Dizziness and imbalance are common complaints that affect the quality of life of individuals who experience these symptoms. Occurrences of dizziness and vertigo precipitate 1.8% of the general population to seek initial evaluations of medical care annually, inflicting a considerable health care burden (Neuhauser et al., 2008). Referrals for evaluation of the “dizzy” patient are frequent.

ABSTRACT: Purpose: The aim of this study was to obtain information regarding the vestibular evaluation and balance assessment coursework and clinical practicum of audiology graduate training programs across the United States. The students’ anticipated competency levels for performing various vestibular/balance procedures, along with their anticipated confidence levels in interpreting the tests, were reviewed. A database of audiology graduate programs was constructed to present information regarding the course/lab components and to provide a central location for information. Method: Audiology doctoral programs approved by the Council on Academic Accreditation were examined by self-report and website curriculum analysis. For the program self-report, professors and/or instructors received an online survey containing questions regarding the vestibular/balance coursework. Respondents were asked for their perceptions of students’ assessment skills along with student interest in vestibular/balance subject matter. The academic institutions’ departmental/program website, course catalogs, and/or academic handbook were accessed in order to construct a database of audiology graduate programs. Results: Variability in course offerings, ranging from 0 to 8 credit hours, was found. Only 34.5% of respondents indicated that their programs prepare students very well to manage vestibular/balance patients. Rotational and otolith function testing were reported as particular areas in which students may need additional training. Conclusion: Data suggest that the vestibular/balance component in many audiology doctoral training programs could be strengthened. More extensive didactic instruction along with hands-on training may provide graduating audiologists with increased knowledge in the identification and management of vestibular impairments, thus improving the quality of care for individuals with dizziness or imbalance. The findings provide important implications for the academic coursework and clinical training of audiology doctoral students.

KEY WORDS: vestibular, balance, academic preparation, clinical training
and often necessitate comprehensive multidisciplinary diagnostic evaluations from primary care physicians, otolaryngologists, neurologists, physical therapists, audiologists, and others. Noted barriers to the diagnosis and/or treatment of vestibular impairments for audiologists and physicians include a perceived lack of knowledge and training, along with clinical time constraints and lack of interest due to vague patient reports of symptoms (Polensek, Tusa, & Sterk, 2009).

In a critical review of the various causes of dizziness, peripheral vestibular etiologies were most common, with 44% of patients displaying peripheral vestibulopathy including benign paroxysmal positional vertigo (BPPV) (16%), labyrinthitis (or vestibular neuronitis) (5%), and Meniere’s disease (5%) (Kroenke, Hoffman, & Einstadter, 2000). The remaining peripheral etiologies were most often categorized as a nonspecific vestibulopathy.

The scope of practice in audiology from both the American Speech-Language-Hearing Association (ASHA) and the American Academy of Audiology (AAA) includes the diagnosis and management of vestibular disorders (AAA, 2004; ASHA, 2004). Although the role of the audiologist in vestibular/balance procedures is well defined, only 37% of audiologists in a 2008 survey reported providing vestibular assessment, and a mere 11% reported administering vestibular rehabilitation (ASHA, 2008).

Whenever a patient exhibits nystagmus, subjective vertigo, abnormal gait, balance dysfunction, or other conditions suggesting peripheral or central vestibulopathy, an audiologic evaluation of the vestibular system and/or balance assessment is warranted (ASHA, 2006). The Preferred Practice Patterns for the Profession of Audiology (ASHA, 2006) further describe the audiologic balance system evaluation as including a detailed case history, bedside assessment, electronystagmography (ENG)/video- and/or ENG (VNG), dynamic visual acuity (DVA), rotational testing, computerized dynamic posturography (CDP), otolith function testing, and falls risk assessment.

The majority of surveyed certified audiologists in an ASHA practice and curriculum analysis indicated the importance of mastery during the audiology graduate academic and clinical preparation for ENG/VNG (81%), postural control tests (65%), DVA (59%), bedside tests (58%), and vestibular evoked myogenic potentials (VEMPs, 59%), along with the interpretation of these tests (78%) (ASHA, 2007). Table 1 provides common abbreviations that are used in vestibular/balance testing.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Procedure</th>
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<tbody>
<tr>
<td>CDP</td>
<td>Computerized dynamic posturography</td>
</tr>
<tr>
<td>CRM</td>
<td>Canalith repositioning maneuver</td>
</tr>
<tr>
<td>DVA</td>
<td>Dynamic visual acuity</td>
</tr>
<tr>
<td>ENG</td>
<td>Electronystagmography</td>
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<tr>
<td>HSN</td>
<td>Head shake nystagmus test</td>
</tr>
<tr>
<td>MCT</td>
<td>Motor control test</td>
</tr>
<tr>
<td>SHA</td>
<td>Sinusoidal harmonic acceleration</td>
</tr>
<tr>
<td>SOT</td>
<td>Sensory organization test</td>
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<tr>
<td>SVV</td>
<td>Subjective visual vertical</td>
</tr>
<tr>
<td>VEMP</td>
<td>Vestibular evoked myogenic potential</td>
</tr>
<tr>
<td>VNG</td>
<td>Videonystagmography</td>
</tr>
<tr>
<td>VST</td>
<td>Velocity step test</td>
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</table>

Table 1. Common abbreviations included in vestibular/balance assessments.

Recognized by both the Council for Higher Education Accreditation and the U.S. Secretary of Education, the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA) is the authority for granting and regulating accreditation to audiology graduate programs established at colleges and universities across the country (ASHA, 2011). In addition to the administrative structure and governance, faculty and student standards, program assessments, and program resources, the CAA outlines in detail the curriculum, including both academic and clinical education, that all audiology doctoral programs seeking to establish and retain accreditation must contain. These minimum requirements outline what doctoral programs in audiology must accomplish while allowing flexibility for individual programs to achieve academic excellence in a variety of ways.

The CAA audiology curriculum standards require that “students have opportunities to acquire the knowledge and skills needed for entry into independent professional practice across a range of practice settings and to qualify for relevant state and national credentials for independent professional practice” (ASHA, 2011). The basic academic and clinical topics related to the auditory and vestibular systems that must be addressed are (a) foundations of audiology practice, (b) prevention and identification, (c) evaluation, and (d) treatment. According to the CAA, opportunities for students to acquire knowledge about the vestibular system must be provided in the specific areas of audiology listed in Table 2.

