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Abstract

Purpose: Vestibular/balance screeners can improve the efficiency of the diagnostic process. Despite prior literature illustrating the importance of screeners, research suggests that many professionals do not utilize screening protocols. **Methods:** Thirty-two audiologists and thirty-four physical therapists completed an electronic survey with questions regarding the use of screeners and the referral process. The survey examined variables surrounding the use of vestibular/balance screeners among audiologists and physical therapists, including frequency of use, commonly used screeners, and factors affecting the use or non-use of screeners. **Results:** Physical therapists utilized vestibular/balance screeners statistically more often and used a larger variety of screeners compared to audiologists. The most commonly reported factors for not using screeners were lack of time, training, and reimbursement. **Conclusions:** This study highlights the importance of screener training for both audiologists and physical therapists. With increased interdisciplinary interaction and screener use, accurate diagnoses and referrals can be made sooner in order to create treatment plans for patients with vestibular/balance disorders.

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Purpose: Vestibular/balance screeners can improve the efficiency of the diagnostic process. Despite prior literature illustrating the importance of screeners, research suggests that many professionals do not utilize screening protocols. **Methods:** Thirty-two audiologists and thirty-four physical therapists completed an electronic survey with questions regarding the use of screeners and the referral process. The survey examined variables surrounding the use of vestibular/balance screeners among audiologists and physical therapists, including frequency of use, commonly used screeners, and factors affecting the use or non-use of screeners. **Results:** Physical therapists utilized vestibular/balance screeners statistically more often and used a larger variety of screeners compared to audiologists. The most commonly reported factors for not using screeners were lack of time, training, and reimbursement. **Conclusions:** This study highlights the importance of screener training for both audiologists and physical therapists. With increased interdisciplinary interaction and screener use, accurate diagnoses and referrals can be made sooner in order to create treatment plans for patients with vestibular/balance disorders.

Keywords: audiologist, physical therapist, vestibular screener, balance screener, referral

INTRODUCTION

Balance is largely mediated by three major systems within the body: the visual system, the proprioceptive/somatosensory system, and the vestibular system.¹ When these systems work as they should, balance requires little thought. However, when a problem occurs in one or more of these systems, patients often report significant dizziness and disruption in quality of life. The visual system contributes to balance by measuring the orientation of the eyes and head relative to surrounding objects.¹ The visual system also allows a target to remain in focus when the head is static or in motion. The vestibulo-ocular reflex (VOR) is a reflexive eye movement caused by head movement detected by the vestibular system. This reflex is transient and is required for clear vision during head turns, but also during unstable activities such as walking or running.¹ The visual system also allows for balance adaptation by assessing the surrounding environment and its changes.¹

The proprioceptive/somatosensory system provides information regarding the orientation of the body parts relative to each other, the support surface, and gravity.¹ It permits the orientation and stability of the body during static and dynamic activities, such as a head turn or body movement.² Changes in proprioception in the lower limbs, such as those that may be seen with increased age, have a significant impact on an individual's movement and balance, contributing to the high incidence of falls in the elderly.³

The vestibular system measures linear, gravitational, and angular accelerations of the head. It can be divided into the peripheral and central vestibular systems. Within the peripheral vestibular system are the semicircular canals, the otolithic organs, and the vestibular portion of cranial nerve VIII.¹ The central vestibular systems consist of four vestibular nuclei structures (superior, inferior, lateral, and medial), the cerebellum, the reticular formation, and thalamocortical projections.¹

Because of the number of body systems involved in maintaining balance, the assessment and management of patients complaining of vertigo, dizziness, or imbalance often include several healthcare professionals from various disciplines. Audiologists and physical therapists are two of the healthcare professionals commonly engaged in care for individuals presenting with these complaints. Therefore, the present study focuses on these two professions. Both audiologists and physical therapists hold the qualifications to assess and manage patients with vestibular/balance disorders. The role of the audiologist in the diagnosis and management of vestibular disorders has been well documented in the scope of practice statements from both the American Academy of Audiology (AAA) and American Speech-Language-Hearing Association (ASHA).^{4,5} Both organizations state that an audiologist is qualified to assess vestibular function, as well as non-medically treat or manage vestibular disorders. Similarly, the American Physical Therapy Association (APTA) states that vestibular assessment and management is well within the scope of practice for physical therapists.⁶ As such, both groups of healthcare professionals are able to utilize screeners or diagnostic assessments with the purpose of identifying both the presence and site of lesion of vestibular dysfunction.⁷ These clinicians are also able to obtain a vestibular-specific case history in order to establish if a patient's symptoms are consistent with a vestibular disorder, which in turn helps determine the vestibular test battery. The treatment or management role of audiologists and physical therapists in patients with vestibular/balance dysfunction often includes the implementation of a vestibular rehabilitation plan. The vestibular rehabilitation plan is determined by the patient's symptoms, impairments, and limitations, so an audiologist or physical therapist must conduct a comprehensive assessment to establish an individualized rehabilitation plan.⁷ This assessment aids in determining a diagnosis in order to create a problem list, identifying appropriate treatment options, and predicting the outcomes of rehabilitation. Due to the various causes of vertigo, dizziness, or imbalance, an interdisciplinary approach is vital in assessing and managing vestibular/balance disorders.

