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Original Article

Knowledge Assessment Regarding Pure Tone Audiometry Interpretation Among Speech-Language Pathology/Therapy Professionals

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ABSTRACT

Background: Pure tone audiometry is a fundamental clinical tool for identifying hearing thresholds and classifying hearing-loss severity, but its effective use in rehabilitation requires professionals to interpret both audiometric severity and its functional implications for speech perception and therapy planning. Objective: This study aimed to assess knowledge regarding pure tone audiometry interpretation among speech-language pathology/therapy professionals, with specific focus on hearing-loss severity identification, speech sound deficiency identification, and therapy-needs recognition. Methods: A quantitative cross-sectional observational study was conducted among 58 speech-language pathology/therapy professionals. Data were collected using a structured knowledge assessment form covering four hearing-loss categories: mild, moderate, severe, and profound hearing loss. Correct responses were analyzed descriptively using frequencies and percentages across three knowledge domains. Results: Most participants were female 47 (81.0%), aged 20–30 years 47 (81.0%) and working in school settings 49 (84.5%). Domain-wise performance was highest for therapy needs identification, with 201/232 correct responses (86.6%), followed by severity identification with 172/232 correct responses (74.1%). Speech sound deficiency identification was weakest, with only 68/232 correct responses (29.3%). The overall knowledge score was 441/696 (63.4%). Conclusion: Participants demonstrated reasonable knowledge of therapy needs and severity classification but had substantial difficulty identifying speech sound deficiencies associated with hearing-loss categories. Targeted training is needed to improve functional audiogram interpretation and strengthen clinically applied decision-making. Keywords: Pure tone audiometry; hearing loss; speech-language pathology; audiogram interpretation; speech sound deficiency; therapy needs.

INTRODUCTION

Hearing loss is a major communication-related health condition that affects speech perception, language development, academic participation, social interaction, and overall quality of life. Pure tone audiometry remains one of the fundamental clinical procedures used to estimate hearing thresholds across frequencies and to classify the degree of hearing loss into clinically meaningful categories such as mild, moderate, severe, and profound hearing impairment. Accurate interpretation of an audiogram is not limited to reading decibel thresholds; it also requires understanding how the severity and configuration of hearing loss influence access to speech sounds, communication performance, functional listening, educational participation, and therapeutic decision-making (1). In rehabilitation and educational settings, this interpretation is particularly important because children and adults with hearing loss may require timely referral, auditory training, speech-language intervention, classroom

accommodations, amplification support, or multidisciplinary management depending on the degree and functional impact of the hearing loss (2).

Speech-language pathologists and speech-language therapists frequently work with individuals who present with speech, language, communication, and hearing-related difficulties. Although audiologists are primarily responsible for diagnostic audiological assessment, speech-language professionals are often involved in identifying communication consequences of hearing impairment, counseling families, planning intervention goals, and coordinating care with audiologists, educators, otolaryngologists, and rehabilitation teams. For this reason, they are expected to possess working knowledge of pure tone audiometry interpretation, particularly the ability to recognize hearing-loss severity, anticipate likely speech sound deficiencies, and identify therapy-related needs based on audiometric findings (3). In clinical practice, insufficient understanding of audiometric interpretation may delay referral, weaken intervention planning, or reduce the accuracy with which speech and language goals are aligned with the child's auditory access and communication profile.

The clinical meaning of hearing-loss severity differs across audiometric categories. Mild hearing loss may still interfere with perception of soft speech sounds, speech in noise, and classroom listening, while moderate hearing loss can affect conversational speech perception and may require amplification and structured intervention. Severe and profound hearing loss are usually associated with greater limitations in unaided speech access and often require more intensive audiological, educational, and speech-language support. However, interpretation becomes more complex when professionals must connect threshold levels with functional consequences, particularly speech sound audibility and speech sound deficiency. This distinction is important because a professional may correctly identify the severity category but still fail to understand which speech sounds are likely to be missed or how this hearing profile should shape therapy planning (4).