The primary purpose of this study was to obtain information regarding the vestibular evaluation and balance assessment curriculum and clinical practice of audiology doctoral training programs across the United States in order to provide evidence for strengthening the vestibular/balance component in training programs and to promote postgraduate vestibular/balance continuing education for practicing professionals. In addition, the anticipated competency levels of students for performing various vestibular evaluations and balance assessment procedures were...
Table 2. Council of Academic Accreditation in Audiology and Speech-Language Pathology vestibular topic areas.

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>Anatomy and physiology</td>
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<tr>
<td>Pathophysiology</td>
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<tr>
<td>Embryology and development</td>
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<tr>
<td>Effects of chemical agents</td>
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<tr>
<td>Medical/surgical procedures for treatment of disorders</td>
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<tr>
<td>Administration of conservation programs designed to reduce the effects of toxic agents</td>
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<tr>
<td>Assessment/interpretation of the balance system and determination of the need for balance rehabilitation</td>
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<tr>
<td>Provision of counseling to facilitate understanding balance disorder</td>
</tr>
<tr>
<td>Collaboration with other service providers</td>
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<tr>
<td>Assessment of intervention efficacy for balance disorders</td>
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</table>

reviewed. Students’ anticipated confidence levels in interpreting the test data were also examined. Areas for additional student training and respondents’ overall rating of their programs’ preparation of students were also reviewed. A database was constructed to present information regarding the coursework and lab components of accredited audiology doctoral programs. The database is intended to provide a central location for information that would be accessible to potential audiology students or others in academia who are interested in the vestibular/balance components of audiology doctoral programs.

METHOD

Professor/Instructor Program
Review and Student Assessment Survey

Via a web-based, author-constructed survey that was accessed through SimpleForms (an online form that securely collects and stores survey data), professors and instructors teaching vestibular/balance courses were asked questions relating to their programs’ vestibular coursework and clinical practicum (see Appendix A for the survey). The survey was generated by a focus group containing all of the authors of this article. During the initial planning of the study, two of the authors were completing doctorate of audiology (AuD) degrees at West Virginia University. Given the focus of the current study, their perspective as students was used to aid in generating the survey questions.

To assure the anonymity of all respondents, the researchers sent the survey to potential participants through an e-mail link. In addition to examining the vestibular/balance curriculum of accredited audiology doctoral programs, the survey also examined anticipated student competency levels for various vestibular/balance procedures along with students’ anticipated confidence levels in test interpretation. The survey reviewed vestibular/balance coursework offered along with hands-on experience during lab work, clinical practicum, and residency experiences. All procedures are on file with and have been approved by the West Virginia University Institutional Review Board for the Protection of Human Subjects.

Targeted individuals in this nationwide survey were professors or instructors who were teaching vestibular/balance courses in accredited audiology doctoral programs. The e-mail addresses of all potential participants were obtained from each program’s departmental website. Eighty e-mails containing the survey link were sent to programs at 71 universities across the United States. Some universities had multiple professors/instructors listed as teaching vestibular/balance courses, all of whom received the e-mail link. In the event where the e-mail address for the professor/instructor teaching courses in vestibular/balance subject matter could not be obtained, the e-mail was sent to the university’s department chair. The chair was then asked to forward the information to the appropriate contact. Approximately 1 month after the initial e-mail request was sent, a follow-up second e-mail request was sent. A total of 29 individuals responded to the survey.

The survey specifically examined the number of credit hours of vestibular/balance coursework offered, along with which semester(s)/term(s) courses are taken during the audiology course sequence. Respondents were asked to estimate what percentage of coursework is devoted to traditional lecture material versus hands-on experience. Participants were also asked what resources (e.g., textbooks) are used for course preparation and the students’ overall interest in vestibular/balance studies. Participants were asked to include the percentage of total clinical practicum that students complete on campus versus off campus as well as if clinical practicum and residency sites provide experience with vestibular/balance disorders.

The remaining portions of the survey asked the participants to rank their current students’ anticipated competence in performing and interpreting various vestibular evaluations and balance assessments including ENG, VNG, Dix-Hallpike maneuver, sinusoidal harmonic acceleration (SHA), velocity-step test (VST), CDP, and head shake nystagmus (HSN) testing. Abilities in performing canalith repositioning maneuvers (CRM) were also examined. Areas of vestibular evaluation and balance assessment in which students may benefit from additional education were also examined. The survey took ~15 min to complete.
Audiology Graduate Program
Review of Vestibular/Balance Components

To present information regarding the coursework and lab components for all CAA-accredited audiology programs, we constructed a database containing each program’s total credit hours and catalog listing of vestibular/balance coursework (including lecture and lab), along with the timeline of course offerings (CAA, 2011). Information was obtained via each academic institution’s departmental/program website, course catalogs, and/or academic handbook. Only data available online was included in the review.

The database is limited to coursework specific to the evaluation and treatment of the vestibular/balance systems. Determination of course content was obtained from the universities’ course description. Some programs also listed offerings for supplemental vestibular/balance courses in anatomy/physiology, pathologies, pharmacology, or other areas that are not included in the database. In addition, only those programs specifically stating lab components or practical training in diagnostic procedures are defined as containing hands-on training.

**RESULTS**

**Professor/Instructor Program**

Review and Student Assessment Survey

*Program information: Degrees awarded.* Data were analyzed from 29 respondents teaching at CAA-accredited audiology programs across the United States (resulting in a 36.3% response rate). All programs reportedly offer an audiology doctorate degree, with the overwhelming majority (96.6%; n = 28) offering an on-campus AuD degree. The remaining 3.4% (n = 1) of programs offer only one other doctoral (PhD, EdD, ScD) degree.

*Reported vestibular/balance coursework.* According to the respondents, vestibular evaluation/rehabilitation coursework is introduced to students during the second year of graduate study in the majority (72.4%; n = 21) of audiology programs. Audiology students are exposed to vestibular/balance coursework during the first year in 20.7% of the programs (n = 6) and during the third year in 6.9% (n = 2) of the programs. Although 3 credit hours of traditional lecture and lab coursework devoted entirely to vestibular evaluation/rehabilitation was most common (46.4%; n = 13), program offerings varied from 2 to 6 credit hours (2 credits: 7.1%, n = 2; 4 credits: 21.4% n = 6; 6 credits: 17.9%, n = 5).