Due to the relatively high incidence of dizziness in the population and the significant impact it can have on quality of life, accurate diagnosis is paramount.⁸⁻¹¹ Accurate referral and diagnosis can be aided with the use of vestibular and balance screening tools. Screeners can potentially be used to determine the need for referrals or scheduling for further diagnostic measures and can aid in more accurate and efficient diagnosis of vestibular or balance disorders.¹² Additionally, they are generally quick to administer, use little to no equipment, and require minimal staff training on the use and interpretation.¹²⁻¹⁴ Results from screening measures could potentially prevent further unnecessary tests and clinic visits in order to diagnose a vestibular or balance disorder. Gordon et al¹⁵ identified that 191 patients referred to neurologists for a dizziness evaluation never received a Dix-Hallpike maneuver, which is performed for the diagnosis of BPPV. Li et al¹⁶ found that, on average, a patient with BPPV saw almost four physicians prior to receiving an accurate diagnosis and canalith repositioning treatment. If vestibular/balance screeners were used earlier and more often, it could help prevent underdiagnosis and improve the efficiency of healthcare visits. Proper use of screeners could improve a patient's healthcare experience and would likely show an economic advantage with the decrease in unnecessary tests. Vestibular screenings can also assist in identifying individuals at risk for falls.¹⁷ Agrawal et al¹⁸ took a cross-sectional look at the NHANES which resulted in 5,086 participants that had balance testing performed from 2001-2004. Findings revealed that individuals with vestibular dysfunction were 12 times more likely to fall when compared to individuals without vestibular dysfunction. Individuals without complaints of dizziness that showed abnormal results on postural assessments were also at an increased risk of falling.

These findings suggest that vestibular screening and assessments could detect an individual at risk of falls, even in those lacking vestibular symptoms, which could ultimately reduce the likelihood of future fall-related injuries and deaths.

Vestibular/balance screeners can measure the function of the balance/proprioception system, the visuo-vestibular system (as assessed through VOR function), and the vestibular system. Although not classified as vestibular/balance screening measures, quality of life questionnaires represent subjective patient responses that functional screeners cannot assess, whereas functional screeners allow for quick, objective assessments that give more insight into a patient's impairment by systematically evaluating different components of the balance system.

Factors Affecting Use of Vestibular Screening Measures

Although vestibular and balance screeners are generally easy to administer, they are not always performed for a number of reasons.¹²⁻¹⁴ Polensek et al¹⁹ interviewed five PCPs, two emergency medicine physicians, four neurologists, three ENTs, and four audiologists to qualitatively measure the clinicians' experiences, attitudes, and perceptions towards evaluating and treating patients with vestibular impairment. Results indicated that, when it came to performing vestibular and/or balance screeners, most providers did not know any bedside examinations besides looking for nystagmus or performing the Dix-Hallpike.

The clinicians reported that one major barrier to providing care to patients with vestibular impairment included a lack of education or knowledge, with providers reporting that they had not received adequate training. Other barriers reported were time constraints, difficulty interpreting examination results, lack of diagnostic equipment, lack of exposure to dizzy patients, and problems communicating between medical specialties. Although an older study with a lower number of participants, Polensek et al¹⁹ provides meaningful information regarding vestibular/balance screener use and barriers to seeing dizzy patients in various health professionals. However, only four audiologists were interviewed, and PTs were not included at all. Additional studies examining use among these professionals are, to our knowledge, sparse. Therefore, the present study aims to provide updated information on a larger scale that further explores vestibular/screener knowledge and use in both audiologists and physical therapists.

Present Study

While there are many screening tools available for patients complaining of vertigo, dizziness, and/or imbalance, there is minimal current research regarding the prevalence of use and factors affecting the use of these measures among clinicians working closely with these patients. Therefore, the purpose of the present study was to explore the prevalence of vestibular and/or balance screening measure use in both audiologists and physical therapists, which screeners are being used, and which factors are affecting use or non-use of vestibular and balance screeners among clinicians.

Research Questions

The following research questions were proposed:

(1) How often are audiologists compared to physical therapists conducting vestibular/balance screenings when assessing a patient whose primary or secondary complaint is dizziness/vertigo, or while assessing progress through a rehabilitative program?, (2) What screening measures are most frequently used among audiologists and physical therapists?, (3) What factors affect the use or non-use of vestibular and/or balance screening measures for patients that are reporting vertigo, dizziness, or imbalance?, (4) How often are audiologists compared to physical therapists conducting vestibular/dizziness quality of life questionnaires and which questionnaires are most commonly given?

