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Research Article

Classroom Listening Experiences of Students Who Are Deaf or Hard of Hearing Using Listening Inventory For Education–Revised

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Purpose: This study examined classroom listening experiences reported by students who are deaf or hard of hearing using the Listening Inventory For Education–Revised (LIFE-R).
Method: Retrospective electronic survey responses from 3,584 school-age participants were analyzed using descriptive statistics to report student perceptions of listening difficulty in various classroom scenarios, including the strategies students used when they did not hear or understand. Stratified data were used to explore potential differences between grades and across degree of hearing loss or type of hearing technology.
Results: Average student listening appraisal ratings for 15 classroom, school, and social scenarios was 5.7 based on a 10-point Likert scale (0 = *difficult*, 10 = *easy*), highlighting listening difficulties encountered during the school day. This finding can be considered in context with the average rating of 7.2 reported from a previous study of students with typical hearing using the LIFE-R. The greatest difficulties were reported when trying to listen when other students in the class were making noise and in hearing the comments of other classmates. Average listening difficulty was greater for respondents in Grades 3–6 than those in Grades 7–12. Listening difficulty also generally increased relative to degree of hearing loss. When unable to hear, some students took proactive steps to improve their listening access; some reported they did nothing.
Conclusions: Students who are deaf or hard of hearing can face challenges in hearing and understanding throughout the school day. A functional tool to evaluate and monitor student experiences, such as the LIFE-R, can provide information to make necessary and effective adjustments to classroom instruction and the listening environment.

Because of early identification of hearing loss and the use of advanced hearing technology (e.g., digital hearing aids, cochlear implants, hearing-assistive technology [HAT]), many children who are deaf or hard of hearing (DHH) use listening and spoken language for communication. They are educated in general education settings and have the same academic requirements and achievement expectations as their same-aged hearing peers. According to the U.S. Department of Education, National Center for Education Statistics (2017), 61% of children who are DHH (6–21 years old served under the Individuals with Disabilities Education Act) spend more than 80% of their school day in a general education classroom, and 88% of children who are DHH spend at least some portion of their school day in a general education classroom. Just 12% of children who are DHH attend a separate day school program, residential, or private educational placement. An understanding of DHH students' experiences in the general education classroom is essential to ensure the learning environment and the accessibility of the curriculum are comparable to hearing peers.

It is well recognized that listening experiences of children, including those with normal hearing, are more negatively impacted by noisy environments than those of adults (P. B. Nelson et al., 2009; Seep et al., 2000; Wolfe & Smith, 2016a, 2016b). When learning environments are excessively noisy, children are at risk for potential deficits in speech perception, language development, and educational

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outcomes (American Speech-Language-Hearing Association [ASHA], 2015; Dockrell & Shield, 2004; Neuman et al., 2010; Shields & Dockrell, 2008; Vander Ghinst et al., 2019; Yang & Bradley, 2009). Krijger et al. (2018) and Schafer et al. (2013) reported that even students with normal hearing experienced some level of hearing difficulty across a variety of classroom, school, and social listening environments. This listening impact can be exponential for children who are DHH who have a compromised auditory system, resulting in barriers to learning if there are suboptimal classroom listening conditions (Iglehart, 2016; Krijger et al., 2018; P. B. Nelson & Blaeser, 2010). Background or ambient noise sources that are undesirable or impede access to the desired speech or instructional signal can occur, such as classmates talking or whispering, side conversations among adults, chairs sliding on floors, or students shuffling papers or rummaging through backpacks. There can be noises from heating, ventilation, and air conditioning (HVAC) systems; fans; classroom electronics; and a variety of other hallway or outside noises. A reduction of these competing noise conditions that impact classroom listening can result in lower student stress, improved behavior, and a positive impact on students' educational experiences (Canning & James, 2012; Dockrell & Shield, 2004).

The ASHA (2004) National Standard on Classroom Acoustics and the American National Standards Institute (2010) have recommended that the noise level in unoccupied classrooms should not exceed 35 dB(A) and the signal-to-noise ratio (SNR) in the classroom should be at least +15 dB (ASHA, 2004), meaning that the teacher's voice should be at least 15 dB louder than the noise level of the classroom. Some researchers advocate that the educational environment for children who are DHH should have an SNR of at least +20 dB given the increased difficulty with speech perception compared to children with typical hearing under identical noise conditions (Bess, 1999; Cole & Flexer, 2015). Although there are established standards for classroom acoustics, many classrooms do not meet these requirements. For example, in an evaluation of the unoccupied background noise levels in 32 elementary school classrooms, Knecht et al. (2002) found just four of the 32 classrooms had background noise levels below 35 dB(A), with nine of the classrooms measuring an unoccupied background noise level of 50 dB(A) or higher. When classrooms are occupied with unavoidable student-generated noise, the SNR can vary minute to minute depending on classroom activities and the listener location relative to the speaker, with the SNR in most classrooms ranging +10 dB down to as much as −20 dB or worse (Crandell & Smaldino, 1994; Crandell et al., 2005; Larsen & Blair, 2008). McKellin et al. (2011) reported that comprehending language in noisy environments increases the listener's cognitive burdens where sustained attention and higher concentration are needed. Children who are DHH expend more effort to listen and pay attention, may have increased speech perception difficulty, and experience greater fatigue when listening in noisy or reverberant environments as compared with their typically hearing peers (Hick & Tharpe, 2002; Hornsby et al., 2017; Leibold et al., 2013; L. H. Nelson et al., 2017). The risk to educational impact can be substantial given the interactive constructs of today's classroom. A teacher standing at the front of the class and delivering a didactic lecture throughout the day is not descriptive of most classroom learning dynamics. In a 2016 study sponsored by Phonak Corporation, Feilner et al. (2016) measured the time students in Europe, North America, South America, and Asia engaged in various activities throughout the school day. They found that front-of-the class instruction or students working individually accounted for just 35% of the students' school day, whereas group work or interactive lessons accounted for 34% of the typical school day, and 31% involved other peer-to-peer activities.

The Americans with Disabilities Act (1990) requires that students with hearing loss have access to communication opportunities equal to that of their typically hearing peers, including the use of auxiliary aids and services as appropriate. The use of HAT (e.g., personal FM systems, sound field classroom amplification, desktop FM) can facilitate auditory access for students who are DHH. Recognizing the impact to the listening environment across all activities throughout the school day can inform teachers and students of effective accommodations to ensure students who are DHH have the same access to the curriculum and rich learning opportunities as their hearing peers.

To identify the individual needs of each student, teachers can benefit from having an objective tool to document and monitor student perceptions of the acoustic environment and their classroom listening experiences. One such tool is the Listening Inventory For Education–Revised (LIFE-R; Anderson et al., 2011a). The purpose of the LIFE-R is for students, third grade and older, to self-report their perceptions of how well they can hear in various classroom, school, or social situations as well as their perceptions of the listening environment. There are three sections to the LIFE-R. The first section, called "Before LIFE," contains six multiple-choice questions to query students' general perceptions of how well they hear in the classroom, where they typically are seated in the class relative to the teacher, noises they hear, and how they feel about listening with their hearing technology. The second section of the LIFE-R is the "Student Appraisal of Listening Difficulty". This section prompts students to more fully consider various listening environments by describing 15 typical classroom, school, or social listening scenarios and, using a Likert scale that includes both descriptive ratings and numeric ratings, to indicate how well they hear in each of the scenarios. Finally, the third section, called "After LIFE," contains six multiple-choice questions to probe strategies students utilize or actions they take if the listening environment becomes challenging.