The majority of respondents (75.9%; n = 22) indicated that the coursework focuses only on vestibular rehabilitation 25% of the time or less. The vestibular/balance coursework focuses on rehabilitation 26%–50% of the time in 20.7% (n = 6) of audiology programs, whereas only 3.4% (n = 1) of audiology programs reportedly dedicate up to 75% of their vestibular/balance material to rehabilitation. In addition to the courses exclusively devoted to vestibular/balance subject matter, 92.9% (n = 26) of respondents reported including classes that also partially cover vestibular evaluation and balance assessment material.

One credit hour of hands-on clinical experience is evidenced in 68.0% (n = 17) of the surveyed programs (see Figure 1 for distribution of hands-on lab experience offerings). Most programs offered experiences in the Dix-Hallpike maneuver (96.4%; n = 27), VNG (92.9%; n = 26), bedside assessment and the Epley maneuver (both 85.7%; n = 24), ENG and the Semont maneuver (both 82.1%; n = 23), HSN (78.6%; n = 22), and VEMP (71.4%; n = 20). Only 17.9% (n = 5) of respondents reported offering experience in VST and postural evoked potentials, 25.0% (n = 7) offered SHA, and 28.6% (n = 8) offered auto head rotation and SVV.

Nearly all (92.9%; n = 26) of the respondents reported using Balance Function Assessment and Management (Jacobson & Shepard, 2008) when planning and teaching graduate-level coursework (see Table 3 for all listed resources used). *Vestibular Rehabilitation* (Herdman, 2007) (42.9%; n = 12), *Vestibular Function: Evaluation and Treatment* (Desmond, 2004) (39.3%; n = 11), and *Vestibular Disorders: A Case Study Approach to Diagnosis and Treatment* (Cass, Cass, & Whitney, 2010) (28.6%; n = 8) were listed as additional resources that were incorporated into vestibular/balance coursework. Only 32.1% (n = 9) of respondents indicated using ASHA and AAA online resources for course preparation. National (28.6%; n = 8), state (14.3%; n = 4), and local (3.6%; n = 1) conference materials were even less used. The majority (68.8%; n = 11) of respondents indicated using professional experience to teach and plan vestibular/balance courses.

Most respondents (75.9%; n = 22) rated their students’ level of interest in vestibular/balance studies as medium, 3.4% (n = 1) ranked students’ interest level as low, and 20.7% (n = 6) reported students exhibiting high interest. Only 34.5% (n = 10) of respondents believed that their academic training program (including residency) prepares students very well to work with patients who have vestibular/balance disorders; 20.7% (n = 6) and 44.8% (n = 13) believed that their students are prepared average and well, respectively.

Respondents agreed that further training in VNG (100%; n = 26), ENG (96.2%; n = 25), Dix-Hallpike
maneuver (100%; n = 26), and canalith repositioning (80.8%; n = 21) would not benefit students. However, the majority of respondents felt that students would benefit from further training in rotational testing (80.8%; n = 21) and in otolith function testing (57.7%; n = 15).

Table 3. Resources used when planning and teaching vestibular coursework.

<table>
<thead>
<tr>
<th>Preparation material</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance Function Assessment and Management (Jacobson &amp; Shepard, 2008)</td>
<td>92.9</td>
</tr>
<tr>
<td>Professional experience</td>
<td>68.8</td>
</tr>
<tr>
<td>Vestibular Rehabilitation (Herdman, 2007)</td>
<td>42.9</td>
</tr>
<tr>
<td>Vestibular Function: Evaluation and Treatment (Desmond, 2004)</td>
<td>39.3</td>
</tr>
<tr>
<td>American Speech-Language-Hearing Association online resources</td>
<td>32.1</td>
</tr>
<tr>
<td>American Academy of Audiology online resources</td>
<td>32.1</td>
</tr>
<tr>
<td>Vestibular Disorders: A Case Study Approach to Diagnosis and Treatment (Furman, Cass, &amp; Whitney, 2010)</td>
<td>28.6</td>
</tr>
<tr>
<td>National conference notes</td>
<td>28.6</td>
</tr>
<tr>
<td>State conference notes</td>
<td>14.3</td>
</tr>
<tr>
<td>Local conference notes</td>
<td>3.6</td>
</tr>
</tbody>
</table>

All 29 respondents reported that their program contained clinical practicum experiences with vestibular/balance disorders (excluding residency components). The majority (86.2%; n = 25) of the respondents noted that vestibular/balance practicum was experienced in the residency setting, and 13.8% (n = 4) were unsure if their residencies contained clinical practicum experiences with vestibular/balance disorders. The majority (72.4%; n = 21) of audiology programs offered on-campus practicum experiences totaling 50%–75% of a program’s required clinical hours. Less than one quarter of the clinical practicum requirement is completed in on-campus clinics in 13.8% (n = 4) of universities. More than half of the required practicum hours are offered in on-campus clinics in the remaining 13.8% (n = 4) of the programs.

Evaluation of students’ confidence in vestibular/balance procedures. Survey respondents were asked to rate their students’ anticipated competency, upon completion of the audiology doctoral program, in performing a variety of vestibular evaluation and balance assessment procedures (see Figure 2). The anticipated confidence levels of students in performing various vestibular/balance procedures ranged from high (81.5%; n = 22 for the Dix-Hallpike maneuver) to no competency (39.3%; n = 11 for velocity step test).
The procedures with the highest anticipated students’ ability to perform were the Dix-Hallpike, ENG, VNG, and post HSN test. As expected, 81.5% (n = 22) of respondents rated their students’ anticipated competency as high in performing the Dix-Hallpike maneuver, whereas only 18.5% (n = 5) of respondents rated their students’ anticipated competency as medium. Additionally, more than half (53.6%; n = 15) of the respondents rated their students’ anticipated competency as high for ENG, and 42.9% (n = 12) rated their students’ anticipated competency as high for VNG. Only 3.6% (n = 1) reported low anticipated competency for performing ENG testing. For VNG, 75.0% (n = 21) of the respondents rated their students’ anticipated competency as high, and 25.0% (n = 7) rated their students’ anticipated competency as medium.

The majority of respondents reported anticipating high (48.1%; n = 13) or medium (37.0%; 10 respondents) student competency for the HSN test, whereas the remaining respondents indicated that students would have low (7.4%; n = 2) or no (7.4%; 2 respondents) competency in performing this examination.