Based on previous research, it was hypothesized that both audiologists and physical therapists will rarely conduct vestibular or balance screening measures when assessing a patient reporting vertigo, dizziness, or imbalance, but that audiologists would report performing screeners more often than physical therapists.¹⁹ For those audiologists and physical therapists who reported conducting screening measures, it was predicted that the tandem walk, mCTSIB, gaze-evoked nystagmus, HIT, and Dix Hallpike would be most often performed due to the sensitivity and specificity of each screener based on prior literature and physician reports from Polensek et al.^{12,14,19,20-22} It was further hypothesized that lack of time, training, and experience would be the most common reasons as to why audiologists and physical therapists do not perform screening measures on patients complaining of dizziness, similar to the findings of Polensek et al.¹⁹

METHODS

Survey Procedure

An electronic survey (Appendix A) was distributed to both audiologists and physical therapists via Qualtrics through professional organizations, social media sites, and direct email to obtain information regarding general use of vestibular and/or balance screening measures, including frequency of use, types of measures utilized, and factors affecting use of screeners. Questions on this survey included demographic information, as well as topics regarding how often vestibular and balance screeners are being

used, which screeners are being used, reasons why screeners are not being used, how often vestibular/dizziness quality of life questionnaires are given, which questionnaires are used, how often referrals for vertigo/dizziness are received and provided, from whom they are received and to whom they are provided. Responses on the survey included Likert-scale, check box, and open-ended short-answer. Likert-scale questions were assigned a numerical value (never = 1, almost never = 2, sometimes = 3, almost always = 4, always = 5). Institutional Review Board (IRB) approval through the University of South Alabama was received for the present study.

Participants

Participants included 81 audiologists (AUD) and physical therapists (PT). However, 15 individuals (12 AUDs and 3 PTs) were excluded in analysis because they did not complete the survey or did not see vestibular patients. A total of 32 AUDs and 34 PTs, totaling 66 healthcare professionals, completed the survey. Responses on this survey spanned across the United States, with PT respondents representing 11 states and AUD respondents representing 19 states and South Africa. The majority of AUDs earned the Au.D. degree (n = 28), while the majority of PTs earned the DPT degree (n = 22) (Table 1). Six (19%) AUDs and 18 (53%) PTs obtained specialized training in vestibular assessment and/or treatment beyond their academic curriculum. The majority of respondents (n = 37) were early career professionals with 10 years of clinical experience or less (Figure 1).

Table 1. Highest Education Level of PT and AUD respondents

| Occupation | Highest Education Level | n |
|------------|--------------------------|----|
| PT | B.S./B.A. | 2 |
| | M.S. in Physical Therapy | 9 |
| | DPT | 22 |
| | DScPT | 1 |
| AUD | M.S. in Audiology | 2 |
| | Au.D. | 28 |
| | Ph.D. | 2 |