Previous literature has emphasized the importance of early identification, appropriate hearing assessment, and multidisciplinary rehabilitation for individuals with hearing impairment; however, less attention has been given to the applied knowledge of speech-language professionals in interpreting pure tone audiometry findings. Existing educational and clinical training often emphasizes general hearing-loss categories and referral pathways, but practical competence in linking audiometric severity with speech sound access and therapy needs may remain variable. This gap is clinically relevant because speech-language professionals working in schools, clinics, and hospitals are often positioned close to children and families and may influence early intervention, educational planning, and follow-up compliance. If knowledge is uneven across domains, particularly between severity recognition, speech sound deficiency identification, and therapy-needs interpretation, targeted training can be developed to strengthen the weakest areas of clinical competence (5).

In this context, the present study was conducted to assess knowledge regarding pure tone audiometry interpretation among speech-language pathology/therapy professionals. The study specifically evaluated participants' ability to correctly identify hearing-loss severity, recognize associated speech sound deficiencies, and determine therapy needs across mild, moderate, severe, and profound hearing-loss categories. The research question guiding the study was: What is the level and domain-wise pattern of knowledge regarding pure tone audiometry interpretation among speech-language pathology/therapy professionals? It was hypothesized that participants would demonstrate stronger knowledge in identifying hearing-loss severity and therapy needs than in recognizing speech sound deficiencies associated with different degrees of hearing loss.

MATERIALS AND METHODS

This study was conducted using a quantitative cross-sectional observational design to assess knowledge regarding pure tone audiometry interpretation among speech-language pathology/therapy professionals. A cross-sectional design was selected because the objective was to measure participants'

knowledge at a single point in time and describe domain-wise performance across predefined audiometric interpretation categories. The study population comprised professionals with qualifications in speech-language pathology or speech-language therapy who were working in school, clinical, or hospital settings. The target construct was applied knowledge of pure tone audiometry interpretation, operationalized through correct responses related to hearing-loss severity, expected speech sound deficiency, and therapy needs across four degrees of hearing loss: mild hearing loss of 26–40 dB, moderate hearing loss of 41–70 dB, severe hearing loss of 71–90 dB, and profound hearing loss greater than 90 dB.

Participants were eligible for inclusion if they had completed or were professionally identified with MS SLP/T or postgraduate diploma-level training in speech-language therapy and were actively affiliated with a school, clinical, or hospital-based work setting. Participants from both government and private employment sectors were included to capture variation in professional exposure and service delivery contexts. Individuals who did not belong to the speech-language pathology/therapy professional group or who submitted incomplete knowledge responses were not included in the final analysis. A total of 58 participants were included in the study, and all available complete responses were analyzed. The sample consisted of 47 female and 11 male participants, with most respondents aged 20–30 years. Professional qualification, work setting, and employment sector were recorded to describe the background characteristics of the study participants and to contextualize their knowledge performance.

Data were collected using a structured knowledge assessment form designed to evaluate interpretation of pure tone audiometry findings across clinically relevant hearing-loss categories. The form included demographic and professional variables, including gender, age group, qualification, work setting, and employment sector. The knowledge component assessed three domains: correct identification of hearing-loss severity, correct identification of speech sound deficiency, and correct identification of therapy needs. Each domain was assessed across mild, moderate, severe, and profound hearing-loss categories. Responses were coded as correct or incorrect according to predefined answer criteria based on standard audiometric severity ranges and expected clinical interpretation of hearing-loss impact. The total possible responses for each domain were 232, calculated as 58 participants responding across four hearing-loss categories, and the overall possible knowledge responses were 696 across the three assessed domains.

The primary outcome of the study was overall knowledge performance regarding pure tone audiometry interpretation, expressed as the proportion of correct responses out of the total possible responses. Secondary outcomes included domain-wise knowledge performance for severity identification, speech sound deficiency identification, and therapy needs identification. Category-specific performance was also calculated for each hearing-loss level to identify whether participants demonstrated stronger or weaker interpretation ability for mild, moderate, severe, or profound hearing loss. Demographic and professional variables were treated as descriptive variables and were summarized to characterize the study sample. Knowledge responses were treated as categorical variables and summarized using frequencies and percentages.