Less favorable ratings were provided for canalith repositioning maneuvers, posturography, and rotational testing. In general, respondents rated students’ anticipated competency levels as medium for canalith repositioning maneuvers (e.g., Epley maneuver) and CDP, with 50.0% (n = 14) and 40.7% (n = 11) indicating medium competency, respectively. The only two procedures for which no competency was the most common response were the VST (39.3%; n = 11) and SHA testing (35.7%; n = 10). Remaining ratings for rotational testing ranged from low to high anticipated ratings (SHA low competency: 25.0%, n = 7; medium competency: 32.1%, n = 9; high competency: 7.1%, n = 2; and VST low competency: 28.6%, n = 8; medium competency: 28.6, n = 8; high competency: 3.6%, n = 1).

A Pearson product–moment correlation coefficient was computed to assess the relationship between the amount of credit hours required in vestibular subject matter and the instructors’ ratings of their students’ anticipated confidence in performing vestibular/balance procedures. No significant correlations were found for any of the vestibular evaluation and balance assessment procedures (ENG: r = 1.95, p = 0.319, n = 28; VNG: r = 0.043, p = 0.829, n = 28; Dix-Hallpike: r = 0, p = 1, n = 27; CRM: r = 0.363, p = 0.058, n = 28; SHA: r = 0.280, p = 0.149, n = 28; VST: r = 0.325, p = 0.091, n = 28; HSN: r = 0.229, p = 0.252, n = 27; CDP: r = –0.1.45, p = 0.471, n = 27). An additional analysis was performed to examine the Pearson product–moment correlations between the amount of hands-on laboratory experience and reported anticipated confidence in performing vestibular/balance procedures. Significance was found for two of the assessment procedures, including CRM (r = 0.426, p = 0.034, n = 25) and SHA (r = 0.451, p = 0.024, n = 25). All other correlations were not significant.

Evaluation of students’ confidence in interpretation. Similar trends existed between the respondents’
rating of students’ anticipated competency in performing vestibular/balance procedures and their confidence in interpreting the test results (see Figure 3). In general, 71.4% (n = 20) of respondents felt that their students would have high anticipated confidence in their ability to interpret results from the Dix-Hallpike; however, 28.6% (8 respondents) provided medium anticipated competency. Additionally, 58.6% (n = 17) rated their students’ anticipated interpretation of canalith positioning maneuvers as having high confidence, 27.6% (n = 8) rated students as having medium confidence, 10.3% (n = 3) having low confidence, and 3.4% (n = 1) having no confidence.

Responses for interpretation of VNG and ENG findings were generally rated as high, with 62.1% (n = 18) and 51.7% (n = 15), respectively. None of the respondents anticipated that students would have low or no ability to interpret VNG or ENG results. Results for the HSN test were most often rated as high (42.9%; n = 12) and medium (42.9%; n = 12) anticipated student confidence. Respondents ranked their students’ confidence in CDP interpretation as high (28.6%; n = 12) and medium (42.9%; n = 12); low (8.6%, n = 1), and none (10.7%, n = 3). Instructors’ ratings were the lowest for rotational testing, with 42.9% (n = 12) of respondents reporting SHA as low and 10.7% (n = 3) reporting none; only 35.7% (n = 10) reported SHA anticipated interpretation as medium and 10.7% (n = 3) as high. For the VST, 40.7% (n = 11) rated students’ anticipated confidence in interpretation as low and 18.5% (n = 5) indicated no confidence, whereas 29.6% (n = 8) provided medium ratings and 11.1% (n = 3) provided high ratings.

The Pearson product–moment correlation coefficient was also computed to examine the relationship between the amount of credit hours in vestibular subject matter and the anticipated ratings of students’ confidence in interpretation of vestibular/balance procedures. Again, no significant correlations were found for any of the vestibular evaluation and balance assessment procedures (see Table 4). When the additional analysis was performed to examine the Pearson product–moment correlations between the amount of hands-on laboratory experience and reported anticipated confidence in interpreting vestibular/balance assessment, significance was not found for any of the assessment procedures.

Audiology Graduate Program
Review of Vestibular/Balance Components

At the time of data collection, audiology program information was available online for 63 of the CAA-accredited universities (see Appendix B for all universities’ data). Credit hours of coursework specifically devoted to vestibular/balance subject matter ranged from none (Gallaudet University and University of North Texas) to eight (University of Illinois Urbana Champaign) (M = 3.70 hr, SD = 1.58). More than half (54.0%; n = 34) of the programs offer three...
credit hours of vestibular/balance coursework, 9.5% \((n = 6)\) offer less than three credit hours, and 36.5% \((n = 23)\) offer more. For the first (or only when one course is offered) vestibular/balance course, half offer courses during year two: fall (25.0%; \(n = 13\)) and spring (25.0%; \(n = 13\)) (see Figure 4 for a distribution of all course offerings). For programs offering two courses of vestibular/balance subject matter, less consistency occurred for the semester when the courses were offered in the curriculum sequence, with 10.0% \((n = 1)\) offered in the spring of year one, 40.0% \((n = 4)\) offered in year two (either fall, spring, or summer), and 50.0% \((n = 5)\) offered in year three (either fall, winter, or spring). For the one program that offered three vestibular/balance courses (Salus University), the last course was provided in the summer of year three. A total of 26.8% (19 programs) specifically listed offering hands-on components in the form of lab components or practical training in diagnostic procedures. Please note that this information is based on the programs’ online description; therefore, students are encouraged to verify the information with audiology graduate program coordinators before applying to or entering a program.

**DISCUSSION**

The current survey and online program review suggested that although audiology graduate training programs meet minimal ASHA standards for curriculum, there are inconsistencies among the programs in vestibular evaluation and balance assessment training coursework and clinical offerings. This was noted through variability in credit hour offerings and hands-on laboratory components. Although 3 credit hours of vestibular/balance coursework provided during the second year of study was the most common, ranges of reported coursework varied from 2 to 6 credit hours, and online program data ranged from 0 to 8 credit hours. For both the professor/instructors’ reported data and the online program review, vestibular/balance coursework was offered sometime during the first through third years of the audiology doctoral program.

When professors/instructors were asked about the vestibular rehabilitation components of their coursework, the majority reported that less than one quarter of the vestibular/balance coursework focused on rehabilitation. This supports the ASHA position that audiologists who intend to provide full vestibular rehabilitation should seek extensive education involving
postgraduate coursework in physical therapy, occupational therapy, and/or other disciplines, which are not typically available in audiology programs or in postgraduate audiology courses (ASHA, 1999).