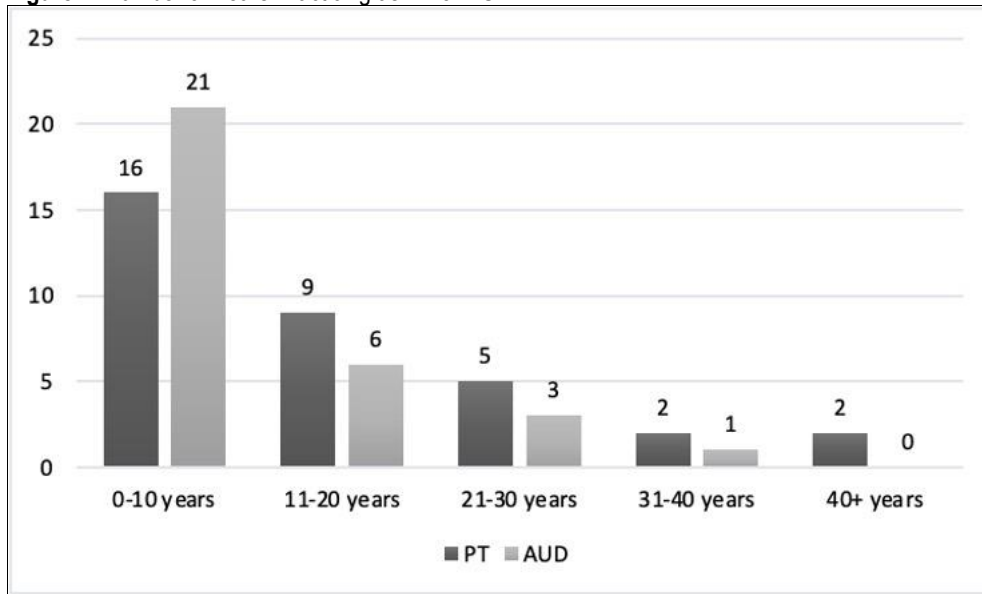
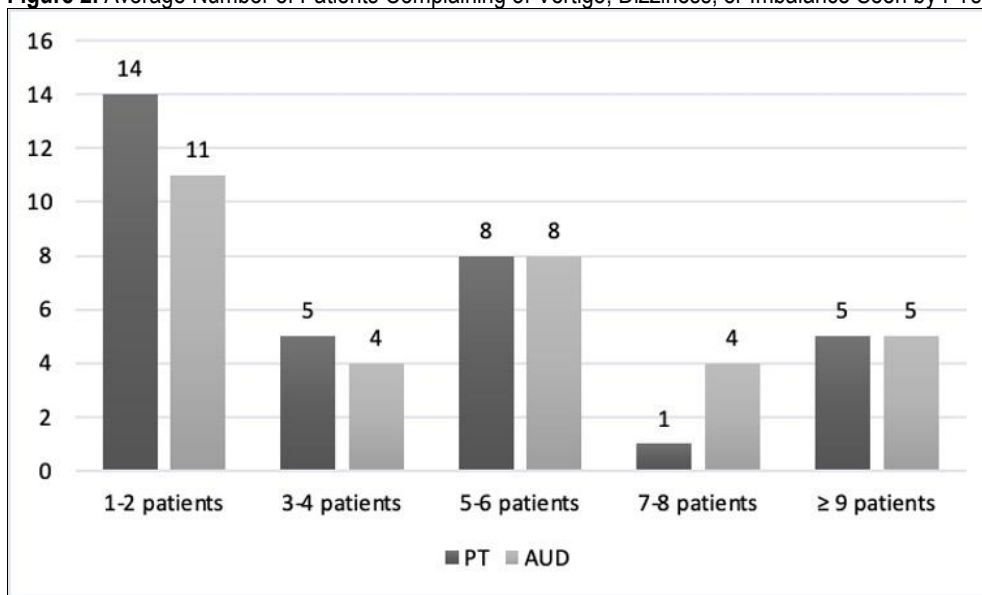
Reported work settings for PTs and AUDs are shown in Table 2. PTs reported working in a variety of settings, though outpatient care was the most common (53%). AUDs reported more variety in their practice settings, with ENT office, private practice, and hospital settings being the most commonly reported sites. When seeing patients complaining of vertigo, dizziness, or imbalance, the majority of both professions reported seeing an average of 1-2 patients per week (n = 25), followed by 5-6 patients per week (n = 18), greater than or equal to nine patients per week (n = 10), 3-4 patients per week (n = 9), and 7-8 patients per week (n = 5). (Figure 2). The most common diagnoses reported by PTs were BPPV (n = 23), vestibular hypofunction (n = 10), and vertigo (n = 5), while the most common diagnoses seen by AUDs were BPPV (n = 26), Meniere's Disease (n = 9), vestibular migraines (n = 8), and vestibular neuritis (n = 8).

Data Analysis

All statistical analyses were completed using the Statistical Package for the Social Sciences (SPSS, Version 27). Because responses to frequency of use questions were obtained using Likert-scale questions, all quantitative statistical comparisons were conducted using the nonparametric Mann-Whitney U analysis. An alpha level of .05 was used to determine statistical significance. Qualitative data were largely obtained utilizing checkboxes or "write-in" responses rather than open-ended questions, so responses were analyzed using descriptive statistics and frequency of response.

Table 2. Clinical settings for AUD and PT respondents

| Clinical setting | PT (n = 34) | AUD (n = 32) |
|---------------------------|----------------|-----------------|
| Private Practice | 6 | 8 |
| Outpatient Rehabilitation | 18 | 1 |
| Inpatient Rehabilitation | 2 | 0 |
| Hospital | 4 | 7 |
| University Clinic | 0 | 5 |
| ENT | 0 | 9 |
| Home Health | 4 | 0 |
| Neurotology | 0 | 1 |
| Multispecialty Clinic | 0 | 1 |

Figure 1. Number of Years Practicing as PT or AUD**Figure 2.** Average Number of Patients Complaining of Vertigo, Dizziness, or Imbalance Seen by PTs and AUDs per Week

RESULTS

When patients complain of vertigo, dizziness, or imbalance as a primary ($p < .001$) or secondary ($p = .037$) complaint, PTs reported performing vestibular and/or balance screeners significantly more often than audiologists (Table 3). When vertigo, dizziness, or imbalance was a primary complaint, AUDs reported performing screeners almost never to sometimes ($M = 2.88$; $SD = 1.58$), while PTs reported using screeners almost always to always ($M = 4.35$; $SD = 1.01$). When vertigo, dizziness, or imbalance is a secondary complaint, both AUDs ($M = 3.22$; $SD = 1.27$) and PTs ($M = 3.94$; $SD = 0.80$) reported performing screeners sometimes to almost always.

When asked about screener use in a rehabilitative program, PTs reported using screeners more often than AUDs ($p < .001$) (Table 3). PTs reported utilization of screeners for a rehabilitative program sometimes to almost always ($M = 3.97$; $SD = .91$) while AUDs reported utilization almost never to sometimes ($M = 2.20$; $SD = 1.37$). It should be noted that 17 AUDs did not answer this question, likely due to working in a largely non-rehabilitative setting.