To minimize measurement bias, the knowledge items were structured around predefined audiometric categories and were scored using uniform criteria for all participants. The same scoring approach was applied across all hearing-loss categories and domains to maintain internal consistency. Data were reviewed before analysis to identify incomplete or inconsistent entries. Only complete responses contributing to the final denominator were included in the calculation of domain-wise and overall knowledge scores. Since the study objective was descriptive and the provided dataset did not include comparison groups or inferential hypotheses by demographic strata, the analysis was limited to descriptive statistics. Frequencies and percentages were calculated for participant characteristics and correct knowledge responses. Domain-wise percentages were calculated by dividing total correct responses by total possible responses for each domain and multiplying by 100. The overall knowledge

score was calculated by dividing the total number of correct responses across all domains by the total possible responses across all domains.

Data were analyzed using descriptive statistical procedures. Categorical variables were presented as frequency and percentage. Knowledge performance was reported in tabular form for each hearing-loss category and for each knowledge domain. No p-values, odds ratios, confidence intervals, or regression models were applied because the available analysis was designed to describe knowledge performance rather than test associations between participant characteristics and knowledge outcomes. Ethical principles for human-participant research were followed by ensuring voluntary participation, confidentiality of participant responses, and use of anonymized data for analysis. The study was conducted with attention to data integrity by applying a consistent coding framework, maintaining a fixed denominator for all domain-wise calculations, and reporting all analyzed knowledge domains transparently.

RESULTS

A total of 58 participants were included in the analysis. The sample was predominantly female, with 47 participants (81.0%) identifying as female and 11 (19.0%) as male. Most participants were in the 20–30-year age group, representing 47 respondents (81.0%), while 11 participants (19.0%) were aged 31–40 years. Regarding professional qualification, 31 participants (53.4%) held an MS SLP/T qualification, whereas 27 (46.6%) had a postgraduate diploma in speech and language therapy. Most participants were working in school-based settings, accounting for 49 respondents (84.5%), followed by clinical settings 5 (8.6%) and hospital settings 4 (6.9%). In terms of employment sector, 46 participants (79.3%) were employed in government institutions, while 12 (20.7%) were working in the private sector.

Table 1. Demographic and Professional Characteristics of Participants

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	47	81.0
	Male	11	19.0
Age group	20–30 years	47	81.0
	31–40 years	11	19.0
Qualification	MS SLP/T	31	53.4
	PGD in SLT	27	46.6
Work setting	School setting	49	84.5
	Clinical setting	5	8.6
	Hospital setting	4	6.9
Employment sector	Government	46	79.3
	Private	12	20.7

Knowledge regarding interpretation of pure tone audiometry varied across the four hearing-loss categories. Correct identification of hearing-loss severity was highest for profound hearing loss >90 dB, where 53 participants (91.4%) responded correctly, followed by moderate hearing loss, 41–70 dB, correctly identified by 50 participants (86.2%). Mild hearing loss, 26–40 dB, was correctly identified by 45 participants (77.6%), whereas severe hearing loss, 71–90 dB, showed the lowest correct severity identification, with only 24 participants (41.4%) responding correctly. This indicates that although participants generally recognized profound and moderate hearing loss more accurately, interpretation of severe hearing loss remained comparatively weak.

Performance was substantially lower for identifying speech sound deficiencies associated with hearing-loss categories. Correct identification was highest for moderate hearing loss, with 31 participants (53.4%) providing correct responses, followed by severe hearing loss, correctly identified by 22 participants (37.9%). In contrast, only 12 participants (20.7%) correctly identified speech sound deficiencies related to mild hearing loss, and only 3 participants (5.2%) correctly identified speech sound deficiencies associated with profound hearing loss. This pattern suggests a major knowledge gap in linking

audiometric severity with expected speech sound limitations, particularly at the mild and profound ends of the hearing-loss spectrum.

Correct identification of therapy needs was generally high across all hearing-loss categories. Therapy needs for both moderate hearing loss and profound hearing loss were correctly identified by 53 participants (91.4%) each, while 50 participants (86.2%) correctly identified therapy needs for mild hearing loss. For severe hearing loss, correct identification of therapy needs was lower but still relatively adequate, with 45 participants (77.6%) responding correctly. Overall, participants demonstrated stronger knowledge of therapy-related decision-making than of speech sound deficiency interpretation.

Table 2. Knowledge Assessment Regarding Pure Tone Audiometry Interpretation by Hearing Loss Severity

Hearing Loss Category	Identification of Severity n (%)	Identification of Speech Sound Deficiency n (%)	Identification of Therapy Needs n (%)
Mild hearing loss, 26–40 dB	45 (77.6)	12 (20.7)	50 (86.2)
Moderate hearing loss, 41–70 dB	50 (86.2)	31 (53.4)	53 (91.4)
Severe hearing loss, 71–90 dB	24 (41.4)	22 (37.9)	45 (77.6)
Profound hearing loss, >90 dB	53 (91.4)	3 (5.2)	53 (91.4)

Domain-wise analysis showed that participants achieved the highest performance in the therapy needs identification domain, with 201 correct responses out of 232 possible responses, corresponding to 86.6% correct performance. The severity identification domain showed moderate-to-good performance, with 172 correct responses out of 232, yielding an accuracy of 74.1%. The weakest performance was observed in the speech sound deficiency identification domain, where only 68 correct responses out of 232 were recorded, corresponding to 29.3% accuracy. The overall knowledge score across all domains was 441 correct responses out of 696 possible responses, giving an overall correct response rate of 63.4%. These findings indicate that while participants were relatively competent in identifying hearing-loss severity and therapy requirements, their ability to interpret speech sound deficiencies from pure tone audiometry results was markedly limited.

Table 3. Domain-Wise Knowledge Performance

Knowledge Domain	Total Correct Responses	Total Possible Responses	Percentage Correct (%)
Severity identification	172	232	74.1
Speech sound deficiency identification	68	232	29.3
Therapy needs identification	201	232	86.6
Overall knowledge score	441	696	63.4

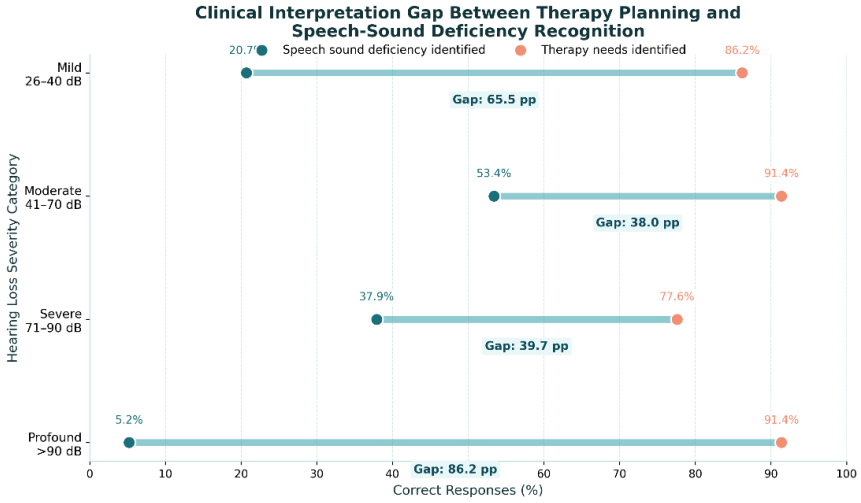

Figure 1. Clinical Interpretation Gap Between Therapy Planning and Speech-Sound Deficiency Recognition

The figure demonstrates a marked clinical interpretation gap between participants' ability to identify therapy needs and their ability to recognize speech-sound deficiencies from pure tone audiometry findings. The largest gap was observed for profound hearing loss, where therapy needs were correctly

identified by 91.4% of participants, but speech-sound deficiency was correctly identified by only 5.2%, producing an 86.2 percentage-point gap. A similarly wide gap was seen in mild hearing loss, with 86.2% correct therapy-needs identification compared with 20.7% correct speech-sound deficiency identification, yielding a 65.5 percentage-point gap. The gaps were smaller but still clinically meaningful for severe hearing loss and moderate hearing loss, at 39.7 and 38.0 percentage points, respectively. Overall, the pattern indicates that participants were more confident in identifying the need for therapy than in translating audiometric severity into functional speech-sound consequences, highlighting a targeted training need in clinically applied audiogram interpretation.