First released in 2011 as a paper-and-pencil document, the LIFE-R became available in a free, online format in 2012 on the Supporting Success for Children with Hearing Loss website (http://successforkidswithhearingloss.com). The online responses collected by user consent beginning in 2013 now constitute a rich source of information on

functional classroom listening experiences of students who are DHH. The responses collected no child-specific information for confidentiality reasons. The purpose of this article is to summarize results obtained from surveys submitted online over a 4-year period (2013–2017) to (a) describe the self-reported listening experiences of children in Grades 3–12; (b) compare reports of listening experiences across three age groups for combined Grades 3–6, 7–9, and 10–12; (c) examine potential listening differences by degree of hearing loss reported; and (d) describe actions students take when unable to hear. This compilation of data can inform parents and professionals of the listening perceptions of students who are DHH and consider beneficial adjustments to the classroom environment or in teacher instructional practices that could result in improved communication experiences and student outcomes.

Method

Survey Questionnaire

The LIFE-R survey can be found at http://successforkidswithhearingloss.com/life-r. Study approval was obtained by the Utah State University Institutional Review Board, and there were no financial or other conflicts of interest.

Participants

Survey responses were collected on those who provided consent for their electronic questionnaire results to be included in study data for analysis. In addition to the link on the Supporting Success for Children with Hearing Loss website, the LIFE-R was also referenced or promoted through numerous professional websites related to services for children who are DHH, with some external websites that contained links directly to the questionnaire.

The recommended procedure for completing the LIFE-R questionnaire with elementary-age children is for teachers to be present while the student completes the questionnaire. This allows the teacher to read and discuss the questions with the student to ensure there is a clear understanding of the language and intent of each question prior to entering a response. Middle school or high school students typically complete the questionnaire independently, with the teacher available to assist or clarify as needed. Professionals are also referred to the instruction manual (Anderson et al., 2011b) posted on the website along with the questionnaire for administration guidance.

Analysis

Retrospective data from the online LIFE-R questionnaire were analyzed to describe functional classroom listening experiences of students who are DHH. The electronic survey software recorded 4,857 initial survey activations. Of those, 1,193 surveys contained either no data or responses were so incomplete as to render them unusable, such as those containing a response to a single question or those in which demographic data were entered, but nothing else. The second author reviewed all survey activations and omitted these unusable entries. In addition, 80 entries from participants in kindergarten through second grade were removed from analysis due to validity concerns of self-report from students younger than third grade, resulting in a clean data set of responses from 3,584 participants.

Results

Results from 3,584 participants who completed the LIFE-R questionnaire are provided. Not all survey participants provided a response to every question, and some survey questions allowed for more than one response. Therefore, the response denominator for each question is noted.

Participants

The LIFE-R was developed for practical application to inform and benefit teachers and students to describe individual listening experiences in the classroom and school environment, not as a research survey. As such, student age was not collected on the survey, and the query to identify student grade in school was added after the original release. The questionnaire also did not collect mode of communication, gender, school placement, socioeconomic status, geographical location, or other demographic data. Students independently and/or with teacher assistance (hereafter referred to as "respondents") entered survey responses.

In the demographics section, respondents self-reported their degree or configuration of hearing loss, categorized as (a) mild (up to 40 dB), (b) moderate (41–70 dB), (c) severe or profound (71 dB+), (d) unilateral, or (e) high frequency, reverse sloping, or fluctuating. Respondents indicated the type of personal hearing technology they used, categorized as (a) bilateral hearing aids, (b) unilateral hearing aid, (c) bilateral cochlear implants, (d) unilateral cochlear implant, (e) bone-anchored devices, or (f) bimodal (any combination of hearing aid, cochlear implant, or bone-anchored, one in each ear). Table 1 highlights the proportion of each in the sample.

Of the 3,584 responses, 509 surveys provided grade information. Of those, just over half (55%) were from elementary-age students in Grades 3–6, with 29% from students in middle school Grades 7–9, and 16% from high school students in Grades 10–12. Of these 509 surveys, 318 indicated the type of hearing technology used, with 53%, 59%, and 57% of participants in Grades 3–6, 7–9, and 10–12, respectively, who used bilateral hearing aids and 20%, 19%, and 21% of participants in Grades 3–6, 7–9, and 10–12, respectively, who used unilateral hearing aids. Twelve percent, 12%, and 11% of participants in Grades 3–6, 7–9, and 10–12, respectively, reported they used bilateral cochlear implants, and 1%, 4%, and 9% of participants in Grades 3–6, 7–9, and 10–12, respectively, reported they used unilateral cochlear implants. Eleven percent, 5%, and 0% of respondents in Grades 3–6, 7–9, and 10–12, respectively, reported using a bone-conduction hearing aid. The

Table 1. Participant descriptors.

Variable	% (*n*)
Grade (*n* = 509)	
Grades 3–6	55 (277)
Grades 7–9	29 (149)
Grades 10–12	16 (83)
Hearing loss degree or configuration (*n* = 3,584)	
Mild loss (up to 40 dB)	21 (746)
Moderate loss (41–70 dB)	26 (922)
Severe or profound loss (71 dB+)	12 (425)
Unilateral loss	18 (645)
High frequency, reverse, or fluctuating	13 (476)
Not reported	10 (370)
Personal hearing technology (*n* = 3,584)	
Bilateral hearing aid	42 (1,515)
Unilateral hearing aid	11 (407)
Bilateral cochlear implant	8 (263)
Unilateral cochlear implant	3 (104)
Bone-anchored device	3 (101)
Bimodal	2 (83)
Information not provided	31 (1,111)
Assistive listening technology (*n* = 3,584)	
Reported available	55 (1,977)
Not reported or not available[a]	45 (1,607)

[a]Unable to distinguish between not reported and not available.

remainder of respondents indicated using some combination of bimodal technology configuration.

Finally, respondents were queried if they had access to HAT. Fifty-five percent of respondents (*n* = 1,977) indicated HAT was available, but it was not possible to determine how many of the students used the HAT that was available, nor was it possible to discern if student responses were based on listening experiences with personal hearing technology plus HAT or only with personal hearing technology. For this reason, results reported do not include interpretations involving listening impact when using HAT (see Table 1).

Student Description of Listening Environment

The first section of the LIFE-R, called "Before LIFE-R," probed respondent perceptions of the classroom arrangement, teacher instructional practices, and students' initial impressions of how well they can hear the teacher when seated in their typical location in the classroom. Of 2,414 responses, 67% reported they were typically seated in the first or second row of the classroom, with the remaining respondents indicating various locations throughout the classroom, changing depending on the class or time of day. Sixty-one percent of respondents reported the teacher taught from the same location in the class or moved around once or twice during the day, with 39% who reported the teacher moved around the room half or most of the time. Therefore, student seating position relative to the teacher could change based on teaching style, class activities, and whether or not the teacher remained in the same general location. The LIFE-R queried "How well do you hear the teacher when seated at your typical location in the classroom?" Of 2,623 responses, 83% reported they could hear well all or most of the time, and 17% reported they missed some or a lot of information. Of the 2,007 respondents who responded to this question and who also indicated their degree of hearing loss, 86% with unilateral hearing loss and 84% with mild hearing loss reported they could hear well all or most of the time, with 82% of those with moderate hearing loss who reported the same. Respondents with a severe or profound hearing loss were further stratified based on type of technology. These differences were notable, but not statistically significant, with 86% of cochlear implant users who reported they could hear well all or most of the time compared with 76% of hearing aid users who reported the same. Implications of these findings as compared with those in the Student Appraisal of Listening Experiences, reported in the next section, are noted in the Discussion section.