Laboratory components with hands-on instruction were reportedly common in the majority of audiology programs; however, the programs’ online course listings often did not specifically state offering hands-on experiences as part of the vestibular/balance course. Students should be encouraged to verify this information, as online course listings were often brief and may not have included the lab component. In addition, the hands-on components of vestibular training available at the institutions may not have been evident in the online listings of the coursework, as they may have been included in different clinical practica that may not have specifically included the words vestibular or balance.

For the self-reported data, the lab focus often did not include rotational testing (VST, SHA, and auto head rotation), postural evoked potential evaluation, otolith testing (SVV), falls risk assessment, or posturography (MCT). Significant correlations were found between the amount of hands-on experience and two of the vestibular/balance assessment procedures (CRM and SHA). The overwhelming majority of respondents also noted that vestibular/balance practicum was experienced in the residency setting, which should increase the students’ knowledge for the assessment procedures provided at the clinical site.

Although the professors/instructors agreed that further training in VNG, ENG, the Dix-Hallpike maneuver, and canalith repositioning would not benefit students, the majority felt that students would benefit from further training in rotational testing and otolith function testing. The ratings of students’ anticipated ability reflected their reported hands-on experiences, with the highest anticipated ability to perform and interpret procedures including the Dix-Hallpike, VNG, ENG, and HSN; lower ratings were provided for CDP, SHA, and VST. The professors’/instructors’ low student ratings indicate that students may not be adequately prepared to perform these procedures upon graduation, and additional clinical training post graduation may be required. Reports suggested that students may need hands-on laboratory experience as part of their academic training to improve their ability to perform and interpret vestibular evaluations and balance assessments.

Although students’ performance and interpretation ratings for the VNG and ENG test battery (including the Dix-Hallpike) were ranked higher than other vestibular/balance assessments, the VNG/ENG alone is insufficient to detect all types of vestibular impairment. In a study reviewing valid and complete ENG tests, 61% of dizzy patients had normal ENG findings (Stockwell, 2000). Due to the high incidence of vestibular impairment that is likely misdiagnosed, it is doubtful that all patients with normal VNG/ENG findings display completely normal vestibular function. The inclusion of rotational testing, otolith evaluation, and posturography in the vestibular test battery would improve the ability of the clinician to diagnose disorders that are not apparent in the VNG/ENG findings. At minimum, audiologists must be able to determine referral criteria and make appropriate recommendations for patients who need additional testing beyond the VNG/ENG.

Surprisingly, only slightly more than one third of the programs reported having graduate students who were very well prepared to work with patients with balance disorders. Audiology programs across the country should be encouraged to collaborate in order to provide a more consistent and comprehensive vestibular/balance curricula and practicum experiences for audiology graduate students. One method for achieving this might be to establish a task force through the CAA and/or audiology associations such as ASHA and AAA to further examine the academic training in vestibular and balance along with other specialty areas in audiology.

As a result of a more unified approach to training, future audiologists may be able to provide a more consistent and comprehensive assessment for patients with vestibular dysfunction and/or balance disorders, increasing the standard of care for dizzy patients. Given the current academic picture, due to the variability in programs, undergraduate students displaying a strong interest in working with patients with balance disorders should be encouraged to seek out AuD programs with more extensive vestibular/balance course offerings and laboratory experiences when applying to graduate schools.

Given the variation in education and training, audiologists who intend to perform vestibular/balance assessment and/or rehabilitation must be certain to obtain the appropriate knowledge and skills to be fully competent to provide these services, which may require education and training (AAA, 2005) beyond graduate school. Furthermore, continuing education in vestibular/balance evaluation and rehabilitation may be beneficial for many practicing audiologists who have graduated from programs with minimal vestibular/balance coursework or clinical practicum. Moreover, due to the extensive skill set required for bedside examination, ENG/VNG, posturography, and rotational testing to comprehensively evaluate the vestibular system, audiologic specialties in vestibular evaluation should be considered and encouraged within the profession (Zalewski, 2009). In fact, certifications in vestibular
assessment or vestibular assessment and management are now available through the American Institute of Balance (AIB) Education Foundation (AIB, 2011). The certification is voluntary for AIB workshop attendees and may be obtained through completion of an educational requisite and written/practical test. Vestibular assessment or vestibular assessment and management certification may be obtained through the AIB by audiologists or physicians. In addition, physical and occupational therapists may obtain certification in vestibular rehabilitation. Recertification by the AIB is required every 2 years.

The programs’ perceptions of student interest in vestibular subject matter was rated medium by the majority, which is surprising considering that in a 2008 AAA survey, audiology students and recent audiology graduates expressed strong interest in vestibular areas of audiology, ranking vestibular assessment/management third behind diagnostics and hearing aids. In addition, >60% of respondents expressed interest in hands-on training at national conventions, making this the second most popular area behind cochlear implant mapping and troubleshooting (AAA, 2008). In a 2010 ASHA survey of certified audiologists, nearly half expressed interest in vestibular disorders and treatment (25.3% reporting a 5 and 19.6% a 4 on a scale from 1 = not at all interested to 5 = very interested).

Study Limitations

It is of critical importance to note that the evaluation of students’ confidence in vestibular/balance procedures and evaluation of students’ competency in interpretation are a reflection of faculty perceptions of preparedness. A limitation of the study is that the students’ abilities were only assessed by the responses of the professors/instructors who completed the surveys. The questions posed in the questionnaire were answered by speculation of the respondents and may not truly represent the students’ own perception. In fact, the findings better reflect the perception of the academic programs’ preparation of the students. Corroborating data for the faculty/instructors’ perceptions are not available; however, future studies may examine current students’ and recent graduates’ perceptions of their academic and clinical preparation in vestibular evaluation and balance assessment. Academic programs are encouraged to review their current vestibular/balance training curriculum. More comprehensive experiences with a focus on rotational, otolith, fall risk, and posturographic evaluations should be incorporated into the vestibular/balance training. More extensive didactic instruction along with hands-on training may provide future audiologists with increased knowledge in identification and management of vestibular impairments, thus improving the quality of care for those with dizziness or imbalance. In addition, continuing education of current audiology practitioners in the performance of vestibular evaluation and balance assessment along with interpretation of these measures should be encouraged.