Table 3. Mean Scores and Standard Deviations for Screener Use

| | PT | | AUD | |
|--------------------------|------|-------|------|-------|
| | Mean | SD | Mean | SD |
| Primary complaint* | 4.35 | ±1.01 | 2.88 | ±1.58 |
| Secondary complaint* | 3.94 | ±.80 | 3.22 | ±1.27 |
| Rehabilitative progress* | 3.97 | ±.91 | 2.20 | ±1.37 |
| Quality-of-life | 2.67 | ±1.47 | 2.93 | ±1.69 |

Note. * indicates a statistically significant ($p < .05$) finding between groups

Table 3 depicts mean scores and standard deviations (SD) for screener use both PTs and AUDs when dizziness, vertigo, or imbalance is a primary complaint or secondary complaint, when screeners are used to assess progress in a rehabilitative program, or when vestibular/balance quality of life measures are used.

PTs and AUDs were similar in their use of vestibular/dizziness quality of life measures ($p = .565$) (Table 3). Although not a statistically significant finding, AUDs ($M = 2.93$; $SD = 1.69$) reported using vestibular/dizziness quality of life measures slightly more often than PTs ($M = 2.67$; $SD = 1.47$) with both groups utilizing quality of life measures almost never to sometimes. It should be noted that statistical power was low on this analysis, so statistical results should be interpreted with caution. However, qualitatively, it is of interest to note that both groups also used a similar number of quality-of-life questionnaires, with PTs utilizing five and AUDs utilizing six different measures. The most commonly used measures for both professions were the Dizziness Handicap Inventory (DHI) ($n = 33$), Activities-Specific Balance Confidence Scale (ABC) ($n = 12$), and Vestibular Disorders Activities of Daily Living Scale (VADL) ($n = 4$).

Qualitative questions aimed at examining the types of screeners used revealed that, in addition to performing screeners more frequently, PTs reported performing a greater array of vestibular/balance screeners compared to AUDs (Table 4). The Fukuda Stepping Test and vHIT were the only vestibular or balance screeners that AUDs utilized more often than physical therapists.

Table 4. Vestibular and/or Dizziness Screening Measures Utilized by PTs and AUDs

| Screening Measure | PT (n = 32) | AUD (n = 21) |
|-----------------------------------|----------------|-----------------|
| Proprioceptive/Balance Screeners | | |
| Romberg Test | 19 | 11 |
| mCTSIB | 19 | 8 |
| Tandem Walk | 14 | 4 |
| Dynamic Gait Index | 15 | 0 |
| Fukuda Stepping Test | 1 | 12 |
| Timed Up and Go | 2 | 2 |
| Berg Balance Scale | 1 | 1 |
| Functional Gait | 2 | 0 |
| Roll Testing | 1 | 0 |
| Visual/VOR Screeners | | |
| Gaze-evoked Nystagmus | 19 | 5 |
| Headshake Test | 12 | 5 |
| Vestibular Ocular Motor Screening | 11 | 1 |
| Dynamic Visual Acuity | 9 | 2 |
| Head Impulse Test | 6 | 2 |
| Video Head Impulse Test | 0 | 5 |
| Vestibular Screeners | | |
| Dix-Hallpike | 27 | 20 |

When examining the factors affecting the use or non-use of screeners, both PTs and AUDs reported that patient report/symptoms and time are the most important factors when choosing a screener. Other factors affecting the choice of vestibular or balance screeners and their frequency can be seen in Table 5.

Twelve AUDs and one PT reported never performing vestibular or balance screening measures. When asked why, the most common AUD responses were lack of time, lack of training, and billing issues (Table 6). The one PT reported lack of time.

Table 5. Factors That Affect Vestibular and/or Balance Screener Choice

| Affecting factor | PT | AUD |
|--------------------------|---------|----------|
| | (n =32) | (n = 20) |
| Patient report/symptoms | 28 | 17 |
| Time | 21 | 10 |
| Cost | 2 | 4 |
| Patient mobility/ability | 2 | 0 |
| Patient age | 1 | 0 |
| Suspected misdiagnosis | 1 | 0 |
| Efficacy of screener | 1 | 0 |
| Patient cognitive level | 1 | 0 |
| Do not perform screeners | 0 | 2 |

Table 6. Reasons as to why PTs and AUDs do not Perform Vestibular and/or Balance Screeners

| Reason for non-use of screener | PT | AUD |
|---------------------------------|--------|----------|
| | (n =1) | (n = 12) |
| Lack of time | 1 | 9 |
| Lack of training | 0 | 7 |
| Billing | 0 | 6 |
| Lack of space | 0 | 4 |
| Lack of equipment | 0 | 4 |
| Lack of experience | 0 | 2 |
| Lack of confidence | 0 | 2 |
| Difficulty interpreting results | 0 | 2 |
| Referral needed | 0 | 1 |
| Other provider performs | 0 | 1 |

DISCUSSION

The aims of this study were to determine the frequency of use of vestibular/balance screeners, which screeners are being used, and the factors affecting the use or non-use of screeners for AUDs and PTs. Results indicated that the PTs surveyed in the present study are utilizing vestibular/balance screeners statistically more often than the AUD sample. Additionally, although PTs utilized screeners more often than AUDs, both groups reported utilizing screening measures more often than expected based on Polensek et al,¹⁹ where various healthcare providers reported little knowledge on vestibular/balance screeners.