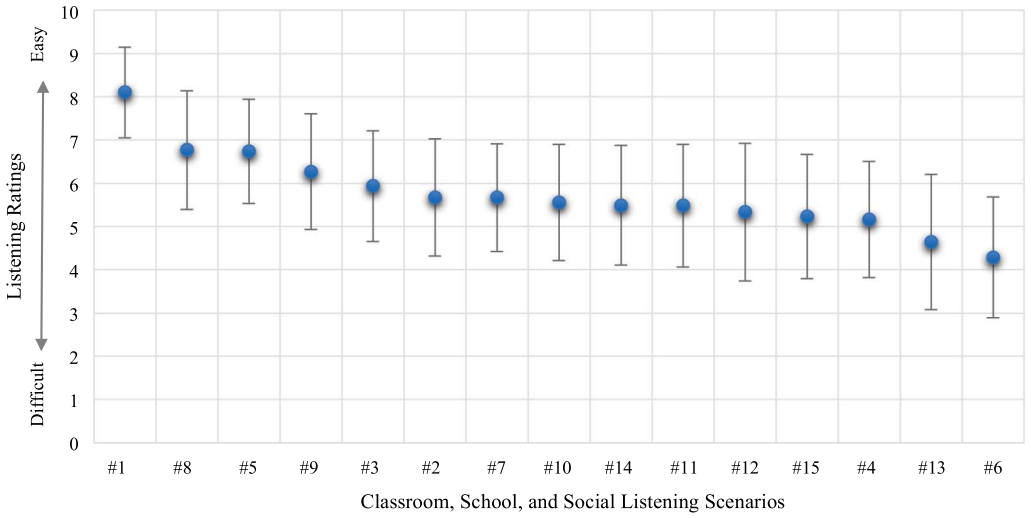
Student Appraisal of Listening Experiences

After completing the initial questions, respondents completed the second section of the LIFE-R, entitled "Student Appraisal of Listening Difficulty" (*n* = 3,462–3,526). In this section, 15 classroom, school, or social student appraisal (SA) listening scenarios were described for participants to consider their listening experiences across a variety of settings and circumstances (see Figure 1). Scenarios 1–10 focused on classroom listening situations, and Scenarios 11–15 focused on school or social listening situations. Respondents rated their perception of listening ability in each scenario using a 10-point Likert scale. This scale allowed respondents to assign a numeric value that also correlated with a descriptor to indicate their rating for each listening scenario: 10 points (*always easy*), 7 points (*mostly easy*), 5 points (*sometimes difficult*), 2 points (*mostly difficult*), or 0 points (*always difficult*).

Listening Scenario Ratings

Using the 0, 2, 5, 7, or 10 Likert scale point values, study respondents reported, on average, a 6.0 (*SD* = 1.7) listening rating for Scenarios 1–10 (SA 1 to SA 10) to describe classroom listening activities. These 10 classroom scenarios queried listening when (a) the classroom was quiet and the teacher was talking at the front of the room, (b) the teacher was talking but the student could not see the teacher's face, (c) the teacher was talking while moving around the classroom, (d) another student across the room answered a question or made a comment, (e) the teacher was explaining an assignment or giving directions, (e) the teacher was talking while students inside the class were being noisy, (f) the teacher was talking while there were noises occurring outside the classroom, (g) the teacher was using some form of instructional technology (e.g., computer, TV, video), (h) the teacher was talking while fan noises (such as when using a projector) or other HVAC noises were present in the classroom, and (i) a teacher was talking at the front of the room while another teacher led a separate small instructional group in the same classroom area.

Figure 1. Classroom, school, and social student appraisal (SA) listening ratings HVAC = heating, ventilation, and air conditioning.



Scenarios Key	
SA-1	Classroom quiet, teacher front
SA-8	Listening to video, computer
SA-5	Understanding directions
SA-9	Fan or HVAC noise
SA-3	Teacher talking while moving
SA-2	Teacher talking, back turned
SA-7	Noises outside of classroom
SA-10	Simultaneous large and small group
SA-14	Listening when outside
SA-11	Small group learning
SA-12	Speaker announcements
SA-15	Listening in social settings
SA-4	Classmate making comment
SA-13	Large room or assembly, no microphone
SA-6	Other students making noise

Using the 0, 2, 5, 7, or 10 Likert scale point values, study respondents reported, on average, a 5.2 (*SD* = 2.2) listening rating for Scenarios 11–15 to describe additional school or social listening activities. These five scenarios queried listening when (a) students in the class were working in small groups, which could include students talking and shuffling papers; (b) listening to speaker announcements in the classroom; (c) listening during large group meetings or school assemblies without a microphone; (d) listening when outside, on the playground, or at the bus stop; and (e) listening in social settings, such as during lunchtime or in the hallways.

The listening scenario reported as most difficult was when trying to hear the teacher while other students were making noise in the classroom (SA 6, average = 4.3, *SD* = 2.8), followed by difficulty when listening in a large room or school assembly without a microphone (SA 13, average = 4.6, *SD* = 3.1). The easiest listening scenario was when the teacher was talking at the front of the room and the classroom was quiet (SA 1, average = 8.1, *SD* = 2.1). The total average score for all 15 SA listening scenarios was 5.7 (*SD* = 1.8). See Figure 1 for mean ratings, including standard deviations, for all listening scenarios.

These listening ratings can be considered in context with those of Krijger et al. (2018) who obtained LIFE-R data from 187 students with normal hearing from 11 Belgium mainstream classrooms. The participants in this study had a mean age of 13 years, 7 months (*SD* = 1 year, 1 month), and the purpose of the study was to translate and validate the LIFE-R questionnaire into Dutch. These study findings showed participants had listening appraisal scenario ratings, on average, of 72.0% (*SD* = 13.9%), which when converted to the scale used in this study, was equivalent to a Likert rating of 7.2 (*SD* = 1.4), indicating students with normal hearing also experienced listening difficulty in various classroom, school, or social settings. Similar to this study, the most difficult listening scenario for participants in the Krijger et al. study was when other students were making noise in the classroom, followed by difficulty in simultaneous large and small group instruction and when listening in a large room or school assembly without a microphone. Because the Krijger et al. study involved a different language than this study and was for the purpose of translating and validating the LIFE-R instrument, comparisons with this study must be made with caution.

However, the Krijger et al. findings can provide valuable context relative to classroom listening experiences of students with normal hearing and further emphasize the potential learning barriers for all students when the listening environment is compromised.

Listening Responses by Grade

Of the 509 questionnaires that included grade information, 453 completed the listening scenario ratings. As shown in Figure 2, respondents in Grades 3–6 reported, on average, poorer overall listening appraisal ratings than respondents in Grades 7–9 and 10–12. Independent-samples *t* tests were used to test for differences in the total 15 scenario listening ratings based on grade. Significant differences were found when the responses from participants in Grades 3–6 were compared with those in Grades 7–9, $t(318) = 3.87$, $p = .001$, and between Grades 3 and 6 compared with those in Grades 10–12, $t(156) = 2.87$, $p = .004$. No significant differences were seen in response ratings between Grades 7–9 and 10–12, $t(168) = 0.57$, $p = .570$. Consistent with findings from the full data set, stratified data showed the most difficult listening environment for all age groups was when trying to listen to the teacher when other students were making noises in the classroom (SA 6). Respondents in Grades 3–6 reported somewhat greater difficulty on average (average = 3.9, $SD = 2.8$) in this scenario than their older counterparts in Grades 7–9 (average = 5.1, $SD = 2.7$) and Grades 10–12 (average = 5.3, $SD = 2.4$), although comparisons were not statistically significant. In 14 of the 15 scenarios, respondents in Grades 3–6 showed a lower average rating of listening perception than respondents in Grades 7–9 and 10–12. The only exception was the scenario when listening to a computer, TV, or video screen (SA 8) in which Grades 3–6 scored, on average, 7.3 ($SD = 2.6$) compared with 6.7 ($SD = 3.1$) and 6.7 ($SD = 2.6$) for Grades 7–9 and 10–12, respectively. Overall, respondents in Grades 3–6 scored, on average, 5.3 ($SD = 2.2$) for all 15 SA listening scenarios, compared with 6.1 ($SD = 1.9$) for respondents in Grades 7–9 and 6.0 ($SD = 2.5$) for respondents in Grades 10–12.

Impact of Degree of Hearing Loss and Type of Hearing Technology

Additional analyses were completed to assess the impact of the degree of hearing loss on student perceptions of listening, with the severe or profound hearing loss category further stratified based on the technology of hearing aid users (unilateral, bilateral, and bone-conduction combined) and cochlear implant users (unilateral, bilateral, and bimodal combined). Respondents who reported reverse-slope, high-frequency, or fluctuating hearing loss were combined and reported as "other." Figure 3 highlights the average responses for each listening scenario (SA 1 to SA 15) and their corresponding 95% confidence interval for each hearing loss category. Responses revealed that, as the degree of hearing loss increased, average difficulty in hearing and understanding also increased or showed a general trend of increased difficulty. In each scenario, HA users with severe/profound hearing loss showed greater hearing difficulty than all other groups. Furthermore, as Table 2 presents, there were statistical differences across the groups in 12 of the 15 scenarios.[1]

Actions Taken When Unable to Hear

After completing the listening appraisal scenarios, the LIFE-R includes a section called "After LIFE." In this section, respondents indicated actions taken when they experience hearing challenges in the context of six described scenarios. Of the fixed response options provided on the questionnaire, respondents could select as many options as applied to them. Therefore, the total *n* represents the total number of responses received (or actions taken) for each category, not the number of respondents. The verbatim questions, along with the three most frequently reported actions, are described. Because only the top 3 are described in the narrative, the percentages in each question in the narrative do not total 100%. However, all responses and descriptive statistics totaling 100% are shown in Table 3.

1) *What do you do to let your teacher know that you didn't hear or understand what s/he said?* Of 4,975 responses, 49% reported they would raise their hand and ask the teacher to repeat what was said or ask for more information. Twenty-one percent would look around to see what other students were doing, and 12% reported they did nothing, hoping they would figure it out.

2) *What do you do if it is too noisy in your classroom, making it hard for you to understand what your teacher says?* Of 4,814 responses, 29% indicated they did nothing and would put more effort into listening, hoping to hear enough to figure out what's going on. Twenty-two percent indicated they would raise their hand to let the teacher know they could not hear, and 20% percent indicated they would try to reduce the noise (e.g., close the door if the noise was in the hallway, ask others to be quiet) or move to a seat away from the noise source.

3) *What do you do when another student's voice is too quiet for you to understand during a class discussion?* Of 3,671 responses, 28% indicated they would turn around in their seat or move to see their classmate's face more clearly. Twenty-eight percent indicated they would do nothing and hoped the classmate's comment would be repeated by the teacher, and 20% indicated they would raise their hand to let the teacher know their classmate's voice was too soft to hear.

4) *What do you do when you can't hear or understand what your friends are saying when you are hanging out?* Of 4,071 responses, 31% reported they usually missed only part of the message and would ask clarifying questions. Twenty-four percent reported they did nothing or walked away, and 21% reported the group would move to a quieter

[1]For a complete numeric breakdown of Likert ratings, total *n* for each question, and degree of hearing loss disaggregated data (mild, moderate, severe/profound, unilateral, and combined group of high frequency, reverse slope, and fluctuating hearing loss), see the Appendix.

Figure 2. LIFE-R listening appraisal scenarios, Likert rating 0–10, disaggregated by grade (n = 453). LIFE-R = Listening Inventory For Education–Revised.

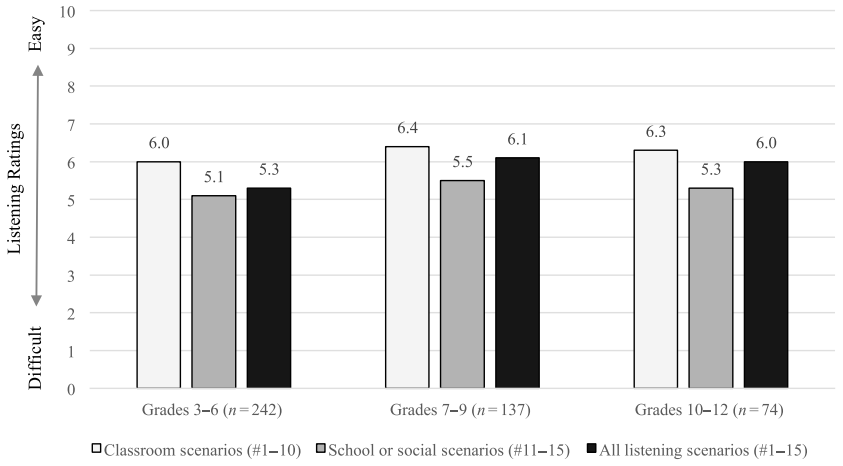


Figure 3. LIFE-R classroom listening situations by degree of hearing loss, showing the average ranking and the 95% confidence interval. LIFE-R = Listening Inventory For Education–Revised; SA = student appraisal.

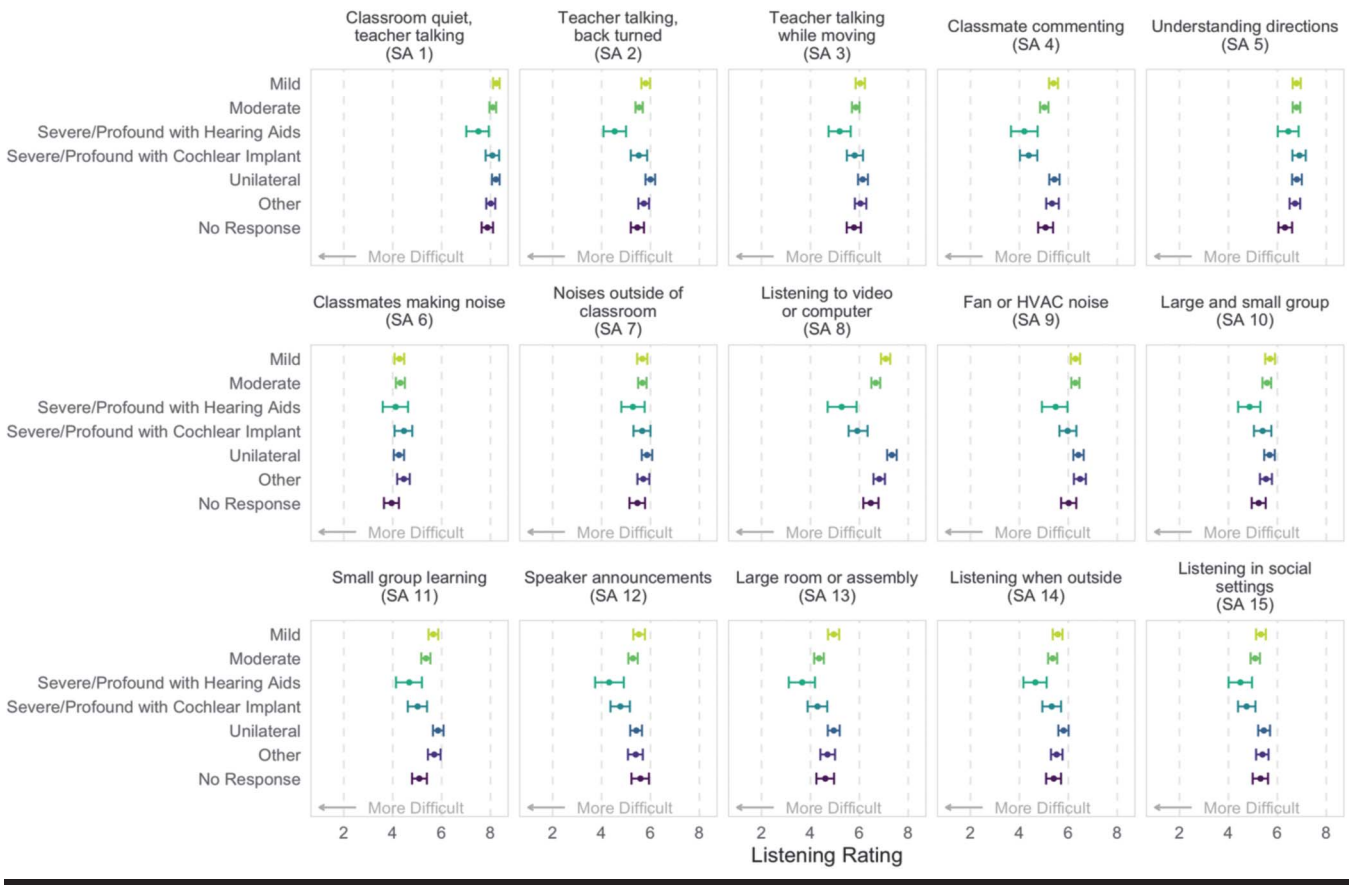


Table 2. Statistical comparisons of the difficulty rankings for each student appraisal (SA) scenario across degree of hearing loss.

Scenario	*F* statistic	*p* value
SA 1	2.52	.015
SA 2	6.01	< .001
SA 3	3.02	.004
SA 4	7.28	< .001
SA 5	1.87	.072
SA 6	1.14	.334
SA 7	1.05	.391
SA 8	13.82	< .001
SA 9	2.91	.005
SA 10	2.38	.020
SA 11	5.76	< .001
SA 12	3.86	< .001
SA 13	5.15	< .001
SA 14	3.28	.002
SA 15	3.20	.002

place or the respondent would stand closer to the person who was talking.

5) *What are the things you do when you are trying to communicate and it's noisy?* Of 3,393 responses, 29% reported they would take action to try to get the noise to stop or would move away from the noise source. Twenty-five percent tried to avoid places where it was noisy, and 17% did nothing and hoped that no one would ask them anything.

6) *What do you do if your listening technology is not working?* Of 3,357 responses, 30% reported they would let their teacher know right away, 29% reported they would do basic troubleshooting themselves to try to figure out what was wrong (e.g., change batteries), and 21% reported they would let the teacher know there was a problem and would leave the class to connect with the audiologist or professional identified to assist them with their hearing technology.

Actions Taken Based on Grade

No statistically significant differences in student actions were found based on degree of hearing loss or type of technology used. When responses were disaggregated by grade, slight response trends were noted. For example, averages were calculated for all the response options of "doing nothing" when unable to hear, with 18.4% of respondents in Grades 10–12 and 19% of respondents in Grades 7–9 who reported they would do nothing if unable to hear compared with 16.6% of respondents in Grades 3–6. Respondents in Grades 7–9 and 10–12 were also slightly more likely to take proactive steps than respondents in Grades 3–6, such as talking to the teacher after class, trying to remove the noise source, or moving away from a noise source when possible. Substantively or statistically, however, there were no notable differences in actions taken by grade.

Discussion

The LIFE-R is a tool for students and teachers to objectively evaluate and monitor students' perception of their communication challenges in the classroom listening environment and implement needed adjustments to maximize auditory access and minimize noise interferences. The finding that 83% of respondents reported they could hear well in their classroom was positive and supports the practicability of students who are DHH to successfully engage in general education settings with typical hearing peers. However, when more scrutinized listening scenario details from the LIFE-R were obtained, respondents showed an overall average listening appraisal score of 5.7 on the 10-point Likert scale (0 = *difficult*, 10 = *easy*), suggesting there are environments and listening conditions that have deleterious effects on students' experiences and learning opportunities. This disparity may also suggest students' perception of listening ability is more substantially impacted than they realize unless they consider specific classroom, school, and social listening situations across the school day. It further may indicate a need for teachers to spend more time in instructing the student about their hearing loss, its impact, and self-advocacy strategies. In considering the LIFE-R average listening appraisal score of 7.2 found in students with typical hearing (Krijger et al., 2018), strategies or solutions for improving the listening environment should be explored to ensure students with hearing loss have access to their learning environment similar to their hearing peers and to improve the listening environment and learning access for all students.

Classroom Environment

Findings from this study highlighted teaching style, such as lecturing while walking around the room or talking while facing and writing on the board, impacted student access in hearing and understanding what was being said. For many teachers, moving around the classroom during a discussion is purposeful to facilitate student engagement and to encourage student contributions to learning activities. At the same time, teachers should be aware of instructional behaviors that negatively impact the listening environment for students who are DHH. Making a concerted effort to avoid instruction that impedes the auditory signal or removes access to facial cues could be simple adjustments for teachers, yet such changes could provide substantial listening improvement for students who are DHH in the class.

Preferential seating (e.g., seated on the first or second row) is a frequently recommended accommodation for students who are DHH. However, such accommodations must be viewed with the classroom instructional dynamics in mind. For example, students seated on the front row of the classroom may adequately hear the teacher or other speakers at the front of the room, but they may not hear the comments or questions of classmates sitting behind them or the lecture from a roaming teacher. This can be particularly difficult during highly interactive discussions in which several students throughout the room are making comments. Some students may benefit from seating placement in the second or third row and toward the side to facilitate auditory access and other visual or facial cues.

Table 3. Students' actions when unable to hear.

Variable	% (*n*)
1. What do you do when you didn't hear what the teacher said? (*n* = 4,975)	
Ask the teacher to repeat or ask for more information	49 (2,430)
Look around to see what other students are doing	21 (1,045)
Do nothing and hope to figure it out	12 (581)
Use agreed-upon facial expression or signal	11 (560)
Ask the teacher after class	7 (359)
2. What do you do if it is too noisy in your classroom? (*n* = 4,814)	
Do nothing, hope to hear enough to figure out	29 (1,377)
Raise hand and let the teacher know you cannot hear	22 (1,052)
Try to remove the noise or ask others to stop making noise	20 (983)
Talk to the teacher after class	13 (625)
Stop attending, do something else	9 (438)
Glare at those who are making noise	7 (339)
3. What do you do when a student's voice is too quiet to hear? (*n* = 3,671)	
Move or take steps to see classmate's face	28 (1,042)
Do nothing, hope the teacher will repeat the comment	28 (1,020)
Raise hand and indicate you cannot hear classmate	20 (738)
Do nothing, hope comment is not important	14 (522)
Remind teacher to use FM	10 (349)
4. What do you do when you can't hear your friends? (*n* = 4,071)	
Usually miss only part of message, ask for clarification	31 (1,245)
Do nothing or walk away	24 (967)
Group will move to quieter place	21 (869)
Friends aware and will provide facial cues	14 (564)
Change subject	10 (426)
5. What do you do when trying to communicate and it's noisy? (*n* = 3,393)	
Try to get noise to stop or move away from noise	29 (995)
Avoid places where it is noisy	25 (848)
Do nothing, hope no one will ask questions	17 (580)
Teacher will use an FM system	13 (434)
Stop paying attention	12 (402)
Switch to a different program on hearing technology	4 (134)
6. What do you do if listening technology is not working? (*n* = 3,357)	
Let teacher know	30 (998)
Troubleshoot technology/change batteries	29 (986)
Find audiologist or other professional	21 (707)
Do nothing or talk to teacher at the end of class	20 (666)

Students with unilateral or asymmetrical hearing loss should be positioned with the better ear closest to the desired speech or auditory signal. In other words, a single recommendation cannot be applied to all classrooms and all children, but through collaboration between professionals, parents, and students, an evaluation of the acoustical environment could result in valuable changes or recommendations to improve the listening experiences of students who are DHH.

Findings from this study support the importance of controlling the noise levels inside the classroom and, to the extent possible, outside the classroom. Although the LIFE-R did not probe how often students encountered disruptive noise levels, many students reported that, when noises did occur in the classroom, it impacted to some degree their ability to hear and understand what the teacher or other students were saying. When other students in the class were talking, dropping pencils, or shuffling papers at their desk, this impacted the listening environment for most survey respondents and reinforces the notion that disturbances that could seemingly be minimal to an adult may be disruptive to all students in the class and particularly those who are DHH. Respondents indicated that noises generated from outside the classroom (hallway, playground, cars, construction, etc.) and ambient noise from computer fans or from HVAC systems were noticeable to them and, for many, resulted in some degree of hearing interference (see Figure 1).

The finding that respondents had difficulty hearing the comments of their classmates (SA-4; average rating = 5.2, *SD* = 2.7) or hearing when other students were making noise in the classroom (SA-6; average rating = 4.3, *SD* = 2.8) raised substantial concerns (see Figure 3). Such communication breakdowns place students at risk of missing important instructional details and may reduce the likelihood that they will attempt to contribute to the discussion themselves if they cannot follow the dialogue. This is particularly concerning given the high percentage of peer-to-peer communications found by Feilner et al. (2016). In keeping with effective instructional practice recommendations, many educators utilize interactive classroom dynamics with substantial student involvement and dialogue, small learning groups, or other interactive constructs. As these practices are implemented, documentation of hearing impact to students who are DHH, as well as making effective accommodations, is critical in helping them maintain

optimal access to the curriculum and actively understanding and engaging in informational exchanges. Similarly, instruction that is appropriately supported by technology, such as videos or smart boards, can enhance students' learning experiences. However, study findings suggested that teachers should be cautious about instruction that requires students to listen to the teacher while simultaneously watching a video screen.

Study findings highlighted the differences in listening perception in elementary-age respondents and those in Grades 7–12. These findings are consistent with previous research that has documented the impact of noise on the still-developing auditory cortex (Wolfe & Smith, 2016a, 2016b) and the resulting cognitive burden placed on young children when trying to learn in a suboptimal listening environment. Engaged students in interactive learning centers or cooperative group learning situations can be rich educational experiences for students, and controlling the noise level in the environment does not necessarily equate to all students facing forward and quietly listening to the teacher. However, educators can be mindful of the unnecessary noises or interactions that do not meaningfully contribute to the learning experience and then make appropriate adjustments or accommodations.

Using some form of HAT is widely advocated and recognized as a means of improving speech perception access for students who are DHH (Anderson & Goldstein, 2004; Collins et al., 2013; L. H. Nelson et al., 2013), yet just slightly more than half of respondents reported using a personal or sound field FM system. The Americans with Disabilities Act (1990) states that students with hearing loss should have communication access that is as effective as that of their peers, accomplished by auxiliary aids and services as individually appropriate. Although not evaluated in this study, previous research has shown the use of HAT can help to "level the playing field" for students who are DHH so that they have communication access similar to hearing peers (Hick & Tharpe, 2002; Hornsby et al., 2017; Leibold et al., 2013). Parents and professionals should be mindful of the availability of these devices and, if not being used, carefully evaluate the potential benefits for children who are DHH to ensure each child has optimal listening and communication access. The need for or benefit of utilizing HAT must be individually determined for each child, and teachers can contribute to these determinations by documenting student performance on an instrument such as the LIFE-R. Even when HAT is utilized, a reduction in background noise and control of the overall listening environment is essential to meet the needs of active, multidimensional classrooms in which the speech or signal source is ever changing with interactive group learning and technology-focused activities (Wolfe et al., 2013).

Impact of Degree of Hearing Loss

As shown in Figures 3, study findings were compelling in highlighting the impact of degree of hearing loss to student listening experiences, with SA scenarios showing trends of greater listening difficulty as degree of hearing loss increased, particularly for respondents with severe or profound hearing loss using HAs. Audiologists should be sure educators know the degree of hearing loss for each student in their class. Through interdisciplinary collaboration with educators, speech-language pathologists, audiologists, and parents, the functional listening and communication access for each child can be effectively monitored, with recommendations for utilizing the most optimal technology as individually appropriate.

These findings also reinforced the importance of taking seriously the potential impact of a unilateral hearing loss. Some may mistakenly believe that, as long as the student has normal hearing in one ear, there would be little cause for concern. As a group, respondents with unilateral hearing loss showed listening appraisal rankings similar to, or only slightly better than, respondents with a mild hearing loss. Furthermore, although the trend showed increased difficulty relative to degree of hearing loss, findings from all groups warrant close evaluation and monitoring. In other words, teachers should evaluate the performance and needs of each student with any degree of hearing loss across the school day and during a variety of listening activities.

Student acquisition of academic knowledge and age-appropriate achievements are fundamental goals of all educational systems. Simultaneously, priorities for students to develop strong connections with their peers and engage in appropriate social interactions also lay foundations for future academic, vocational, and personal successes. Hearing both direct and incidental conversations in hallways, before and after school, during lunch time and recess, and during other social exchanges can contribute to developing peer relationships. Fully participating in large group activities, hearing announcements that come over the speaker system into the classroom, and following the dialogue at a student assembly are also important academic and social components of the school day. An understanding of student experiences during school and other social interactions may be enlightening to teachers and to their parents and could promote valuable conversations about possible technology adjustments, need for HAT, instructional accommodations, or self-advocacy actions on the part of the student.

Student Actions When Unable to Hear

Findings from this study illuminated strategies students utilized when they did not adequately hear or understand their teacher or classmates (see Table 2). Many respondents indicated taking proactive steps to improve their listening access, such as raising their hand to inform the teacher they could not hear, asking for information to be repeated, adjusting their position to provide improved visual access to the speakers' face, or attempting to minimize or remove the noise source. Some respondents reported they often did nothing, hoping the information would either be repeated or not prove to be important, or they would look around to see what other students were doing

and then follow along. These findings reinforce recommendations for educational professionals to know how students in their class would respond to the LIFE-R questions across the school day and the strategies students likely would use when understanding was impeded. Such data could help inform educators of adjustments or adaptations in the classroom environment, teaching behaviors (e.g., talking while facing the board), or in direct teaching of self-advocacy skills that could make a substantial impact to their students' listening experiences.

Teachers can incorporate instruction in self-advocacy skills to teach students to respond to challenging listening situations appropriately and to self-identify effective actions to improve listening access to be full participants in their classroom, school, and social environments. Because study findings highlighted several different actions students may take when they did not hear or understand, it would be important for educators to explore and understand the most likely strategies students in his or her class tend to use and under what circumstances. This understanding could lead to valuable self-advocacy instruction within the contexts most meaningful to each student. Utilizing objective documentation of listening experiences across a variety of learning environments, such as the LIFE-R, could be a useful tool for professionals, parents, and students to ensure optimal listening, language, academic, and social growth for all students in the classroom and particularly for students who are DHH.

Limitations

As a functional educational tool to promote understanding and discussion between teachers and students, and not as a research survey, the LIFE-R questionnaire did not query some components of respondent demographics or educational environment details. For example, because each LIFE-R question is focused on the ability to hear and understand in a general education classroom, it would have been beneficial to confirm that respondents used listening and spoken language as their primary mode of communication and that their responses were in reference to listening experiences in a general education placement. As such, it was not possible to confirm that all respondents met appropriate or relevant inclusion criteria. Respondent age, presence of additional disabilities, gender, cultural or socioeconomic background, age of identification of hearing loss, hearing history, or geographical location would have provided additional demographic clarity. These demographic limitations to the study could impact generalizability of results and/or insufficiently represent the listening experiences of students who use hearing technology and whose primary mode of communication is listening and spoken language in the general education setting.

The survey did not query how often disruptive noises occurred in the classroom. Therefore, the frequency in which hearing and understanding in the classroom were disrupted cannot be inferred, but rather the impact to listening when such noises did occur. It was not possible to confirm that respondents followed procedures in completing the questionnaire as recommended in the LIFE-R instruction manual or to know if they were completed with appropriate teacher support in understanding the questions and providing thoughtful responses. If the teacher was present during questionnaire completion, it was not known if this may or may not have influenced student responses. Accuracy of self-report concerning degree of hearing loss or type of technology used could not be confirmed. The ability to clarify responses that included HAT would have contributed to results and recommendations. Taken together, these limitations should be considered in the context of the study findings, interpretations, and recommendations.

Conclusions

When provided with a variety of listening scenarios, findings from this study illustrated that students who are DHH can face challenges in maintaining an optimal listening environment throughout the school day. A functional tool to evaluate and monitor students' ability to hear and understand in the classroom and during various instructional or social components of the day, such as the LIFE-R, can provide teachers with insight and information to make necessary and effective accommodations and inform the necessity of instruction in self-advocacy skill development. The LIFE-R can facilitate student discussions to help them recognize potential listening breakdowns, to advocate for their listening needs, and to recognize the most effective strategies to employ when hearing or understanding is compromised.

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Appendix (p. 1 of 2)

