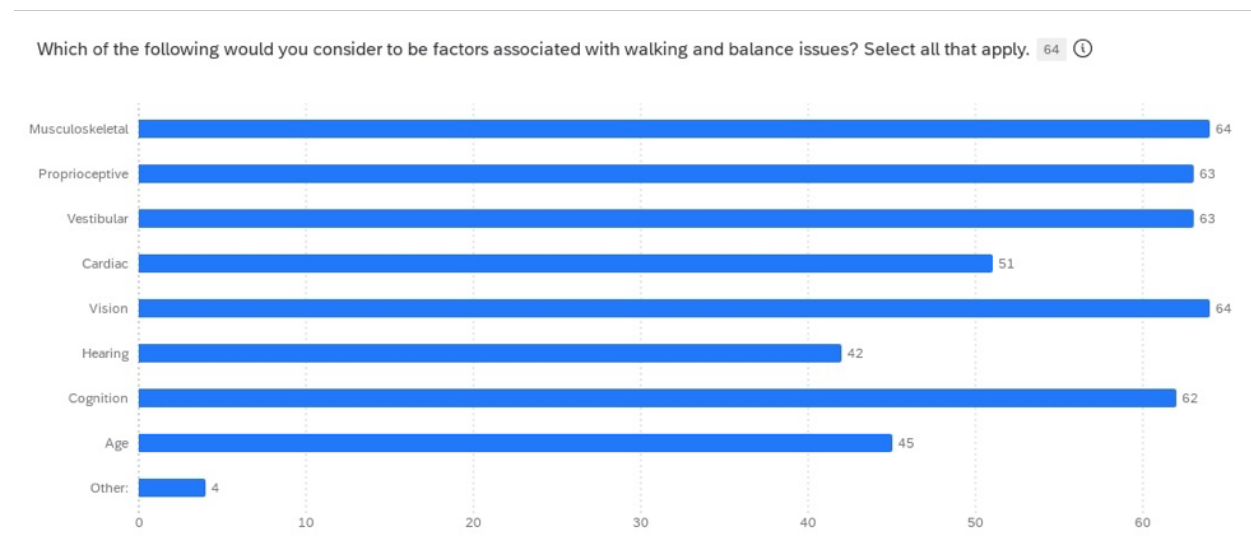


Figure 1: Physical therapists were asked about factors they consider to be associated with walking and balance issues. Physical therapists had the option to select multiple factors in the survey. Some additional responses people responded with were medications, environment, shoe wear and somatosensory. The sample size of this question was 64 people, and values are listed as the actual number of people that selected each response.

When physical therapists were asked about the most important factors to assess in fall risk assessments, the three most common factors selected were musculoskeletal, proprioceptive and vestibular. The three least selected factors were cardiac, hearing and age. While 96% of respondents believed that cognition was a factor associated with walking and balance issues, only 68% believed that this was an important factor to be assessed during a fall risk assessment.

Figure 2 shows the most important factors to be assessed in a fall risk assessment based on degree obtained. Interestingly, cognition was selected by a greater percentage of doctorates, while hearing was selected by a greater percentage of bachelor's and master's degrees.

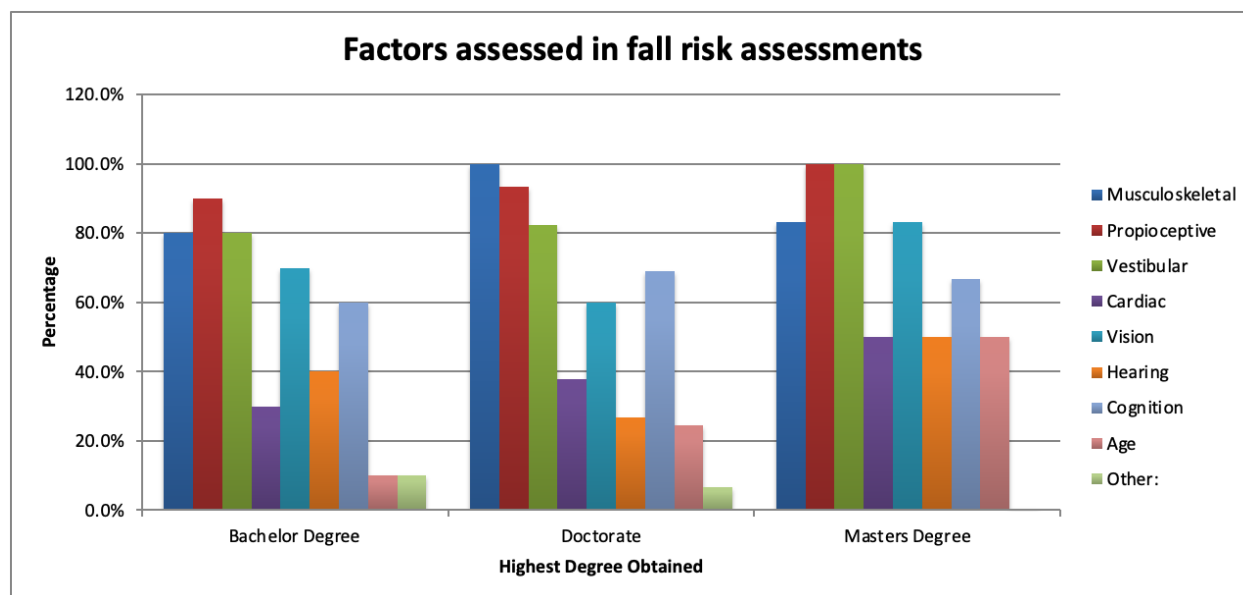


Figure 2: The factors most important to assess during a fall risk assessment broken down by highest degree of education. Responses were separated by degree obtained and percentages in the graph are according to each degree obtained group.

To get a better understanding of current practices surrounding fall risk assessment, physical therapists were asked about the tool they use most often to score fall risk (**Figure 3**). The most used fall-risk assessment tool used by respondents is the Timed Up and Go (TUG), with a third of respondents reporting its use. Tinetti Performance Oriented Mobility Assessment (POMA) is the second most used tool by respondents. In both of these tests, the ability of a patient to sit in a chair, stand up, and walk are taken into account and scored. While there are slightly different procedures to the tests, there is no consideration of additional factors, like cognition or hearing,

that are taken into account and scored during these two assessments. Most of the fall risk assessments that therapists reported using are an assessment of musculoskeletal, proprioceptive, and vestibular abilities. Physical therapists are asked to score stability, time, gait and continuity of physical movements, but these scores do not necessarily reflect cognitive abilities or sensory abilities like hearing.