It should be noted that more than twice the number of PTs (n = 31) compared to AUDs (n = 15) responded to the question regarding use of screeners to assess progress through a rehabilitative program, which could be attributed to the setting in which each group of professionals worked (53% of PTs reported working in outpatient rehabilitation compared to only 3% of AUDs).

When asked to describe reasons that screeners were not utilized, AUDs reported multiple factors that contribute to their lack of use, primarily lack of time (n = 9), lack of training (n = 7), and billing/reimbursement issues (n = 6) (Table 6). Multiple responses indicated concerns regarding confidence or training ("lack of training" (n = 7), "lack of confidence" (n = 2), "lack of experience" (n = 2), and "difficulty interpreting results" (n = 2)), suggesting that additional training on the use of vestibular/balance screening measures may improve the frequency of use of these measures. These findings are similar to the Polensek et al¹⁹ study that found PCPs, ENTs, AUDs, emergency medicine physicians, and neurologists reported a lack of confidence, training, education, and/or knowledge which contributed to interacting with vestibular patients. The providers in Polensek et al¹⁹ also reported lack of proper reimbursement from third-party payers, lack of equipment, and difficulty interpreting results, similar to the present study findings (Table 6). Interestingly, because the majority of PTs in the current study reported using screening measures, only one PT responded to the question of why screeners were not utilized ("lack of time").

In examining the measures that were most often performed, a variety of vestibular and balance screeners were reported, though the most common individual screener utilized by both PTs (n = 27) and AUDs (n = 20) was the Dix Hallpike maneuver (DHP). The reasons behind the high incidence of use for both groups of professionals could be multifaceted. Demographic information obtained from respondents revealed that both AUDs and PTs reported that the most often-seen diagnosis was BPPV, so it is plausible that the test for BPPV (DHP) would also be the most often reported screener. However, an additional contributing factor could be that the DHP can be used as both a screener and a diagnostic measure, with the main, and often only, difference between the two being the use of goggles to record eye movements in the diagnostic protocol. Although the survey used in this study specifically

asked about screening measures, it is possible that individuals reporting use of the DHP as a screener were actually utilizing it as part of a diagnostic protocol.

Similarly, the Head Impulse Test (HIT) can be used both as a screener and a diagnostic tool (vHIT), with the main difference being the use of recording goggles in the diagnostic protocol. In the present study, PTs reported a higher incidence of use of the HIT compared to AUDs, but AUDs reported a higher incidence of use of the vHIT, which is more often used as a diagnostic measure. For both the DHP and HIT/vHIT protocols, it is unclear from the survey results if the reported incidence of use reflects true screening protocols or if diagnostic use of the protocols was being reported as use of a screener. There is a possibility that other screeners mentioned in the survey could be affected by this as well. Additional clarification is needed in future iterations of the survey to establish the use of a true screening protocol compared to a diagnostic protocol. It is also important to note in the discussion of screener vs diagnostic versions of various test protocols that audiologists often do not get reimbursed for performing screening versions of tests (e.g., Dix-Hallpike, vHIT, and gaze) while they are able to be reimbursed for these measures when utilized diagnostically. Therefore, many audiologists may choose not to perform the screening measure, but instead go straight to a diagnostic test. Indeed, as mentioned above, audiologists reported billing/reimbursement among the top three reasons as to why they choose not to perform screeners.

In examining overall screener categories, both PTs and AUDs most often reported performing balance/proprioceptive screening measures. The most common balance/proprioceptive screeners reported by PTs were the mCTSIB (n = 19) and Romberg test (n = 19). For AUDs, the most common balance/proprioceptive screeners were the Fukuda Stepping Test (n = 12) and Romberg test (n = 11). It is likely that balance/proprioceptive screeners were the most often reported category of use because patient symptom reports often reflect a complaint of overall balance difficulties. PTs and AUDs indicated that patient report or presenting symptom(s) are the most commonly reported factor influencing choice of screener (Table 5). Vestibular/balance patients are likely to present with a complaint of feeling generally “off balance” when reporting their concerns, including patients with acute attacks (e.g., Meniere’s Disease, vestibular neuritis) that may report feeling “off balance” after an attack. This could lead the AUD or PT to choose a screener that measures whole-body balance, such as a balance/proprioceptive measure. Additionally, this category of screener generally requires minimal to no equipment, has a greater number of available screening tests for clinical use, and can be performed in virtually any clinical setting, all of which are likely contributing factors to the higher incidence of reported use in this category.