Likert Ratings for Each LIFE-R Question

	Total *N*	Always easy	Mostly easy	Sometimes difficult	Mostly difficult	Always difficult
Classroom quiet, teacher talking (SA 1)	3,526	49% (1,718)	37% (1,311)	12% (416)	2% (57)	> 1% (24)
Mild hearing loss	744	51% (377)	38% (282)	10% (74)	1% (10)	> 1% (1)
Moderate hearing loss	903	48% (434)	38% (346)	12% (103)	2% (16)	> 1% (4)
Severe/profound hearing loss	411	47% (192)	36% (145)	13% (56)	2% (10)	2% (8)
Unilateral hearing loss	641	52% (332)	36% (233)	10% (60)	1% (9)	1% (7)
HF, rev slope, fluctuating	474	46% (221)	38% (178)	14% (65)	2% (8)	> 1% (2)
Teacher talking, back turned (SA 2)	3,518	12% (416)	34% (1,190)	38% (1,328)	11% (401)	5% (183)
Mild hearing loss	743	14% (100)	35% (258)	36% (269)	11% (82)	4% (34)
Moderate hearing loss	900	10% (88)	33% (293)	41% (370)	11% (102)	5% (47)
Severe/profound hearing loss	409	10% (39)	30% (121)	38% (158)	15% (62)	7% (29)
Unilateral hearing loss	638	15% (97)	36% (230)	36% (228)	8% (54)	5% (29)
HF, rev slope, fluctuating	475	13% (60)	35% (166)	35% (168)	13% (60)	4% (21)
Teacher talking while moving (SA 3)	3,510	16% (565)	34% (1,203)	34% (1,184)	12% (414)	4% (144)
Mild hearing loss	741	17% (122)	35% (263)	34% (251)	10% (74)	4% (31)
Moderate hearing loss	898	15% (129)	35% (313)	35% (312)	12% (110)	3% (34)
Severe/profound hearing loss	408	11% (44)	36% (146)	34% (141)	13% (52)	6% (25)
Unilateral hearing loss	637	21% (132)	33% (209)	30% (195)	12% (76)	4% (25)
HF, rev slope, fluctuating	474	17% (83)	33% (153)	36% (172)	11% (52)	3% (14)
Classmate making comment (SA 4)	3,504	11% (380)	26% (922)	37% (1,319)	18% (614)	8% (269)
Mild hearing loss	740	11% (85)	29% (210)	38% (287)	16% (116)	6% (42)
Moderate hearing loss	896	9% (79)	26% (235)	39% (344)	19% (173)	7% (65)
Severe/profound hearing loss	408	8% (31)	21% (87)	34% (139)	25% (102)	12% (49)
Unilateral hearing loss	636	12% (76)	30% (188)	38% (243)	13% (82)	7% (47)
HF, rev slope, fluctuating	474	14% (69)	25% (116)	37% (175)	16% (76)	8% (38)
Understanding directions (SA 5)	3,511	24% (828)	43% (1,531)	24% (843)	6% (220)	3% (89)
Mild hearing loss	742	24% (180)	43% (318)	25% (181)	7% (52)	1% (11)
Moderate hearing loss	896	24% (208)	45% (409)	24% (213)	4% (37)	3% (29)
Severe/profound hearing loss	408	21% (85)	50% (199)	23% (96)	5% (19)	2% (9)
Unilateral hearing loss	640	26% (167)	42% (272)	22% (139)	6% (40)	4% (22)
HF, rev slope, fluctuating	473	24% (114)	40% (189)	27% (129)	8% (36)	1% (5)
Classmates making noise (SA 6)	3,516	6% (222)	21% (732)	35% (1,230)	22% (785)	16% (547)
Mild hearing loss	741	6% (42)	21% (156)	36% (263)	22% (164)	15% (116)
Moderate hearing loss	900	6% (56)	22% (192)	34% (312)	23% (208)	15% (132)
Severe/profound hearing loss	410	7% (30)	21% (86)	35% (142)	22% (90)	15% (62)
Unilateral hearing loss	639	6% (37)	22% (138)	34% (220)	22% (141)	16% (103)
HF, rev slope, fluctuating	474	9% (41)	19% (91)	36% (173)	21% (99)	15% (70)
Noises outside of classroom (SA 7)	3,502	15% (522)	32% (1,114)	34% (1,188)	13% (451)	6% (227)
Mild hearing loss	737	15% (110)	31% (229)	35% (255)	13% (96)	6% (47)
Moderate hearing loss	897	14% (120)	34% (305)	34% (307)	12% (109)	6% (56)
Severe/profound hearing loss	409	13% (53)	32% (132)	35% (142)	14% (57)	6% (25)
Unilateral hearing loss	638	18% (118)	31% (196)	33% (209)	11% (70)	7% (45)
HF, rev slope, fluctuating	474	15% (70)	33% (155)	33% (160)	13% (60)	6% (29)
Listening to video or computer (SA 8)	3,506	30% (1,050)	36% (1,254)	22% (781)	8% (272)	4% (149)
Mild hearing loss	742	33% (248)	36% (269)	22% (162)	6% (42)	3% (21)
Moderate hearing loss	895	28% (248)	37% (331)	22% (202)	9% (81)	4% (33)
Severe/profound hearing loss	407	20% (79)	31% (125)	27% (112)	13% (53)	9% (38)
Unilateral hearing loss	638	37% (239)	36% (229)	20% (127)	4% (25)	3% (18)
HF, rev slope, fluctuating	474	31% (145)	36% (170)	21% (101)	9% (43)	3% (15)
Fan or HVAC noise (SA 9)	3,462	22% (752)	35% (1,200)	29% (1,017)	10% (342)	4% (151)
Mild hearing loss	732	21% (154)	36% (261)	30% (219)	9% (67)	4% (31)
Moderate hearing loss	885	21% (185)	35% (309)	31% (275)	10% (89)	3% (27)
Severe/profound hearing loss	404	16% (66)	36% (145)	30% (122)	11% (43)	7% (28)
Unilateral hearing loss	632	25% (159)	33% (210)	28% (174)	10% (61)	4% (28)
HF, rev slope, fluctuating	465	24% (112)	36% (169)	27% (123)	10% (48)	3% (13)
Large and small group (SA 10)	3,469	13% (468)	31% (1,084)	35% (1,207)	14% (478)	7% (232)
Mild hearing loss	735	15% (109)	32% (238)	34% (246)	13% (99)	6% (43)
Moderate hearing loss	895	13% (116)	33% (292)	34% (303)	15% (138)	5% (46)
Severe/profound hearing loss	400	11% (43)	29% (119)	36% (143)	15% (59)	9% (36)
Unilateral hearing loss	631	15% (93)	32% (204)	35% (220)	10% (64)	8% (50)
HF, rev slope, fluctuating	470	15% (69)	29% (137)	34% (161)	16% (74)	6% (29)

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Likert Ratings for Each LIFE-R Question

	Total *N*	Always easy	Mostly easy	Sometimes difficult	Mostly difficult	Always difficult
Small group learning (SA 11)	3,499	15% (522)	30% (1,036)	32% (1,127)	15% (538)	8% (276)
Mild hearing loss	740	16% (117)	29% (219)	34% (253)	15% (107)	6% (44)
Moderate hearing loss	895	14% (120)	30% (269)	31% (282)	17% (152)	8% (72)
Severe/profound hearing loss	406	11% (45)	28% (114)	30% (123)	19% (77)	12% (47)
Unilateral hearing loss	638	19% (118)	31% (195)	32% (206)	12% (78)	6% (41)
HF, rev slope, fluctuating	472	17% (78)	31% (144)	32% (153)	14% (68)	6% (29)
Speaker announcements (SA 12)	3,491	19% (671)	24% (825)	28% (977)	18% (618)	11% (400)
Mild hearing loss	741	20% (151)	25% (185)	28% (206)	16% (119)	11% (80)
Moderate hearing loss	896	18% (157)	23% (208)	31% (277)	18% (161)	10% (93)
Severe/profound hearing loss	402	13% (50)	23% (94)	27% (108)	20% (82)	17% (68)
Unilateral hearing loss	638	20% (129)	25% (157)	26% (168)	18% (115)	11% (69)
HF, rev slope, fluctuating	470	20% (96)	23% (108)	28% (131)	18% (83)	11% (52)
Large room or assembly (SA 13)	3,490	13% (441)	21% (759)	29% (1,008)	21% (716)	16% (566)
Mild hearing loss	739	14% (106)	23% (172)	31% (224)	19% (140)	13% (97)
Moderate hearing loss	891	11% (94)	21% (184)	28% (248)	23% (206)	17% (159)
Severe/profound hearing loss	404	9% (37)	20% (80)	27% (110)	24% (95)	20% (82)
Unilateral hearing loss	636	15% (96)	25% (155)	27% (174)	18% (118)	15% (93)
HF, rev slope, fluctuating	473	13% (62)	21% (198)	30% (144)	21% (98)	15% (71)
Listening when outside (SA 14)	3,512	14% (500)	30% (1,040)	34% (1,189)	15% (527)	7% (256)
Mild hearing loss	743	15% (112)	29% (215)	35% (261)	14% (103)	7% (52)
Moderate hearing loss	897	12% (106)	30% (268)	35% (318)	16% (142)	7% (63)
Severe/profound hearing loss	408	12% (50)	29% (118)	31% (128)	18% (73)	10% (39)
Unilateral hearing loss	641	17% (107)	33% (213)	31% (200)	13% (81)	6% (40)
HF, rev slope, fluctuating	473	14% (66)	31% (147)	33% (154)	16% (76)	6% (30)
Listening in social settings (SA 15)	3,495	13% (451)	29% (1,000)	32% (1,131)	16% (558)	10% (355)
Mild hearing loss	740	13% (96)	30% (219)	32% (239)	17% (123)	8% (63)
Moderate hearing loss	893	13% (110)	28% (248)	31% (279)	17% (160)	11% (96)
Severe/profound hearing loss	406	8% (30)	27% (111)	35% (141)	17% (69)	13% (55)
Unilateral hearing loss	635	16% (102)	28% (178)	32% (204)	14% (87)	10% (64)
HF, rev slope, fluctuating	473	14% (65)	29% (138)	34% (161)	14% (65)	9% (44)

Note. SA = student appraisal; HF = high frequency; HVAC = heating, ventilation, and air conditioning.