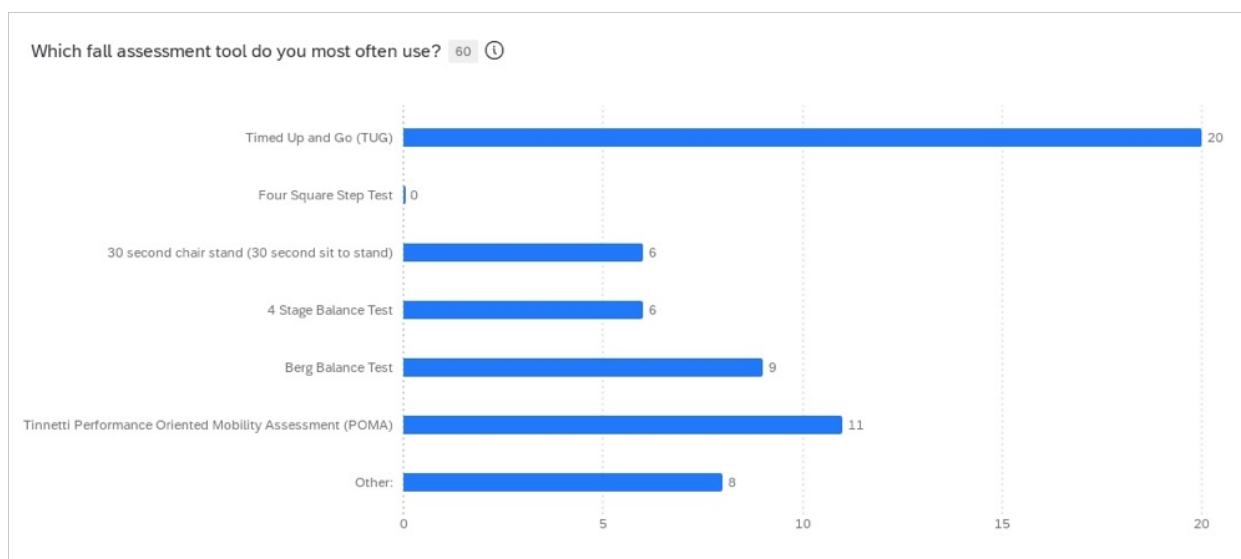


Figure 3: Physical therapists were asked to select the fall risk assessment tool they use most often in their practice. Some additional responses for fall risk assessment tools used were the 5x sit to stand, a functional gait assessment, and the 10-meter walk. This survey question was only answered by professionals who perform fall risk assessments. The total sample size for this question was 60 people, and values are listed as the number of people that selected each assessment.

Cognitive Screening and Service to Cognitively Impaired

When physical therapists were asked which healthcare professionals would be expected to assess cognition, primary care physicians and neurologists were selected the most. Primary care physicians can be a gatekeeper to further healthcare and become familiar with patients and a variety of issues they may present. Neurologists are brain and nervous system specialists, and are tasked with being cognition professionals. The next three most selected health care professionals were speech-language pathologists, occupational therapists and physical therapists. These health care professionals were selected by 70% or more of survey participants. Physical therapists were specifically asked if cognitive screening fell within their scope of practice. Cognitive screening being within the scope of practice was agreed on by 81%, while 18% responded they were unsure if it was within the scope of practice. Participants trained in school or professional development on the purpose and use of cognitive screening tools made up 72%. Respondents trained to use cognitive screening tools is slightly lower than the percentage of physical therapists who agreed cognitive screening was within physical therapy scope of practice. Physical therapists receiving a doctorate were more likely to have been educated about cognition in their university training programs, whereas physical therapists who received a bachelor's or master's degree were more likely to have learned about cognitive screening tools in professional development opportunities (**Figure 4**).

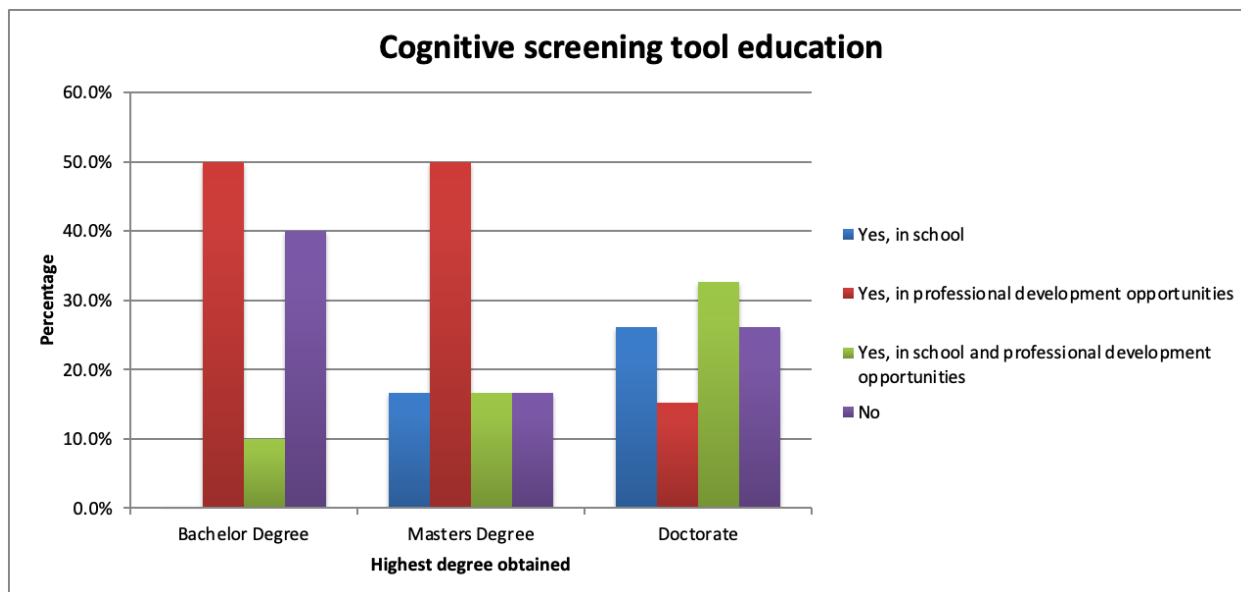


Figure 4: This figure shows the differences in where physical therapists learned about cognitive screening tools based on what degree they obtained. Percentages are according to each degree obtained group.

Cognitive screening tools were most used after physical therapists suspected their patients had a cognitive impairment (43%). While the use of cognitive screening tools may not be guaranteed during a fall risk assessment, 22% indicated that this is a context they would use a cognitive screening tool. Few participants (10%) said they would not use a cognitive screening tool to generate objective data, in the case of suspected cognitive impairment, or during a fall risk assessment. Of those who use cognitive screening tools, the two most selected cognitive screening tools were the MMSE and the Mini-Cog. Cognitive screening tools were not used by 16% of respondents. In some cases, another health care professional (speech language pathologist or occupational therapists) in their workplace performed cognitive screenings.

In questions 17-20 on the survey, participants were asked about their comfort and beliefs with cognitive impairment (**Table 4**). Physical therapists uncomfortable administering a cognitive screening tool made up 32% of participants, with an additional 16% selecting a neutral position. As many as 45% of the participants appear to not be confident in their ability to properly administer a cognitive screening. In previous questions, 81% of the responding physical therapists agreed it was within the scope of practice and only 27% of the participants indicated they had not been trained to use cognitive screening tools. It appears training is not instilling confidence in all physical therapists to perform assumed tasks. Physical therapists uncomfortable treating patients with cognitive impairments made up 24% of participants. A group of physical therapists (26%) reported working with geriatric patients in less than half of their caseload, which may correlate with the 24% who are uncomfortable treating patients with cognitive impairment. It is possible that some physical therapists do not work with patients with cognitive impairments. With a basic physical therapy education plan, the ideal is that new graduates feel comfortable working with any population, but with the option of specialization and working with target populations, there will be some physical therapists more equipped to treat some populations than others. Of respondents, 52% agreed that cognitive impairment reduced treatment effectiveness. Physical therapists that received a doctoral degree were more likely to agree with this statement, while physical therapists with bachelor's and master's degrees were more likely to disagree or answer with a neutral position. Nearly all respondents (92%) agreed that cognitive impairment increased risk of falling. We expected this response as 95% of physical therapists selected cognition as a contributing factor to falling in question 8.

Service to Hearing Impaired and Attitudes

Hearing is important for communication, especially in a physical therapy clinic where communication is typically verbal and there are a variety of other noises and distractions. Also, with the relationship between hearing loss, fall risk, and cognition, it seems relevant that physical therapists know about patients' hearing loss. However, in practice, asking about hearing loss in case history is inconsistent with 60% reporting that hearing loss is not asked or only sometimes asked. Physical therapists were asked which health care professionals they would refer patients to for further hearing assessment. Almost 50% would refer to the primary care physician, 43% to an audiologist, and 8% to an SLP. Many full hearing assessments require the referral of a primary care physician, so it's important that physical therapists have open communication with the primary care provider and can direct patients with potential hearing loss towards a full hearing assessment. While only audiologists can perform a full hearing assessment, primary care physicians and SLPs can perform hearing screenings.

When physical therapists were asked about intentional changes to communication they make when dealing with a patient with hearing loss, a variety of different strategies were used. The question was previously created and used in a survey of palliative care workers (Smith et al., 2016), and the responses were broken down into recommended and non recommended strategies. In **Table 3** the responses of physical therapists are separated into recommended and non-recommended strategies. In addition to the options provided, three therapists said they will use their hand or an ASL interpreter to communicate with patients.

Table 3: Physical therapists were asked about changes they make to their communication when speaking with a patient with hearing loss. In the options provided to physical therapists, there were recommended and non-recommended strategies for communication. This table breaks down the strategies with the percentage of physical therapists that selected the option, values listed as % (n=). The total sample size for this question was 60.

Non-Recommended Strategies	Percentage	Recommended Strategies	Percentage
Shouting	1.7% (1)	Ensuring you are enunciating your words clearly	81.7% (49)
Raising my voice	63.3% (38)	Speaking slowly	81.7% (49)
Speaking in the patient's ear	38.3% (23)	Speaking in a low-pitched tone of voice	50% (30)
Speaking to the caregiver instead	48.3% (29)	Writing information	73.3% (44)
		Reducing extraneous sounds	66.7% (40)
		Closing the door to the room	55% (33)
		Facing the patient	90% (54)
		Making sure the patient is wearing hearing aids	88.3% (53)

In addition to intentionally changing communication, physical therapists were asked about their use of pocket talkers. Pocket talkers are a personal sound amplification device that helps amplify the desired sound source and reduce background noise (Marrone, 2012). They are ideal for one-on-one or small group settings and provide a communication solution at the moment. Three-fourths of physical therapists responded they do not use pocket talkers, or they are unfamiliar with the device. A pocket talker could be another way to improve communication between provider and patient with hearing loss, and could benefit a physical therapy clinic.

In questions 25-30, physical therapists were asked about their knowledge and beliefs about hearing loss (**Table 4**). When physical therapists were asked about treatment effectiveness, 47% of physical therapists agreed that hearing impairments decreased treatment effectiveness. One-third of physical therapists agreed that hearing loss negatively impacted the quality of care they provide, a third selected a neutral position and the following third disagreed with the statement. Hearing loss created communication problems during treatment according to 75% of respondents, while 15% took a neutral position, which could add up to 90% of physical therapists having communication problems with their patients with hearing loss. Physical therapists (90%) indicated they were comfortable with treating patients with hearing loss. It's important that physical therapists are not only comfortable but are still able to provide effective treatments and have positive communication interactions despite the presence of hearing loss.

Two thirds of physical therapists disagreed that hearing loss and cognitive ability may have a relationship, with an additional 15% selecting an unsure position. The majority of physical therapists in this study are unaware of the relationship between hearing loss and cognition. In the

survey, physical therapists were asked if they believed hearing loss can increase fall risk. This statement was disagreed on by 18%, with 30% taking an unsure position. Almost half of physical therapists are unaware of the relationship between hearing and fall risk. While physical therapists may not directly treat hearing and cognitive impairments, both hearing and cognition will impact the lives of their patients and their physical functioning. Hearing loss seems to be an area that needs more education regarding the impacts it could have on fall risk and cognition.

Table 4: Physical therapists were asked about beliefs and comfort with aspects of treatment associated with cognitive impairment and hearing loss. Participants were asked to rank how much they agreed or disagreed with a statement. Questions 17-20 were associated with cognition, while questions 25-30 are associated with hearing.

Values are listed as the whole group, % (n=).

Question	Extremely disagree or uncomfortable	Somewhat disagree or uncomfortable	Neither agree or disagree	Somewhat agree or comfortable	Extremely agree or comfortable
Question 17 (n=57): I am comfortable administering a cognitive screening assessment	18% (10)	14% (8)	16% (9)	42% (24)	11% (6)
Question 18 (n=61): I am comfortable	7% (4)	10% (6)	7% (4)	44% (27)	33% (20)

treating patients with cognitive impairments					
Question 19 (n=61) : Cognitive impairment decreases treatment effectiveness	10% (6)	20% (12)	18% (11)	39% (24)	13% (8)
Question 20 (n=61) (*): Cognitive impairment increases risk of falling	5% (3)	0% (0)	3% (2)	46% (28)	46% (28)
Question 25 (n=60): Hearing impairments decrease treatment effectiveness	12% (7)	12% (7)	30% (18)	42% (25)	5% (3)
Question 26 (n=59): Hearing loss negatively impacts the quality of care I can provide	5% (3)	26% (15)	37% (22)	32% (19)	0% (0)

Question 27 (n=60): Hearing loss creates communication problems during treatment.	0% (0)	10% (6)	15% (9)	57% (34)	18% (11)
Question 28 (n=60): I am comfortable treating patients with hearing loss.	2% (1)	2% (1)	8% (5)	38% (23)	50% (30)
Question 29 (n=60): Hearing ability is related to cognitive ability.	47% (28)	18% (11)	15% (9)	12% (7)	8% (5)
Question 30 (n=60): Hearing loss increases risk of falls.	5% (3)	13% (8)	30% (18)	40% (24)	12% (7)

Continuing Education

Respondents of the survey most often had attended professional development opportunities related to aging and fall risk, as well as general service to and issues associated with geriatric patients. At the end of the survey, physical therapists were asked about continuing education opportunities they were interested in attending. Physical therapists could select multiple

continuing education topics. Some of the topics listed were: aging and cognition, aging and hearing, fall risk and cognition, fall risk and hearing, service administration to patients with cognitive decline, service administration to patients with hearing loss. Topics related to cognition were selected by more physical therapists in each category in comparison to the hearing counterpart (**Table 5**).

Table 5: Physical therapists were asked about continuing education topics they would be interested in attending. Cognition and hearing were separated to compare differences in interest of cognition related topics and hearing related topics. The sample set for this question was 48 people. Values are listed as a % of the sample set, followed by actual value (n=).

Topic	Cognition	Hearing
Aging	60.4% (n=29)	37.5% (n=18)
Fall Risk	70.8% (n=34)	56.3% (n=27)
Service Administration	52.1% (n=25)	31.3% (n=15)

There seems to be a disconnect between the interest and knowledge of physical therapists. Treatment effectiveness and communication is impacted by hearing, as shown by respondents, and best practice communication strategies are not always used. The knowledge of the relationship between cognition and hearing and fall risk and hearing is not widely known among physical therapists. Pursuing additional education about the topic of hearing loss may not be of high priority. Part of this may come down to a large fraction of physical therapists feeling comfortable with hearing loss, but not being aware of better methods to communicate. If communication could be improved, treatment would likely be more effective.

Discussion:

Participant Characteristics

Three-fourths of the respondents had a doctorate degree as their highest level of education and over half described their job title as a DPT. Our finding differs from the national average of physical therapists as nationally the majority of physical therapists received a bachelor's as their highest level of education, with less than one-fourth of physical therapists being doctorate holders (Physical therapist demographics and statistics, 2022). There are more bachelor degree physical therapists than DPTs nationally, due to the change in licensure requirements in recent years. Over time, it will be expected that every physical therapist receives a DPT in order to practice. Compared to the national average, a greater number of survey respondents also have received additional certifications related to geriatric patients (Miles et al., 2019). Having a higher response rate from DPTs, doctorate holding physical therapists, and physical therapists with geriatric related certifications is similar to previous studies that focused on dementia and fall risk in home health (Miles et al., 2019). Our survey, like the Miles et al. (2019) survey, was sent to APTA Geriatric discussion boards, so physical therapists interested in fall risk, cognition and hearing topics may be more interested in responding.

The majority of respondents in our survey worked in outpatient clinics; however respondents do work in a variety of other settings including care more contained to hospitals or in home health. Nationally, most physical therapists work in outpatient clinics, followed by hospital or specialty clinics and home care (Physical therapist demographics and statistics, 2022). Workplace demographics were similar to Blackwood & Martin (2017), but only physical therapists from

Michigan were involved in the study, whereas the current survey would accept physical therapists from any state. In Miles et al. (2019) only home care physical therapists were surveyed.

The majority of physical therapists reported seeing patients longer than thirty minutes which is a trend seen in outpatient clinics, and was an expected result. Similar to Blackwood & Martin (2017), most physical therapists spent greater than 50% of their time with older adults. While physical therapists may see a wide range of age groups, it is likely physical therapists will work with older adults, especially as adults encounter more injuries or movement related issues.

In our survey, survey respondents' years of experience created an inverted u-shape, with the majority of respondents falling within the 0-5 year range or the greater than 15 range. There were an equal number of less than five years of experience physical therapists as there were greater than 15 years of experience physical therapists. Previous studies (Blackwood, 2017; Miles, 2019) had the majority of their respondents with over 15 years of experience as a physical therapist.

Fall Risk Assessment Factors and Tools

Any factors associated with walking and balance issues should be assessed and then addressed in order to prevent and rehabilitate patients from falling. Although physical therapists responded that there are a multitude of factors that impact walking and balancing issues, there is not the same emphasis of assessing all these factors in a fall risk assessment. Commonly used fall risk assessments do not typically have sections that involve cognition or sensory ability screening. In the future, especially with the knowledge of the impact cognitive decline (Chua, 2022;

Mirelman, 2012; Montero-Odasso, 2012) and hearing loss (Campos, 2018; Lin, 2012) on risk of falls, it would benefit the physical therapy community to create a fall risk assessment that takes into account these additional factors. The risk of falling is influenced by factors beyond human movement, so this should not be the only factor assessed in fall risk assessments.

In this survey, respondents were asked about which fall risk screening tool they used. The Timed Up and Go (TUG) was the most popular. While this test is reliable for correlating mobility and balance issues to fall risk, and is easy to administer with its simple and specific instructions, there is no insight into cognitive or hearing ability. In other studies (Blackwood & Martin, 2017), the fall risk assessment tools used by physical therapists were not specified. Fall risk could be exacerbated by cognitive decline and hearing loss. To get a full understanding of a patient's fall risk, physical therapists should pair a fall risk assessment with a cognitive screening tool each time.

Cognitive screening tools

Of physical therapist's screening for cognition, the most commonly used screening tools were the Mini-Cog and Mini Mental State Examination (MMSE), followed by the Montreal Cognitive Assessment (MoCA) and Saint Louis University Mental Status (SLUMS). As discussed in a previous study (Blackwood & Martin, 2017), the MMSE is designed to differentiate patients with dementia from their peers, but is not reliable in differentiating patients with other cognitive impairments. In an outpatient clinic, where most of the survey respondents worked, the presence of mild cognitive impairments may be more common than dementia alone, so it's critical to use tools that identify multiple cognitive impairments. Blackwood & Martin (2017) was preferential

to the use of the MoCA and SLUMS screening tools in physical therapy practices, as these have a lower cost to the user, standardized instructions publicly published, and are better at identifying patients with mild cognitive impairments. In the current study, there was a similar number of physical therapists indicating they used the MoCA and SLUMS tools compared to the previous study. While the Mini-Cog only takes 3-4 minutes to administer, which may be a reason it's often used by our respondents, it has not been approved to identify mild cognitive impairment. Instead the MoCA has been recommended to be used for identification of mild cognitive impairments (Carolan Doerflinger, 2013). When the MoCA was compared to the MMSE and the SLUMS test, the MoCA had better sensitivity, and was the test best able to identify a patient with mild cognitive impairments in a screening (Bachinskaya, & Muller, 2016). Because of these factors, it may be in physical therapy clinics best interest to pursue training in using the MoCA tool. Also, this is meaningful information for educators, as providing education on the use of this tool in DPT programs may increase usage in practice. More doctorate-holding physical therapists reported learning the purpose and use of cognitive screening tools in school, so it's essential that skills taught in DPT programs translate to practice.

Knowledge and attitudes toward cognition

Throughout the survey, physical therapists agreed cognition was a contributing factor to falls, and cognitive screening was within the scope of practice. Yet, one third of participants reported they did not feel comfortable administering screening assessments, and over half believed cognitive impairment was detrimental to treatment effectiveness. Similar questions were asked in Miles et al. (2019). In the current survey, there was a greater percentage of physical therapists that agreed cognition negatively impacted treatment effectiveness than in Miles et al. (2019). The

percentage of physical therapists who answered neutrally to the question was slightly less in the current study in comparison to the previous study. While the majority of physical therapists in our study indicated they were comfortable treating patients with cognitive impairments, they appear to believe their treatment will not be as successful. In Longhorn et al. (2020), physical therapy treatment resulted in improved physical functioning and cognitive abilities. Not only does this show physical therapy can be successful in the presence of a cognitive impairment, but fall risk can be mitigated and further cognitive decline diminished. Knowing the presence of a cognitive impairment should impact the individual treatment plan, but not the success of treatment. Physical therapists need to know how to screen for cognitive decline and then alter treatment in the presence of a cognitive impairment. Negative mindsets need to be changed so as not to hinder progress of rehabilitation. Education can have an influence on confidence and attitudes when treating patients with cognitive impairments (Staples & Killian, 2012). Addressing some of the negative mindsets and lack of confidence with administering cognition screenings in physical therapy programs, and working to overcome this, could result in better treatment for patients in the future.

Communication and treatment of patients with hearing loss

To our knowledge, this is the first survey to examine physical therapist's comfort with issues and specific changes physical therapists make to communicate with patients with hearing loss.

Within practice there is inconsistency asking about the presence of hearing loss. It may not always be obvious to the physical therapist if a patient has hearing loss, but its presence could have communication and fall risk implications.

The majority of physical therapists reported feeling comfortable treating patients with hearing loss, although hearing loss appears to be a challenge during treatment. Almost half of physical therapists believed hearing loss decreased treatment effectiveness, and an overwhelming majority (75%) agreed it created communication problems. Many of the survey questions about physical therapist's experience with hearing loss and knowledge of additional communication strategies were inspired by Smith et al. (2016). In Smith et al. (2016), palliative care workers were surveyed on their knowledge. Similar to our study, palliative care workers selected they were comfortable caring for patients with hearing loss, but frequently experienced communication breakdowns. When palliative care workers were asked about communication problems created by hearing loss, slightly more participants agreed to have experienced them (88%). Being able to overcome this barrier is necessary to provide the best treatment for patients, requires some knowledge of alternative communication strategies and tools.

When a patient has hearing loss, there are some communication strategies that are recommended (Smith et al., 2016), which help the patient understand or allow the patient to use multiple cues to create meaning. Recommended strategies are used the majority of the time, yet some physical therapists may opt to raise their voice or speak to the caregiver instead. Raising one's voice may not always overcome deficits in hearing, and the presence of high frequency sounds in our voice may not be heard by those with high frequency hearing loss, regardless of a loudness increase. Speaking to the caregiver instead can make patient's feel isolated and dependent, and may not result in a positively perceived interaction by the patient. Further recommendations included always facing patients with hearing loss, talking in a slightly elevated voice but not shout, and presenting information slowly and clearly. Stevens et al. (2019) recommended appropriate one-

on-one communication to be modeled for providers, so providers have a better understanding of the way they are perceived by patients. Using multiple strategies at once, can create better understanding and better perceived care (Stevens et al., 2019). Positive interactions create buy-in by the patient, and can lead to better treatment outcomes (Ambady et al., 2002).

One solution to communication breakdowns caused by hearing loss are pocket talkers. These handheld devices can isolate desired sound information, and transmit it through headphones to the patient. During a communication breakdown, pocket talkers may provide a quick fix. Pocket talkers appear to not be used in practice, unused by 35% of physical therapists, and the tool's existence unknown by 40% of physical therapists. Fewer palliative care workers were unaware or did not use the device (Smith et al., 2016). Teaching physical therapists about these electronic devices may encourage use in practice and provide another communication option in the presence of hearing loss.

Knowledge of relationship between hearing, cognition and fall risk

To our knowledge, this is the first survey to examine knowledge of the relationship between hearing loss and cognition and fall risk. Knowledge of the relationship between hearing and cognition, and hearing and fall risk was not common among participants. A majority of physical therapists (65%) disagreed that cognition and hearing abilities are related, with another 15% responding with a neutral position. Just over half agreed hearing loss can increase fall risk, and 30% responded with a neutral position. A previous study (Pichora-Fuller et al., 2015) correlated hearing loss with an increased cognitive age, and greater risk for cognitive impairment. Hearing loss was correlated with an increased self-report of falls (Lin & Ferrucci, 2012). Campos et al.

(2018) found that sounds can create a stabilizing effect, and helps people understand where they are in an environment. With high frequency hearing loss, the hearing loss common among older adults, high frequency sound cues are missed, which may make it more difficult to understand in a dynamic environment. Hearing can also become more effortful for people with hearing loss, so when people attempt to perform multiple tasks, hearing and walking, performance in one or both of the activities may decline (Campos et al., 2018). In this scenario, important auditory input may be missed, or focus on mobility is decreased, which could lead to a fall. More bachelor's and master's holding physical therapists thought hearing was an important factor to consider in a fall risk assessment in comparison to doctorate holding physical therapists. Based on these responses, hearing loss and its association with increased fall risk and cognitive decline may not be taught in DPT programs, but instead is learned through experience.

Research shows there is an association between hearing loss, cognition and fall risk (Campos, 2018; Sakurai, 2022), and that positive communication creates better treatment outcomes (Ambady et al., 2002). Our survey suggests that physical therapists, while comfortable treating patients with hearing loss, may not have the skills to fully overcome communication barriers, and are not aware of relationships with cognition and fall risk. Topics related to hearing loss may be an area DPT programs are lacking in material. Educators may want to know these trends, so when building lesson plans, more information on hearing loss and its effects can be added.

Continuing Education

With an aging population, issues associated with aging will become more prevalent. People with hearing loss have reported experiencing less independence in their homes and mobility difficulties (Campos et al., 2018). Cognitive decline and hearing loss can cause social isolation; not engaging in social and sensory activities can promote further decline in both cognition and hearing (Campos, 2018; Pichora-Fuller, 2015). Having balance and walking issues, or a fear of falling, can create a physical barrier from social participation, making people more homebound. Knowledge of the interconnected relationship between cognition, hearing and fall risk, may help physical therapists understand the challenges of older adults, and treat physical issues, so as to not further hinder social participation. It's optimal that physical therapists are prepared to work with issues, like cognition and hearing, which may affect mobility and independence. From the respondents, it is evident there is a desire to seek more information about the relationship between cognition and fall risk. However, there was not the same interest in pursuing continuing education opportunities focused on hearing loss. Creating awareness of issues associated with hearing loss, like an increased risk of falls and cognitive decline, may spark physical therapists' interest in learning more about how they may address these issues. These are issues that physical therapists in the survey have shown are within scope of physical therapy practice. Also, if continuing education opportunities provided physical therapists skills and tools to overcome communication disconnects, then it could assist in making treatment more successful for patients with hearing loss.

Limitations

This survey is not able to determine statistical significance of responses based on education received due to small numbers of respondents with bachelor's and master's degrees. Overall there was not a high survey response, which limits the validity of any trends or relationships. Also, many respondents had additional certifications related to geriatric health, which is not similar to the national population of physical therapists. The survey was posted to many discussion boards related to geriatric health, which would account for the higher rate of geriatric health interested physical therapists. If the study were to continue, the survey would need to also be spread beyond geriatric focused circles. In the future, it would be necessary to recruit more survey respondents in order to see if education, or experience, has a greater impact on knowledge of fall risk and its association with cognitive decline and hearing loss.

Conclusion

The aim of this study was to examine the confidence and competence of physical therapists related to fall risk and the addition of exacerbating issues, cognitive decline and hearing loss. Trends about physical therapists' knowledge and comfort were identified. Physical therapists are focused on body mechanics during a fall risk assessment. Screening for cognition in a fall risk assessment is inconsistent, although not absent in all cases. Physical therapists do not seem to be fully confident in skills to screen for cognition or treat patients with cognitive decline. Hearing loss seems to be an area physical therapists need further education. They report feeling comfortable treating patients with hearing loss, but experience many communication breakdowns. Also, the majority do not know relationships between hearing and cognition and hearing and fall risk. Additional education may be needed about cognition, and especially

hearing. University training programs may want to add information and teach skills related to treating patients with cognitive decline and hearing loss.

Creating an educational module specifically for physical therapists about the basics of hearing loss and its effects- including relationship to cognition and falls and impact on communication- may provide service benefits in practice. For example, it should teach physical therapists to read an audiogram and have an understanding of sounds that may be missed by older patients with high frequency hearing loss. Across the lifespan, hearing changes in a predictable manner. Understanding some of the expected changes, and their resulting audiograms, could prepare physical therapists to have some expectations for hearing when working with patients, young or old.

Physical therapists should have some training on appropriate communication strategies when working with patients with hearing loss. This could help physical therapists understand the benefit of talking in a low tone of voice and adding visual cues when communicating with patients with hearing loss. Having handouts to give to patients with basic directions on how to perform popular exercises or use equipment can provide visual cues to patients when auditory information is not understood. Patients with or without hearing loss can reap the benefits of visual information, and is a tool physical therapists should consider always using.

Another topic may be communication devices that can assist physical therapists. Here physical therapists may learn about devices that alter signal-to-noise ratio, like the pocket talker, and benefit the listener. Having some basic knowledge of hearing aids- function, placement in ear,

volume control- could provide benefits to physical therapists, especially when they deal with patients who use hearing aids. There are also additional communication tools, like induction loops, that could be installed in healthcare settings, which transmit an electromagnetic signal straight to patients hearing aids. This will provide physical therapists knowledge of more tools which may assist them in providing effective treatment. Having specific training on best methods of communication and additional tools to use when dealing with patients with hearing loss could potentially boost confidence to overcome communication breakdowns. In turn, reducing negative feelings about treatment effectiveness in the presence of hearing loss.

References

- Ambady, N., Koo, J., Rosenthal, R., & Winograd, C. H. (2002). Physical therapists' nonverbal communication predicts geriatric patients' health outcomes. *Psychology and Aging, 17*(3), 443. <https://doi.org/10.1037//0882-7974.17.3.443>
- American Physical Therapy Association. (2017, September 13). *Physical therapist's scope of practice*. APTA. Retrieved February 23, 2023, from <https://www.apta.org/apta-and-you/leadership-and-governance/policies/position-scope-of-practice>
- Bachinskaya, L., & Muller, A. (2016). "Comparison of four cognitive screening tools: Clinical utility in a skilled nursing setting and relationship to discharge location." *School of Occupational Master's Capstone Projects. 5*.
http://soundideas.pugetsound.edu/ot_capstone/5
- Blackwood, J., & Martin, A. (2017). Screening for cognitive impairment as a part of falls risk assessment in physical therapist practice. *Journal of Geriatric Physical Therapy, 40*(4), 197-203. <https://doi.org/10.1519/JPT.0000000000000098>
- Carolan Doerflinger, D. M. (2019). *Mental status assessment of older adults: The Mini-Cog™*. Try this general assessment series. <https://hign.org/consultgeri/try-this-series/mental-status-assessment-older-adults-mini-cog>
- Chang, J. E., Weinstein, B. E., Chodosh, J., Greene, J., & Blustein, J. (2019). Difficulty hearing is associated with low levels of patient activation. *Journal of the American Geriatrics Society, 67*(7), 1423-1429. <https://doi.org/10.1111/jgs.15833>
- Chua, K. W. D., Fauble, B. M., & Gans, R. E. (2022). Association of cognitive impairment and fall risk in older adults: A prospective cross-sectional analytical study. *Journal of Otolaryngology-ENT Research, 14*(1), 8-12.
<https://doi.org/10.15406/joentr.2022.14.00497>

- Campos, J., Ramkhalawansingh, R., & Pichora-Fuller, M. K. (2018). Hearing, self-motion perception, mobility, and aging. *Hearing Research*, 369, 42-55.
<https://doi.org/10.1016/j.heares.2018.03.025>
- Lin, F. R., & Ferrucci, L. (2012). Hearing loss and falls among older adults in the United States. *Archives of Internal Medicine*, 172(4), 369-371.
<https://doi.org/10.1001/archinternmed.2011.728>
- Longhurst, J., Phan, J., Chen, E., Jackson, S., & Landers, M. R. (2020). Physical Therapy for gait, balance, and cognition in individuals with cognitive impairment: A retrospective analysis. *Rehabilitation Research and Practice*, 2020, Article ID 8861004.
<https://doi.org/10.1155/2020/8861004>
- Marrone, N. (2012, November 12). What is a pocketalker ®?. *Continued*. Retrieved March 13, 2023, from <https://www.speechpathology.com/ask-the-experts/what-is-a-pocketalker-2074>
- Miles, J. D., Staples, W. H., & Lee, D. J. (2019). Attitudes about cognitive screening: A survey of home care physical therapists. *Journal of Geriatric Physical Therapy*, 42(4), 294-303.
<https://doi.org/10.1519/jpt.0000000000000179>
- Mirelman, A., Herman, T., Brozgol, M., Dorfman, M., Sprecher, E., Schweiger, A., Gilaldi, N., & Hausdorff, J. M. (2012). Executive function and falls in older adults: New findings from a five-year prospective study link fall risk to cognition. *PloS one*, 7(6), e40297.
- Montero-Odasso, M., Verghese, J., Beauchet, O., & Hausdorff, J. M. (2012). Gait and cognition: A complementary approach to understanding brain function and the risk of falling. *Journal of the American Geriatrics Society*, 60(11), 2127-2136.
<https://doi.org/10.1111/j.1532-5415.2012.04209.x>

Physical therapist demographics and statistics [2023]: Number of physical therapists in the US.

(2022, September 09). Zippia. Retrieved March 13, 2023, from

<https://www.zippia.com/physical-therapist-jobs/demographics/>

Pichora-Fuller, M. K., Mick, P., & Reed, M. (2015, August). Hearing, cognition, and healthy aging: Social and public health implications of the links between age-related declines in hearing and cognition. *Seminars in Hearing, 36*(3), 122-139. <http://dx.doi.org/10.1055/s-0035-1555116>

Rossi-Katz, J., & Arehart, K. H. (2011). Survey of audiologic service provision to older adults with cochlear implants. *American Journal of Audiology, 20*(2), 84-89. [https://doi.org/10.1044/1059-0889\(2011/10-0044\)](https://doi.org/10.1044/1059-0889(2011/10-0044))

Sakurai, R., Kawai, H., Yanai, S., Suzuki, H., Ogawa, S., Hirano, H., Ihara, K., Takahashi, M., Kim, H., Obuchi, S., & Fujiwara, Y. (2022). Gait and age-related hearing loss interactions on global cognition and falls. *The Laryngoscope, 132*(4), 857-863. <https://doi.org/10.1002/lary.29898>

Smith, A. K., Ritchie, C. S., & Wallhagen, M. L. (2016). Hearing loss in hospice and palliative care: A national survey of providers. *Journal of Pain and Symptom Management, 52*(2), 254-258. <https://doi.org/10.1016/j.jpainsymman.2016.02.007>

Staples, W. H., & Killian, C. B. (2012). Education affects attitudes of physical therapy providers toward people with dementia. *Educational Gerontology, 38*(5), 350-361. <https://doi.org/10.1080/03601277.2010.544605>

Stevens, M. N., Dubno, J. R., Wallhagen, M. I., & Tucci, D. L. (2019). Communication and healthcare: self-reports of people with hearing loss in primary care settings. *Clinical Gerontologist, 42*(5), 485-494. <https://doi.org/10.1080/07317115.2018.1453908>

Tinetti, M. E. (1994). Prevention of falls and fall injuries in elderly persons: A research agenda.

Preventive Medicine, 23(5), 756-762. <https://doi.org/10.1006/pmed.1994.1130>

Appendix 1

1. Which of the following best describes your job title?
 - Physical Therapist, PT
 - Physical Therapist, DPT
 - Physical Therapy Assistant, PTA
 - None of the above

2. What is your highest level of education?
 - High School
 - Associate Degree
 - Bachelor Degree
 - Masters Degree
 - Doctorate

3. What specialization certifications do you have related to geriatric health?
 - Geriatric Certified Specialist (GCS)
 - Certification as an Exercise Expert for Aging Adults (CEEAA)
 - Lee Silverman Voice Treatment (LVST LOUD)
 - Certificate OASIS Specialist-Clinical
 - Other:

4. Which of the following best describes your place of employment?
 - Acute Care
 - Subacute Care
 - Sports Medicine Facility
 - Outpatient
 - Home Care
 - Academic Institution
 - Wellness
 - Skilled Nursing/Long Term Care Facility
 - Other:

5. How many years have you been a licensed specialist?
 - 0-5
 - 6-10
 - 11-15
 - greater than 15

6. What is the average appointment time allotted for an individual patient each day?
 - 0-15 min
 - 16-30 min
 - 31-45 min
 - 46-60 min
 - greater than 61 min

7. What percentage of patients do you see on a monthly basis that are over the age of 65?
- 0-10%
 - 11-20%
 - 21-30%
 - 31-40%
 - 41-50%
 - 51-60%
 - 61-70%
 - 71-80%
 - 81-90%
 - 91-100%
8. Which of the following would you consider to be factors associated with walking and balance issues? Select all that apply.
- Musculoskeletal
 - Proprioceptive
 - Vestibular
 - Cardiac
 - Vision
 - Hearing
 - Cognition
 - Age
 - Other:
9. Do you perform fall risk assessments?
- Yes
 - No
10. Which fall assessment tool do you most often use?
- Timed Up and Go (TUG)
 - Four Square Step Test
 - 30 Second Chair Stand
 - 4 Stage Balance Test
 - Berg Balance Test
 - Tinetti Performance Oriented Mobility Assessment (POMA)
 - Other:
11. Which factors do you think are the most important to assess in a fall risk assessment? Select all that apply.
- Musculoskeletal
 - Proprioceptive
 - Vestibular

- Cardiac
- Vision
- Hearing
- Cognition
- Age
- Other:

12. Which of the following health care specialists would you expect to assess cognition?

Select all that apply.

- Audiologist
- Neurologist
- Primary Care Physician
- Psychologist
- Speech-Language Pathologist
- Physical Therapist
- Occupational Therapist
- Nurse
- Other:
- None of the above

13. Do you feel that cognitive screening is within the scope of practice for physical therapists?

- Yes
- Unsure
- No

14. Have you received formal education on the purpose and use of cognitive screening tools?

- Yes, in school
- Yes, in professional development opportunities
- Yes, in school and professional development opportunities
- No

15. In what context would you use a cognitive screening tool? Select all that apply.

- Generate objective data
- Suspected cognitive impairment
- Fall risk assessment
- Other:
- None of the above

16. What cognitive screening tool do you use most often?

- MMSE
- Trail Making Test A and/or B
- SLUMS

- Mini-Cog
- Montreal Cognitive Assessment
- Clock Drawing Test
- Cognitive Abilities Screening Instrument (CASI)
- Other:

17. To what degree do you agree with this statement: I am comfortable administering a cognitive screening test.

- Extremely uncomfortable
- Somewhat uncomfortable
- Neither comfortable nor uncomfortable
- Somewhat comfortable
- Extremely comfortable

18. To what degree do you agree with this statement: I am comfortable treating patients with cognitive impairments.

- Extremely uncomfortable
- Somewhat uncomfortable
- Neither comfortable nor uncomfortable
- Somewhat comfortable
- Extremely comfortable

19. To what degree do you agree with this statement: Cognitive impairment decreases treatment effectiveness.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

20. To what degree do you agree with this statement: Cognitive impairment increases risk of falling.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

21. Is hearing loss asked about in your case history?

- All the time
- Sometimes
- None of the time

22. If you suspect a patient has a hearing loss, who do you refer them to for further assessment?
- Audiologist
 - Speech-Language pathologist
 - Primary care physician
 - Occupational therapist
 - Other:
 - I do not make a referral
23. When you know that a patient has hearing loss, what strategies do you use to communicate with patients with hearing loss? Select all that apply.
- Shouting
 - Raising my voice
 - Speaking in the patient's ear
 - Ensuring you are enunciating your words clearly
 - Speaking slowly
 - Speaking in a low pitched tone of voice
 - Writing information
 - Speaking to the caregiver
 - Reducing extraneous sounds
 - Closing door to the room
 - Facing the patient
 - Making sure patient is wearing hearing aids if they have them
 - Other:
 - None
24. Do you use a pocket talker when working with patients with hearing loss?
- All the time
 - Sometimes
 - None of the time
 - Unsure what a pocket talker is
25. To what degree do you agree with this statement: Hearing impairments decrease treatment effectiveness.
- Strongly disagree
 - Somewhat disagree
 - Neither agree nor disagree
 - Somewhat agree
 - Strongly agree
26. To what degree do you agree with this statement: Hearing loss negatively impacts the quality of care I can provide.

- Extremely negative
- Somewhat negative
- Neither positive nor negative
- Somewhat positive
- Extremely positive

27. To what degree do you agree with this statement: Hearing loss creates communication problems during treatment.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

28. To what degree do you agree with this statement: I am comfortable treating patients with hearing loss.

- Extremely uncomfortable
- Somewhat uncomfortable
- Neither comfortable nor uncomfortable
- Somewhat comfortable
- Extremely comfortable

29. To what degree do you agree with this statement: Hearing ability is related to cognitive ability.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

30. To what degree do you agree with this statement: Hearing loss increases risk of falling.

- Strongly disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

31. Have you attended any professional development opportunities related to the following topics? Select all that apply.

- Aging and Fall Risk Assessment
- Aging and Cognition
- Aging and Hearing Loss

- Cognition and Fall Risk
- Hearing and Fall Risk
- Service to patients with cognitive impairment
- Service to patients with hearing loss
- Service administration to geriatric patients
- General issues related to geriatric patients
- Other:
- None of the above

32. Would you be interested in attending professional development opportunities related to the following topics? Select all that apply.

- Aging and Fall Risk Assessment
- Aging and Cognition
- Aging and Hearing Loss
- Cognition and Fall Risk
- Hearing and Fall Risk
- Service administration to patients with cognitive impairment
- Service administration to patients with hearing loss
- Service administration to geriatric patients
- General issues related to geriatric patients
- Other:
- None of the above