The most common screeners that interpret vision or the VOR reported by both AUDs and PTs were gaze-evoked nystagmus and the headshake test. Unlike other screeners that interpret vision or the VOR surveyed, neither gaze-evoked nystagmus nor the headshake test require equipment, which may be a contributing factor to their increased use. When looking at all the screening measures across categories, AUDs reported higher incidence of use compared to PTs for only the Fukuda Stepping Test and the vHIT. Based on sensitivity and specificity from previous research it was originally hypothesized that the Tandem walk, mCSTIB, gaze-evoked nystagmus, HIT, and DHP would be the most often reported vestibular or balance screeners.^{12,14,20-22} Survey results showed that the most common screeners (in order) were the DHP, Romberg test, mCTSIB, gaze-evoked nystagmus, and Tandem walk. As previously discussed, clinicians may not be utilizing the screener version of the HIT and instead may administer the diagnostic version (vHIT), which could have led to decreased reported use in the current study. Additionally, the Romberg test may have been more commonly reported because it is a quick screener that examines whole-body balance and does not require equipment.

Interestingly, assessment of the use of quality-of-life measures revealed no statistically significant differences between PTs and AUDs, with both groups reporting use of the Dizziness Handicap Inventory (DHI) most frequently. Although there was not a statistically significant difference between these groups, AUDs reported conducting quality of life measures slightly more often than PTs (Table 3). Because quality of life measures are often used to measure pre- and post-treatment outcomes, it could be assumed that PTs would report increased use rather than AUDs. This increased use of quality-of-life measures from AUDs, compared to the decreased use when looking at the frequency of performing functional screening measures, could be attributed to the ease of administering quality of life measures.

Summary/Implications

The results from this survey suggest that audiologists in general are not using screeners as often as physical therapists, and indicate that the reasons for the lack of use are complex and multifactorial, citing issues with time, training, and billing/reimbursement as the most often cited factors, and lack of proper equipment and space as other off-cited issues. In part, the findings of this study highlight the need for further training among audiologists, which could lead to decreased reports of non-use due to lack of training, experience, or confidence. Of note, many of the screeners reported in this study require minimal equipment or technology, an important factor given the cost of most vestibular diagnostic equipment. Additionally, this points to

the need for billable codes for screening measures among audiologists, a major issue of importance that should be increasingly brought to light among advocacy groups for the profession.

Limitations and Future Directions

Although this study revealed significant differences between PTs and AUDs regarding the use of vestibular/balance screeners and referrals, there are several limitations that should be mentioned. In retrospect, several questions in the survey could have been worded differently to obtain more accurate or specific responses from participants. For example, when asking how often screening measures are performed for a primary or secondary complaint of vertigo, dizziness, or imbalance, “primary” and “secondary” could have been more clearly defined for the participants. Additionally, the majority of AUDs and PTs surveyed reported seeing an average of 1-2 patients complaining of dizziness, vertigo, or imbalance per week. While this does provide interesting insight into this specific demographic, it may not generalize to those professionals that see much larger numbers of these patients regularly. Future research could aim to examine these specific demographics of practitioners separately to explore any differences in screener use based on the number of patients seen per week. As mentioned, the majority of the PTs in this study (53%) reported working in an outpatient rehabilitation setting, which could have increased the reported frequency of use results, whereas only 3% of AUDs reported working in this setting. Further studies examining screener use may show different findings due to the work setting of the participants.

As mentioned previously, the use of the Dix Hallpike and vHIT as screeners should have been differentiated from using them as diagnostic measures, as it is possible that, although the survey was specifically requesting information about screener use, some of the reported numbers may include use for diagnostic purposes. If used diagnostically, these tests could be billed through insurance, whereas when used as a screener, there is often not the option to bill for services, thereby potentially leading to a lack of screener use. Indeed, several audiologists pointed to the lack of reimbursable codes for screeners as a reason they chose not to use them. However, while the survey in the present study focused exclusively on screeners, it is recognized that some of the respondents may have selected screening measures that were actually used diagnostically, and this was not clearly delineated in the survey, potentially affecting the numbers reported for certain screeners, such as the Dix-Hallpike and vHIT.

Despite these limitations, the present study can help guide others in looking at the benefits of screener use, and the possible next steps after receiving screener results. Prospective studies examining screener use should verify the differentiation of the screener vs diagnostic measurement. When distinguished, future research could determine factors that lead to the decision of using either the screener or diagnostic version. Further studies on screener training for AUDs can also show if training elicits more screener use. Future research can also explore the complexities of screener use and choice of screeners, as well as referral choices and practices that affect referrals for vestibular/balance concerns among healthcare providers. Additionally, further research could also consider exploring the ways case history questions and/or paper questionnaires are utilized to assist in determination of screener and further diagnostic test measures.