REFERENCES


Contact author: Ashleigh J. Callahan, Department of Speech Pathology and Audiology, West Virginia University, 807-F Allen Hall, P.O. Box 6122, Morgantown, WV 26506. E-mail: ashleigh.callahan@mail.wvu.edu.
APPENDIX A (p. 1 of 5). VESTIBULAR CURRICULUM QUESTIONNAIRE

The purpose of this questionnaire is to compare the vestibular training that students receive across AuD programs.

What graduate degrees in audiology does your program award?
Check all that apply.
☐ Masters (M.S., M.A., M.Ed., M.C.D)
☐ Doctoral (Au.D. entirely online)
☐ Doctoral (Au.D. on campus)
☐ Doctoral (Ph.D., Ed.D., Sc.D.)
☐ Other - If ‘Other’ please specify:

Is your audiology degree program accredited by the American Speech-Language-Hearing Association (ASHA)?
☐ Yes
☐ No

What percentage of total clinical practicum do your students complete in College/University on-campus settings?
☐ 0%
☐ Less than 25%
☐ 26%–50%
☐ 51%–75%
☐ More than 75%

On average, approximately how many patients does the College/University on-campus clinic see annually with dizziness as a primary complaint?

Approximately how many of these patients with dizziness as a primary complaint receive formal vestibular evaluations (Example: Dix-Hallpike Maneuver, Electronystagmography, etc.)?

During which year of graduate study do you introduce your students to vestibular studies?
☐ 1st
☐ 2nd
☐ 3rd
☐ 4th

If your program of study contains coursework devoted entirely to vestibular evaluation/rehabilitation, how many credit hours are students required to take as part of the total graduate curriculum in vestibular subject matter (including lecture and laboratory components)?
☐ N/A
☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ 6
☐ Other - If ‘Other’ please specify:

What percentage of the vestibular coursework focuses on vestibular rehabilitation?
☐ 0%
☐ Less than 25%
☐ 26%–50%
☐ 51%–75%
☐ More than 75%
APPENDIX A (p. 2 of 5). VESTIBULAR CURRICULUM QUESTIONNAIRE

What percentage of the total course is devoted to traditional lecture material?

- 0%
- Less than 25%
- 26%–50%
- 51%–75%
- More than 75%

What resources do you typically use when planning/teaching your vestibular courses?
Check all that apply.

- Alan Desmond, 2004, Vestibular Function: Evaluation and Treatment
- Joseph Furman, Stephen Cass & Susan Whitney, 2010, Vestibular Disorders: A Case Study Approach to Diagnosis and Treatment
- Susan J. Herdman, 2007, Vestibular Rehabilitation
- American Speech and Hearing Association Online Resources
- American Academy of Audiology Online Resources
- State Conference Notes
- National Conference Notes
- Local Conference Notes
- Professional Experience

What portion of the total course credit is devoted to “hands-on” clinical experience?

- N/A
- 1 credit hour
- 2 credit hours
- 3 credit hours
- 4 credit hours
- 5 credit hours
- 6 credit hours

What type of “hands-on” experience do your students obtain as part of the vestibular lab portion of the course?
Check all that apply.

- Bedside assessment (e.g., gaze stabilization, smooth pursuit, saccades, and head thrust testing)
- Post Head-Shake Nystagmus Test
- Electronystagmography (ENG)
- Video-nystagmography (VNG)
- Dix-Hallpike Maneuver
- Epley Maneuver
- Semont Maneuver
- Log-roll
- Sinusoidal Harmonic Acceleration Rotational Testing
- Velocity-Step Test
- Auto Head Rotation
- Sensory Organization Test
- Motor Control Test
- Postural Evoked Responses
- Vestibular Evoked Myogenic Potentials
- Subjective Visual Vertical
- Dynamic Visual Acuity
- Falls Risk Assessment
- N/A
- Other - If ‘Other’ please specify:
APPENDIX A (p. 3 of 5). VESTIBULAR CURRICULUM QUESTIONNAIRE

Does your program of study contain coursework which partially includes vestibular subject matter?
☐ Yes
☐ No
☐ Unknown

Does your program of study (excluding residency) contain clinical practicum experiences with vestibular disorders?
☐ Yes
☐ No
☐ Unknown

Does your residency (if included in your program of study) contain clinical practicum experiences with vestibular disorders?
☐ Yes
☐ No
☐ Unknown

In general, how would you rank your student’s level of interest in vestibular studies?
☐ High
☐ Medium
☐ Low

How well do you feel your academic training program (including residency) prepares students to work with patients having vestibular disorders?
☐ Poor
☐ Average
☐ Well
☐ Very Well

Please rate your students’ anticipated competence in performing the following procedures of vestibular assessment/treatment:

Electronystagmography (ENG)
☐ High competency
☐ Medium competency
☐ Low competency
☐ Not competent

Video-nystagmography (VNG)
☐ High competency
☐ Medium competency
☐ Low competency
☐ Not competent

Dix-Hallpike Maneuver
☐ High competency
☐ Medium competency
☐ Low competency
☐ Not competent
APPENDIX A (p. 4 of 5). VESTIBULAR CURRICULUM QUESTIONNAIRE

Canalith Positioning Maneuvers (Ex: Epley Maneuver)
- High competency
- Medium competency
- Low competency
- Not competent

Sinusoidal Harmonic Acceleration Rotational Testing
- High competency
- Medium competency
- Low competency
- Not competent

Velocity-Step Test
- High competency
- Medium competency
- Low competency
- Not competent

Head-Shaking Test
- High competency
- Medium competency
- Low competency
- Not competent

Computerized Dynamic Posturography - CDP
- High competency
- Medium competency
- Low competency
- Not competent

Please rate your students’ anticipated confidence level in interpreting the following test data:

Electronystagmography (ENG)
- High
- Medium
- Low
- None

Video-Nystagmography (VNG)
- High
- Medium
- Low
- None

Dix-Hallpike Maneuver
- High
- Medium
- Low
- None
Canalith Positioning Maneuvers (Ex: Epley Maneuver)
- High
- Medium
- Low
- None

Sinusoidal Harmonic Acceleration Rotational Testing
- High
- Medium
- Low
- None

Velocity-Step Test
- High
- Medium
- Low
- None

Head-Shaking Test
- High
- Medium
- Low
- None

Computerized Dynamic Posturography (CDP)
- High
- Medium
- Low
- None

In regards to your program’s vestibular training, do you feel that there are any areas that your students would benefit from further training?
- Electronystagmography (ENG)
- Video-nystagmography (VNG)
- Dix-Hallpike Maneuver
- Canalith Positioning Maneuvers (Ex: Epley Maneuver)
- Rotational Testing
- Otolith Functioning Testing
- Other - If ‘Other’ please specify:
**APPENDIX B (p. 1 of 6). VESTIBULAR/BALANCE COURSEWORK OFFERED IN ACCREDITED AUDIOLOGY GRADUATE PROGRAMS**

<table>
<thead>
<tr>
<th>Audiology graduate programs listed by state</th>
<th>Credit hours</th>
<th>Specific course(s) offered</th>
<th>Semester(s) offered</th>
<th>Hands-on component</th>
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<td>AT Still University - Arizona School of Health Sciences</td>
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<td>Florida</td>
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<td>Fall Year 1; Spring Year 3</td>
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<td>University of Iowa</td>
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<td>Idaho State University</td>
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<td>CSED 7740: Advanced Vestibular Assessment; CSED 6633: Introduction to Evoked Potential Audiometry and Balance Assessment</td>
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<td>Illinois</td>
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<td>Spring Year 2</td>
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<td>Spring Year 2</td>
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<td>Northwestern University</td>
<td>NA</td>
<td>CSD 426: Vestibular Disorders</td>
<td>NA</td>
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<td>Rush University</td>
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<td>CDS646: Vestibular Assessment and Rehabilitation; CDS646L: Vestibular Assessment and Rehabilitation Lab; CDS646: Vestibular Assessment and Rehabilitation; CDS6276: Vestibular II</td>
<td>Spring Quarter Year 1; Summer Quarter Year 2</td>
<td>Y</td>
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<tr>
<td>University of Illinois Urbana</td>
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<td>SHS 593: Vestibular Assessment and Rehabilitation; SHS 651: Electrophysiologic Indices of Audition and Balance</td>
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<td>University of Illinois Urbana</td>
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<td>Ball State University</td>
<td>NA</td>
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<td>Purdue University</td>
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<td>SLHS 56300: Vestibular Assessment and Rehabilitation</td>
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# APPENDIX B (p. 2 of 6). VESTIBULAR/BALANCE COURSEWORK OFFERED IN ACCREDITED AUDIOLOGY GRADUATE PROGRAMS

<table>
<thead>
<tr>
<th>State</th>
<th>University/Institution</th>
<th>Credit Hours</th>
<th>Specific course(s) offered</th>
<th>Semester(s) offered</th>
<th>Hands-on component</th>
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<tr>
<td>Kansas</td>
<td>University of Kansas</td>
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<td>AUD 818: Vestibular Systems/ Rehabilitation</td>
<td>Fall Year 2</td>
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<td></td>
<td>Wichita State University</td>
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<td>Kentucky</td>
<td>University of Louisville</td>
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<td>Louisiana</td>
<td>Louisiana State University Health Science Center New Orleans</td>
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<td>SPTHAUD 7211: Electronystagmography (ENG); SPTHAUD 7323: Advanced Vestibular Testing and Rehabilitation</td>
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<td>Louisiana Tech University</td>
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<td>Massachusetts</td>
<td>Northeastern University</td>
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<td>SLPA 6726: Assessment &amp; Treatment of Balance Disorders</td>
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<td></td>
<td>University of Massachusetts Amherst</td>
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<td>COMM-DIS 646: Assessment/ Rehabilitation of Balance Disorders and Tinnitus</td>
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<td>Towson University</td>
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<td>University of Maryland College Park</td>
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<td>Michigan</td>
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<td>Western Michigan University</td>
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<td>Minnesota</td>
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<td>University of Southern Mississippi</td>
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<td>University of North Carolina Chapel Hill</td>
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<td>Nebraska</td>
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<td>New Jersey</td>
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<td>New York</td>
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<td>AUD 76300: Vestibular Evaluation &amp; Management</td>
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<td>Long Island Aud Consortium - Adelphi/Hofstra/St. John’s Universities</td>
<td>3</td>
<td>AUD 522: Current Issues in Advanced Vestibular</td>
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<td>Syracuse University</td>
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<td>CSD 787: Vestibular Assessment and Management</td>
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<td>CDS 610: Vestibular Testing (C)</td>
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## APPENDIX B (p. 3 of 6). VESTIBULAR/BALANCE COURSEWORK OFFERED IN ACCREDITED AUDIOLOGY GRADUATE PROGRAMS

<table>
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<tr>
<th>Audiology graduate programs listed by state</th>
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<th>Specific course(s) offered</th>
<th>Semester(s) offered</th>
<th>Hands-on component</th>
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<tr>
<td>Northeast Ohio AuD Consortium - Kent State/University of Akron</td>
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<td>Evaluation and Management of Balance Disorders</td>
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<td>NA</td>
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<td>AU725PBC: Vestibular and Balance Evaluation I; AU 826FAC: Clinical Skills: Vestibular and Balance Lab; AU 725SBB: Vestibular and Balance Evaluation 2; AU 836RAB: Vestibular Rehabilitation</td>
<td>Fall Year 2; Spring, Year 2; Summer, Year 3</td>
<td>Y</td>
</tr>
<tr>
<td>University of Pittsburgh</td>
<td>4</td>
<td>CSD2251: Vestibular Assessment and Rehabilitation; CSD2058: Clinical Procedures Lab</td>
<td>Summer Year 2</td>
<td>Y</td>
</tr>
<tr>
<td>Texas</td>
<td></td>
<td></td>
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<tr>
<td>Lamar University</td>
<td>3</td>
<td>SPHS 6354: Electrophysiology II</td>
<td>Spring</td>
<td>-</td>
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<tr>
<td>Texas Tech University Health Sciences Center</td>
<td>4</td>
<td>AHSL 7365: Balance Function; AHSL 7165: Balance Function Lab</td>
<td>Spring Year 2</td>
<td>Y</td>
</tr>
<tr>
<td>University of North Texas</td>
<td>0</td>
<td>No specific course listed</td>
<td>n/a</td>
<td>-</td>
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<tr>
<td>University of Texas at Dallas</td>
<td>3</td>
<td>AUD 7351: Physiologic Assessment of Vestibular and Auditory System</td>
<td>Summer Year 2</td>
<td>-</td>
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<tr>
<td>University of Texas Austin</td>
<td>NA</td>
<td>CSD 590E: Advanced Auditory Electrophysiology</td>
<td>Spring Year 2</td>
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<td>Virginia</td>
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<tr>
<td>James Madison University</td>
<td>3</td>
<td>CSD 516: Vestibular Physiology and Testing</td>
<td>Fall Year 1</td>
<td>-</td>
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<tr>
<td>Washington</td>
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<td></td>
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<tr>
<td>University of Washington</td>
<td>4</td>
<td>574: Balance Assessment</td>
<td>Summer Year 1</td>
<td>Y</td>
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<tr>
<td>Washington University</td>
<td>2</td>
<td>507: Assessment and Management of Vestibular Disorders</td>
<td>Spring Year 3</td>
<td>-</td>
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<tr>
<td>Wisconsin</td>
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<tr>
<td>University of Wisconsin AuD Consortium</td>
<td>3</td>
<td>845: Human Balance System; 846 Lab: Human Balance System</td>
<td>Fall Year 2</td>
<td>Y</td>
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<tr>
<td>West Virginia</td>
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<tr>
<td>West Virginia University</td>
<td>4</td>
<td>SPA 736: Vestibular Evaluation &amp; Rehab.; SPA 737: Lab Vestibular Eval. &amp; Rehab.</td>
<td>Fall Year 2</td>
<td>Y</td>
</tr>
</tbody>
</table>

Note. The source of information for each audiology graduate program is listed alphabetically by state on the next few pages.
APPENDIX B (p. 4 of 6). VESTIBULAR/BALANCE COURSEWORK OFFERED IN ACCREDITED AUDIOLOGY GRADUATE PROGRAMS

AL: Auburn University

AR: University of Arkansas at Little Rock

AZ: Arizona State University

AZ: AT Still University - Arizona School of Health Sciences

AZ: University of Arizona

CA: San Diego State University

CO: University of Colorado at Boulder

CO: University of Northern Colorado

CT: University of Connecticut

DC: Gallaudet University

FL: Nova Southeastern University

FL: University of Florida

FL: University of South Florida

IA: University of Iowa

ID: Idaho State University

IL: Illinois State

IL: Northern Illinois University

IL: Northwestern University
Summer session course listings. (2011). Retrieved April 15, 2011, from Northwestern University, Summer NU Web site: http://www.scs.northwestern.edu/summeru/courses/?Department=CSD&Course=426-0&Day=Tu&Sec=28

IL: Rush University

IL: University of Illinois at Urbana-Champaign

IL: Ball State University

IN: Indiana University
Curriculum for AuD program: general requirements. (2010). Retrieved April 25, 2011, from Indiana University, College of Arts & Sciences, Department of Speech and Hearing Sciences Web site: http://www.indiana.edu/~comsci/audiology/fort_lauderdale/degree_requirements.html

IN: Purdue University

KS: University of Kansas

Callahan et al.: Academic Training Vestibular/Balance 135
APPENDIX B (p. 5 of 6). VESTIBULAR/BALANCE COURSEWORK OFFERED IN ACCREDITED AUDIOLOGY GRADUATE PROGRAMS

Academic catalog. (2011-2012). Retrieved April 20, 2011, from The University of Kansas, Academics Web site: http://www2.ku.edu/~distinction/cgi-bin/degree-requirements

KS: Wichita State University
Doctor of Audiology (AuD). (2011). Retrieved April 21, 2011, from Wichita State University, Department of Communication Sciences and Disorders Web site: http://webis.wichita.edu/?uscsdp=academics/aud

KY: University of Louisville

LA: Louisiana State University
Audiology courses. (n.d.). Retrieved April 26, 2011, from Louisiana State University, Health Science Center School of Allied Health Professions Web site: http://alliedhealth.lsuhs.edu/communicationdisorders/Audiology/AUDcourses.pdf

Audiology course sequence. (n.d.). Retrieved April 26, 2011, from Louisiana State University, Health Science Center School of Allied Health Professions Web site: http://alliedhealth.lsuhs.edu/communicationdisorders/Audiology/AuDCourseSequence.pdf

LA: Louisiana Tech University

MA: Northeastern University


MA: University of Massachusetts Amherst

MD: Towson University

MD: University of Maryland

MI: Wayne State University

MN: University of Minnesota

MS: University of Southern Mississippi
Doctor of Audiology curriculum. (2010). Retrieved April 18, 2011, from University of Southern Mississippi, Speech and Hearing Sciences Department Web site: http://campuspub.usm.edu/c/document_library/get_file?uuid=c58edfda-2173-4e02-bc8e-6dc02c86093&groupId=263244

MO: Missouri State University

NC: East Carolina University

NC: University of North Carolina Chapel Hill

NE: University of Nebraska Lincoln

NJ: Montclair University

NY: CUNY Grad Center - Brooklyn Col/Hunter Col


NY: Long Island Aud Consortium - Adelphi/Hofstra/St. John's Universities

NY: Syracuse University

NY: University at Buffalo

OH: Northeast Ohio AuD Consortium - Kent State/University of Akron


OH: Ohio University
Ohio University Communication Sciences and Disorders graduate handbook. (2010-2011). Retrieved April 26, 2011, from Ohio University, School of Rehabilitation and Communication Sci-
OH: University of Cincinnati
OK: University of Oklahoma Health Sciences
PA: Bloomsburg University
PA: Salus University
PA: University of Pittsburgh
SD: University of South Dakota
TN: East Tennessee State University
TN: University of Memphis
TN: University of Tennessee
TN: Vanderbilt University
TX: Lamar University
TX: Texas Tech University
TX: University of North Texas
TX: University of Texas at Dallas
TX: University of Texas at Austin
AuD program. (n.d.). Retrieved April 21, 2011, from Department of Communication Sciences and Disorders, College of Communication, the University of Texas at Austin http://csd.utexas.edu/graduate/aud-program
UT: University of Utah
UT: Utah State University
VA: James Madison University
WA: University of Washington
WA: Washington University
WI: Wisconsin
WV: West Virginia University
Graduate student handbook for audiology. (2010-2011). Retrieved April 12, 2011, from West Virginia University, Department of Speech Pathology and Audiology Web site: http://spa.wvu.edu/r/download/77838