Overall, the results demonstrate a clear domain-specific pattern in knowledge performance. Participants showed the strongest competence in recognizing therapy needs, with correct responses exceeding 85%, and reasonably good performance in severity identification, with approximately three-fourths of responses correct. However, knowledge related to speech sound deficiency identification was substantially poorer, with fewer than one-third of responses correct. This discrepancy suggests that participants may understand broad audiological categories and intervention needs but have difficulty translating audiometric findings into functional speech-sound implications, which is a clinically important component of pure tone audiometry interpretation.

DISCUSSION

The present study assessed knowledge regarding pure tone audiometry interpretation among speech-language pathology/therapy professionals and demonstrated a clear domain-specific pattern in performance. Participants showed relatively stronger competence in identifying therapy needs and hearing-loss severity, but substantially weaker performance in identifying speech sound deficiencies associated with different levels of hearing loss. Overall knowledge performance was moderate, with 441 correct responses out of 696 possible responses (63.4%), indicating that while participants possessed a basic working understanding of audiometric interpretation, important gaps remained in translating audiometric findings into functional speech-language implications. This distinction is clinically important because pure tone audiometry provides threshold-based information, but effective rehabilitation planning requires professionals to interpret how these thresholds affect speech audibility, communication access, educational participation, and therapy priorities (1,2).

The strongest performance was observed in therapy-needs identification, where participants achieved 201 correct responses out of 232 possible responses (86.6%). This suggests that most respondents were able to recognize when therapeutic or rehabilitative support was needed across mild, moderate, severe, and profound hearing-loss categories. Correct therapy-needs identification was highest for moderate and profound hearing loss, with 53 participants (91.4%) responding correctly in each category, followed by mild hearing loss with 50 correct responses (86.2%) and severe hearing loss with 45 correct responses (77.6%). These findings indicate that speech-language professionals may be more confident in broad intervention decision-making than in detailed audiological interpretation. This may reflect routine clinical exposure to referral and therapy planning, where the need for intervention is often emphasized more than the precise relationship between hearing thresholds and speech sound access.

Severity identification showed moderate-to-good performance, with 172 correct responses out of 232 possible responses (74.1%). Participants performed best in identifying profound hearing loss, with 53 correct responses (91.4%), followed by moderate hearing loss with 50 correct responses (86.2%) and mild hearing loss with 45 correct responses (77.6%). However, severe hearing loss was correctly identified by only 24 participants (41.4%), making it the weakest category for severity classification. This finding suggests that participants may have difficulty distinguishing severe hearing loss from adjacent categories, particularly when threshold ranges require more precise interpretation. Such misclassification can have practical consequences because severe hearing loss is often associated with

substantial limitations in unaided speech perception and may require more intensive audiological and speech-language management than moderate hearing loss (3,4).

The most notable weakness was observed in the speech sound deficiency identification domain, where participants achieved only 68 correct responses out of 232 possible responses (29.3%). This domain was particularly poor for profound hearing loss, with only 3 participants (5.2%) correctly identifying associated speech sound deficiencies, and for mild hearing loss, with only 12 participants (20.7%) responding correctly. Even the highest performance in this domain, observed for moderate hearing loss, was limited to 31 correct responses (53.4%). These findings indicate a major gap in functional interpretation of audiometric results. While participants were generally able to recognize that therapy was required, they were less able to identify how hearing-loss severity affects access to speech sounds. This is a clinically significant concern because speech-language intervention depends not only on knowing that a person has hearing loss, but also on understanding which speech sounds may be inaccessible, distorted, or inconsistently perceived.

The interpretation gap was further reflected in the derived comparison between therapy-needs identification and speech sound deficiency identification. The largest gap was observed for profound hearing loss, where therapy needs were correctly identified by 91.4% of participants, but speech sound deficiency was correctly identified by only 5.2%, yielding an 86.2 percentage-point gap. A similarly important gap was seen in mild hearing loss, where 86.2% correctly identified therapy needs but only 20.7% correctly identified speech sound deficiencies, resulting in a 65.5 percentage-point gap. These findings suggest that participants may recognize the presence of clinical need without fully understanding the underlying speech-perceptual implications of audiometric thresholds. This pattern is important because mild hearing loss may be underestimated despite its potential impact on high-frequency consonant perception, classroom listening, and speech-in-noise comprehension, while profound hearing loss may require more advanced understanding of limited unaided speech access and the need for coordinated audiological and communication-based intervention (5,6).

The demographic profile of the sample may also help interpret the findings. Most participants were female 47/58 (81.0%), aged 20–30 years 47/58 (81.0%), and working in school settings 49/58 (84.5%). Most were employed in government institutions 46/58 (79.3%), while a smaller proportion worked in private settings 12/58 (20.7%). This distribution suggests that the findings mainly reflect knowledge patterns among relatively young professionals working in school-based environments. School settings may provide frequent exposure to children with speech, language, and learning needs, but may offer less direct exposure to detailed audiological assessment than specialized audiology clinics or hospital-based hearing services. This may partially explain why therapy-needs identification was stronger than speech sound deficiency interpretation. The findings therefore support the need for targeted continuing professional development that strengthens applied audiogram interpretation, especially the link between hearing thresholds, speech sound audibility, classroom communication, and therapy planning.

The findings have practical implications for professional training and service delivery. Speech-language pathology/therapy curricula and workplace training should place greater emphasis on functional audiogram interpretation rather than only severity classification. Training should include case-based interpretation of audiograms, speech banana mapping, functional listening consequences, referral indicators, amplification-related considerations, and therapy planning based on hearing-loss severity. Particular attention should be given to mild and profound hearing-loss categories, where the gap between therapy-needs recognition and speech sound deficiency identification was most pronounced. Strengthening this competency may improve interdisciplinary communication between speech-language professionals, audiologists, teachers, physicians, and families, and may support more accurate counseling and intervention planning.

This study has limitations that should be considered when interpreting the findings. The sample size was modest and limited to 58 participants, with a predominance of young professionals and school-based

respondents, which may restrict generalizability to all speech-language pathology/therapy professionals. The analysis was descriptive and did not test associations between participant characteristics and knowledge performance. Therefore, it cannot determine whether qualification, work setting, age, or employment sector significantly influenced knowledge scores. The study also assessed correct responses across selected hearing-loss categories but did not include detailed information on participants' years of experience, prior audiology training, frequency of audiogram use, or exposure to hearing-impaired clients. Future studies should include larger and more diverse samples, assess training background and clinical experience, and apply inferential analysis to identify predictors of stronger audiometric interpretation competence. Despite these limitations, the study identifies a clinically meaningful knowledge gap and provides a useful basis for targeted training in applied pure tone audiometry interpretation.

CONCLUSION

This study found that speech-language pathology/therapy professionals demonstrated moderate overall knowledge regarding pure tone audiometry interpretation, with 441 correct responses out of 696 possible responses (63.4%). Participants performed best in identifying therapy needs, achieving 86.6% correct responses, and showed moderate performance in hearing-loss severity identification, with 74.1% correct responses. However, knowledge of speech sound deficiency identification was markedly poor, with only 29.3% correct responses, indicating a substantial gap in translating audiometric thresholds into functional speech-language implications. The largest interpretation gaps were observed in profound and mild hearing loss, suggesting that professionals may recognize the need for therapy without fully understanding the speech-perceptual consequences of hearing loss. These findings highlight the need for targeted professional training in functional audiogram interpretation, with emphasis on linking hearing-loss severity to speech sound access, communication outcomes, and individualized therapy planning.

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