CONCLUSION

The present study emphasizes the importance of interdisciplinary care for patients with vestibular or balance dysfunction. Increased use of screeners may decrease the amount of office visits before a correct diagnosis is made for patients experiencing vertigo, dizziness, and imbalance. With better interdisciplinary interaction, more accurate referrals could be made to correctly diagnose and create management plans for these patients. The relationship between AUDs and PTs should also be noted, as it is significant to the diagnosis and management of vestibular and/or balance disorders, which can ultimately provide a patient with the best care possible.

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APPENDIX A: SURVEY

1. What is your highest education level in your clinical discipline?

- B.S./B.A in _____
- M.S. in _____
- Au.D.
- DPT
- Ph.D. in _____
- Other: _____

2. Do you have specialized training in vestibular assessment and/or treatment beyond your academic program? (Ex. Certification)

- Yes
- No

3. How many years have you been practicing? _____

4. In what type of setting do you practice?

- ENT office
- Private practice
- Hospital
- Outpatient rehabilitation
- University clinic
- Other: _____

5. In what state do you currently practice? _____

6. Do you see patients with issues of vertigo, dizziness, or imbalance?

- Yes
- No

7. If you answered "no" to seeing patients with issues of vertigo, dizziness, or imbalance, why not?

8. On average, approximately how many patients with issues of vertigo, dizziness, or imbalance do you see per week?

- 1-2 patients
- 2-4 patients
- 5-6 patients
- 7-8 patients
- ≥9 patients

9. What are the most prevalent vestibular diagnoses you encounter (top 3)?

10. When a patient reports vertigo, dizziness, or imbalance as the primary complaint, how often do you perform vestibular/balance screening measures?

| | | | | |
|-------|---------------|---------------|---------------|--------|
| | Almost Never | Sometimes | Almost Always | |
| Never | (25% of time) | (50% of time) | (75% of time) | Always |

○ ○ ○ ○ ○

11. When a patient reports vertigo, dizziness, or imbalance as a secondary complaint, how often do you perform vestibular/balance screening measures?

| | Almost Never | Sometimes | Almost Always | |
|-------|---------------|---------------|---------------|--------|
| Never | (25% of time) | (50% of time) | (75% of time) | Always |
| ○ | ○ | ○ | ○ | ○ |

12. How often do you use vestibular/balance screeners to assess progress in a rehabilitative program?

| | Almost Never | Sometimes | Almost Always | |
|-------|---------------|---------------|---------------|--------|
| Never | (25% of time) | (50% of time) | (75% of time) | Always |
| ○ | ○ | ○ | ○ | ○ |

13. Which vestibular/balance screening measure(s) do you perform? Select all that apply:

- Tandem Walk
- Fukuda Stepping Test
- Romberg Test
- Modified Clinical Test of Sensory Interaction on Balance (mCTSIB)
- Dynamic Gait Index (DGI)
- Gaze-evoked nystagmus
- Dynamic Visual Acuity (DVA)
- Headshake test
- Head Impulse Test
- Video Head Impulse Test (vHIT)
- Vestibular Ocular Motor Screening (VOMS)
- Dix Hallpike
- Other: _____

14. What factors affect your choice of screening measures? Select all that apply:

- Time
- Cost
- Patient report/symptoms
- Other: _____

15. If you answered "never" to performing screening measures on a patient complaining of vertigo and/or dizziness, why not? Select all that apply:

- Lack of time
- Lack of training
- Lack of experience with vestibular patients
- Lack of space
- Lack of equipment
- Lack of confidence
- Billing

- Difficulty interpreting results
 Negative perception of vestibular patients
 Other: _____

16. How often do you perform vestibular/dizziness quality of life questionnaires? (Ex. DHI, VADL, ABC, etc.)

| | Almost Never | Sometimes | Almost Always | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Never | (25% of time) | (50% of time) | (75% of time) | Always |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

17. Which vestibular/dizziness quality of life questionnaires do you perform with your patients?

18. How often do you receive referrals based solely on the patient's report of vertigo, dizziness, or imbalance?

| | Almost Never | Sometimes | Almost Always | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Never | (25% of time) | (50% of time) | (75% of time) | Always |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

19. Which professional(s) do you receive the most referrals from regarding vertigo, dizziness, or imbalance? Select all that apply:

- Primary Care Physician (PCP)
 Otolaryngologist (ENT)
 Neurologist
 Neurotologist
 Audiologist
 Physical Therapy
 Other: _____

20. How often do you provide referrals based solely on the patient's report of vertigo, dizziness, or imbalance?

| | Almost Never | Sometimes | Almost Always | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Never | (25% of time) | (50% of time) | (75% of time) | Always |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

21. Which professional(s) do you refer to when a patient reports vertigo, dizziness, or imbalance? Select all that apply:

- Primary Care Physician (PCP)
 Otolaryngologist (ENT)
 Neurologist
 Neurotologist
 Audiologist
 Physical Therapy
 Other: _____

22. Please enter your email address if you would like to be entered to win a \$25 Amazon gift card:
