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The Listening Shift: Evaluating a Communication-Strategies Training Program for Telepractice Nurses Experiencing Hearing Challenges

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Abstract

Workers who wish to remain employed should be supported in doing so, even if they are experiencing age-related disabilities, such as hearing loss. I aimed to better understand the strategies from which workers with hearing loss might benefit, and how they can be supported in adopting these strategies. To collect rich data, I recruited telepractice nurses who rely on listening to make critical decisions about triaging and health care recommendations. My first research question was: *What strategies exist for making telephone speech more intelligible for health care providers and patients with hearing challenges?* I performed a scoping review following the Joanna Briggs Institute's protocol. I identified 11 types of strategies, many of which required cooperation from, and disclosure to, providers' employers, co-workers, and clients. This led me to consider the public narrative workers associated themselves with when they disclosed. Thus, my second research question was: *How do Canadian newspapers portray workers with hearing loss?* Through a thematic analysis of newspapers articles on this topic, I found they are predominantly portrayed as striving cheerfully both towards functioning normally and towards differentiating themselves and their hearing loss as unique and positive. To further explore how a subset of adults with hearing loss strive to work with a hearing loss, I developed an online communication-strategies training program tailored to nurses with hearing challenges. I then used a multiple case study to answer the following research question: *How do nurses with hearing challenges change in terms of their telephone performance and workplace wellbeing in response to participation in an online communication strategies training program?* Results suggested that nurses engaged in a problem-solving process before adopting strategies, and that strategy adoption could positively contribute to their performance. Together, the findings from these studies suggest that strategies exist to enhance the performance of workers with hearing loss, but the process of adopting these strategies can be demanding. Organizations should take steps to proactively support their nurses, health-care providers, and potentially other workers

with hearing loss in identifying communication strategies and adapting them to their unique context.

Keywords: hearing loss; aural rehabilitation; telephone; nurse; intervention; performance; media; scoping review; multiple case study

Co-Authorship Statement

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WHL	Worker with Hearing Loss
HRC	Hanover Research Council
CNO	College of Nurses of Ontario

Chapter One: Introduction

Literature Review

A country's demographics are linked to its economic performance (Abel 2001, 2003; Brooks 2002). For example, Bakshi and Chen (1994) found that the economic booms enjoyed during the 1980s and '90s were attributable to the fact that Baby Boomers, born between 1945 and 1965, were entering their prime working years. Today, Baby Boomers' retirement is described as an economic 'headwind' (Liu & Spiegel, 2011). The Bank of Canada has predicted that by 2030, unless the situation is managed actively, the increased prevalence of retired persons will reduce Canada's projected per capita output by 20% (Boivin, 2012), lowering Canada's anticipated standard of living. According to the 2016 Retirement Confidence Survey, a third of Americans over 50 plan to continue working after 65 and two-thirds plan to continue working for pay even after officially retiring. However, far fewer actually do so with the majority citing a factor beyond their control; disability or ill health pushing them out of the workforce (Helman, Copeland, & VanDerhei, 2016).

Managing Disability in the Workplace

With appropriate accommodation, persons with chronic conditions and disabilities (e.g., arthritis, diabetes, hearing loss) typically can be as effective as other employees. According to Jahiel and Scherer (2010), people take on a disabled identity when their personal characteristics interact with barriers in their environment. The Accessibility for Ontarians with Disabilities Act obliges employers to accommodate employees with disabilities (Beer, 2010), removing the barriers that create the "disabled person" identity. A 2012 survey found that 57% of accommodations did not have a financial cost associated with them, and those that did frequently involved one-time investments of $500 on average (Loy, 2016). Furthermore, a review of thirteen organizations from healthcare, hospitality, and retail sectors suggested that workers with disabilities performed as well as typical able-bodied employees, required no additional supervision, and remained on the job for an average 4.6 months longer than the average able-bodied employee (Hernandez & McDonald, 2010). Similarly, a study done at Washington Mutual Inc.'s call centre found that while the turnover rate of able-bodied customer service representatives was 45%, turnover in those with disabilities was 8% (Romano, 2003). With lower rates of turnover and few additional costs, workers with disabilities may provide additional value to their employer. There may be a business case for proactively accommodating workers with chronic conditions and disabilities, and for supporting their resilience.

McCraty and Atkinson (2012) define resilience as "the capacity to prepare for, recover from, and adapt to stress, adversity, trauma or tragedy" (p. 49). Employers can build employee resilience through the provision of cognitive and behavioral training, sufficient job control, or stressor-specific support programs (Koerber, Rouse, Stanyar & Pelletier, 2017). Disability management exemplifies a stressor-specific program with the potential to promote employee resilience and benefit the organization as a result.

Currently, programs exist to support health and resilience in the workplace. Workplace wellness programs aim to prevent the occurrence or progression of disease (Goetzel & Ozminkowski, 2008; Hind & Rouse, 2014). However, disability is more than "just a health problem" (World Health Organization, 2018, para. 2). While disability management programs exist to accommodate employees whose disabilities require them to take time off from work (Dyck, 2006), such interventions respond to the dilemma of work absence, rather than preventing it. As a result, both preventative wellness programs and traditional disability management programs overlook the needs of workers with disabilities who attend work regularly. This inattention raises questions around how society perceives workers with disabilities, how they cope, and how their potential to contribute in the workforce might be impacted by the provision of proactive support services.

Hearing Loss in the Workplace

The World Health Organization defines disability as "an umbrella term, covering impairments, activity limitations, and participation restrictions" (World Health

Organization, 2018, para. 1). Hearing loss is estimated to cause more people worldwide to experience moderate to severe disability than any other condition (World Health Organization, 2008). Hearing loss can by described by six degrees of severity: slight, mild, moderate, moderately-severe, severe, and profound (Gelfand, 2009). Adults with a mild loss (i.e. average sensitivity thresholds of 30 dB HL to 40 dB HL) have a threshold of hearing that normally-hearing individuals can approximate by deeply inserting earplugs (Toivonen, Pääkkönen, Savolainen, & Lehtomäki, 2002). At this degree of hearing loss, individuals will struggle with soft or distant speech. Further, damaged cells in the hearing organ can lead this population to struggle with understanding speech presented in background noise (Edwards, 2003). Persons who have a moderate or moderately-severe loss will generally struggle to understand l speech spoken at a normal loudness level unless they have amplification, such as that provided by a hearing aid, and a quiet listening environment. The term ‘hard of hearing’ applies to individuals with mild to moderately-severe hearing loss who communicate through speech (Canadian Association of the Deaf, 2015). Persons who have severe or profound hearing loss typically struggle to understand speech even in quiet environments and with amplification. Individuals with these levels of loss (audiologically described as ‘deaf') generally use assistive technologies such as hearing instruments or cochlear implants and may use sign language to communicate. ‘Deaf’, when capitalized, describes the sociological group of individuals who use sign language and identify with the culture of those who use this language (Canadian Association of the Deaf, 2015). Within this dissertation, I focus on workers with mild to moderately-severe hearing loss who choose to communicate through speech, whether or not they use hearing assistive technologies such as hearing aids. This demographic comprises the vast majority of workers experiencing hearing loss (Goman & Lin, 2016; Statistics Canada, 1992).

The prevalence of hearing loss in Canadian working-aged adults ranges from 7% in ages 20 to 39 to 20% in ages 50 to 59 (Feder, Michaud, Ramage-morin, Mcnamee, & Beauregard, 2015). Because workers with hearing loss (WHL) are less likely to participate in the labor force (Mohr et al., 2000), the prevalence of hearing loss within the actual Canadian workforce is less clear. A study undertaken in Sweden found that 11% of working adults reported hearing loss (Hasson, Theorell, Westerlund, & Canlon, 2010) while in the Netherlands, it has been estimated at 3% (Cuijpers, Lautenbach , & Kösters, 2007 as cited by Gussenhoven et al., 2013). Productivity loss accounts for most of hearing loss' national economic burden, a burden estimated at 1.4% of GDP in Australia (Access Economics, 2006). Hearing loss affects certain job tasks that require auditory or verbal communication, such as telephone use. According to Scherich (1996), telephone hearing challenges lead more workers with hearing loss to quit, take early retirement, or be fired from their jobs than any other hearing challenge.

WHL struggle with using the telephone, participating in group meetings, and integrating into their organization's social fabric (Backenroth, 1995; Jennings, Shaw, Hodgins, Kuchar, & Bataghva, 2010; Scherich, 1996). They must manage their hearing loss in addition to performing job-related tasks. In consequence, workers' degree of hearing loss correlates with work-related fatigue as measured by the Need for Recovery scale (Nachtegaal, Festen, & Kramer, 2012). WHL, particularly female workers, more frequently experience an imbalance between the job demands placed on them, and the amount of control (i.e., ability to make decisions and have those decisions respected) they have in dealing with these demands (Danermark & Gellerstedt, 2004). Moreover, a narrative qualitative study by Martindale (2017) found that working women face barriers to accessing resources that they report might be helpful in coping with the challenges they face. These barriers include the cost of devices and services and a lack of understanding and awareness on the part of those they might turn to for help, including employers, audiologists and other health-care providers (Martindale, 2017). The imbalance between demands and resources correlates with poorer health and psychosocial outcomes (Van der Doef & Maes, 1999).

The poor quality of social support that WHL experience exacerbates this imbalance (Nachtegaal, Festen, & Kramer, 2012). Women working with hearing loss face workplace harassment more frequently, while managers encourage male employees with hearing loss to develop their skills less frequently, as compared with their typically-hearing peers (Danermark & Gellerstedt, 2003, p.115). Poor job outcomes, including disproportionate employment in unskilled and semi-skilled jobs, lower salaries, career immobility, frequent turnover in search of fairer treatment, and early retirement are all more common within this population (Hogan, O'Loughlin, Davis, & Kendig, 2009; Kochkin, 2010; Mowry & Anderson, 1993). Williams, Falkum, and Martinsen (2015) found that, within a population of employees with hearing loss, the severity of the hearing disability did not predict depression symptoms as measured by the Hospital Anxiety and Depression Scale. Rather, a fear of negative evaluation from others and avoidant communication strategies predicted symptoms of depression. Additional challenges may exist for adults who develop hearing loss in their later working years. As an example, middle-aged adults with childhood-onset disabilities demonstrate higher levels of workforce participation than those with adult-onset disabilities (Verbrugge & Tang, 2002). Concerns around ageism may complicate the disclosure and accommodation requests for older workers with hearing loss (Jennings & Shaw, 2008). The need to adapt to a new disability within an existing job may present a greater challenge than starting a new job with a disabling condition. Despite these many challenges, adults with hearing loss who participate in the workforce enjoy greater wellbeing than those with hearing loss who retire or take disability leave (Grimby & Ringdahl, 2000).

To summarize, hearing loss presents a cost to society, and instead of systematic support for managing this disability, WHL face forms of discrimination. We need a deeper understanding of the public discourse around workers with hearing loss and how to support them through programming, such as communication-strategies training.

Training in Communication Strategies

People with limited experience with, or knowledge of, the impacts of hearing loss may incorrectly believe that hearing aids, like eyeglasses, can provide users with normal hearing. However, even when fit with hearing aids, most persons with hearing loss have lower speech comprehension scores and they must exert more 'listening effort' than persons with no hearing loss (Picou, Ricketts, & Hornsby, 2013). Communication-strategies training helps persons with hearing loss to optimize their listening environments and repair communication when it breaks down (Tye-Murray, 2014). Hnath-Chisolm, Abrams, & McArdle (2004) found that veterans fit with hearing aids performed better, at least in the short term, when communication-strategy training accompanied their hearing aid fitting. The strategies taught in such training programs have been gleaned from the experiences of persons with hearing loss and the professionals who work with them. For example, Trychin is a psychologist with hearing loss who has developed materials and programs for supporting adults with hearing loss. He has identified the following list of communication strategies that can be used by persons with hearing loss, (2003, p.7):

- *Pick the best spot to communicate by avoiding areas that are poorly lit and very noisy.*
- *Anticipate difficult situations and plan how to minimize problems.*
- *Pay attention to the speaker*
- *Look for visual clues to what is being said.*
- *Ask for written clues of ke words, if needed.*
- *Provide feedback that you understand or fail to understand.*
- *Do not bluff.*
- *Arrange for frequent breaks, if discussions or meetings are long.*
- *Provide feedback to the speaker by saying how well he or she is doing.*
- *Try not to interrupt too often.*
- *Set realistic goals about what you can expect to understand.*

Task-specific communication strategies have also been developed. For example, Castle (1988) and Erber (1985) have written guides on telephone use for persons with hearing loss. I describe their strategies, and other strategies for telephone use, in chapter two.

Tye-Murray (2014) asserts that communication strategy training should occur in three phases: (1) formal instruction, (2) guided learning, and (3) real-world practice (see

Figure 1). In the first stage, the instructor explains the strategy with an example and presents a pencil-and-paper activity that allows the participants to become comfortable with the concept. Next, in the guided learning phase, the participants role-play to practice and gain feedback. Finally, through real-world practice, participants progress from using the strategy with friends and family to applying it at work and with strangers. In the following section, I will describe past communication-strategies training interventions for WHL and the lessons gained from them.

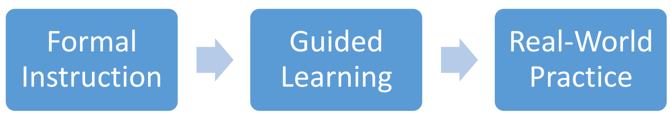

Figure 1. Tye-Murray's (2014) phases of communication strategy training.

Aural Rehabilitation for Workers with Hearing Loss

Holistic 'aural rehabilitation' contains, among other components, communication-strategy training. Understanding the World Health Organization's (WHO) International Classification of Impairments, Disabilities and Handicaps (1980) is central to understanding aural rehabilitation. In the WHO framework, a physical impairment can lead to a disability (i.e., a limited ability to perform functions) which can in turn lead to a handicap (i.e., the disadvantages associated with the disability). Aural (or audiological) rehabilitation is an interactive process that supports individuals to manage the limitations imposed by hearing loss (American Speech-Language-Hearing Association, 2001) to "restore or optimize participation in activities considered limitative" by the individual or their communication partners (Gagné 2000, p. 6). Aural rehabilitation can address disability and handicap in a range of environments. Research attention has been devoted towards the role of aural rehabilitation and communication-strategy training in the workplace.

In 2013, Gussenhoven and colleagues published a systematic review of the literature on vocational aural rehabilitation programs. They summarized programs that support workers with hearing difficulties and instruments that assist in the identification of workers' auditory perceptual demands. Their review identified 10 publications describing seven vocational aural rehabilitation programs and two tools for identifying workplace hearing demands. These programs occurred in a range of settings (i.e., audiology clinics, community agencies, workplaces), employed a range of professionals (e.g. audiologists, psychologists, occupational health experts), and varied in duration from one half-day to seven weekly sessions. The programs provided education in technical devices, communication strategies, and financial decisions, such as early retirement. The majority included education in the prescription and fitting of hearing aids and assistive devices. Most also included training in hearing tactics (i.e. communication strategies). A few provided training in coping strategies, such as assertiveness and relaxation techniques, or recommended workplace accommodations. Of the seven programs reviewed, four reported quantitative results. The programs demonstrated some benefits to their participants in terms of work readiness, communication strategies, and the severity of hearing problems. At the same time, their methodological quality was limited; the authors did not include power calculations or include a control group. A more in-depth examination of these quantitatively evaluated studies provides insights into how to support workers with hearing loss. I have described these along with three additional, relevant studies.

This line of research began with a publication in 1988. Lalande, Riverin and Lambert (1988) taught strategies to reduce the distress and hearing handicap experienced by workers with noise-induced hearing loss. As a pilot program, the research team provided employees of a noisy Montreal bottling plant with a hearing support program. Through seven two-hour, weekly classes, this program provided workers with the opportunity to learn stress management techniques, communication strategies and tools for accepting and adapting to hearing loss. Classes included group discussions on the challenges the participants faced, presentations on coping strategies, practical exercises, and the discussion of homework assignments. Researchers invited 99 noise-exposed workers to participate. They were invited based on their exposure to noise; elevated hearing thresholds were not prerequisite. Five workers participated, and three of these five workers completed the program. In follow-up interviews, these three participants revealed that while they felt better equipped to manage their hearing loss, they also felt more distressed about its implications.

Getty and Hétu (1991) sought to improve upon Lalande's pilot project by recruiting a larger sample and rooting the intervention in theory. They took a more community-based approach to recruitment, relying on an occupational health nurse who was trusted by the population of interest to recruit a total of 48 workers with occupational hearing loss. The program was based on the Blum hearing health approach (Hétu & Getty, 1991). As a result, the trained instructors focused on strategies that both minimized the precursors to hearing problems and repaired hearing problem when they arose. In addition to teaching communication strategies, the course, spread out over eight hours of class time, included training in hearing loss, the use of assistive listening devices, and the use of hearing aids. Audiologists attended each session and were available to provide follow-up care after the program. The intervention's success was evaluated through qualitative interviews in which workers and their spouses reported a reduction in their perceived handicap and a greater sense of mastery in coping with hearing loss. On the other hand, the researchers did not use a control group, and quantitative results came from a psychometrically untested questionnaire, making the results difficult to interpret.

Hallberg and Barrenas (1994) provided a psychoeducational support program for working, middle-aged Swedish men with occupational hearing loss. Based on Soder's (1988) conceptualization of disability as an interaction between a person's body and the environment in which they live, the program focused on reducing problematic interactions between the workers' environment and their hearing loss. As in the intervention designed by Getty and Hétu (1991), it aimed to treat not only the individual but also the individual's social network. To this end, the intervention included spouses in the classes. The course content included coping strategies by which both the affected person and their partner could facilitate communication. Of the 53 participants, researchers assigned 27 to participate in the intervention, and 26 to form the control group. Of those assigned to the intervention, 12 completed the program. Compared to the control group, intervention participants demonstrated a significant quantitative improvement in hearing handicap, as measured by The Hearing Handicap and Support Scale (Erlandsson, Hallberg, & Axelsson, 1993). In contrast, results did not suggest a change in social support (as measured by the Hearing Handicap and Support Scale), acceptance of hearing loss (as measured by the Acceptance of Illness Scale) or coping strategies, as measured by Demorest and Erman's (1987) Communication Strategies Scale of the Communication Profile for the Hearing Impaired.

Six years later, Ringdahl et al. (2001) tested the effectiveness of a far more intensive program, composed of 160, rather than 12 hours of training. Working adults who experienced hearing loss, and secondary psychosocial problems, participated. The full-time program lasted four weeks and was designed to improve participants' understanding of hearing loss and ways to manage it. The research team screened 200 patients from the caseload of a state hearing therapist and social worker, and the team recruited 39 participants. Instructors sought to help participants approach rather than avoid their hearing-related problems through this more intensive rehabilitation program. Participants rated the program highly and, based on the Communication Strategies Scale of the Communication Profile for the Hearing Impaired (CPHI; Demorest & Erdman 1987), they showed lower levels of avoidant communication strategies after the intervention. Nevertheless, they did not score significantly higher on the use of adaptive communication strategies subscale of the CPHI. They also showed no significant decrease in their symptoms of distress, as measured by the Symptom Checklist (SCL-90R; Derogatis, 1976). Ultimately, this intensive program led to outcomes that were mixed and not clearly better than the briefer programs provided by Getty and Hétu (1991) and Hallberg and Barrenas (1994). This supports the view of Preminger (2007), who reported that while a minimum of three 90-minute sessions were required to provide significant benefit to participants, additional or longer sessions did not provide greater benefit.

The results of the interventions described thus far were published between 1988 and 2000. They consisted of group aural rehabilitation classes held in the community, wherein workers with hearing loss learned about hearing loss and its consequences, communication strategies, emotional adjustment, and hearing instruments and devices. These programs demonstrated mixed results in terms of participants' uptake of communication strategies, decrease in hearing handicap, and improvements in overall wellbeing. In the decade following the year 2000, no additional studies were published in this area.

More recently, two programs have tried new approaches to supporting workers with hearing loss. In 2014, Williams, Falkum and Martinsen used cognitive therapy to support 15 workers experiencing hearing challenges and mental distress. Participants learned to challenge negative cognitions. They learned to recognize when they were avoiding hearing challenges and to use alternative coping strategies. Compared to the control group who received treatment as usual, this intervention group showed a significant reduction in both anxiety and avoidant coping strategies. Taking another approach, Gussenhoven et al. (2015) provided workers with hearing loss with one-on-one multidisciplinary evaluations and follow-up plans tailored to the workers' unique psychosocial, occupational and hearing needs. Participants reported high levels of satisfaction with the program and moderate improvements in their functioning at work. Despite these positive outcomes, the participants and their employers implemented few recommendations from their follow-up plans. Further investigation revealed that they found many recommendations impractical within their work environment.

Disability accommodations lead to good outcomes when implemented (Loy, 2016). However, to promote implementation, recommended accommodations must account for both the employee, their job tasks, and their work environment. For this reason, my research focusses on one particular job task, telephone work. As telephone work is frequently performed in call centres, I will now describe the nature of hearing challenges within this work environment.

Call-centre workers and hearing loss

A high percentage of call-centre workers face communication-related problems. One study compared call-handling customer service representatives with non-call-handling administrative staff who also worked in call centres (Taylor, Baldry, Bain, & Ellis, 2003). Call handlers reported sore throats, cough, and voice loss more frequently, as well as significantly higher levels of earache attributed to “problems with headsets and poor audial environment” (Taylor, Baldry, Bain, & Ellis, 2003, p. 443). A third of the call-handlers in this study reported trouble hearing over the phone, attributing their difficulties to background noise in combination with poor telephone connections. In a review of 1183 Swedish call-centre workers, 11% self-reported a hearing loss (Gavhed & Toomingas, 2007). This number is almost three times the prevalence of self-reported hearing loss in the population: 4% of Canadians self-report a hearing loss, despite 12% having one (Feder et al., 2015). Furthermore, 43% of operators report dissatisfaction with the background noise levels in their call centre, and 11 of 15 call centres tested had background noise levels that surpassed the maximum recommended noise level for office work (Gavhed and Tomingas, 2007). This finding is relevant to those with hearing loss, because they struggle to understand speech in the presence of background noise (Dubno, Dirks, & Morgan, 1984).

Managing background noise and other hearing challenges may be difficult in the rigid work environment of a call centre. Worker with disabilities fare less well in inflexible work environments (Baumgartner, Dwertmann, Boehm, & Bruch, 2015), but management within call centres exert high levels of control (Bain & Taylor, 2000). In addition, relative to workers in other industries, call-centre workers experience high levels of work-related stress, illness, and both voluntary and involuntary turnover (Norman, Nilsson, Hagberg, Tornqvist, & Toomingas, 2004). Call-centre workers must engage in emotional labor to maintain a friendly and enthusiastic demeanor (Goldberg & Grandey, 2007; Taylor & Bain, 1999). Unsurprisingly, call-centre workers report high levels of emotional exhaustion (Lewig & Dollard, 2003), which may leave fewer resources for managing hearing challenges. This imbalance may be more acute for telepractice nurses with listening challenges, whose performance on the telephone impacts the health of their clients. Within my dissertation, these nurses are my target population.

Nurses working with hearing loss

To my knowledge, no data exist on the prevalence of hearing loss among nurses, and I must assume that it is comparable with the levels found in the general population. Nevertheless, one might assume that it can be critical to a nurse's job to be able to understand speech effectively. In a study completed by Dare (2009), 82% of nurses reported that communication challenges had a high to very high impact on their ability to work efficiently, and an even greater proportion reported that it threatened patient safety. According to the Joint Commission Center for Transforming Healthcare (2014), ineffective communication was the leading cause of adverse health care events in all categories investigated between 1995 and 2006. Misunderstandings over the telephone can lead to serious consequences, but telepractice nurses have access to few management strategies to prevent such miscommunications. Best practice guidelines in telepractice nursing provided by the College of Nurses of Ontario (CNO; 2009) emphasize the importance of effective communication during phone calls. The college urges nurse to "find solutions to communication and language or cultural barriers" (p.4). Unfortunately, the guidelines do not describe how to do so.

This absence of attention to the impact of hearing loss may be due to skill and ability requirements. The CNO's (2012) Requisite Skills and Abilities document requires that nurses be able to hear "well enough to provide care" (p.3), and "listen… at a level that provides for safe and accurate understanding of words and meanings" (p. 2). In keeping with such requirements, researchers found that health-care professionals with disabilities (including hearing loss) reported that in order to maintain employment, they needed to hide their disability from employers and colleagues (Matt, 2008; Neal-Boylan, 2012). Oddly, the patients of these same professionals were not reported to express concerns around the limitation posed by the professionals' disability (Matt, 2008), rather, they reported that the disability supported the patient-provider rapport. Thus, while nurses with disabilities gain the trust of clients, they still feel the need to hide their disability from their employer (Matt, 2008; Neal-Boylan, 2012). To understand this inconsistency, I will further explore public discourse around workers with hearing loss later this dissertation.

Nurses' work on the telephone

Nurses use the telephone to meet a variety of patient-care goals, and the use of telepractice in healthcare is growing (Goodwin, 2007). In more traditional health-care settings, nurses use the telephone to provide clients with lab results, schedule appointments, organize medications refills, follow-up on patients after discharge, and consult with other professionals. Nurses also provide education and counselling to patients with various conditions through not-for-profit hotlines (e.g., the Alzheimer's Association 24/6 Helpline). In addition, nurses perform triage. Originally, untrained receptionists triaged the clients who called into their physician's office. Nurses stepped in during the 1980s, developing and performing telephone protocols to ensure patients in need could access help immediately, while preventing unnecessary medical appointments (Lafferty & Baird, 2001). Through the telephone, nurses save time and financial resources, while improving access to care (Katz, 2001).

Based on a search of 'nurse' and 'telephone' in *indeed.ca,* a popular job search site, telephone work is most frequently included in the job descriptions for health advisory roles and office nurses. The CNO (2015) describes office nurses as "providing nursing services to support the care delivered by a physician or group of physicians" (p. 76). They define a telephone health advisory service as "a program that provides free, confidential 24/7 access to health information via telephone (e.g., TeleHealth Ontario)" (p.75). Many nurses perform telephone health advising within a call centre, warranting a greater examination of hearing challenges within this work environment.

Nurses in Call Centres

Collin-Jacques (2004) evaluated the nature of nurses' work in a call centre in England and a call centre in Quebec. She found that in Quebec the call-centre work was an extension of the professionals' previous nursing experience. The nurses hired at this call centre had significant prior nursing experience. At the Quebecois call centre, they applied the same profession-wide 'nursing process' (assess, plan, implement, and evaluate) they had learned in nursing school and had used in previous positions. They performed their patient assessments independently, relying on their clinical expertise. Quebecois nurses only used their computers to document their findings and to pull up the scientific nursing protocols relevant to the patient concern they had identified. While the protocols existed to maintain quality, these nurses altered them to match the needs of their patients. Nurses working in Quebec relied primarily on their clinical judgement.

On the other hand, British call-centre nurses relied primarily on the computer software and its algorithm. These nurses assessed clients by asking computer-prompted questions. Based on patients' responses, nurses checked off either (a) 'yes'/'uncertain'/ 'no' or (b) the symptoms that had been reported by the patient. The system then provided recommendations for the nurse to share with the client. British nurses could override their system and provide a different recommendation, if they documented their rationale for doing so. As with most non-professional call-centre workers, managers closely monitored the nurses in England. The call-centre dialing system tracked the number of calls nurses took and the frequency with which they overrode the algorithm's recommendations. The British telephone advisory nurses followed the computer prompts, asking questions that guided clients to provide one of a finite number of answers. As a result, the British nurses had less control and flexibility than the nurses in Quebec.

Such rigid managerial processes can make disabilities like hearing loss more difficult to manage (Baumgartner, et al., 2015). Telepractice nurses depend on hearing and listening to perform assessments, and in their profession, poor communication presents a safety risk. In combination with the lack of flexibility found in call-centre work, these nurses present a demographic that stands to benefit from a communication strategies training program. Their single communication modality and metrics-based understanding of their own performance also make them an ideal population through which to assess and model the outcomes of a communication strategy training program.

Conclusion

The components and outcomes of communication strategy training programs for workers with hearing loss have been studied since the 1980s. Nevertheless, at the outset of my studies, I was able to identify areas in which to build upon the existing work. First, the process by which participants changed in response to these programs was unclear. Second, the cost or performance impact of such programs remained unexamined. This prevented employers from evaluating their value in the context of an organization-funded wellness and disability management strategy. Third, strategies needed to be better tailored to the specific contexts and communication challenges experienced by participants. Fourth, given that many strategies require workers to disclose their hearing loss publicly, and that many workers worry about the negative consequences of doing so, it was important to examine the discussion of workers with hearing loss in Canada’s public sphere.

In building upon the existing literature, telepractice nurses make for well-suited study participants. Such workers perform most of their listening work through a single modality: communicating with clients over the telephone. This single listening task allows me to provide a tailored communication-strategies training program. In addition, many nurses working in this role receive regular and standardized performance reviews, improving their awareness of their own performance, and potentially their ability to self-rate their own performance. Moreover, the importance of hearing patients may translate into greater motivation and course engagement on the part of the nurses.

I aimed to contribute to the research developing communication strategies training programs for workers with hearing loss. In preparing to develop and assess an intervention, I performed a scoping review of telephone listening strategies for telephone health care providers, increasing the likelihood that the communication strategies recommended in the program would be appropriate. This scoping review, described in chapter two, followed the scoping review protocol outlined by the Joanna Briggs Institute. Next, as workers with hearing loss resist using strategies that make their hearing loss public, I explored the public discussion of hearing loss applying critical framing theory to seven English-language Canadian newspapers. In the following chapter, Chapter Four, I developed and analyzed an online communication training program for telepractice nurses with hearing challenges. I used a multiple case study methodology to analyze the course. Through grounded theory analyses of each case's interviews, discussion forum comments, and surveys, I built a program logic model outlining the mechanism by which nurses engaged with the course and changed in response to it. In the concluding chapter, I summarized the findings that had emerged for each chapter's research question:

> *Chapter 2: What strategies exist for making telephone speech more intelligible for health care providers and patients with hearing challenges?*
>
> *Chapter 3: How do Canadian newspapers portray workers with hearing loss?*
>
> *Chapter 4: How do nurses with hearing challenges change in terms of their telephone performance and workplace wellbeing in response to participating in an online communication strategies training program?*

In the conclusion, I contextualized these findings within the body of research introduced here.

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Chapter Two: Increasing the accessibility of telephone-based health care for clients and providers with hearing loss: a scoping review with recommendations

Introduction

Health care providers use the telephone to meet a variety of client-care goals, including client follow-up after discharge, consultations with other health-care providers, the provision of lab results, health education, and triage through hotlines (Lafferty & Baird, 2001). The use of telepractice within healthcare is growing (Goodwin, 2007), and through using the telephone, providers save on time, cost, and improve access to care (Katz, 2001). However, as the population ages and experiences more hearing loss (Brant & Fozard, 1990), older clients, as well as older health care providers, will more frequently struggle to understand speech over the telephone.

In health care settings, the prevalence of mild to moderately-severe hearing loss may be underestimated as affected clients and providers often conceal their loss due to concerns of stigmatization (Hines, 2000; Neal-Boylan, 2012). In Canada hearing loss impacts 10% of the adult population under 50 (Feder, 2015). The prevalence of hearing loss rises to 47% of adults aged 60 to 79 (Statistics Canada, 2015). Similar statistics appear in other developed and westernized countries (e.g., Lin, Thorpe, Gordon-Salant, & Ferrucci, 2010).

Most people with hearing loss experience a mild to moderate impairment (Goman & Lin, 2016). Within this range, adults will struggle to understand soft or even moderately-loud speech, particularly in the presence of background noise (Gelfand, 2009). Unlike adults with severe to profound hearing loss, the vast majority of those with mild to moderate-severe impairment continue to communicate through spoken language (Goman & Lin, 2016), but experience significant barriers to accessing telephone-based health care (Bager, Hentze, & Nairn, 2013; Ball, Franco, Tyrell, & Couturie, 1998; Cervi & Everitt, 2002; Kochkin, 2010). Researchers frequently exclude persons with hearing loss from studies on healthcare's telephone-based delivery (e.g., van den Berg, Schumann, Kraft, & Hoffman, 2012; Tyrrell, Couturier, Montani, & Franco, 2001). In spite of this, professional requirements mandate that health care providers can hear speech well enough to understand its meaning (College of Nurses of Ontario, 2012). For providers with mild to moderate hearing loss, meeting this requirement may be more challenging over the telephone.

Telephones convert the speech signal from acoustic to electromagnetic (via microphone), and back to acoustic (via speaker) upon arriving at the communication partner's phone, losing signal richness in the process (Brain, 2000). Telephone lines only transmit a portion of the frequency bandwidth used for speech, making sounds such as 's' and 'th' harder to hear. While on the telephone, users lack visual cues by which to identify and clarify misunderstandings. The use of hearing aids is not always a satisfactory solution. Out of 15 communication domains, modern digital hearing aids users expressed the lowest satisfaction with the instruments' helpfulness on the telephone (Kaplan-Neeman, Muchnik, Hildesheimer, & Yael, 2012).

In the 1980s, Erber (1985) and Castle (1988) documented telephone listening strategies. Their recommendations are summarized in Table 1. However, some of these recommendations are outdated because of changes to telecommunication and hearing aid technologies. Audiologists can provide expertise, but current audiological care models provide only limited reimbursement for counseling clients in communication strategies and assistive devices (White, 2006). Practice guidelines in the provision of telehealth require clinicians to problem solve in order to resolve communication barriers but fail to provide suggestions for how to do so (College of Nurses of Ontario, 2009). This results in a knowledge gap which the current scoping review aims to address.

Table 1

Recommendations for managing hearing challenges on the telephone, as described by Erber (1985) and Castle (1988)

To avoid misunderstanding, the person experiencing telephone hearing challenges should:

- Ensure the phone's speaker is placed by the hearing aid microphone, if they are using a hearing aid
- Familiarize themselves beforehand with the topics and the jargon that might arise in the call
- Use assistive technology (e.g., a hearing aid set to its telephone setting or a phone amplifier)
- Reduce distractions by making calls in aquiet environment, requesting that others not interrupt while on the phone, and avoiding calls when ill, tired, stressed, or in pain
- Call back if noise or technical troubles arise on their own end
- Disclose telephone hearing troubles to colleagues and callers when necessary
- Maintain control of the conversation
- Meet face-to-face when possible
- Track commonly confused words and numbers; confirm these when they arise
- Keep a list these strategies by the phone for reference purposes

Upon misunderstanding, the person experiencing telephone hearing challenges should:

- Take note of unclear points to be resolved
- Request repetition, if this request generally works on the first attempt
- Make a guess and have the call partner confirm
- Ask the call partner to rephrase what they had said
- Ask for a single keyword
- Ask that the call partner spell out hard-to-hear words using code words (e.g., NATO alphabet)
- Ask that the call partner relay large numbers digit by digit, and if needed, count up to each digit
- Confirm the central message before hanging up
- Request that the call partner use the strategies below, as required

<u>The call partner should:</u>

- Place the telephone microphone near their mouth
- Speak clearly: pausing between phrases, speaking somewhat louder, stressing important syllables, and maintaining intensity (not fading) at the ends of sentences
- Make calls in a quiet environment
- Reduce sources of distortion in their speech (e.g., speaking with food or a cigarette in their mouth; sniffing or coughing during speech; raising their voice)
- Provide forewarning before changing the conversation topic
- Be concise and direct, using simple sentences and avoiding jargon
- If needed, transfer the caller to someone with an easier-to-understand voice (e.g., a caller with a high frequency-loss may be transferred from a female to a male speaker)
- Confirm that the person with hearing challenges has understood them correctly
- Keep a list of these strategies by the phone for reference purposes

In performing this scoping review, I aimed to identify strategies by which health care providers with hearing loss could use the telephone more successfully, and which all providers could use to make the telephone more accessible to clients with hearing loss. The literature on telephone listening strategies contains heterogeneous patient populations and methodologies. In areas of heterogeneous research, scoping reviews can "summarize and disseminate research findings… to policymakers, practitioners, and consumers who might otherwise lack the time or researches to undertake such work themselves" (Arksey and O'Malley, 2005, p.6). As such, a scoping review methodology was used to identify strategies for increasing the accessibility of telephone-based health care for clients and providers with hearing loss.

Methods

Literature Search

We followed the scoping review protocol described by the Joanna Briggs Institute (JBI) (Peters et al., 2015). The JBI protocol requires reviewers to articulate a research question, identify relevant studies, chart the data, and then collate, summarize and report the results. As recommended by Levac, Colquhoun and O'Brien (2010), after following these steps we consulted with stakeholders, namely telepractice nurses experiencing hearing challenges. We drew upon the population, concept, and context of interest, to develop the following research question:

> *What strategies exist for increasing the accessibility of telephone-based health care for clients and providers with hearing loss?*

To identify relevant studies, I used the search terms: “telephone” AND “hearing loss” OR “hearing impairment” in Web of Science and Medline. I reviewed the relevant texts that emerged for the key terms in their titles, abstracts and index terms. These terms were used to build search strategies around (1) hearing loss, (2) telephones and telemedicine, and (3) management strategies within CINAHL, MEDLINE, and Web of Science. Because CINAHL and MEDLINE index articles relating only to health care, these databases were complemented by Web of Science, which covers a wider range of disciplines. The selected terms, and their synonyms were searched as subject headings and keywords. Within Web of Science, where subject headings do not exist, these terms were searched as keywords only. The resulting searches are shown in Figures 2, 3, and 4.

Terms Relating to Hearing Loss
AND (MH "Hearing Loss, Partial") OR (MH "Hearing Loss, Sensorineural") OR (MH "Hearing Loss, Noise-Induced") OR (MH "Hearing Loss, High-Frequency") OR (MH "Hearing Loss, Conductive") OR (MH "Hearing Disorders") OR (MH "Presbycusis") OR (MH "speech intelligibility") OR (MH "speech discrimination") OR (MH "speech perception") OR (TI "Hearing Loss") (TI "Hearing Disorder*") OR (TI "Presbycusis") OR (TI "speech intelligibility") OR (TI "speech discrimination") OR (TI "speech perception") OR (TI "speech recognition")
OR (AB "Hearing Loss") OR (AB "Hearing Disorder*") OR (AB "Presbycusis") OR (AB "speech intelligibility") OR (AB "speech discrimination") OR (AB "speech perception") OR (AB "speech recognition")
Terms Relating to Telephones and Telemedicine
(TI "Telemedicine") OR (TI "Telerehabilitation") OR (TI "Telenursing") OR (TI "Telehealth") OR (TI "Teleconferenc*") OR (TI "Interactive Voice Response Systems") OR (TI "Telecommunications") OR (TI "Telephone Information Services") OR (TI "Telephone") OR (TI "Cellular Phone") OR (TI "Voice Mail") OR (TI "Telepractice") OR (TI "caller") OR (TI "telephone user") OR (TI "mobile phone") OR (TI "cell phone")
OR (AB "Telemedicine") OR (AB "Telerehabilitation") OR (AB "Telenursing") OR (AB "Telehealth") OR (AB "Teleconferenc*") OR (AB "Interactive Voice Response Systems") OR (AB "Telecommunications") OR (AB "Telephone Information Services") OR (AB "Telephone") OR (AB "Cellular Phone") OR (AB "Voice Mail") OR (AB "Telepractice") OR (AB "caller") OR (AB "telephone user") OR (AB "mobile phone")
OR (MH "Telemedicine") OR (MH "Remote Consultation") OR (MH "Telerehabilitation") OR (MH "Telenursing") OR (MH "Telehealth") OR (MH "Voice Mail") OR (MH "Teleconferencing") OR (MH "Interactive Voice Response Systems") OR (MH "Telecommunications") OR (MH "Telephone Information Services") OR (MH "Telephone") OR (MH "Cellular Phone") OR (MH "Telephone Consultation (Iowa NIC)") OR (MH "Text Messaging") OR (MH "Voice Mail")
Terms Relating to Management Strategies
AND (MH "usability study") OR (MH "social participation") OR (MH "equipment design") OR (MH "job accommodation") OR (MH "Health service accessibility") OR (MH "communication aids for disabled") OR (MH "rehabilitation of hearing impaired") OR (MH "communication skills training") OR (MH "hearing aids") OR (MH "hearing aid fitting") OR (MH "assistive technology devices") OR (MH "assistive listening systems") OR (MH "assistive technology services") OR (MH "assistive technology")
OR (AB "technology") OR (AB "captel") OR (AB "assistive device*") OR (AB "handicapped aid*") OR (AB "assistive technology device*") OR (AB "hearing aid compatible") OR (AB "prosthesis") OR (AB "equipment design") OR (AB "hearing aid") OR (AB "amplification") OR (AB "fitting formula") OR (AB "aural rehabilitation") OR (AB "communication method") OR (AB "accessibility") OR (AB "barrier*") OR (AB "accommodation") OR (AB "universal design") OR (AB "participation") OR (AB "usability") OR (AB "strategy") OR (AB "tactic") OR (AB "skill")
OR (TI "technology") OR (TI "captel") OR (TI "assistive device*") OR (TI "handicapped aid*") OR (TI "assistive technology device*") OR (TI "hearing aid compatible") OR (TI "prosthesis") OR (TI "equipment design") OR (TI "hearing aid") OR (TI "amplification") OR (TI "fitting formula") OR (TI "aural rehabilitation") OR (TI "communication method") OR (TI "accessibility") OR (TI "barrier*") OR (TI "accommodation") OR (TI "universal design") OR (TI "participation") OR (TI "usability") OR (TI "strategy") OR (TI "tactic") OR (TI "skill")

Figure 2. Search terms used in CINAHL. MH = mesh heading search; TI = title search; AB = abstract search

<u>Terms Relating to Hearing Loss</u>
AND ("hearing loss" or "hearing disorders" or "presbycusis" or "speech intelligibility" or "speech perception" or "speech recognition" or "speech discrimination").tw. OR Speech Intelligibility/ or Speech Perception/ or Presbycusis/ or hearing disorders/ or hearing loss/ or hearing loss, bilateral/ or hearing loss, conductive/ or hearing loss, high-frequency/ or hearing loss, mixed conductive-sensorineural/ or hearing loss, sensorineural/
<u>Terms Relating to Telephones and Telemedicine</u>
AND (telenursing or telehealth or telephone or telecommunications or "cellular phone" or "cell phone" or "mobile phone" or caller or "telephone user" or telemedicine).tw. OR call centers/ or telecommunications/ or telephone/ or answering services/ or cell phones/ or Telerehabilitation/ or Remote Consultation/ or telemedicine/
<u>Terms Relating to Management Strategies</u>
(technology or captel or "assistive device*" or "handicapped aid*" or "assistive technology device*" or "hearing aid compatible" or "hearing aid" or "amplification" or "fitting formula" or rehabilitation or method or accessibility or barrier or accommodation or "universal design" or participation or usability or strategy* or tactic* or skill*).tw OR Communication Aids for Disabled/ or Communication Barriers/ or Equipment Design/ or Technology/ or Health Services Accessibility/ or "Correction of Hearing Impairment"/ or Hearing Aids/ or "Prostheses and Implants"/ or self-help devices/ or communication aids for disabled/ or sensory aids/

Figure 3. Search terms used in Medline; .tw = title and abstract search; / = subject hearing search

<u>Terms Relating to Hearing Loss</u>
AND (TI=("hearing loss" OR "hearing disorders" OR "presbycusis" OR "speech intelligibility" OR "speech perception" OR "speech recognition" OR "speech discrimination") OR TS=("hearing loss" OR "hearing disorders" OR "presbycusis" OR "speech intelligibility" OR "speech perception" OR "speech recognition" OR "speech discrimination"))
<u>Terms Relating to Management Strategies</u>
(TS=(technology OR captel OR "assistive device*" OR "handicapped aid*" OR "assistive technology device*" OR "hearing aid compatible" OR "hearing aid" OR "amplification" OR "fitting formula" OR rehabilitation OR method or accessibility OR barrier OR accommodation OR "universal design" OR participation OR usability OR strategy OR tactic OR skill) OR TI=(technology OR captel OR "assistive device*" OR "handicapped aid*" OR "assistive technology device*" OR "hearing aid compatible" OR "hearing aid" OR "amplification" OR "fitting formula" OR rehabilitation OR method OR accessibility OR barrier OR accommodation OR "universal design" OR participation OR usability OR strategy or tactic or skill))
<u>Terms Relating to Telephones and Telemedicine</u>
AND (TS=(telenursing OR telehealth OR telephone OR telecommunications OR "cellular phone" OR "cell phone" OR "mobile phone" OR caller OR "telephone user" OR “remote consultation” OR telemedicine) OR TI=(telenursing OR telehealth OR telephone OR telecommunications OR "cellular phone" OR "cell phone" OR "mobile phone" OR caller OR "telephone user" OR “remote consultation” OR telemedicine))

Figure 4. Search terms used in Web of Science; TS = topic search; TI = title search

Using Endnote to organize the articles, texts were evaluated based on inclusion criteria extending from the components of the research question. Articles were selected if they included and/or were pertinent to (a) clients and providers with mild to moderately-severe hearing loss who communicated primarily through spoken language, and (b) strategies for increasing accessibility within the context of telephone-based health care. Non-English texts were excluded. Furthermore, I excluded (a) research and development around technologies not yet available, or no-longer available, (b) texts providing strategies exclusive to cochlear implant or bone-anchored hearing aid users, (c) described strategies designed to be used by audiologists in hearing-aid fitting, rather than non-audiologist knowledge users, (d) articles describing automatic speech recognition technology without addressing its applications to the telephone or persons with hearing loss, (e) articles describing telephone strategies for children rather than adults, or (f) articles which had no abstract and, based on the title, appeared irrelevant to the research question. Finally, articles were excluded if they carried a high risk of conflict of interest. I defined articles as 'high risk for conflict of interest' if they met all three of the following criteria: they were (1) written by employees of an assistive device manufacturer, (2) evaluated a device sold by that manufacturer, and (3) the article was not published in a peer-reviewed journal.

I independently applied these criteria to the titles and abstracts, as did my supervisor, Dr. Mary Beth Jennings. When differences of opinion arose over a texts' potential relevance, we included the citation to be evaluated as a full-text. In the full-text review, I rejected those texts that met the exclusion criteria and failed to meet the inclusion criteria. As a reliability check, Dr. Jennings applied the inclusion and exclusion criteria to 61 articles rejected at this stage. Our resulting inter-rater reliability was found to be 95%.

Data Extraction

Given the heterogeneity of methodologies used in the included texts, four data extraction tools were developed a priori. After I extracted articles from each category, the extraction tools were evaluated by the second reviewer, Dr. Mary Beth Jennings, who found them to be appropriate.

Table 2

Data Extraction Categories by Type of Research

Types of Research	**Data Extracted**
Experimental Studies with Human Participants	Sample size Hearing status Independent variables Dependent variables Results
Experimental Studies with Assistive Devices	Device Independent variables Dependent variables Results
Qualitative Research	Sample size Hearing status Research question Methodology Results
Survey-based Research	Sample size Hearing status Variables of interest Results
Expert's Opinion	Strategy described

Data Synthesis

Data was extracted from the texts and analyzed to identify strategies. The recommendations described by audiologists, hearing loss and rehabilitation researchers, industry-funded educators and other experts were extracted directly. The reviewers extracted participant characteristics, variables of interest, and findings from the empirical research. These findings were then organized into recommendations.

Secondary Data Source: Reflections from Telepractice Nurses with Hearing Challenges

As recommended by Levac and colleagues (2010), strategies identified in the review were presented to telepractice nurses. This comprised the final stage of the scoping review: the consultation with stakeholders. Strategies from the program were developed into a communication-strategies training program presented to 12 telepractice nurses with telephone-hearing challenges. These nurses represented, at least in part, the population of health care providers intended to benefit from the recommendations. The course, entitled ‘The Listening Shift’ was delivered on *OpenLearning*, an online educational platform. The twelve nurses completed the program in six small cohorts. Through three telephone interviews as well as discussion forums on the *OpenLearning* platform, each nurse described their experiences with managing hearing challenges and using the strategies presented. These interviews and forums were collected as part of a multiple case study for the purpose of investigating how nurses with hearing challenges respond to a communication-strategies training program (please refer to Chapter Four for a complete description). A secondary analysis of these data sources was performed to enrich this scoping review with the practical considerations and experiences these knowledge users shared in the process.

Recruitment. Nurses were recruited in three ways. First, letters of information were mailed to 820 telephone-advisory and office nurses who had registered to participate in research through the College of Nurses of Ontario. Second, nurses were recruited through a ‘snowballing’ technique wherein previous participants passed along informational posters about the research project to others in their social network. Finally, posters were distributed to 54 public locations, including public health units and various professional organizations for nurses. Nurses could participate if they worked for at least four hours each week on the telephone and experienced hearing challenges while doing so. Moreover, they needed internet access to view the strategies and participate in the online forums.

Data collection and analysis. Through three semi-structured interviews, each nurse reflected on their telephone hearing challenges, the strategies they already used, and those strategies suggested presented to them based on the literature review. The first interview occurred before exposure to the strategies, the second after a month of access to the strategies through *OpenLearning*, and the third and final interview three months later. In addition, nurses discussed their perspectives on the strategies through discussion forums included under the description of each strategy. Interviews were transcribed. These transcriptions along with discussion forum comments were uploaded to RQDA, an open-source tool for qualitative analysis. Comments speaking to practical considerations in the implementation of a strategy were coded. These were then organized based on the strategy from the literature to which they corresponded and will be described along with said strategies in the narrative below.

Results

Initially, 1179 articles were identified from the databases, of which 1019 texts remained after removing duplicates; a further 808 were excluded based on their title and abstract. Full texts of the remaining 212 articles were reviewed for relevance. From this search, fifty-seven articles met the inclusion criteria. The reference sections from these articles were searched, yielding an additional eight articles. In addition, Seminars in Hearing and the Journal of the Academy of Rehabilitative Audiology were hand searched from 2000 to the present, yielding two papers. These two journals were known to be highly relevant to the research question. For the same reason, the Hearing Loss Magazine, a publication of the Hearing Loss Association of America, was hand searched from 2013 to present. This publication routinely describes new assistive technologies, and this hand search identified two additional articles. Eleven additional articles, located through non-systematic searches, were also included in the final review. This process is outlined in Figure 5, below. The eighty texts are listed in Appendix A.

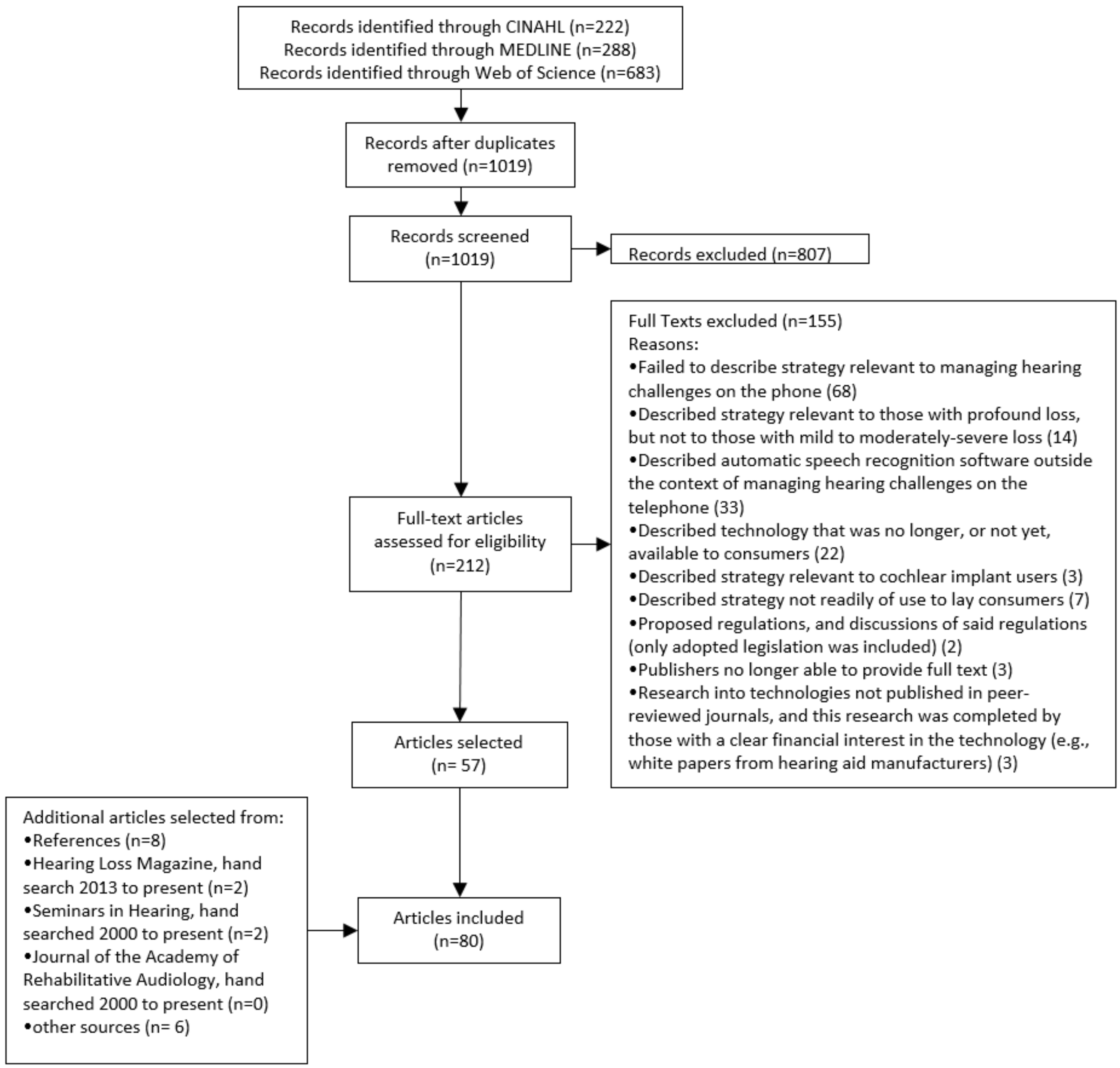

Figure 5. Flow Diagram of Scoping Review

Methodologies Adopted

Five methodologies emerged. First, 29 of the texts described experimental studies with human participants (see Appendix B). In these experiments, variables, such as sound source (e.g., mobile phone), level of background noise, signal amplitude, the presence or absence of visual cues, etc. were primarily modified to observe their impact upon participants' speech intelligibility. Other outcomes of interest included the subjective rating of sound quality, level of residual hearing disability, task load, and proficiency in the use of assistive technology. In the second category, two lab-based studies reported on the outputs of amplification devices (i.e., telephone amplifiers and hearing aids) (Appendix C). In the third category, five articles included qualitative analyses of interviews and open-ended surveys. These studies were performed to understand the telephone experiences of people with hearing loss (Appendix D). Appendix E outlines nine surveys that report on the telephone habits and needs of persons with hearing loss. The final category (Appendix F) includes 35 texts in which audiologists, hearing loss and rehabilitation researchers, industry-employed educators and other experts described strategies and assistive technologies for the telephone.

Strategies

From across the methodologies, the evidence supported 11 strategies. Supported strategies included amplifying the telephone signal, reducing background noise, routing the telephone signal to both ears, using internet-based telephony services and captioned telephone, optimizing the use of mobile phones, digital phones, assistive technology and telephone communication tactics, as well as strategies for requesting accommodation. These strategies are described below. They are presented in conjunction with the relevant reflections of telepractice nurses who have hearing challenges.

Amplification. Twenty texts (Appendix G) suggested that a volume louder than that provided by traditional telephones improves intelligibility for participants with hearing challenges (Holmes & Frank, 1984; Stoker, French-St. George, & Lyons, 1986). This is particularly the case when the signal is amplified to match the individual's hearing loss, frequency by frequency (Kam, Sung, Lee, Wong, & Hasselt, 2017; Mackersie, Qi, Boothroyd, & Conrad, 2009). Articles written by audiologists, researchers, and other experts described amplification options: amplified phones, in-line-handset amplifiers, captioned telephoned, and as an impromptu solution: speakerphone (Vanderheiden, 2006). Captioned telephones (e.g., Hamilton's CapTel®, or Sorenson's CaptionCall®) offer the possibility of entering the user's hearing thresholds into the telephone to provide frequency-specific amplification tailored to the user's hearing loss (Hamlin, 2012). Many adults with hearing loss use amplified telephones and find them to improve their comprehension on the phone (Geyer & Schroedel, 1999; Kaplan & Holmes, 2010; Kepler, Terry, & Sweetman, 1992; Pichora-Fuller, 1981; Scherich, 1996).

Of the twelve nurses, five, all of whom worked in call-centre like environments, reported using Plantronics© brand telephone amplifiers. These devices integrate with their dialing system and provide additional volume control as well as signal processing designed to increase sound quality. Eleven out of the 12 nurses reported having sufficient amplification. However, two nurses reported that these amplifiers could produce internal noise in the form of auditory static interference if they set the telephone volume at too a high level or if power cords or other electronic devices lay in close proximity.

Background noise. Nine texts addressed background noise in the environments surrounding both the telephone user and their telephone conversation partner (Appendix H). Telephone-speech intelligibility decreased as the background noise in the listener's environment increased (Holmes, Frank, & Stoker, 1983; Holmes, Keplan, & Yanke, 1998; Julstrom, Kozma-Spytek, & Isabelle, 2011; Kepler, Terry, & Sweetman, 1992; Mackersie, Qi, Boothroyd, & Conrad, 2009; Picou and Ricketts, 2013; Plyler, Burchfield, & Thelin, 1998). All participating nurses cited background noise as a concern, with the exception of one subset: telephone advisory nurses who worked from home. Their organization mandated that they work alone and behind a locked door. This protected the privacy of their callers and limited background noise in their workspace. Learning of this through the discussion forums, two nurses working in call-centre-like environments expressed the desire to do the same. Three nurses working in clinics managed noise by procuring private rooms from which to make hard-to-hear calls, while another arrived early, stayed late, or worked over her lunch to make calls in quiet.

Earplug-style headsets can increase speech intelligibility by attenuating background noise (Nakao et al., 2008). One nurse reported keeping an earplug in her non-telephone ear while taking calls in order to manage background noise. However, Picou and Ricketts (2013) found that placing an earplug in the opposite ear yielded no improvement in speech recognition. Rather, attenuating background noise may only have a positive impact on telephone-speech intelligibility when noise is reduced in the ear listening to the telephone speech. This is consistent with the experiences of one nurse working in a call-centre environment who exchanged a unilateral headset for a Plantronics©-brand noise-attenuating headset. Despite already having unilateral hearing loss in her non-telephone, 'open' ear, the noise attenuation in her telephone ear proved valuable. She reported greater clarity and ease of listening with the device.

Sidetone must be considered when discussing background noise and the telephone. Sidetone is sound captured by a telephone's microphone and fed directly back to the same telephone's earpiece (Marriam-Webster.com, 2018). Sidetone feeds the speaker's voice, along with background noise from the speaker's environment, directly back to their listening ear. When participants disengaged the sidetone, or even placed their hands over their telephone's microphone to muffle this sidetone, the intelligibility of telephone speech improved (Holmes, Frank, & Stoker, 1983; Plyler, Burchfield, & Thelin, 1998). Two nurses suggested a third and to them preferable mechanism for disengaging sidetone. When listening to their client in a noisy environment, they placed themselves on mute.

Bilateral listening. Two experiments evaluated listening to the telephone through hearing aids in both ears (bilaterally) rather than one (Appendix I). Bilateral listening, accomplished through Bluetooth technology, resulted in greater speech intelligibility than traditional unilateral acoustic listening (i.e., lifting the telephone to one ear and listening to it through one's hearing aid) (Picou & Ricketts, 2011). The same authors also compared unilateral wireless listening to bilateral wireless listening. Their findings suggested that bilateral listening yielded greater intelligibility (Picou & Ricketts, 2013).

The majority of nurses used monaural (single-sided) headsets. However, two nurses from the same worksite had been given the option of upgrading to a bilateral headset. Both had done so. One found it reduced the perception of background noise, and made it easier concentrate, but the other found it provided little additional benefit. She expressed a desire for a binaural headset with noise attenuating properties. In contrast with the evidence they had been presented, both workers perceived the value of binaural headsets to lie in their ability to block noise bilaterally, rather than present the signal to both ears.

Providing visual cues through captioned telephone. Thirteen texts described text-based strategies (Appendix J). In the United States, automatic speech recognition technology makes telephone call captioning possible. Even when the accuracy of the captioning is as low as 20%, Zekveld, Kramer, Kessens, Vlaming, and Houtgast (2008; 2009) found that automatically generated captions improved the intelligibility of telephone speech.

Currently, communication assistants use automatic speech recognition to provide captioned telephone services in the United States. Kozma-Spytek (2013) described how captioned phones look and are used in the same way as normal phones. They are, however, connected not only to the telephone network, but also to the internet. Through the high-speed internet connection, a communication assistant listens to calls and repeats what the speaker has said in real time. Automatic speech recognition software transcribes the communication assistant's speech into text, providing real-time captions for the call while the communication assistant remains transparent. The individual with hearing loss speaks to and hears their communication partner directly (Hamlin, 2013). Users automatically access captioning when making outbound calls. When calling a person who uses a one-line captioned phone, the caller will first need to dial a toll-free number before inputting the individual's phone number (Endres, 2009). In the United States, every telephone subscriber pays a fee to cover the cost of the service. As a result, American captioned-telephone users do not cover the cost alone, paying the same fees as those who do not use the service. At the time of publication, this service was unavailable in Canada. As a result, the interviewed nurses could not provide feedback about the implementation of this technology in telephone-based nursing.

Asynchronous text-based communication provides another alternative to the telephone (Ingrao, 2013). Two surveys found that most deaf and hard of hearing adults use email and text messaging, and they use these alternatives frequently (Bowe, 2002; Maiorana-Basa & Pagliaro, 2014). Email and text messaging meet personal communication needs (Ruppel et al., 2016). They also meet professional communication needs: 60% of audiologists with hearing loss reported using email as a replacement for the telephone when contacting clients (Yoder & Pratt, 2005). Nurses with greater control over their telephone work reported using email and letter mail when calls were too difficult to understand. However, one nurse who struggled to understand accents over the phone noted that the clients who had accents were often newcomers without internet access or email.

Additional frequency bandwidth through internet-based telephony and provision of visual cues. In contrast with traditional telephony, internet telephony (i.e., Voice over Internet Protocol, or VoIP) transmits all frequencies captured by the microphone, providing higher sound quality (Ingrao, 2013). Eight texts described this technology (Appendix K). VoIP is significantly more intelligible than traditional telephony, provided the internet connection is stable (i.e., there is minimal packet loss) (Brault, Gilbert, Lansing, McCarley, & Kramer, 2010; Mantokoudis, Kompis, Duback, Caversaccio, & Senn, 2010; Mantokoudis et al., 2012). The availability of such stable connections is becoming more prevalent (Atcherson, Franklin, Smith-Olinde, 2015; Mantokoudis et al., 2012). In addition, internet telephony can allow for integrated video, speech, and text communication (Ingrao, 2014; Vanderheiden, 2006). Examples include Facetime, Skype, and Google plus, of which the latter can facilitate lip reading by zooming in on speakers' mouths (Atcherson, Franklin, Smith-Olinde, 2015,). Such audio-visual calls can improve speech comprehension (Brault et al., 2010). Still, the degree of benefit depends on the barriers and facilitators present. Lag and dysynchrony between the transmission of audio and visual information reduce the benefits. On the other hand, greater benefits exist when participants' speech read proficiently, and when the associated video stream includes contextual cues, such as the communication partner pointing to their wrist to indicate time (Brault et al., 2010; Lidestam, Danielsson, & Lonnborg, 2006).

Six nurses relied on video conferencing to connect with trainers and colleagues within their organization. One reported that due to multiple participants, each participants' video-feed was too small to speech read. Moreover, the multiple participants led to considerable background noise. On the other hand, one nurse working in a rural clinic facilitated remote consultations for clients through video conferencing. While she wished the video-conferencing set-up had a higher maximum volume, she still found that due to the visual component, the system led to clearer communication.

Nurses performing telephone triage reported that their industry might be moving towards video conferencing with clients. They predicted that video conferencing would reduce listening challenges, encourage client civility by reducing anonymity, and allow them to better evaluate visual symptoms. They also expressed concerns, including the need to monitor one's body language, longer call times, and the discomfort of seeing potentially abusive callers face-to-face.

Selecting appropriate coupling strategies. Coupling occurs when two electrical components (i.e., a telephone and hearing aid) connect and transfer signal from one to another. Nineteen texts described three telephone-to-hearing aid coupling strategies: (a) acoustic coupling (i.e., simply lifting the phone to the ear), (b) telecoil induction, or (c) via Bluetooth (Appendix L). The specific mechanics of these strategies extend beyond the scope of this paper. However, the most favorable intelligibility outcomes, rivaled only by amplified phones, came from Bluetooth transmission (Kim et al., 2014; Picou & Ricketts, 2013), followed by telecoil induction (Picou & Ricketts, 2013; Sorri et al., 2003). It should be noted that the relative intelligibility benefit of telecoil induction over acoustic coupling was inconsistent, and Holmes (1985), Lowe and Goldstein (1982), and Pyler, Burchfield, and Thelin (1998) failed to find a significant difference between these two coupling strategies.

Preferences for coupling strategy differ between hearing aid users (Stoker, 1981). Stinson and Daigle (2004) found that users may need to hold the telephone two centimeters from their ear to minimize feedback when using the acoustic approach, which can feel uncomfortable (Kepler, Terry, & Sweetman, 1992). Stray electromagnetic signals create background noise for users of telecoil induction (Julstrom, Kozma-Spytek, & Isabelle, 2011). Moreover, these users reported frequently needing to hold the telephone in an odd position to optimize the telecoil induction of the phone's signal (Kepler, Terry, & Sweetman, 1992). Finally, wireless coupling is a good fit for confident smart phone users (Ng, Phelan, Leonard, & Galster, 2016), but it shortens a mobile phone's battery life. Moreover, while it is designed to redirect the audio signal of incoming calls' to the user's hearing aids, it at times fails to automatically do so (Smith & Davis, 2014).

Many research participants with hearing loss chose to use the telephone without hearing aids (Pichora-Fuller, 1981). In fact, the most popular hearing-aid-related telephone strategy was to remove hearing aids for calls, relying on the amplification (if any) provided by the telephone (Kaplan and Holmes, 2010).

Only one of the participating nurses wore hearing aids. She relied on acoustic coupling between the headset she used for phone calls, and her hearing aid. While this solution was not recommended in the literature, she was satisfied with it. Two of the remaining nurses reported that if they were to use hearing aids, they would be most interested in wireless coupling, while another two looked more favorably at using a telephone amplifier with a binaural headset, sidestepping the use of hearing aids.

Optimizing mobile and digital phones. Twelve sources addressed the use of mobile and digital phones with hearing aids (Appendix M). The integration of hearing aids with smartphones has made hearing-aid use less stigmatizing (Ng, Phelan, Leonard,

& Galster, 2016). Moreover, mobile phones allow for video-calls and text messaging, which can supplement speech cues to promote understanding (Vanderheiden, 2006). Wireless (i.e., Bluetooth) coupling between telephones and hearing aids is considered the most appropriate strategy for experienced smart phone users (Ng, Phelan, Leonard, & Galster, 2016). However, simplified phones (e.g., the Jitterbug®) and the 'easy mode' setting on more standard mobile phones may make this technology more accessible to less experienced users (Vanderheiden, 2006).

By 2021, 85% of phones in the United States must be hearing aid compatible (Federal Communication Commission, 2016; Hearing Loss Association of America, 2016). These phones must be labelled, and customers have the right to try these phones, evaluating their intelligibility, before making a purchase (Atcherson, Franklin, and Smith-Olinde, 2015). A web page from the Federal Communication Commission (2017) describes the importance of purchasing phones and hearing aids that have favorable telephone/hearing aid compatibility. These carry the label M3 (or preferably M4). Users of telecoil-induction should seek out phones and hearing aids with the additional label of T3 (or preferably T4). These designations are required of phones labelled 'hearing aid compatible'. Smartphones allow for other assistive features that may be useful to users of telephone-based health care (e.g., vibrating ringers). Certain phones include more specialized features, such as a higher maximum volume output, and 'senior mode', which provides additional amplification in the high frequencies (Atcherson, Franklin, Smith-Olinde, 2015). In the United States, captioned calls can also be procured on mobile phones through an application (Kozma-Spytek, 2013; Hamlin, 2012).

While all the participating nurses communicated with patients using wireline phones (instead of cell phones), all described particular challenges in understanding clients calling from cell phones. While poorer signal quality represented a less tractable contributor to the problem, many challenges could be managed. First, cell phones users frequently held the microphone at an inappropriate distance from their mouth. Nurses found it helpful to guide users in positioning the mouthpiece. Second, callers were more likely to be engaged in noisy activities while using a cell phone (e.g., driving, or washing dishes), so at times nurses needed to ask the callers to stop and focus on the conversation.

Improving hearing-aid users' telephone skills. Seven texts (Appendix N) suggested that hearing-aid users mishandle their hearing aids when using the telephone (Holmes, Kaplan, & Yanke, 1998; Iwahashi, Jardim, & Bento, 2013). To illustrate, participants frequently failed to hold their telephone in a position that allowed for optimal transmission of the electromagnetic signal from the handset to their hearing aid's telecoil (Picou and Ricketts, 2013). This low skill level appears to persist even as hearing-aid experience increases over time (Campos, Bozza, & Ferrari, 2014; Desjardins & Doherty, 2009). However, online training modules did lead to significantly better telephone handling, when provided (Ferguson, Brandreth, Brassington, Leighton, & Wharrad, 2015), as did instruction and simple repetition (Wittich, Southall, & Johnson, 2016).

Nurses were given instruction in telephone handling, and two of the twelve nurses reported changing their habits as a result. One nurse, an experienced hearing-aid user, began placing her headset's earpiece higher on her ear to better present the signal to her behind-the-ear hearing aids. Another nurse who had a unilateral hearing loss switched her unilateral headset to her better-hearing (albeit non-dominant) ear and reported a resulting reduction in hearing challenges.

Improving user's telephone communication tactics. As described in Appendix O, experts recommended that when using the telephone, persons with hearing loss employ strategies used by operators and airline pilots, such as spelling out challenging words using the NATO alphabet (Castle, 1994). Seven of the twelve nurses reported finding this suggestion helpful with an adjustment: replacing obscure terms in the NATO alphabet, such as 'Zulu', with terms more culturally relevant to the population with whom they were speaking. One nurse described how she borrowed phrases from 911 operators, such as "can you repeat that for confirmation purposes?"

Ingrao (2013) recommended that callers prepare the points they wish to address beforehand and disclose challenges at the start: "I have a hearing loss and understand much better when people speak slowly and distinctly, spell names and repeat numbers twice" (p. 30). Caissie and Tranquilla's (2010) reported that clear speech could be most reliably elicited by asking a communication partner to "enunciate consonants more carefully… and avoid slurring words together" (p. 99).

Almost all participating nurses endorsed guiding clients to address the root source of a call's hearing challenges. They discussed the importance of taking leadership in the calls, guiding clients to position their handset's receiver closer to their mouth, pull over if driving, or switch from speakerphone to handset. These strategies facilitated intelligibility; however, nurses also reported that they interrupted the calls flow and impeded the development of rapport. While not explicitly presented as a strategy, nurses worked to manage this disruption. They would, for example, frame their requests around their clients' interests. They used phrases such as "I'm here to help you" and "if I can't hear you that presents certain risks". In requesting better hearing conditions, some nurses also refrained from blaming themselves or the caller for hearing challenges. Instead, they would place the responsibility on technology or circumstances. For example, one nurse would ask callers to speak more slowly, citing her need to take notes, while another would ask clients to take her off speakerphone, saying that her headset did not work well with speakerphone. A common strategy was to blame the telephone line and explain that they would call back for a better connection, even if they knew the hearing challenge was coming from their patient's background. They reported this call back strategy to be effective.

In qualitative interviews, health care users with hearing loss suggested that health centers provide alternatives to automated telephone menus. They also recommended that providers ask clients with hearing loss about their preferred communication approach, check in on the effectiveness of its implementation, and have clients summarize key discussion points to confirm their understanding (Iezzoni, O'Day, Killeen, & Harker, 2004).

Providers should be prepared for the telephone needs and preferences of clients with hearing loss. Persons with hearing loss may struggle to understand a non-native accent (Ferguson, Jongman, Sereno, & Keum, 2010). They may be limited in the time they can spend on the phone, due to fatigue, and ask family members or neighbors to take calls for them (Harris, Thomas, & Lamont, 1981; Scherich, 1996). Two nurses described times when clients with hearing loss asked family members with normal hearing to speak on their behalf. While this resolved hearing challenges, the nurses failed to articulate a method for ensuring their message was delivered accurately to the client.

Requesting accommodation for telephone work. Three experts addressed how employees with hearing loss could request accommodation for telephone hearing challenges (Appendix P). Ingrao (2014) recommended that when requesting accommodation, workers first identify which job functions and environments present problems. Next, they should approach their employer with the information and propose to shift towards performing more non-problematic job tasks in more favorable job environments. Ingrao (2014) further recommended using “help us” rather than “help me” language, and focusing on how it will increase the employee’s productivity and customer service quality. Potential accommodations included acoustically favorable office space, an amplified headset, a captioned phone, moving to a department that uses the phone less, or leaving phone work to co-workers. To demonstrate the value of assistive devices, employees might bring into work an assistive device they use at home (e.g., a phone amplifier) so their employer can see its value (Castle, 1994). Holmes (1994) noted that in the United States a phone amplifier is considered a reasonable accommodation. However, Castle (1994) recommends employees be open to splitting the cost of assistive devices with their employer.

Nurses considered the strategy but either declined to request accommodation, or did so in a way that was more subtle. Rather than formally requesting a noise-attenuating headset, two allowed their hearing challenges to emerge in a social conversation with their managers, leading the manager to ‘offer’ the accommodation they needed. A third had timed her request for a quieter workstation with a floor plan re-organization. This allowed her to procure better acoustics without having to move a colleague. Such judiciousness protected relationships. Nurses depended on their workplace relationships to manage their hearing challenges. For example, one nurse needed colleagues to take the calls that she struggled to hear, another needed colleagues to save her a seat in quieter areas of the call centre, and a third benefitted from the receptionist who arranged for clients to see her face-to-face, rather than over the telephone.

Accounting for individual differences. In selecting the appropriate assistive device, rehabilitation professionals were encouraged to consider the unique characteristics of the end user. Two texts describe this (see Appendix Q). Characteristics of interest include users' preferences, situational and lifestyle needs, the environments in which they will use the device, their ability to cover the devices cost, and whether or not they can learn to operate the device. Alerting needs must also be considered. For example, one user may not be able to hear the ringer on an amplified phone, while for another, its volume is disruptive (Garstecki, 1994). Finally, some people will choose not to act on the telephone strategies suggested by a professional; success is more likely if they have accepted their loss and, due to significant frustration on the phone, want to engage with the problem (Kozelsky, 2005).

Through *OpenLearning,* nurses were presented with an array of strategies and encouraged to practice those most relevant to them. Nurses in the first two cohorts were given no special instruction as to which strategies would be most relevant. Those in later cohorts were oriented towards those strategies most appropriate to their context and needs. This was accomplished through weekly personalized emails. A higher proportion of nurses in later cohorts completed the strategy review. This suggests such tailoring may increase engagement.

Discussion

The purpose of this scoping review is to identify, summarize and disseminate strategies for managing hearing challenges experienced by both providers and users of telephone-based health care. The strategies, drawn from 80 texts and informed by the insights of 12 nurses with telephone hearing challenges, are summarized in Tables 3 and 3. Time and resources must be used responsibly; thus, some types of calls (e.g., conveying important test results) should draw on more strategies than others (e.g., confirming an appointment). Context must be considered, and care providers and clients should be prepared to engage in a problem-solving process as they tailor these strategies to their unique goals and environment (Gagné & Jennings, 2007). Still, the literature supports certain strategies. Those that health care providers can implement directly are labelled as 'Strong Recommendations' in Tables 3 and 4. Certain strategies require cooperation from colleagues and employers, and as such are labelled as discretionary recommendations (Joanna Brigg's Institute, 2014).

Table 3

Strategies for increasing the accessibility of telephone-based health care for clients with mild to moderately-severe hearing loss

<u>Strong Recommendations</u>

It is recommended that health care providers:

- Follow the advice for performing clear speech: "enunciate consonants more carefully… and avoid slurring words"
- Reduce background noise and guide clients to do the same
    - if the client cannot reduce noise on their end, guide them in covering the mouthpiece of their telephone to reduce sidetone while they listen
- At the start of a call, ask clients with hearing loss how the provider can communicate with them more effectively
    - check in on the effectiveness of these strategies part-way through the call
    - at the end of the call, have the client summarize key points to ensure they understood
- Keep calls brief and listen for signs of fatigue on the part of the client
- Use code words to spell out hard-to-hear words (e.g., the NATO phonetic alphabet), ensuring the code words are familiar to their client by for example using "S as in Sandwich", rather than "S as in Sierra"

- Have a plan for how the provider will maintain the client's confidentiality and confirm that the client has received and understood their message, should the client ask the provider to speak to someone else
- Guide clients in optimizing their use of technology:
    - encourage client to meet with their audiologist to find an appropriate strategy for coupling their phone with their hearing aids
        - Encourage heavy smartphone users to speak with an audiologist about wireless coupling that will allow the signal to be streamed bilaterally from their phone to their hearing aids, or
    - Guide the clients in experimenting with the phone's position relative to their hearing aid to find a clearer telecoil induction signal (if the client is using telecoil induction)
    - Confirm that clients are listening with their better ear and holding the phone to the hearing aid's microphone (which may be behind their ear) if they are acoustically coupling the phone with their hearing aids
    - inform the client that they can purchase amplified phones from many electronics stores, or
    - inform Australian and American clients that they can procure a captioned phone through Telecommunications Equipment Distribution Programs (American), or the National Relay Service (Australian)
        - When calling clients who use captioned telephones, remember to call the captioning service's 1-800 number before inputting the client's phone number
- When clients call in, provide an alternative to automatic voice menus, which people with hearing loss struggle to navigate

<u>Discretionary Recommendations</u>

It is suggested that health care providers:

- Consider asking a colleague with a native accent to speak to clients with hearing loss over the phone for them, if the provider has a non-native accent
- Provide alternatives forms of remote health care, such as email, instant messaging, or video calls

Table 4

Strategies for increasing the accessibility of telephone-based health care for providers with mild to moderately-severe hearing loss.

<u>Strong Recommendations</u>

It is recommended that health care providers:

- Work with their IT department and manager to procure amplification in the form of
  - an in-line amplifier that can be connected to an existing desk phone via the handset/headset, or
  - an amplified phone, or
  - a captioned phone that will, once their audiogram is input, provide amplification complementary to their hearing loss, and
- See their audiologist to learn how to use their hearing aids with their workplace telephone more skillfully.
- Find a telephone solution that allows the signal to be presented to both ears, options include
  - using Bluetooth to wirelessly stream the signal to bilateral hearing aids (wireless streamers can be plugged into digital office phones), or
  - using a bilateral headset, or
  - working with their audiologist to develop a hearing aid program that streams acoustic or telecoil-induced signals to both hearing aids.
- Ensure that their mobile telephone and hearing aids have an M rating of 3 or higher. If they use telecoil induction, ensure their mobile phones and hearing aids have a rating of T3 or higher.
- Reduce background noise by
  - moving to a quieter workstation,
  - using a noise attenuating headset, and
  - muting or muffling sidetone by pressing mute or covering the handset's microphone with their palm.
- Guide callers in addressing the root sources of hearing challenges (e.g., reducing background noise)
- Elicit clear speech from their callers by asking them to 'enunciate consonants more carefully… and avoid slurring words'
- Use code words to spell out hard-to-hear words (e.g., the NATO phonetic alphabet), ensuring the code words are familiar to their client
- Summarize their callers' key points to confirm understanding
- Take a win-win approach to requesting accommodation to protect relationships with their employers and colleagues

<u>Discretionary Recommendations</u>

It is suggested that health care providers:

- Work with their managers and IT departments to procure and install a captioned phone connected to a free or low-cost captioning service (if they are living in the United States or Australia)
- Converse with clients through video calls, email, or instant messaging

These recommendations should be considered in light of the evidence that supports them. While systematically assessing the quality of the literature is beyond a scoping review's domain, it can be said that this field of literature is in an early stage. Communication strategies came largely based on recommendations from audiologists, researchers, and educators. Such communication strategies need to be evaluated through experimental research designs. Conversely, various technologies and strategies for managing background noise were developed and tested in lab settings. These findings need to be tested in the field broadly, and in telephone-based health care specifically, to ensure the benefits generalize. Moreover, the literature provided an uneven discussion of listening challenge. For example, participating nurses frequently cited cell phones as a source of hearing challenges. While strategies for managing cell phone signal quality can easily be found through a Google search (James, 2018), the research literature has neglected this topic.

Conclusions

Persons with hearing loss struggle to access telephone-based healthcare (Iezzoni et al., 2004), and are frequently excluded from research on the topic (e.g., van den Berg, Schumann, Kraft, & Hoffman, 2012; Tyrrell, Couturier, Montani, & Franco, 2001). As the importance of mobile health-care delivery expands (Goodwin, 2007), this exclusion becomes more problematic. Strategies, as outlined in Tables 3 and 4 above, can make telephone-based health care more accessible, and should be disseminated to health care providers who work with clients over the phone. Alternatively, employers can provide health-care providers with more interactive online training modules (see Chapter Four). Future research in telephone-based health care can use these strategies to include more participants with hearing loss, and thereby produce findings which better represent the population of health-care users. Within reason, those with disabilities should be able to work and access to health care (Rasmussen, & Lewis, 2007). As these recommendations show, opportunities for greater access exist.

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Chapter Three: Representations of Workers with Hearing Loss in Canadian Newspapers: a Thematic Analysis

Introduction

In the United States there are more adults with hearing loss under the age of 65 than over (Feder et al, 2015), and hearing loss is the world's most prevalent disabling condition (World Health Organisation, 2004). Hearing loss is widely perceived as an impairment of old age (Erler & Garstecki 2002) and accommodations are provided less readily for hearing loss than for other disabilities (Danford 2003). Getty and Hétu (1991) outlined recommendations for normalizing hearing in working-aged adults and encouraged the media to play a greater role in challenging stereotypes. More recently, Manchaiah and colleagues (2015) echoed this sentiment after reporting that hearing aids and hearing loss triggered more negative than positive connotations in normally hearing participants sampled from Europe and Asia. However, no research has identified how newspapers, an influential form of media and social perception (Chong & Druckman, 2007), currently frame workers with hearing loss.

This population's workplace experiences are complex. Although participation in the workforce is linked with higher quality of life than disability leave or early retirement (Grimby & Ringdahl 2000), employees with hearing loss represent a vulnerable population (Danermark & Gellerstedt 2004). Managing auditory signals is a highly complex process. Employees must monitor their acoustic environment for expected (e.g. patient heartbeat), unexpected (e.g. messages over a public announcement system) and/or changes in auditory stimuli (e.g. stridence in a customer's tone of voice), as well as listen to and comprehend signals that may come from multiple sources in multiple forms (Jennings et al, 2010). Given their additional auditory demands, workers with hearing loss experience greater fatigue than their colleagues at the end of the work day (Nachtegaal et al, 2012). These sensory challenges are compounded by the psychosocial impacts of working with a hearing loss. Workers with hearing loss experience a lower sense of control and social support in their jobs (Danermark &

Gellerstedt, 2004) and may worry in advance about how they will manage challenging listening situations (Grimby & Ringdahl, 2000).

Although disclosing hearing loss to employers and coworkers can make accommodation more likely, anxiety is associated with having to choose when and to whom to disclose, knowing that while some colleagues are aware of the trait, others are not and, after disclosure, dealing with coworkers who forget or are unwilling to communicate effectively (Tye-Murray et al, 2009; Southall et al, 2011; Ragins, 2008; Major & O'Brien, 2005; Clair et al, 2005). By raising awareness about hearing loss, the media has the ability to support workers in educating others.

Positively framing workers with hearing loss may not only change publicly held perception about the disability, but reduce self-stigma. Self-stigma occurs in people with hearing loss who (1) think that a hearing loss is stigmatizing, (2) agree with this devaluation, and (3) apply it to themselves (Watson et al, 2007). Some workers with hearing loss may be hesitant to disclose or wear hearing aids out of concern for their professional image, promotion opportunities and job security (Fok et al, 2009; Hétu et al, 1994; Jennings et al, 2011; 2013). One way to counteract self-stigma, posited by the authors of this article, is to provide greater media exposure to successful narratives of workers with hearing loss.

There are a number of theories that can guide media analysis, such as Moscovici's theory of social representations (Moscovici 1988), dependency theory (Ball-Rokeach 1998) and critical framing theory (Edelman, 1993). In this study the goal is to explore how workers with hearing loss are positioned in newspapers, and how this positioning comes about. Framing theory, which is underscored by social representations, was identified as supporting this understanding. Framing theory holds that cultures have frames, much like cultures have stereotypes and norms (Borah 2011). According to Edelman (1993, p.232), the "social world is a kaleidoscope of potential realities, which can be readily evoked by altering the ways in which observations are framed and categorized". By focusing on certain features of issues or events, and placing these within a certain field of meaning, the mass media invokes certain cultural frames over others, and thereby selects a reality to present. Quantitative framing research suggests that framing can impact social representations, or the ways that societies thinks about issues, when these social representations are not generalized, but rather are unique and/or isolated attitudes or beliefs (Sibley et al. 2006). The specific social representations that are created are explored by qualitative framing research. One qualitative approach, critical framing theory, asserts that the mass media generally selects the frames held by elites by, for example, interviewing 'experts' rather than the men and women directly impacted by an events or issues (D'Angelo, 2002).

Analyses of the media's framing of hearing loss have focused on television programs and a specific event, the Deaf President Now! campaign at Gallaudet University. Foss (2014) studied the framing of hearing loss in entertainment television. In the television programs that were analyzed, hearing loss was presented as isolating, embarrassing and threatening to the affected individuals in their work situations. The programs rarely showed characters actively managing the disorder until, generally, at the end of the episode or series when the character's hearing loss was suddenly and completely resolved through a surgery, cochlear implant or hearing aid. In another analyses of hearing loss in the media, Kensicki (2001) identified four frames used in the newspaper coverage of the Deaf President Now! campaign at Gallaudet University, a university for the Deaf and hard of hearing. She concluded that the media presented the meaning of the campaign in four ways (1) effective conduct, (e.g. a member of congress acknowledged the campaign's success), (2) internal unification (e.g. a description of the size and unity of a peaceful demonstration), (3) external support (e.g. lists of organizations supporting the campaign), and (4) justifiable action (e.g. directly linking their campaign to the way a Deaf candidate had been passed over for the position) (Kensicki, 2001). Overall, the study concluded that the movement had positive media coverage. Interestingly, the interviewees described in Kensicki's sample articles emphasized how their Deafness made them culturally unique but equally valid. However, persons with hearing loss who use spoken English have a less differentiated identity than members of the Deaf community (Laszlo, 1994), and no newspaper analysis has yet evaluated the frames used to describe people with hearing loss in general or workers with hearing loss in particular. I do not know how or if the media plays a role in challenging publicly held views related to workers with hearing loss and so to understand how they are represented in this medium I performed a thematic analysis of Canadian newspaper articles.

To meet the goals of this analysis, I took a critical framing approach. The goal of this analysis was not to further problematize the issue of hearing loss in the workplace, or the newspapers handling of this issue, but rather to understand how workers are positioned. Specifically, I was interested in what the journalists choose to write about, who they select as sources (i.e. interviewees), and how these sources frame workers with hearing loss. This information allows me to compare the resulting themes to the experience of living and working with hearing loss as captured through empirical studies. Critical framing theory provides a paradigm for talking about and interpreting these themes.

Methods

To obtain a breadth of perspectives, I chose seven English-language newspapers from major cities across Canada which circulate at least 90 000 copies daily (Chronicle Herald, Montreal Gazette, Toronto Star, Winnipeg Free Press, Calgary Herald, Edmonton Journal, and Vancouver Sun). To search within these newspapers, we used Factiva (global.factiva.com), a research database available through libraries that contains media records (e.g. newspapers, radio transcripts) from around the world. Using the combined search terms of “work” and “hearing loss”, I identified relevant articles from the Factiva database published between January 1st of 1995 and January 10th of 2016. This timeframe was chosen to cover the period when many Baby Boomers entered their late middle age, a period where hearing loss and employment most commonly overlap (Cruickshanks et al, 1998). No consideration was given to where the article was originally published (i.e. articles originally published in the United States but reprinted in

Canadian newspapers were included). The newspaper articles referenced here can be found in the Factiva database by searching the articles by title, or in databases, such as 'LexisNexis News' and Proquest's 'Canadian Major Dailies'.

Of the 770 articles that emerged, 121 discussed persons who were of working age. Of these, 26 unique articles met my criteria. These criteria were:

- Article discussed paid workers with hearing loss
- Articles made reference to the workers' competence
- Workers communicated using English rather than sign language on the job

The newspaper articles, in pdf format, were uploaded into NVivo (2012), a qualitative analysis software program. Researchers read and coded the articles using this software program.

To identify the frames used, a thematic network analysis of articles, described by Attride-Stirling (2001) was conducted. Mathes and Kohring (2008) have recommended the use of hierarchical clusters or networks to qualitatively identify media frames. This analysis began with immersion in the data, focusing on the discourse around these workers' competence. Next, two of the authors open coded the articles. They independently coded meaningful units of text (sentences, brief paragraphs). Codes, such as 'hearing dogs', 'job search', and 'creative advocacy', emerged. The researchers then compared coding results and their codes were consolidated into a framework and used to recode the articles. The authors next placed the codes within categories and explored different hierarchies for the emerging categories of concepts. For example, 'hearing dogs' and 'creative advocacy' were both consistently identified in articles about community members with hearing loss. As a result, these codes were placed together in a category that fell under 'community members with hearing loss' in the hierarchy. In keeping with Attride-Stirling's (2001) approach, basic themes were abstracted from the lowest categories, and organizing themes from higher-level categories. Thus, the basic themes of '*Create and advocate'* and *'Managing hearing loss through a hearing dog'* merged with others under the organizing theme of '*Workers with hearing loss in the* *community create their best day themselves'*. In the process, frames emerged around specific categories of workers: workers with hearing loss when discussed as a population, prominent people working with hearing loss and community members working with hearing loss.

Results

Over the 21-year period and across the seven newspapers only 26 unique articles from the 770 search hits for 'hearing loss' and 'work' met the inclusion criteria. This small proportion of qualifying articles is due to the fact that many of the articles that included the term 'hearing loss' (1252 in total) also included the term 'work' (770 of 1252). 'Work' has multiple meanings and uses that are not relevant to this papers' subject matter (e.g. workplace noise or how hearing aids work).

The selected articles that did meet my inclusion criteria fit under a global theme of *Focusing on a good worklife or focusing on a limited worklife*. This global theme is expressed through three organizing themes. The first, *Prominent individuals struggle, take action, and continue despite hearing loss* includes three basic themes and from eleven articles, drawn largely from arts and entertainment sections, that recount the lives of prominent persons (e.g. celebrities, politicians) with hearing loss. The second organizing theme, *Workers with hearing loss in the community create their best day themselves* contains three basic themes based on eight articles largely printed in the lifestyle sections. These articles contain descriptions of local workers with hearing loss who had found innovative ways to deal with their condition. The final organizing theme, *Workers with hearing loss, as a generalized whole, are portrayed as being either competent or limited* contains two basic themes that were conveyed in seven articles. These articles focus on workers with hearing loss as a group and originate primarily from the business and career sections. Tables 5, 6 and 7 outline these organizing themes. Two articles spoke to two themes and are listed, therefore, twice in the tables.

Table 5

Organizing Theme: Prominent individuals struggle, take action, and continue despite hearing loss.

Basic Themes	Article Title (Year)
Struggled to achieve success	Morra, B., 2000. Hearing loss no sound barrier for model. *Toronto Star*, p.FA 02.
	Zekas, R., 2000. Sets accompli. *Toronto Star*, p.EN 01.
	Beatty, J., 2001. The adventurous life of Geoff Plant. *The Vancouver Sun*, p.A21.
	Wickens, M., 2004. Ray Stapley, Wheels' first mechanic, 92. *Toronto Star*, p.G10.
	Cohen, H., 2007. Third place a charm for this Idol contestant; Yamin nets lucrative recording deal. *Calgary Herald*, pp.26–27.
	Calgary Herald, 2016. Calgary: The people project, January 4. *Calgary Herald*.
Took action to maintain success	Walker, M., 2004. Artistic era ends, Forum director Bjelajac "leaves big shoes to fill." *Winnipeg Free Press*, pp.37–39.*
	Ouzounian, R., 2008. The trials of Richard Thomas. *Toronto Star*, p.E03.
Experimented with strategies	Kansas City Star, 1997. Aging baby boomers may have ear for trouble U.S. President Bill Clinton's hearing aids rattle his generation. *Toronto Star*, p.E4.
	Associated Press, 2001. Rush Limbaugh almost totally deaf, but plans to carry on with radio show. *Edmonton Journal*, p.C2.
	Canadian Press, 2013. Alberta premier almost deaf in right ear. *The Vancouver Sun*, p.B5.

*This article can be found in the Factiva database under the title: *Artistic era end Forum [sic] director Bjelajac "leaves big shoes to fill."*

Table 6

Organizing Theme: Workers with hearing loss in the community create their best day themselves

Basic Theme	Article Title (Year)
Managing challenges through technology	Lawson, B., 2000. Internet, e-mail opening job doors for deaf. *Toronto Star*, p.Bu06. Ubelacker, S., 2006. Skull used to help hearing: Executive decides results trump fashion. *Edmonton Journal*, p.A14. Scurfield, M., 2015. Telling cousin family secret would ruin her life. *Winnipeg Free Press*.
Managing challenges through a hearing dog	Besson, A., 2005. Labrador gives life back to hard-of-hearing owner Dog trained to alert her to noise, possible danger. *Winnipeg Free Press*, p.D5. Mcdougall, J., 2011. Doctor trains own dog to aid in hearing. *Calgary Herald*, p.S1/Front.
Create and advocate	Turenne, P., 2004. CHHA conference to hear from leading expert. *Winnipeg Free Press*, p.4. Purdy, C., 2003. Hard of Hearing radio: It’s exactly what it sounds like: Auditory Adam keeps bass deep, tones low on university station. *Edmonton Journal*, p.A1/Front. Livingstone, D., 2009. Hearing aids can make a loud statement. *Toronto Star*, p.L03.

Table 7

Organizing Theme: Workers with hearing loss, as a generalized whole, are portrayed as either competent or limited

Basic Themes	Article Title (Year)
Workers who identify as having a hearing loss present this population as competent	Canadian Press, 2005. Visual alert system aids hearing impaired. *The Vancouver Sun*, p.G4.
	Winston, I., 2010a. Tools for hearing impaired to employ at home, work. *The Vancouver Sun*, p.E4.
	Winston, I., 2010b. Safety for hearing-impaired requires attention to details; Danger signals must be changed. *Calgary Herald*, p.C5.
	Shaw, G., 2004. Job search can be tough for hard of hearing. *The Vancouver Sun*, p.E1/Front.
Those who do not identify as having a hearing loss present these workers as limited	Canadian Press, 2007. Hearing Loss erodes income. *Edmonton Journal*.
	Mitchell, K. & Sugar, M., 2004. Mocking hearing loss is cruel and hurtful. *The Gazette*, p.E2.
	Shaw, G., 2004. Job search can be tough for hard of hearing. *The Vancouver Sun*, p.E1/Front.
	Turenne, P., 2004. CHHA conference to hear from leading expert. *Winnipeg Free Press*, p.4.
	Quan, D., 2014. Hearing woes a top RCMP disability claim; Mounties need to analyze causes, report says. *Calgary Herald*. Calgary.

Prominent Individuals Struggle, Take Action, and Continue Despite Hearing Loss

Hearing loss appeared in the newspaper biographies of people in the public eye, including writers, artists, community leaders, actors, and political figures. In five of the eight articles that contributed to this theme, hearing loss was not the main focus but it was described as a barrier that the person-of-interest actively engaged with in order to achieve or maintain their professional success. Basic themes under this organizing theme describe the ways in which workers with hearing loss (1) S*truggle with hearing* *loss to achieve success,* (2) *Take action with hearing loss to maintain success,* and (3) *Experiment with strategies and continue despite hearing loss*.

Struggle with hearing loss to achieve success. One article focused on Elliot Yamin, whose hearing loss was listed among a number of challenges he dealt with before he won third place on American Idol in 2006. “To get there, he battled Type 1 diabetes (he was diagnosed at 16), 90 per cent hearing loss in his right ear, crooked teeth in a looks-obsessed industry and, of course, Simon Cowell” (Cohen, 2007). Geoff Plant, the Canadian province of British Columbia’s Attorney General from 2001 to 2005, was born with a severe cleft lip and palate and as a result developed hearing loss in early childhood. In an article describing his career, a friend explained: “‘He's one of those kids who really had to struggle coming out of the gate… had to struggle to make his place in the world’” (Beatty, 2001).

Take action with hearing loss to maintain success. Managing hearing loss in order to maintain success was described in the narratives of notable people who acquired hearing loss after acquiring fame. An article on the life of actor Richard Thomas, described how he managed the onset of cochlear otosclerosis: “For a while, there was doubt whether that career would even continue… ‘If it wasn't for the fact that I took action in time,’ he says gratefully, ‘I wouldn't be able to tour Twelve Angry Men’” (Ouzounian, 2008).

Experiment with strategies and continue despite hearing loss. Discussions of notable people who have more recently acquired hearing loss considered their problem-solving strategies. When former United States President Bill Clinton’s annual physical revealed a high frequency hearing loss, an article described his choice of amplification: “The devices will be small, will fit in his ear canal and can be popped in as needed” (Kansas City Star, 1997). In the case of Rush Limbaugh, a radio talk show host who acquired sudden-onset hearing loss, a journalist wrote: “[Limbaugh] is experimenting with ways to continue communicating with telephone callers on his show. If that doesn't work, he may do the show without callers”(Associated Press, 2001). Hearing loss was presented as a factor that people actively managed in order to achieve or maintain their success.

Workers with Hearing Loss in the Community Create Their Best Day Themselves

Articles within the second organizing theme described the successes of local workers with hearing loss in proactively managing their professional challenges through technology, hearing dogs, or creative career choice. Basic themes included (1) *Turn to technology* (2) *Turn to hearing dogs* and (3) *Create and advocate.*

Turn to technology. One article recounted an executive's decision to use a visible bone anchored hearing aid:

> Most people with hearing aids want them tiny and unobtrusive, tucked inside the ear where they can't be seen. But when conventional aids failed to give John Pepperell the level of sound sense he wanted, he decided to use his head -- literally -- and think outside the box. (Ubelacker, 2006).

Another article described a 22-year-old with a severe hearing loss. Working as a web designer, the man explained that through accessing the internet "the location barrier, the age barrier, the gender barrier, the race barrier, the disability barrier have been thrown out the window. Everyone is equal" (Lawson, 2000).

Turn to hearing dogs. Other articles described workers who were using hearing dogs. One outlined how a psychiatric nurse "turned to an unlikely source", a Labrador retriever, to help her hear important sounds, such as her alarm clock (Besson 2005). Another piece described a chiropractor's "entrepreneurial style" in independently training her dog to assist her in hearing important sounds at her practice (Mcdougall, 2011).

Create and Advocate. Journalists also described workers with hearing loss who advocated for the needs of all people with hearing loss through creative career choices. In one article, a jewelry designer with hearing loss launched a line of fashion accessories for hearing aids under the slogan "visibility is understanding" (Livingstone, 2009).

Another story described a new radio show developed by a person with hearing loss who "created HOH Radio, not only to play music for the hard of hearing -- songs with deep bass or drums and few vocals -- but also to educate people about hearing loss" (Purdy, 2003). Each of these stories presented workers using both disclosing and problem-solving strategies to move through the professional barriers associated with their disability.

Workers with Hearing Loss, as a Generalized Whole, are Portrayed as Either Competent or Limited

The themes discussed so far have addressed representations of specific individuals working with a hearing loss. Articles associated with the third organizing theme discussed the workplace experiences of persons with hearing loss more generally. In these articles, depending on the sources that the journalists chose to quote (workers with hearing loss themselves, or those without hearing loss, such as not-for-profit employees and hearing-aid industry researchers), the framing either presented a positive and solution-oriented perspective or focused on the disability-related challenges. As such, the two basic themes are (1) *Workers with hearing loss present their population as competent,* and (2) *Those who do not identify as having a hearing loss present this population as limited.*

Workers with hearing loss present their population as competent. On the one hand, workers with hearing loss present themselves and those like them as capable. In an article describing alerting devices for persons with hearing loss, Colin Cantlie, who has a hearing loss**,** was quoted stating "I think it's absolutely essential that this type of equipment and technology moves into the business world," because, he said speaking for the entire community of persons with hearing impairment "Through technology, I can be just as successful as anybody else can be." (Canadian Press, 2005).

Another article, describing the experiences of a number of women working with a hearing loss, quoted workers who framed their employment experiences around their hard work and contributions. One woman explained "I'm the perfect temp for this place

… I am so grateful to the people here and as a result I work very hard for them." (Shaw, 2004) and another explained "I'd like to gain more experience, take on more challenges and maybe I'll be able to mentor new employees" while a third interviewee, referring to an offer for additional work, explained "They said they enjoyed my personality and that I was a hard worker so they wanted me back" (Shaw, 2004). While these women were speaking about themselves as individuals, the article quoting them discussed workers with hearing loss as a population. The comments from these women reflected positively on workers with hearing loss as a whole.

Those who do not identify as having a hearing loss present this population as limited. When people who do not have a hearing loss themselves are interviewed, the discourse selected by journalists for inclusion in the articles is more problem than solution oriented. The director of the Western Institute for the Deaf and Hard of Hearing, who was not identified as having a hearing loss, explained that "people who are deaf [sic] and hard of hearing face many barriers in finding jobs and building careers" (Shaw, 2004). In another article, a journalist began by stating "fatigue, depression, anxiety, underemployment, reduced physical safety, a lack of any sense of belonging, and not being understood are all problems that people with hearing loss can experience." A third article quoted the executive director of the Hearing Industries Association' education arm. He said "Hearing loss prevents employees from fully engaging in meetings and conversations, which fuels anger, instability and anxiety, while giving co-workers the impression that they're less competent" (Canadian Press, 2007).

Articles within this organizing theme spoke generally about the experience of working with a hearing loss. The quotes from workers with hearing loss were positive and solution oriented, whereas statements from those without hearing loss, which included not-for-profit employees and hearing-aid-industry researchers, spoke to the negative implications of the disability in the workplace.

Discussion

Given the media's potential for challenging stigma (Getty & Hétu, 1991), this investigation set out to identify the frames Canadian newspapers use when describing workers with hearing loss. Much of what was written in the newspapers presented these workers as successful, confident and creative problem solvers. Limitations and difficulties that workers with hearing loss face were raised primarily in quotes from persons without hearing loss in articles describing this demographic as a collective rather than as individuals.

The media's inconsistent framing between individuals with disabilities and groups of persons with disabilities has been identified in previous research. Journalists are increasingly drawn to stories about individuals with disabilities (Devotta et al., 2013), and particularly to the 'Supercrip' narrative (Temple Jones, 2014). Supercrips, as they have been called within the disability community, are extraordinarily accomplished people with disabilities, who are held up as sources of inspiration and examples of what can be accomplished with hard work. As I found with hearing loss, journalists wrote about specific individuals with disabilities as heroes, but were less positive when describing people with disabilities as a social category. Auslander and Gold (1999) studied the terminology journalists used to describe people with disabilities, and found that journalists were less likely to use sensitive, person-first language (i.e. person(s) with disabilities rather than disabled person(s)), when describing groups. The authors hypothesized that dealing with a social category, rather than an individual, affords journalists more emotional distance and as a result they use expedient, rather than respectful language. Sibley, Liu and Kirkwood (2006) proposed that framing influences specific and isolated attitudes of an audience more readily than their core attitudes. I hypothesize that this phenomena applies to journalists as well as readers. When faced with facts about *individual* workers with hearing loss, journalists appear more prepared to talk about abilities rather than limitations than they are when discussing groups of these workers. Thus, the problem-focused frame I found in articles describing workers with hearing loss as a group is consistent with the individual/group dichotomy that newspapers apply to other disabilities.

The descriptions of workers with hearing loss as a category are also similar to the representations of people with hearing loss found in research on other media, such as television, as well as within empirical research. Foss (2014) found that the creators of entertainment television programs showed people with hearing loss delaying help-seeking, experiencing problems in doing their job and withdrawing. These emotional, occupational and social challenges, while discouraging, are documented in empirical research into the experiences of workers with hearing loss (Danermark & Gellerstedt, 2004; Jennings & Shaw, 2008; Southall et al, 2010). Interestingly, within the newspaper articles, these challenges were less frequently discussed, and were most often found in quotes from interviewees who were not identified as having a hearing loss. This raises questions. Did workers with hearing loss bring up the challenges they faced? If not, why? If so, why did reporters failed to mention these challenges? The frame of 'cheerful striving' that has been applied to workers with disabilities may answer these questions.

The 'cheerful striving' frame, as described by the disability activist Paul Longmore (1995, as cited by Church et al, 2005, p.16) is particularly relevant:

> In order for people with disabilities to be respected as worthy [employees], to be considered as whole persons or even approximations of persons, they have been instructed that they must perpetually labour to "overcome" their disabilities. They must display continuous cheerful striving toward some semblance of normality.

Workers, and indeed reporters, may find it is not socially acceptable to describe the full extent of disability-related challenges. Longmore's conclusion is supported by other findings. "Maintaining a positive attitude" was one of the themes that Tye-Murray et al (2009) identified in focus groups with workers with hearing loss. Likewise, Jennings et al (2013), through a qualitative analysis of interviews of WHL, found that they strove to keep those around them comfortable, for example, through the use of humor. Church and Luciani (2005) wrote that employees with a disability working in a Canadian bank, despite facing very real challenges, engaged in the “work of keeping it light” to meet the social expectations of their corporate environment. According to Smart (2001), these social expectations are increased by the media’s ‘Supercrip’ framing of individuals with disabilities, which praises ‘self-made men’ while ignoring or minimizing the barriers faced by people with disabilities.

Critical framing theory holds that economic and political elites favor certain frames over others (D’Angelo, 2002). Within the articles reviewed, ‘prominent individuals with hearing loss’ share characteristics with the elites described in critical framing theory. Articles within the first organizing theme, *prominent individuals struggle, take action, and continue despite hearing loss*, drew on this powerful social class as both subject matter and sources. The framing within these articles aligned closely with the social mandate of ‘cheerful striving towards normalcy’, suggesting that this is a frame is favored by such elites. These articles are consistent with Dahl’s (1993) position that the mass media, rather than normalizing success in persons with disabilities, presents them as “overcoming great odds to achieve their status” (p.5) and “learning to cope and living happily ever after” (p.2).

Critical framing theory also asserts that the frames held by those in power (in this case the expectation of ‘cheerful striving’) are used by the mass media even when interpreting issues and events that that relate to non-elite social classes. As such, one would anticipate that the ‘striving towards normalcy’ frame would also be applied to articles discussing community workers with hearing loss. To some extent this was true in my sample of newspaper articles. Articles within the second organizing theme, *workers with hearing loss in the community create their best day themselves*, focused on the strategies workers were using to manage their work-related hearing challenges. However, the journalists and the interviewees who contributed to, and are the topic of, articles within this organizing theme transform the social mandate of ‘striving towards some semblance of normality’ in two ways. First, they make the worker’s hearing loss (and adaptation to this hearing loss) the focus of the article rather than a detail in a larger story of success. Second, the hearing loss management strategies they described make the worker's hearing loss more, rather than less distinctive. To demonstrate the difference, an article on Bill Clinton, from the first organizing theme, emphasized his hearing aids' small size, while the article on a jewelry maker with hearing loss, from the second organizing theme, described bejeweled hearing aids and the importance of making the disability visible. Articles within this theme retain the expectation of 'cheerful striving', but workers strive for something other than 'normalcy'.

Clair et al (2005) has suggested that both normalizing an invisible stigmatizing trait, as used in articles about prominent workers with hearing loss, and differentiating the trait, as used in articles about community members working with hearing loss, are effective tools for workers with disabilities seeking to educate those around them. However, twenty-six articles over 21 years across seven major Canadian newspapers is likely insufficient to significantly influence public perception of workers with hearing loss.

As expressed by Getty and Hétu (1991) and Manchaiah et al. (2015), the media has a role to play in reducing stigma towards hearing loss, but more needs to be done to bring workers with hearing loss to the media's and ultimately the public's attention. The American Speech and Hearing Association has identified advocacy as a professional role and activity for audiologists. As such, audiologists and audiological researchers should learn to write press releases that communicate the relevance and importance of hearing loss in the workplace and other settings (see Nicoll (2015) for a press-release writing guide designed for healthcare professionals). My findings demonstrate a tendency for articles that interview workers with hearing loss to provide a more positive portrayal of their demographic than audiological experts with a normal hearing status. As such, audiologists and researchers should build relationships with local consumer groups, such as the Canadian Hard of Hearing Association and the Hearing Loss Association of America, so that when contacted by the media they can support journalists in finding interviewees who are comfortable sharing their direct experiences.

Before concluding, certain limitations should be considered. First, because the articles were drawn from large-circulation English-language newspapers in Canada, care should be taken in generalizing the findings beyond this region and culture. Second, given the few articles discussing hearing loss in the workplace, the findings are limited to informing how the media frames the issue. The results cannot shed light on society's understanding of hearing loss in the workplace as such a small number of articles are unlikely to have made any significant impact on public perception.

Conclusion

When newspapers write about workers with hearing loss, they most frequently present an image of workers cheerfully striving towards a good worklife. While this framing is not beyond criticism, it draws attention to the abilities of workers with hearing loss that are otherwise overlooked. However, in order to make workplaces, and indeed society at large, more accessible to individuals with hearing loss, audiologists and researchers need to help journalists to access more of these stories, and access more of them from their direct source: workers with hearing loss.

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Chapter Four: Multiple Case Study of the Listening Shift

Introduction

Canadian print media represent workers with hearing loss as 'striving cheerfully' (Koerber, Jennings, Shaw, & Cheesman, 2017). In spite of this positive media narrative, the research literature has documented less positive experiences. Workers who have a hearing loss report higher levels of need for recovery after work (Nachtegaal, Festen, & Kramer, 2012), lower levels of control relative to the job demands they face, and lower levels of support from management (Danermark & Gellerstedt, 2004). Despite the narrative of 'striving', many have not accessed hearing healthcare services. For example, in Australia, roughly 40% of the adults estimated to have hearing difficulties have not gone to a health care provider for advice about their hearing, and two-thirds do not own hearing aids (Hartley et al., 2010; Schneider et al., 2010). This lack of help-seeking in response to hearing loss may be more prevalent among working-aged adults. For example, 55 to 65 year-olds with hearing loss were two times *less* likely to use hearing aids than adults over 65 with similar levels of loss. Adults between the ages of 21 and 44 were four times *less* likely to use hearing aids (Kochkin, 2007). Workplace difficulties, and workers' reticence to seek out assistive devices, appear inconsistent with the narrative of workers 'taking action', as identified in the thematic analysis (Koerber et al., 2017). This disparity warrants a more in-depth examination of how workers with hearing loss strive and take action, in particular when provided with an opportunity to do so through a communication-strategies training program.

The research literature on communication-strategy training programs for workers with hearing loss has demonstrated mixed results in terms of benefits to participants, and no clear trajectory towards more favorable outcomes. In an effort to identify areas for growth, I sought to understand the mechanism by which workers with hearing challenges change in response to communication-strategies training programs. In this chapter, I will describe the development of a communication-strategies training program, and model how it impacts participating telepractice nurses with hearing challenges. I will use a multiple case study approach, relying on grounded theory to build logic models describing participants' activities and outcomes.

A valuable support program should not only benefit workers with hearing challenges (i.e., by increasing workplace wellbeing), but also ensure its own sustainability by demonstrating value to employers (i.e., by improving employee performance). I was interested in developing an intervention that accomplished both goals. To this end, I tailored the intervention to a specific population and a specific task: nurses who work on the telephone. I used the program to answer the following research question:

> *How do nurses with hearing challenges change in terms of their telephone performance and workplace wellbeing in response to an online communication-strategies training program?*

This research question led me to explore two components of the program: (a) its outcomes, and (b) the mechanism by which participants arrived at these outcomes. I evaluated potential changes to the employees' workplace wellbeing and performance and the mechanisms for these changes using a multiple case study approach (Yin, 2014). Following the approach recommended by Strauss and Corbin (2008), I approached the research question with a theoretical starting point: constructs within the Job Demands and Resources Model of Work Engagement (i.e., the JDR model) (Bakker & Demerouti, 2007). The multiple case study involved a grounded theory analysis of ethnographic interviews and discussion forum comments. I triangulated these findings against quantitative self-report measures completed before and after program participation, as well as at a three-month follow-up.

I used logic models to express both my hypotheses and results. The existing literature on workplace wellness and performance provided a baseline understanding. This guided the development of the 'proposed' logic model which articulated my hypotheses. Based on the existing understanding, I predicted that the program would act as a resource, allowing nurses to better manage the demands of their hearing challenges and to enjoy greater wellbeing and performance. I developed a proposed program logic model outlining my hypotheses for the nature of this process. This logic model was then replaced by a data-driven model, developed after the collection and analyses of self-report assessment scales, interviews, and discussion forum comments.

Three topics comprise the remainder of this introduction. First, I will describe the Job Demands and Resources Model of Work Engagement (Bakker & Demerouti, 2007), an influential model of workplace wellbeing and performance which underpins the design of my proposed logic model, research and its analysis. Second, I will explore previous research into the delivery of online training in audiology, and thereby identify best practices for the development of the communication training program I ultimately delivered. I will end the introduction with a description of my experiences working in a call centre. These experiences informed the judgements I made in developing interview protocols, designing the intervention, and analyzing results.

Wellbeing and Performance: Job Demands and Resources Model of Work Engagement

Job performance must be defined broadly. In Koopmans and colleagues' 2011 conceptual framework of individual work performance (see Figure 6), job performance contains four components. The first, task performance, includes the execution of the technical functions of the job while contextual performance, the second component, involves the individual's motivation and work-related wellbeing. The third component, an individual's ability to adapt to change in work roles and environment, is referred to as adaptive performance. The final category of performance, counterproductive work behavior, includes practices such as absenteeism and theft. Depending on a worker's roles, these elements of performance contribute to greater or lesser degrees to another way of categorizing performance: 'in-role- and 'extra-role' performance (Bateman & Organ, 1983). In-role performance, most closely aligned with task performance, describes an employee's effectiveness in completing the duties that make up their job description. Extra-role performance, most closely aligned with contextual performance, speaks to employees' contributions that go beyond their job description. For example, appropriately triaging a client would demonstrate in-role performance in a telepractice nurse, but voluntarily mentoring a new nurse would demonstrate extra-role performance.

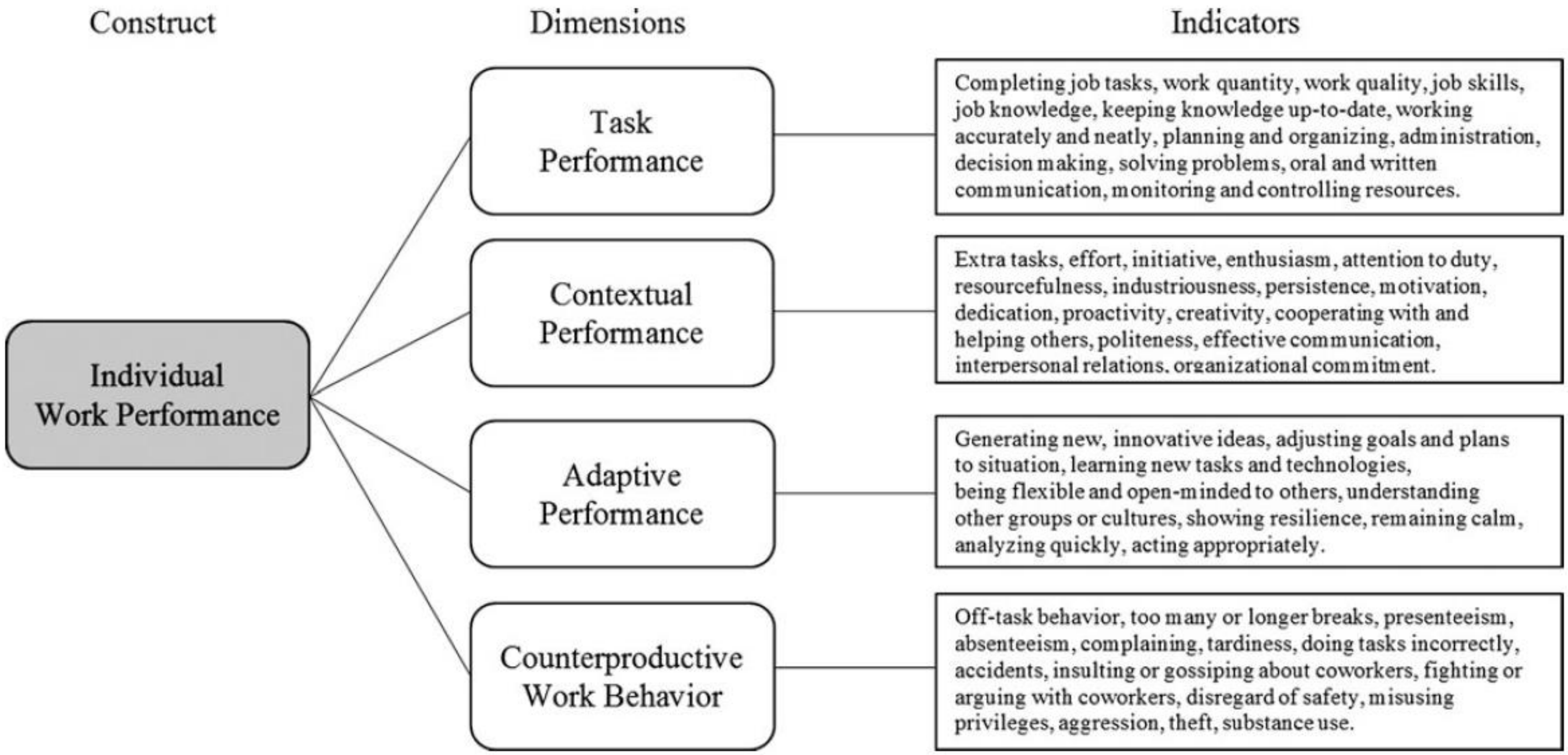

Figure 6. Koopman and colleagues' (2011) Heuristic Conceptual Framework of Individual Work Performance.

Precursors to performance have been identified for task performance specifically. As defined in Table 8 and presented in Figure 7, Motowildo, Borman, and Schmit's (1997) model identifies task knowledge, skills, and habits as the precursors of task performance. In keeping with this model, aligning knowledge, skills, and habits with the communication strategies taught in training programs, may improve the task performance. Understanding how to improve performance more globally calls for a broader model of work performance. The Job Demands and Resources Model of Work Engagement provides such a model.

Table 8

Elements of Motowildo, Borman and Schmit's (1997) task performance model.

Element	Definition
Task Knowledge	Understanding the technical principles and details of the organization's core functions
Task Skill	Applying task knowledge to make decisions; problem solve and carry out procedures quickly and accurately
Task Habits	Patterns of behavior that contribute or detract from the organization's goals

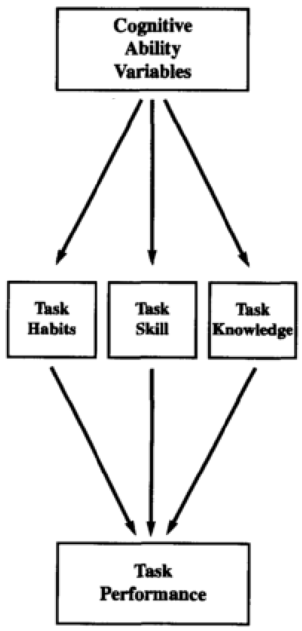

Figure 7. Task performance element of Motowildo, Borman and Schmit's (1997) Theory of Individual Differences in Task and Contextual Performance.

In this research, the Job Resources and Demands Model of Work Engagement (Figure 8) was used to evaluate the outcomes of the program, as well as provide a preliminary 'map' for how these changes might occur. This model synthesizes older models of workplace wellbeing, such as Karasek's Demand Control model (Van der Doef & Maes, 1999) and Siegrist's Effort-Reward imbalance model (de Jonge, Bosma, Peter, & Siegrist, 2000) to create a more comprehensive overview of the constructs that contribute to workplace performance and wellbeing (Bakker & Demerouti, 2007). In this model, personal and job resources increase work engagement and buffer the negative consequences of job demands. Job resources include any element of the socio-emotional, organizational or physical work environment that instrumentally helps workers perform their duties, manage job demands, manage the mental and physical consequences of job demands, as well as meet personal goals and experience growth. Thus, teaching communication strategies tailored to their work environment should provide workers with hearing loss with a job-related resource. Communication strategy training is predicted to lead to increased execution of effective communication strategies, with this execution representing increased job performance.

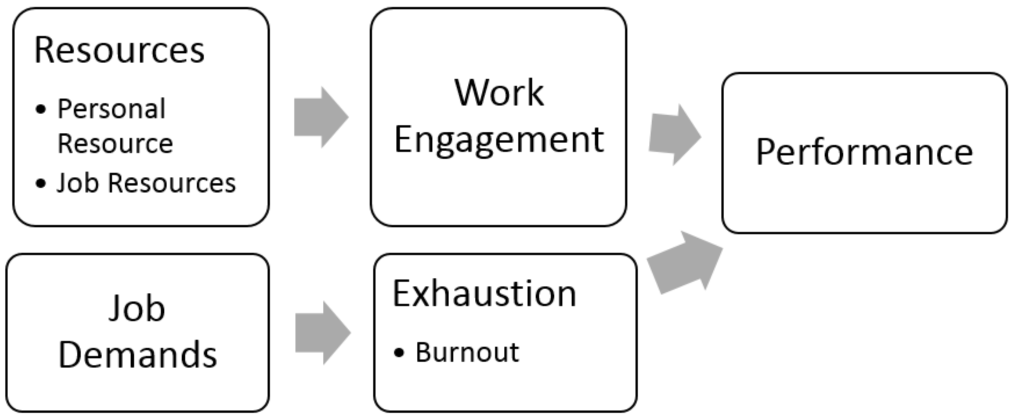

Figure 8. Job Demands and Resources Model of Work Engagement.

Within this model, personal resources are also important contributors to performance and wellbeing (Bakker & Demerouti, 2007). Personal resources include self-efficacy related constructs, such as hope, optimism, and self-esteem. Self-efficacy, or a person's confidence in their ability to perform a specific behavior (Bandura, 199x), correlates positively with workplace performance (Stajkovic & Luthans, 1998). Bandura (1997) has identified four factors that build self-efficacy. These four factors can be used to develop nurses' personal resources in handling difficult-to-hear calls. 'Enactive mastery experiences' or opportunities to practice and master the communication strategy provide the most important increases. Vicarious experience, or watching the communication strategy successfully modelled, provide an additional source of self-efficacy. When individuals see others succeed or fail, their levels of self-efficacy increase or decrease respectively. Social persuasion, meaning encouragement (or dissuasion) by others also impacts self-efficacy. Finally, individuals' affective and physiological states impact their self-efficacy. For example, a nurse who feels nervous when asking a client to speak more slowly will feel less efficacious about making these requests, regardless of their competence in so doing.

According to the model of work engagement, while job demands lead to exhaustion and burnout, job and personal resources can increase job engagement. Job engagement is characterized by vigor, dedication, and absorption (Bakker & Demerouti, 2008). Resources can mitigate the negative effects of job demands, ultimately leading to higher levels of both in-role and extra-role performance. Based on these models, providing a resource (communication strategies training) that helps affected workers to manage their listening demands, while increasing their self-efficacy in implementing those strategies, should improve their performance and wellbeing. The development of these communication strategies and the associated self-efficacy requires evidence-based teaching strategies.

Because adults make up the population of interest, principles of andragogy, i.e., adult education, inform the development of communication-related knowledge, skills, and habits in nurses with hearing challenges. According to Knowles (1980), andragogy consists of four central tenets: (1) adults are independent, autonomous and self-directed towards goals, (2) internal factors provide the strongest motivations for learning, (3) adults are most interested in learning subjects that have immediate relevance to real-life tasks and problems, and (4) previous experience, existing knowledge and personal conceptions are used as a starting point in learning. Overall, andragogy calls on instructors to respect the knowledge, skills, and motivation inherent in adult learners. These tenets of andragogy were applied in an online learning platform.

Online Training as a Tool for Improving Communication Performance

The training of nurses in the knowledge, skills, and habits required for effective communication must consider the characteristics of this population. First, the working-age population has limited free time (Chin & Williams, 2006), and the principle of 'least intervention' holds that brief interventions early in the progression of a disability may be more effective at supporting job retention than more involved, ongoing supports (Dyck, 2006). As a result, to capture the interest of nurses with telephone hearing challenges, the intervention should be engaging, easy to access and time-limited. Second, the stigma surrounding hearing loss may prevent employees in need from seeking help (Kochkin, 2007). As a consequence, ensuring the confidentiality of participants may encourage more persons to participate. Finally, adults with hearing loss are already turning to online resources to access supportive discussion forums (Choudhury, Dinger, & Fichera, 2017). Thus, online training presents a way to provide engaging, accessible programs, while protecting workers' confidentiality and meeting them where they are.

Over the last fifteen years, a number of online programs have sought to help adults manage their hearing challenges (Andersson et al., 2002; Andersson & Kaldo, 2004; Kaldo et al., 2008; Kaldo-Sandstrom et al., 2004; Laplante-Lévesque, Pichora-Fuller, & Gagné, 2006; Manchaiah et al., 2013; Molander et al., 2015; Swanepoel & Hall, 2010; Thorén et al., 2014; Thorén et al., 2011; Vlaescu et al., 2015). Through a series of educational modules paired with reflection, skill practice tasks, peer interactions through discussion forums and clinician support through email, these programs have addressed tinnitus, barriers to adapting to hearing aids and other audiological needs. This body of research has demonstrated both promising results and areas for further development. Over the following pages, I will describe online interventions which have been provided to new hearing aid users and those experiencing tinnitus. I will discuss the challenges encountered in delivering these programs, and recommendations for managing these challenges.

New hearing aid users*.* Several studies have evaluated how online programs can provide follow-up to hearing-aid dispensing. Such follow-up aims to help clients adjust to hearing aids (acclimatization) and cope with lingering hearing challenges. In 2006, Laplante-Lévesque, Pichora-Fuller, and Gagné evaluated the benefits of sending daily emails to new hearing aid users. Their multiple case study focused on three participants and explored how this approach could facilitate client-audiologist communication. The emails included information on communication strategies or assistive devices, as well as questions that invited recipients to explore their adjustment process. The first participant found the program beneficial; it gave her a greater sense of control over her hearing loss. The second participant, pressured to take part in the online program by his spouse, enjoyed little benefit. The third reported that it reinforced her already positive adjustment. The authors concluded that online tools could support the acclimatization process.

Another online program used self-study (online readings, quizzes, and activities), peer interaction, and audiologist coaching to introduce hearing-aid users to their hearing anatomy, the audiogram, the nature of hearing, hearing aids and coping strategies. The program was interactive, and participants emailed their homework to the audiologist for feedback (Thorén et al., 2011). As measured by the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), this group's levels of anxiety and depression decreased post-participation in comparison to the control group. However, both groups showed a significant decrease in their hearing handicap as measured by the Hearing Handicap Inventory for the Elderly (Ventry & Weinstein, 1982). It is possible that this positive outcome in the control group reflected a placebo effect in the control group. This control group participated in an online discussion-forum with others experiencing hearing loss. Alternatively, discussion forum participation may provide a therapeutic benefit. A follow-up study took this into account and provided a program that incorporated a discussion forum along with the pre-existing readings, reflections, quizzes, and interactions with a professional. This intervention, using the same outcome measures chosen for the previous study, demonstrated not only a significant reduction in handicap both directly after the intervention but also at a three-month follow-up. Participants also demonstrated a significant reduction in depression and anxiety at follow-up (Thorén et al., 2014). These findings suggest not only the benefits of online aural rehabilitation but also potential benefits associated with peer interaction through discussion forums.

Online aural rehabilitation programs continue to face certain challenges, particularly around retention. Manchaiah, Ronnberg, Andersson, and Lunner (2014) described their clinical trial of an online internet-based pre-fitting counselling program as 'failed' when they reported on the results. The authors had recruited participants who had not yet been fit with hearing aids. They recruited them online and only communicated with participants through email. The approach did not seem to support retention. Only 22.5% of participants completed both the pre- and post-program questionnaires. Of this small group that completed both questionnaires, only half completed all activities provided in the online counselling program. The activities involved considerable self-reflection and the authors reported that many participants were unprepared for this level of introspection. From pre-program to post-, researchers found no significant changes in scores on the metrics used: the Hearing Handicap Questionnaire (Gatehouse & Noble, 2004), the Hospital Anxiety and Depression Scale (Spinhoven et al., 1997) the University of Rhode Island Change Assessment (Dozois, Westra, Collins, Fung & Garry, 2004), and the Hearing Disability Acceptance Questionnaire (Manchaiah, Molander, Ronnberg, Andersson, & Lunner, 2014). Authors speculated that these low retention rates might have been averted by connecting with participants through a phone call at the start of the program or providing more information-focused course content.

Tinnitus. A series of four studies provided internet-based cognitive-behavioral therapy for tinnitus management (Andersson et al., 2002; Andersson & Kaldo, 2004; Kaldo et al., 2004; 2008). The first study used a self-help manual containing 10 modules designed to be completed over six weeks (Andersson et al., 2002). Researchers delivered these modules through a webpage that outlined the assignments and provided access to instructors. Instructors answered questions and gave encouragement through email. The program called on participants to practice the presented skills and strategies daily for between 30 and 45 minutes. Compared to participants in the waitlisted control group, those receiving the intervention reported significant decreases in their experiences of negative emotions in general, as measured by the Hospital Anxiety and Depression Scale, and their levels of tinnitus-related distress, as measured by the Tinnitus Reaction Questionnaire. However, the program experienced a high level of attrition. Fifty-one percent of the participants who started the program did not respond to follow-up questions.

Follow-up studies, including a case study and an evaluation of factors that predicted success in the program, allowed researchers to refine the intervention protocol (Andersson & Kaldo, 2004; Kaldo-Sandstrom et al., 2004). In 2008, the updated protocol was tested (Kaldo et al., 2008). This program contained an expanded self-help manual, gave participants more control in setting treatment goals and deciding when they would complete specific modules, and encouraged them to book the time when they would work on the intervention each day. Moreover, participants received more detailed and personalized instructions to guide their use of the platform. Researchers compared the participants' outcomes to a control group receiving the same program, but through face-to-face group therapy, rather than online. As in the 2002 study, those receiving internet training showed significant reductions in tinnitus-related distress, insomnia, anxiety, and depression, with results comparable to the changes seen in the face-to-face group therapy program. However, the internet training program was 1.7% more cost effective. Unfortunately, while retention improved compared to the 2002 study, 38% of the internet participants did not complete all six modules. While this attrition rate was comparable to the number of live participants who did not attend all six group sessions, managing attrition remains a priority for online training.

Challenges. Online supports for hearing challenges tend to provide results comparable to those experienced through face-to-face support. However, as described, certain challenges are apparent. These include incorporating interpersonal interaction, raising programs' credibility, and managing attrition.

***Increasing interaction*.** Online instructors face barriers to building relationships with their students and helping their students connect with one another. These barriers have consequences. For example, a health promotion program designed for older workers found that those workers who engaged in a face-to-face health coaching and follow-up telephone contact showed significantly greater changes on a variety of health indicators as compared to peers participating in an interactive online program with no interpersonal interaction (Hughes et al., 2011). Connection with the health coach seemed important as the purely web-based program not only had poorer outcomes but showed a lack of engagement with the interactive online components. The social elements of face-to-face learning can motivate participation in learning experiences (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010) and online courses may benefit from facilitating more interaction.

In their 2009 review, the Hanover Research Council (HRC) provided recommendations for building instructor-participant and participant-participant relationships. To build instructor-participant relationships, the HRC recommended that at the start of the program, instructors introduce themselves through an electronic post. This post should use a conversational tone, and this tone should be maintained throughout the course. Instructors should then provide positive, personalized, email feedback in response to participant's initial forays into using the online platform. Martin (2009) states that providing multiple modalities of synchronous (online chat, video-conferencing) and asynchronous (email, discussion forum) communication facilitates instructors in building relationships that support their students, and while these connections should be very frequent at the start of the course, they can stabilize as learners grow comfortable in the environment. A schedule of communication should be laid out for students so that they know what to expect.

To build participant-participant relationships, the HRC recommends that instructors pose interesting discussion questions on the forum and ask participants to brainstorm responses. They also encourage the use of collaborative assignments, such as asking participants to collectively create a wiki page, a suggestion seconded by Martin (2009). Instructors then remain engaged with students by summarizing group discussions and providing meaningful feedback on both collective and individual assignments. To foster a safe environment, Martin (2009) suggests posting discussion board rules and making it clear which contributions to the site will be public and which will be private.

Increasing credibility. Online programs must also manage participants' perception that they are less legitimate. Kaldo et al. (2008) evaluated both online participants' and live-group participants' perceptions of their tinnitus program's credibility. The authors found that before the start of the intervention, participants rated the internet-based program as less credible than the in-person program. Further, participants of the live-group program believed that their program helped them more than an online program would have, despite similar outcomes. Participants seemed to inaccurately perceive online treatment as less legitimate. However, steps can be taken to increase online contents' credibility. In a qualitative study, Eysenbach & Köhler (2002) identified the ways that consumers evaluate the reliability of online health information. Important factors included: the authors' credentials, citing scientific literature, the ease with which participants could use the site and understand the language, an absence of advertisements, recently updated materials, third-party endorsement and professionalism in the site's design.

Managing attrition. As described previously, attrition was a challenge in the online CBT-based tinnitus management courses evaluated by Kaldo et al., (2002; 2008). The proportion of participants completing the online course in its entirety ranged from 49% to 62% (Andersson et al., 2002; Kaldo et al., 2008). The hearing-aid adjustment course developed by Thorén et al., (2011; 2014) had a much lower attrition rate, with only 17% (5 of 29) participants failing to complete the first intervention and 14% (11/78) not completing the second. However, in both cases, the rates of attrition in the online intervention resembled the rate of attrition in the face-to-face control groups.

Both research teams identified barriers that stood in the way of participants completing the course. These included finding the program too demanding, technical problems with the course or computer, vacation plans, and concerns about the security of their personal information (Thorén et al., 2014; Thorén et al., 2011). In addition, participants reported challenges due to a lack of time, the program proceeding too quickly, and for the tinnitus management program, a lack of the peace and quiet at home needed to perform the homework (Andersson et al., 2002). Thus, while online programs may be more accessible than in-class experiences, other barriers must be addressed.

To manage attrition, the Hanover Research Council (2009) recommended reaching out to students who fall behind. The authors encourage instructors to contact students who have been absent from the platform for a set period (e.g., one week) to ensure they are not having technical difficulties. Likewise, they recommend connecting through email with students who have not submitted assignments.

Giving participants control*.* Based on Chin and Williams' (2006) theoretical framework for effective online course design, course content should be based on expressed learning needs from the participants. Consistent with Kaldo and colleagues' (2008) decision to give participants more control in setting tinnitus treatment goals, the HRC recommended that at the start of the course, participants be given an opportunity to share their course goals. This can be accomplished through a survey, and the results can be used to tailor the learning experience to the elements that motivate participants to stay involved.

Basing course content around learners’ expressed needs follows the principles of andragogy, which includes the supposition that adults learn best when information directly relates to real-life challenges. Case-based learning caters to this learning style and Erikson and Noonan (2010) reported that adults ages 50-65, in comparison to their younger classmates, particularly appreciated online case-based learning activities. Martin (2009) recommends that online assignments, case-based or not, allow adult students to draw from past experiences, express personal opinions and create space for experimentation and creativity, thereby fostering intellectual creativity. As described by Chin and Williams’ theoretical framework, knowledge construction and real-world application should be prioritized over knowledge reproduction.

Preventing and managing technical difficulties*.* Kaldo et al., (2008) identified the importance of providing clear instructions and managing technical challenges in online courses. This finding holds greater importance in the current intervention, as older adults are more likely to have hearing loss and therefore to need interventions for hearing loss (Feder et al., 2015). Erickson and Noonan (2010), in their investigation into the online learning experiences of adults ages 50 to 65, reported that older adults taking an online course posted more questions about using the online platform than their younger counterparts.

The Hanover Research Council (HRC, 2009) recommends the following to prevent students from experiencing technical troubles. First, instructors should initially post an orientation to the technological platform as well as strategies for learning online. Second, instructors should encourage students to contact them right away when they experience question or confusion related to the course content or technology. Third, the instructor should include instructions for where to turn for help if students experience technical difficulties and how to reach the instructor with questions. In turn, the instructor should reply to each email promptly, a recommendation emphasized in Chin and Williams' (2006) framework for online course design.

The HRC suggests that the burden of needing to ask and answering questions can be reduced by providing a 'frequently asked questions' page on the course site. In a similar vein, Erickson and Noonan (2010) suggest that questions be answered through an online forum where the answers can be seen by peers.

Greater ease of use can be achieved by meeting the design criteria for web-based learning platforms developed by Hsu, Yeh, and Yen (2009). These criteria present best practices for online instruction, teaching materials, learning tools and learning interface. These criteria lay out concrete goals for online course developers (see Appendix R).

Through this review of the literature, I have outlined the current understanding of workplace performance and wellbeing, previous online interventions addressing hearing challenges, and strategies for managing the challenges encountered in these online interventions. These findings guided my development of an online communication-strategies training program for telepractice nurses who struggle to hear on the telephone. I chose this demographic because, as identified in the introduction, I aimed to address an additional challenge identified previously: participants' perception that recommendations provided in vocational aural rehabilitation lack relevance (Gussenhoven et al, 2015). To this end, I chose to direct the program towards nurses working on the telephone. This focused my intervention on a single task relevant to all participants: telephone communication. To increase the likelihood of providing communication strategies appropriate to this job task, I gained personal experience in telephone work.

Relevant Experience

The development of the course, as well as my selection of questionnaires and qualitative analysis, were informed by field notes I took during a six-week contract within a call centre. I did not perform the work of a telepractice nurse. However, I gained personal experience with the types of hearing challenges presented by telephone work. Moreover, I became acquainted with the unique physical and organizational environment of a call centre, an environment in which many telepractice nurses work.

The call centre had been built in the downtown of a large city. The open concept workspace had high ceilings and a large floor space of roughly 8000 square feet. Windows facing the street lined the perimeter of the room. Workstations came together in 8-desk pods, with desks separated by chest-high fabric screens. My colleagues and I used pass cards to enter and leave the centre and signed into computer dialing systems at the start of each shift. These dialing systems recorded our average call times, and the personal time we used for breaks. We each made calls with a binaural Plantronics©-brand headset which connected to the dialing system through a Plantronics©-brand amplifier.

I found the work straightforward and repetitive but also emotionally demanding. We made outbound telephone calls for a credit card company, following a script. Maintaining a professional and friendly demeanor throughout the four-hour shifts could be challenging when tired or sick. My colleagues and I watched the clock closely during the shift.

Managers monitored our work closely but also supported us. The organization tried to promote a positive environment: they had painted the walls yellow and superiors distributed small tokens (e.g., Keurig™ cups to use at the coffee maker) to recognize high-quality calls. Managers coached us in dealing with challenging customers and reaching higher pay grades. All front-line managers had previously worked in our position and continued to make calls when not performing administrative and management duties. While we experienced a sense that they were facing these demands with us, they monitored us closely. Managers listened to our calls and tracked our call times. They met with us for monthly performance reviews and our bonuses depended on scoring over 90 on a 100-point performance scale.

During training sessions and shift meetings, managers and trainers never initiated discussions around hearing challenges. The initial training involved a discussion of the call centre's organizational values, which included a statement banning harassment of people with disabilities, but the trainer did not discuss how to manage hearing challenges while on the phone. When I asked about how to manage hard-to-hear calls, the manager guided me to code the call as 'language barrier', end the call, and move on. Almost all my colleagues were young, post-secondary students, and none disclosed a hearing loss. However, one complained of a previous call-centre position where she had worked next to a woman with hearing loss. The woman had spoken loudly when working on the phone, leading my colleague to use an earplug in her open ear. I spoke with my manager about my research and he described taking a three-month leave because of pulsatile tinnitus that had made it difficult for him to hear callers.

In working on the phone lines, I gained a first-hand sense of the hearing challenges that accompanied the job. Much of the time I enjoyed perfectly intelligible calls; however, I struggled to hear clients using cell phones in poor reception, using a speakerphone, speaking with an accent, or when the background noise rose on my end.

Background noise in the call centre fluctuated based on the number of people working that shift and the workstation. My hearing falls within the normal range, and I found that I did not always want to reduce background noise. Hearing others allowed me to adopt their successful strategies, and the noise-induced ‘buzz’ helped me remain alert despite the repetitive nature of the work. However, not all workers agreed. One colleague would consistently choose a secluded workstation, citing a desire for quiet.

I found certain strategies to be effective in managing hearing challenges. However, I had obstacles to overcome in their implementation. Background noise from other customer service agents decreased when I sat at a workstation in the periphery of the room. Unfortunately, this distance from the centre of the room visually shielded me from the manager’s line-of-sight. As a result, sitting in these locations was met with some disapproval when I could have chosen more central desks. Taking less popular shifts when fewer people were working on the floor proved to be a more feasible solution for avoiding background noise. Next, I felt uncomfortable asking customers to communicate clearly. Many of the customers we called did not want to talk to us, and I expected them to be unaccommodating towards requests for better communication. However, on the occasions that I did ask customers to take me off speakerphone or speak more clearly, they politely complied.

Other strategies met with more challenging obstacles. First, while each workstation came with a Plantronics©-brand telephone amplifier, my peers and I found it most comfortable to take calls at the highest volume setting on the devices. As such, these tools could provide no additional amplification for managing soft-spoken clients. Second, poor cell-phone reception could make calls entirely unintelligible, regardless of modifiable factors (e.g., the client’s manner of speech, whether they were using speakerphone, or the presence of background noise). In these cases, we had to explain that we would call back later and end the call.

While working in the call centre, I focused on the experiences and hearing challenges of telephone workers. However, the most frequent source of hearing challenges came from clients with hearing loss. Approximately once per shift, I would call such a client. The customer would frequently ask a family member on their end to 'translate', but the employer organization worried about the legal implications of providing the individual's financial information to an unverified third party.

The technology and listening challenges I experienced during this observation period allowed me to better conceptualize the telephone work performed by nurses, and the call-centre-like environments they work in. This observation period informed my development of the study design, selection of questionnaires, writing of ethnographic interview questions, and interpretation of the data. It also supported me in developing 'The Listening Shift', the online communication strategies training program provided in the research. This program, as well as the details of data collection and grounded-theory analyses, will be described below.

Methods

In this section, I will describe the theoretical foundations and components of the communication training program. I will describe the multiple case study methodology employed, the cases, the qualitative and quantitative sources of data collected for each case, and how I analyzed this data using grounded theory.

The 'Listening Shift' Program

In keeping with the approach taken by Gussenhoven et al. (2015), I developed the 'Listening Shift' program to provide more targeted recommendations for workers with hearing loss. Informed by my call centre work and based on the scoping review of telephone strategies described in Chapter Two, I developed the intervention content for the program. This online communication strategies training program, tailored to nurses experiencing hearing challenges while working on the phone, contains four modules: *Technology to Help You Hear, Telephones and Hearing Aids, Requesting Accommodation* and *Listening Strategies*. The course relies on the best practices in online education (Table 9), the elements of task performance (Table 10), self-efficacy theory (Table 11), principles of andragogy (Table 12), and the recommended strategies for managing participant attrition described in the introduction.

Table 9

Best practices in online education, and their incorporation into the program.

Best Practice in Online Education	Associated Program Elements
Facilitate interaction	Discussion forum
Need for instruction in use of online platform	In person instruction in how to use website after intake interview
Interaction with instructor/coach	Instructor builds rapport with participants at intake assessment. Instructor provides positive feedback into initial forays into using discussion forums and completing assignments. Instructor follow-up with students who fall behind to ensure they are not having technical difficulties. Instructor provides synchronous (online chat) and asynchronous (email) methods for students to connect
Course Credibility	Cite scientific literature, grade 5 reading level and intuitive site set up. Absence of advertisements, make explicit the course's association with Western University and the National Centre for Audiology. Ensure that the site design and content looks professional
Attrition	Place reasonable demands on students (less than one hour per module). Predict and manage technical problems, address concerns about the security of their personal information, allow students to choose the pace, facilitate participants in accessing the resources they need to practice (e.g., suggest alternative to calling a friend to practice)

Building Participant Relationships	Pose interesting questions on the forum and ask participants to brainstorm responses. Ask participants to work collectively on assignments. Create a sense of safety by posting discussion board rules and clarifying which contributions will be public and what will be private
Give participants control	Give participants an opportunity to share course goals through the intake interview and choose which strategy they will implement for homework. Use case-based learning to allow participants to draw from past experiences, express opinions and be creative
Prevent and manage technical difficulties	In addition to instructing participants in platform use at intake interview, post an orientation to the technological platform Encourage students to contact instructor right away if they experience technical difficulties and respond to these requests promptly. Post a frequently-asked-questions page Provide a forum on which online participants can post questions. This allows peers to see the answers provided by the instructor and potentially answer questions themselves Meet the design criteria for web-based learning outlined by Hsu, Yeh and Yen (2009) (see Appendix R)

Table 10

Elements of task performance, and their incorporation into the program.

Theoretical Concept	Associated Program Elements
Task Knowledge	*Learning:* Present strategies through captioned videos and wiki pages
Task Skill	*Practicing:* Through assignments, have participants practice at home
Task Habits	*Implementing:* At the end of the course, provide participants with a printable summary of the strategies presented. Encourage them to place it where they will see it regularly and follow through in turning these strategies into habits.

Table 11

Elements of self-efficacy, and their incorporation into the program.

Theoretical Concept	Associated Program Element
Mastery Experiences	Participants are given various tasks to choose from. The tasks are simple and easy to accomplish.
Modeling	Participants are asked to share their successes on the discussion forum.
Social Persuasion	Participants will recruit allies through the networking activities to help them stay on track with managing their hearing challenges.
Physiological Factors	Participants not forced to participate in activities beyond their comfort level, and guided in developing a support network to reduce the stress associated with completing the challenges.

Table 12

Principles of andragogy, and their incorporation into the program.

Theoretical Concept	Associated Program Elements
Adults are independent, autonomous, and self-directed towards goals	Course participation is voluntary, and participant can select the activities and information pages most relevant to them.
Internal factors provide the strongest motivation for learning	Information presented in an engaging way and assignments designed to provide a challenge without overextending abilities.
Adults are most interested in learning subjects that have immediate relevance to real-life tasks and problems	The course provides practical, tailored solutions to participants' hearing challenges in telepractice nursing.
Previous experience, existing knowledge and personal conceptions are used as a starting point in learning	Participants asked to share their experiences and expertise with fellow participants in the comments sections below lessons and activities.

Participants took part in the course through a series of five cohorts, with each cohort containing between one and four participants. Each cohort completed the four modules over a four-week period. Each week, members of the cohort watched the videos and read the information pages associated with the course module. They then participated in an 'introductions' activity, designed to help them network with others in the group, audiologists in their community, organizations that support people with hearing challenges, or recruit the support of a close family member or friend. Finally, they applied and practiced the strategies taught in the module through a series of practice activities, from which they chose the three activities most relevant to their professional needs. Comment sections associated with the lesson and activities allowed participants to share their experiences.

As the course facilitator, I responded to students' assignments, discussion forum comments and questions using the online platform as well as email. I also offered support to students who fell more than a week behind in the program, through an email check-in. The specific components of the four modules are described below in Tables 13 through 16. There was greater participant interest in the *Listening Strategies* module than in the *Requesting Accommodation* module. To account for this preference, I switched the order of these two modules after the first two cohorts had completed the course and provided feedback. Thus, the final three cohorts worked through the listening strategies module during the second week, and the requesting accommodation module last. Furthermore, users in these later cohorts were guided towards the course components most relevant to them, and explicitly permitted to overlook irrelevant components

Table 13

Week 1: Technology to Help You Hear

Learning Outcome	*By the end of this module, participants will have identified and tried technologies of interest to them.*
Formal Instruction	Information page: Principles of Hearing Well on the Phone
	Information page: Phone Amplifiers
	Information page: Pairing a Phone Amplifier with a Headset
	Information page: Telephone Technology and Infection Control
	Information page: The Benefits of Video Conferencing
	Information page: Connectors and Adaptor Cables
Networking	Introduce Yourself: Participants post an interesting fact about themselves, and a hearing-related question for other participants.
Guided Learning and Real-World Practice (Participants select and complete three)	Address Background Noise: Muffle Sidetone
	Address Background Noise: Find a Quiet Place to Make Calls
	Telephone Alternatives: Email, Video Conferencing and Face-to-Face Meetings
	Infection Control
	Headset Trial
	Telephone Amplifier Settings: High Tone or Low Tone?
	Setting Up Equipment and Answering Phone Calls
	Preparing for Technical Problems

Table 14

Week 2: Telephones and Hearing Aids

Learning Outcome	*By the end of this module, participants will understand ways to couple hearing aids with the telephone and will have reflected upon and explored which option is most appropriate for them.*
Formal Instruction	Information page: Pairing your Telephone with Your Hearing Aids
	Information page: More Information on the Acoustic Approach
	Information page: More Information on Using an Around-Ear Headset
	Information page: More Information on the Telecoil
	Information page: More Information on Bluetooth Streaming
Networking	(Re)Introduce Yourself to a Hearing Expert
Guided Learning and Real-World Practice (Participants select and complete three)	Hearing Aid Decision Making Tool
	Share Your Questions about and Experiences with Hearing Aids
	Which Telephone Option do you Prefer?
	Set up a Meeting with an Audiologist
	Hearing Aid Users, Manage Feedback on the Phone
	Hearing Aid Users, Find the Best Phone Position
	Hearing Aid Users, Master your Phone Program

Table 15

Week 3: Requesting Accommodation

Learning Outcome	*By the end of this module, participants will be able to identify the stages of taking a win-win approach to requesting accommodation. They will also have identified accommodations that may help them in the workforce and contemplated whether or not to take these requests forward to their employer.*
Formal Instruction	Video: Getting Back up from the Boss, Requesting Accommodation Attachment: Should you Disclose? Decision Tree Information page: The Win-Win Approach to Accommodation Video: Requesting Accommodation, Epilepsy Example Link: Working with Hearing Loss, A Guide for Employees, Employers and Entrepreneurs
Networking	Introduce Yourself to a Hearing Organization
Guided Learning and Real-World Practice (Participants select and complete three)	Gratitude, not Guilt: Responding to Help from Coworkers Decide if you Need Accommodation Book a Hearing Test Prepare to Request Accommodation Role Play: Practicing an Accommodation Request Did you Make a Request? Share how it went!

Table 16

Week 4: Listening Strategies

Learning Outcome	*By the end of this module participants will develop confidence in taking control of conversations and instructing customers in how better to communicate with them. In addition, by the end of this program, participants will master strategies for efficiently and professionally repairing communication breakdowns through general questions and seeking confirmation.*
Formal Instruction	Video: Help the Client be Heard
	Video: Confirm and Clarify
	Video: Letters and Numbers
	Information page: Connecting with Coworkers
Networking	Introduce a Friend or Family Member to Listening Strategies
Guided Learning and Real-World Practice (Participants select and complete three)	Manage Noise on your Caller's End
	Manage an Unintelligible Call
	Manage Unhelpful Caller Habits
	When You Missed what They Said…
	Manage Numbers
	Manage Specific Words
	Use of Listening Strategies – You be the Judge
	The Quick Brown NATO Fox: a NATO Alphabet Exercise
	Make a Difficult-to-Hear Call
	Clarify and Confirm at Work
	Help your Patient be Heard

During the program development process, I consulted with Drs. Mary Beth Jennings and Margaret Cheesman, two senior faculty members with expertise in hearing loss in older adults, adult aural rehabilitation, and workplace accessibility. In addition, I consulted with a specialist in online education within the Graduate Program in Health and Rehabilitation Sciences at Western University. Finally, a layperson who experienced telephone hearing challenges in the workplace read through the modules to assess the clarity of the information and the website's ease of navigation.

The Multiple Case Study Methodology

To understand how course participants changed in response to the program, I performed a multiple case study evaluation based on the case study design and methodology described by Yin (2014). Case studies are used to "investigate a contemporary phenomenon (the 'case') in its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident," (Yin, 2014, p.4). The case study approach accommodates the complexities of evaluating online communication-strategies training and has been used in past evaluations of internet-based audiological-information counseling, both for new hearing aid users and individuals with tinnitus (Andersson & Kaldo, 2004; Laplante-Lévesque, Pichora-Fuller, & Gagné, 2006).

Case studies answer 'how' questions (Yin, 2014). When evaluating interventions, developing of a 'logic model' that links an intervention to its ultimate outcomes through immediate and intermediate effects visualizes 'how' an intervention impacts its users. Thus, the multiple case study methodology allowed me to develop a mechanism of how the course contributed to program outcomes in each case, and answer my research question: *How do nurses with hearing challenges change in terms of their telephone performance and workplace wellbeing in response to an online communication-strategies training program?*

Cases. I answered the research question by studying 'cases'. Cases are individuals, events, organizations or even relationships. Within this research project, 12 cases were included, corresponding to the 12 participating nurses. More specifically, the cases included the changes in listening demands, listening resources, workplace wellbeing, and workplace performance that these nurses experienced during and after the course. This case definition is limited to the period starting one month before the baseline interview and extending three months after the intervention.

The nurses included in the study met three inclusion criteria. First, they self-reported hearing challenges when using the telephone at work. They did not need to report a diagnosed hearing loss as it has been suggested that communication-strategies training programs be provided based on self-reported hearing challenges, rather than on the results of an audiometric assessment (Stephens & Kramer, 2009). This less restrictive criterion includes the population unaware of their hearing loss and those who have not sought a diagnosis (Hartley et al., 2010; Schneider et al., 2010). In addition, this inclusive approach allows for participation on the part of those with 'hidden hearing loss', wherein clients present with essentially normal hearing thresholds but difficulty understanding speech (Plack, Barker, & Prendergast, 2014). The second criteria held that participants must work on the telephone for four or more hours a week as a registered nurse (RN), registered practical nurse (RPN), or nurse practitioner (NP). Third, nurses needed to have a phone and internet access outside of work (either through a mobile device or a computer). Fourth, participants needed the time and motivation to commit to the program.

Recruitment. Random sampling is fundamental to the external validity of quantitative research, however, my research follows qualitative methodology, and I did not select my cases randomly. My aim was not to produce findings generalizable to the population of all workers with hearing loss. Rather, I endeavored to select participants so as to "test developing ideas… by selecting phenomena that are crucial to the validity of those ideas" (Maxwell, 1992). As such, I engaged in purposeful sampling (Patton, 1990). I selected telepractice nurses with hearing challenges because they could provide information-rich cases. Telepractice relies on a single hearing task, listening on the telephone to make critical decisions around triaging and health care recommendations. This specificity allowed me to address concerns around the relevance of strategies presented in interventions. In addition, these nurses, their clients, and their employers were uniquely positioned to benefit from their adoption and use of effective communication strategies. Furthermore, nurses working in these call-centre-like environments attend regular performance reviews, making them more objective raters of their performance. This is vital as performance can be difficult to measure (Kessler et al., 2003), and employers considering additional supports for workers with hearing loss will want to know about anticipated performance benefits. Thus, I did not seek to recruit cases the cases that reflected the whole population of workers with hearing loss, but rather those who would support me in answering my research question.

Twelve telepractice nurses participated in the program and provided the 12 case studies. These nurses were recruited through mailed letters, posters, and the snowballing recruitment method. The College of Nurses of Ontario (CNO) provided a list of nurses who have consented to be contacted, via mail, with invitations to participate in research. At the time of the study, this list contained 170 RNs who worked in telephone health advisory services (i.e., telepractice), as well as 674 RPNs who worked as office nurses. These nursing roles are associated with telephone duties, based on a search of ‘nurse’ and ‘telephone’ on indeed.com, a popular job search site in Canada. To access these mailing lists, I provided the CNO with the research protocol, and proof of approval from Western’s Health Sciences Research Ethics Board. I then mailed the listed nurses a poster describing the study, as well as a letter of information explaining the research protocol and inviting them to contact me. I performed two mail-outings. I sent the first, in May 2017, to 170 nurses working in telephone advisory settings, and an additional 650 nurses working in office settings. I sent the second, in August 2017, to 500 of the nurses working in office settings. Of the 12 participants, two responded to the first mailing and one through the second.

In addition, participants joined the program through ‘snowballing’, whereby those who had already participated in the study passed information about the research on to colleagues. Four participants expressed the desire to pass on course information. I sent these nurses electronic copies of the recruitment poster and the letter of information. Of the 12 participants, four participants joined because a telehealth nurse had emailed information on the course to all of the Telehealth Ontario advisory nurses.

These four nurses had already received the letter in the mail, but this reminder from a colleague led them to participate.

Finally, I distributed posters to 54 public locations where nurses would see them: nursing homes, home care organizations, cancer centres, various professional organizations for nurses, telephone health advisory sites across Canada, and six public health units housing Health Connection lines (local telephone health advisory services) in Ontario. Of the 12 participants, five participants joined after seeing these posters.

Interested nurses contacted me via telephone or email. I screened individuals through a telephone call to ensure that they met the inclusion criteria. I arranged for those who met the inclusion criteria to participate in the course intake. I informed those who did not that they could participate in the program after the research project had been completed, and I placed them on a waitlist. In the telephone intake, eligible participants chose a username and password with which to access the online content. I showed them how to log into the course platform, navigate through the course's content, complete course activities, and access the baseline questionnaire. Finally, participants also took part in the half-hour baseline interview during this phone call.

Nineteen participants started the program, but seven left the course and did not participate in the post-course assessment. These nurses were removed from the study. A discussion of their reasons for leaving will be included in the results section. Twelve nurses completed the baseline and post-course interview and questionnaire. These nurses selected pseudonyms to use within the course. One nurse, however, felt it was important to use her full name on the platform and did so after a discussion of the risks this could pose to her confidentiality. I shortened her name and the other nurses' pseudonyms to pseudo-initials, two-letter abbreviations which I used to reference the participants in the results section. The data collected from these 12 participating nurses make up this study's 12 cases.

Data Sources for each Case. This multiple case study took an 'embedded case study' approach, drawing from different sources to provide three subunits of analysis.

Case studies can draw on a variety of data sources including documentation, archival records, interviews, direct observations, participant observations, and physical artifacts (Yin, 2014). In addition to the standard practice of memo writing, in this case study I drew on documentation, self-report assessment scales, and interviews. I collected documentation, in the form of forum discussions from the course website, with participants' permission. Participants completed self-report assessment scales at baseline, post intervention and follow-up. These scales will be discussed in more detail later in this chapter. I also performed semi-structured ethnographic interviews with the participants at these three time points. As the quality of the semi-structured interviews depends on the quality of the questions asked, the following section will outline how I developed the semi-structured interview protocol.

Semi-structured interviews. The nurses and I completed the semi-structured interviews over the telephone. As recommended by Leech (2002), the protocol drew on ethnographic question styles described by Spradley (1979). These questions styles, outlined in Table 17, explore how participants conceptually organize their world. Yin (2014) describes the importance of differentiating between the questions that drive a case study, and the questions that a researcher asks of the interviewees. Thus, my mental line of inquiry ('*how do program participants change in terms of workplace performance and wellbeing?*') was not the question I asked of participants in my verbal line of inquiry (see the interview protocol in Appendix S), but rather the question I asked of myself in analyzing their answers. More specifically, I sought to reduce participants' researcher-pleasing bias by asking these broader, more categorical questions (e.g., what resources help you manage these [hearing challenges]?) rather than more pointed, leading questions (e.g., how has the program helped you manage hearing challenges in the workplace?). A worker with telephone hearing challenges piloted this interview protocol along with the self-report assessment scales that will be discussed shortly.

Table 17

Ethnographic question types included in the semi-structured interviews.

Question Types	Goal of Question Types	Example
Grand Tour Question	Learn about important factors in interviewee's experience, and explore how these factors relate	"Walk me through any hearing challenges you experience during your typical work shift."
Mini Tour Question	Explore the factors within a *specific part* of an interviewee's experience, and how these factors relate	"When you've finished with a call and it's time to move on to the next one, how do you feel? What do you think about? What do you do?"
Example Questions	Gain clarification on specific terms used by the interviewee	"You said that your boss gave you a hard time when you asked for accommodation, can you give me examples of how he gave you a hard time?"
Experience Questions	Learn more about specific or unusual experiences	"Can you tell me about a few recent calls where you had trouble hearing? What did you do?"

Memos. In keeping with the grounded theory approach to analysis, I wrote memos during data collection and analyses (Willig, 2013). These tracked my thoughts, ideas and questions, and charted the development of emerging logic models. I included definitions of the categories I identified, the ways in which categories differed and, using flowcharts, my emerging sense of how these categories related to one another.

Forum discussion comments. Comment sections followed each of the course's videos, information pages, and homework activities. Many of these course components ended with an explicit prompt for participants to share relevant opinions, expertise or experiences. While I included these discussion forums to enrich the course, I also expected them to provide data. As these forums involved conversing with other participants I anticipated that, as found in focus groups (Leung & Savithiri, 2009), participants would express themselves with greater candor as compared to in the interviews with myself, the researcher. In addition, I expected that participants would together develop a more sophisticated narrative of their experiences through discussion and debate.

Self-Report Assessment Scales

To identify quantitative changes in nurses' performance and work-related wellbeing, participants completed a set of self-report questionnaires. Given my interest in understanding *how* the communication-strategies training program impacted nurses, my outcomes of interest had the potential to be influenced by many independent variables, making case study methodology a more valid method for answering my research question than quantitative analyses alone (Yin, 2014). However, quantitative measures of change still provided a subunit of analyses. I did not include these measures to make statistical inferences in isolation, but rather to enrich my understanding of interviews and discussion forum comments. The self-report questionnaires are described in detail below.

Demographic questionnaire. Descriptive metrics were collected at baseline and included basic information on nurses' age range, gender, the nature of their work, their hearing status, and technologies used to assist hearing on the telephone (see Appendix T).

Degree of hearing loss. Because participants lived across Ontario and Manitoba, I could not perform direct audiometric testing. Instead, participants completed the Better Hearing Institute's Quick Hearing Check (see Appendix U). This measure has been psychometrically assessed in over 10 000 participants and demonstrates excellent internal reliability. It moderately correlates with the Gallaudet scale, Pomp's scale of difficulty of hearing in noise, and perceptions of hearing loss from both individuals and their spouses. Scores on this measure explain 82% of the variability found within audiometrically determined thresholds (Kochkin & Bentler, 2010). In addition, participants who had their hearing tested outside of the study were asked to mail in a copy of their audiogram.

Self-report performance and work-related wellbeing measures. Self-report questionnaires collected at baseline, post-intervention and follow-up evaluated the constructs within the Job Demands and Resources Model of Work Engagement (see Figure 9). As described below, all measures have been validated in previous studies, with the exception of the Self-Efficacy for Difficult-to-Hear Calls Questionnaire and the course evaluations. These questionnaires were pilot tested by an adult who experienced hearing challenges while working on the phone. This pilot test ensured that future participants could interpret the questions posed to them. Based on this pilot test, terms within a few questions were defined. After recruiting participants and collecting program participants' responses to these metrics, data were evaluated using the Wilcoxon signed-rank test to compare participant scores at baseline, post intervention and at the three-month follow-up.

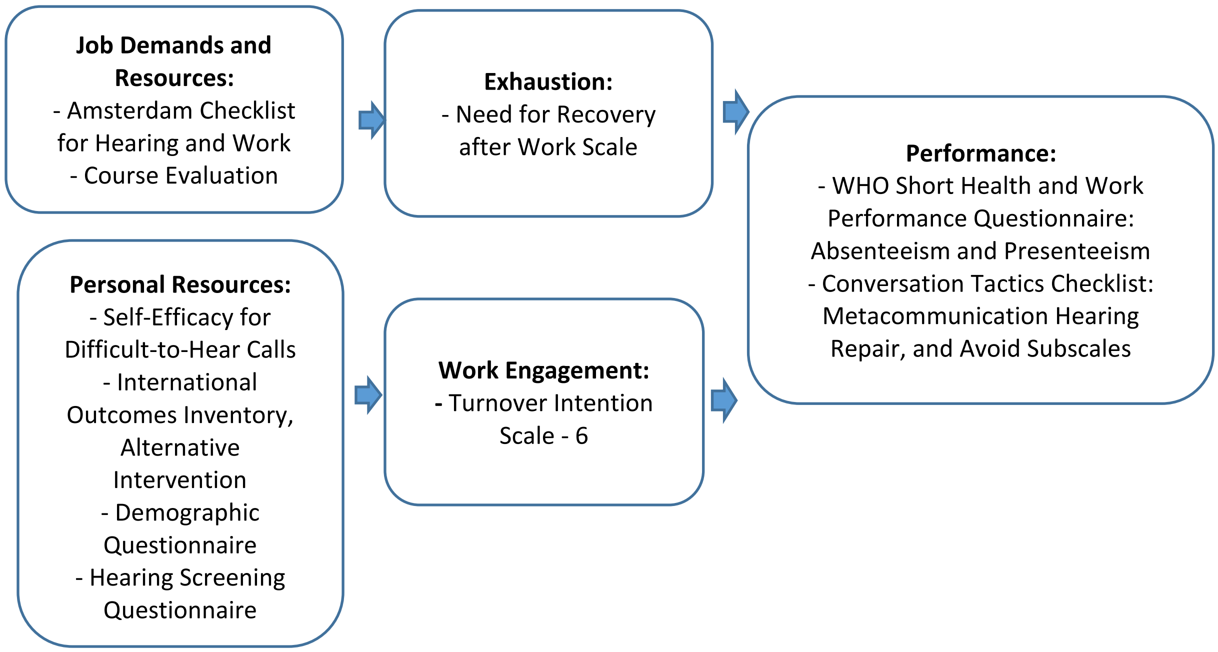

Figure 9. Self-report measures of constructs within the Job Demands and Resources Model.

The Amsterdam Checklist for Hearing and Work *(see Appendix V).* Working conditions relevant to hearing challenges were measured through the Amsterdam Checklist for Hearing and Work. This protocol measures the nature of participants' work as it relates to their hearing (Kramer, Kapteyn, & Houtgast, 2006) and provides insight into the job demands and resources experienced by the respondents. It contains three parts. The first section evaluates the nature of the respondents' work (e.g., temporary versus permanent), the acoustic nature of their work environment, and their use of sick days over the past twelve months. Participants complete this section using short answers. I excluded the second section which has respondents use a four-point Likert-type scale to report on the frequency with which they must perform various hearing activities at work, and the effort it takes to perform these activities. This section can provide an overview of the listening demands when participants come from a variety of different occupations. However, because I was only interested in nurses' telephone work, participants were not asked to complete this section. In the final section, participants use a four-point Likert-type scale to report on their job demands, as well as their job control and social support. They also report on their career satisfaction. Means are calculated for each of these subscales. This final section is amenable to psychometric evaluation and has shown good levels of reliability, ranging from 0.72 for the job demands subscale to 0.85 for the job control subscale (Kramer et al., 2006).

Need for Recovery after Work *(see Appendix W).* The Need for Recovery after Work Scale is a rigorously developed measure of employees' end-of-workday fatigue (de Croon, Sluiter, & Frings-Dresen, 2006). This scale asks participants to endorse or reject 11 statements pertaining to their need for recovery after work. The sum score is then calculated, with items scored such that a higher score reflects a greater need for recovery after work. This scale demonstrates very good internal consistency and has a test-retest reliability that ranges from good to excellent. Moreover, this measure has been found to mediate the relationship between work efforts and stress-related health problems, as well as predicting both short and long-term absences (van Veldhoven, 1996 as cited by van Veldhoven & Broersen, 2003). By mapping onto these theoretically predicted relationships, the measure exhibits construct validity (Cronbach & Meehl, 1955). Most importantly, the outcome is relevant to workers with hearing loss, because they experience an above average need for recovery after work (Nachtegaal et al., 2009).

Self-Efficacy for Difficult-to-Hear Calls *(see Appendix X).* Currently, no validated measures exist with which to evaluate self-efficacy for managing difficult-to-hear calls. However, a questionnaire has been developed to evaluate self-efficacy for managing everyday communication situations, the Self-Efficacy for Situational Management Questionnaire (SESMQ: Jennings, 2014). This questionnaire is a well-validated and highly reliable measure of communication management self-efficacy in persons with hearing loss. This questionnaire presents participants with 20 challenging communication scenarios and asks them to report how well they think they would hear in the situation and their degree of confidence in their ability to manage the situation. Unfortunately, only two of the scenarios are directly relevant to managing communication challenges over the phone. In keeping with Bandura's (2006) assertion that self-efficacy measures are meaningful insomuch as they are tailored to the domain of interest, I developed a questionnaire specific to telephone communication challenges. This questionnaire, based on the SESMQ, contains four questions, each with two parts. The questions are based on four listening challenges described by Castle (1988) in her overview of the difficulties persons with hearing loss face in using the phone: background noise, soft-speakers, accents, and a poor line or signal. These scenarios were presented as four brief telephone transcripts, each representing one of the four listening challenges. Participants are asked to describe, in short-answer form, how they would manage the specific listening challenge in the call, and then report their level of confidence on a Likert-type scale ranging from zero to one-hundred for each of the scenarios. I scored the questionnaire by taking the mean of the four Likert-type scale responses to obtain an overall self-efficacy score.

The Conversation Tactics Checklist *(see Appendix Y).* The Conversation Tactics Checklist (Hallam & Corney, 2014) was developed from the literature that documents the ways in which people, both with and without hearing loss, manage communication in difficult listening situations. Fifty-four strategies are distributed between eight a priori categories: facilitate communication, use alternative modes of communication, optimize available information, employ meta-communication skills, hearing repair, partner repair, use non-verbal coercive means to influence or improve communication, and avoid communication.

Participants are asked to rate the degree to which they use each strategy within these categories on a four-point Likert-type scale. This measure has been validated on a sample of 188 participants with hearing thresholds ranging from normal to profoundly impaired. Williams, Falkum and Martinsen (2015) used the Avoid Communication subscale from this checklist to evaluate the impact of their cognitive behavioral training program on the wellbeing of workers with hearing loss, and the measure identified a significant reduction in avoidant communication strategies. Within my research, I used the Meta-communication skills subscale, the Hearing Repair subscale and the Avoid communication subscales because each was relevant to professional communication over a telephone. The Metacommunication skills subscale described strategies such as ‘keep calm and unflustered when you miss one thing, so as not to miss the next’ and ‘mentally fill in the gaps or guess when you miss parts of the conversation’. The Hearing Repair subscale described strategies such as ‘ask the talker to say something in a different way’ and ‘interrupt others if you begin to lose track of the conversation’. Strategies in the Avoid communication subscale included ‘pretend to understand what the talker is saying’ and ‘end the conversation if the other person looks irritated’. A score was calculated for each factor by taking the mean of the Likert-type responses within the factor’s subscale.

Turnover Intention Scale - 6 *(see Appendix Z).* To understand participants work engagement, nurses were asked to complete a measure of turnover intentions. The Turnover Intention Scale (TIS-6) is a six-item questionnaire with good reliability (α= 0.80). Respondents are asked to rate six statements relating to their workplace satisfaction and thoughts about leaving their job on a five-point Likert-type scale. The total score is taken by calculating the mean of the participants’ Likert-type response to each individual question, where a higher score suggests a greater intention to leave the organization. In a validation study, scores on the TIS-6 correlated with the constructs in its theoretical network as would be expected. Scores were moderately to strongly correlated with depersonalization, emotional exhaustion, and workplace alienation. Likewise, they were negatively correlated with both employees’ work-based identity and engagement. In addition, workers who later resigned scored significantly lower (M= 5.14, SD = 1.26) on the TIS-6 than those who remained (M = 4.13, SD = 1.28) (Bothma & Roodt, 2013).

WHO Short Health and Work Performance Questionnaire (HPQ) *(Appendix AA).* This tool was developed to identify the performance consequence of illness in the workplace. While this questionnaire as a whole measures job-related accidents and absenteeism, along with work performance, Kessler et al., (2003) have used and evaluated the absenteeism (absenteeism) and presenteeism (ability to perform at work) questions independently from the rest of the questionnaire. These questions alone have been shown to demonstrate sufficient sensitivity to identify the impact of various illnesses on performance (Kesler et al., 2003). Following this approach, participants in my study completed the three, Likert-type presenteeism questions. I compared participants means across baseline, post-course, and follow-up.

The International Outcome Inventory – Alternative Intervention (IOI-AI) *(see Appendix AB).* The course was evaluated based on the IOI-AI (Hickson, Worrall, and Scarinci, 2006). Participants are asked to answer seven questions about potential benefits from the course using a five-point Likert-type scale. Each item is scored independently, with a higher score reflecting a better outcome. The inventory is designed to provide a tool of comparison through which to evaluate hearing supports (other than hearing aids) provided by research facilities and clinics across the globe. The measure demonstrates acceptable internal consistency with a coefficient alpha ranging between 0.67 and 0.88 across factors.

Course Evaluation *(see Appendix AC).* At the end of the course, participants rated the program using a course evaluation scale I developed. The course evaluation asked participants to rate, using a five-point Likert-type scale, their overall satisfaction with the course and their perceived benefit. The number of participants rating their benefit and satisfaction with the course as 'not at all', 'slightly', 'moderately', 'very much', and 'completely' was then tallied. Next, participants rated with five-point scales the degree to which the course met the goals of andragogy: how engaging, enjoyable, relevant, and useful they found the course, their comfort in participating in the discussion forum, and the usefulness of the presented strategies. Across cases, mean scores were calculated for each of these items. Mean scores were also tallied for each item assessing the degree to which the course met the principles of building self-efficacy: the confidence they gained from reading others' comments, from instructor encouragement, and the program's ease of use.

Data Analyses

Data collection and analysis in case studies roots itself in propositions drawn from experience and theory (Yin, 2014). As demonstrated in my research question and case definition, the propositions of this case study come from the JDR model of work engagement. I predicted that the program would act as a resource in the model, allowing nurses with hearing challenges to cope and enjoy greater wellbeing and performance. The logic model in Figure 10 outlines this anticipated relationship. This preliminary logic model presents my visual hypotheses of how the program will impact participants.

A logic model displays a 'theory of action', outlining the mechanism by which a program solves a problem (McLaughlin & Jordan, 1999). As demonstrated in Figure 10, it contains the following core components:

- The human and financial 'inputs' required for the program
- The 'activities' which are performed
- The services or products provided to the program's users as 'outputs'
- The 'outcomes' of the program, beginning with short-term benefits or changes, and then charting the intermediate and long-term effects.

Logic models can be used in program evaluation case studies to compare the theoretical underpinnings of a program to the case study's findings. To avoid confirmation bias, Yin (2014) recommends that researchers search for alternative explanations for identified relationships. I developed the rival explanations included in the preliminary logic model, a priori. They emerged from discussions with committee members with previous experience in evaluating both aural rehabilitation programs and workplace wellness programs. Specifically, rival explanations stemmed from discussions of the confounding variables which threatened the research protocol's internal validity. I used the interviews and other data sources to explore how participants' workplace performance and wellbeing changed after the program, and whether these changes can be attributed to the program rather than rival explanations.

I searched for rival explanations during interviews and data analyses. To understand the role of participants' 'readiness for change' in the program's success, I asked participants for the reasons that led them to participate in the intervention during baseline interviews. In the post-intervention and follow-up interviews, I explored rival explanations broadly. I asked participants to describe factors, other than the intervention, that have impacted their ability to manage hearing challenges, and their performance and wellbeing at work. I also supported participants in avoiding the researcher pleasing bias by stating at the start of the post and follow-up interviews that I needed to hear about negative and neutral outcomes of the program, as well as positive outcomes. Thus, through interviews, I endeavored to address the role of confounding variables and I searched for rival explanations.

I analyzed interview transcripts and discussion forums by applying a grounded theory approach to the Logic Model technique outlined by Yin (2014). For each of the 12 interviewees, I used grounded theory to build separate causal models, linking the intervention and rival explanatory factors to interviewees' changing perceptions of listening demands and resources, job engagement/ burnout and performance. After building a model for each interviewed participant, I compared the models and identified the elements shared between, or particular to, each of the cases. I then returned to the logic model proposed in Figure 10 and modified it based on my findings. I will now describe this process in greater detail.

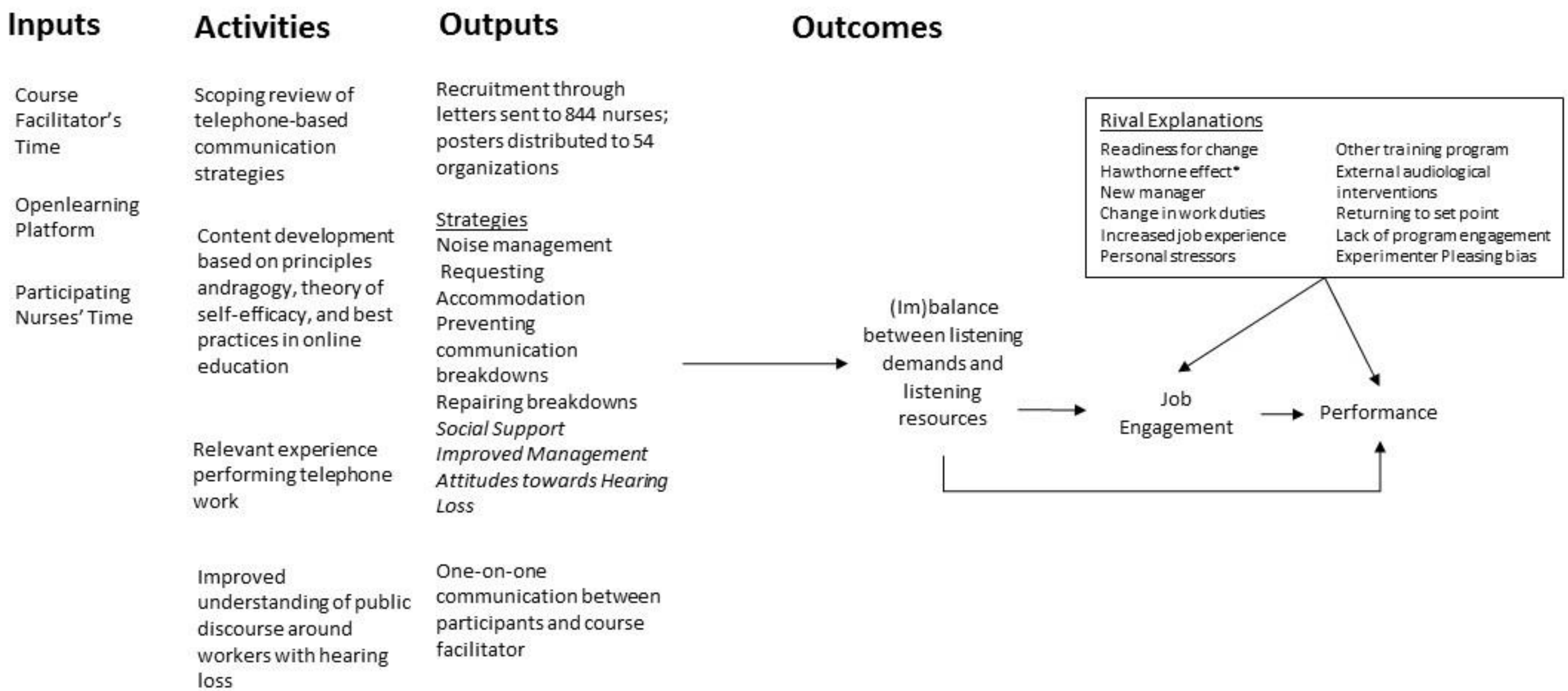

Figure 10. Proposed program logic model, arrows represent predicted causal relationships explored through the case studies.

*The Hawthorn effect asserts that workers change their behavior and performance in response to research-related surveillance

The development of logic models through grounded theory. Grounded theory identifies processes and builds theories (Willig, 2013). It has been recommended as an analytical approach for case-study interviews (Eisenhardt, 1989), and for the development of logic models (Goertzen, Fahlman, Hamptom, & Jeffery, 2003). There are three theoretical schools of grounded theory. The first, promoted by Glaser (2008), advocates for allowing theory to emerge from the data through a purely inductive approach. The second, outlined by Strauss and Corbin (1990) calls for beginning with a general theoretical understanding that informs interview questions, and taking an inductive-deductive approach to data analysis. The third, defined by Charmaz (2008) as constructivist grounded theory, considers a researcher's background and experiences as essential to the theory that emerges. The second variant, from Strauss and Corbin (1990), was most appropriate for this research project. Case study methodology requires that theory is used to define the case and develop the research question. Within this methodology, analytical approaches cannot be purely inductive. While Strauss and Corbin's approach roots itself in the data, it allows for pairing this induction with a theory-driven, deductive analysis.

As outlined by Willig (2013), building grounded theories relies on identifying categories of meaning and the relationships between these categories. Categories exist at different levels of abstraction. At the lowest level, categories are descriptive, for example, the descriptive category 'job resources' might cover references to a supportive manager, or a helpful technology. At a higher level, categories are more interpretive, for example, the lower level categories of emotions, and work environment may be placed in the interpretive category 'demands overwhelm resources' if the emotions are negative and the work environment makes excessive demands. These categories are then organized based on their relationships into theories. Goertzen, Fahlman, Hamptom, and Jeffery (2003) argue that grounded theory lends itself to the development of logic models. Grounded theory provides a systematic way of identifying concepts, identifying the relationships between concepts, and building a visual representation that tells participants' stories, or in the case of program participants, the story of the program: the logic model. I used grounded theory to build two within-case logic models for each participant (one theory-driven and one data-driven) and an across-case logic model for the program as a whole. These models described how the program contributed to listening demands and resources as well as to wellbeing and performance in the workplace.

The collection and organization of the data began by audio-recording ethnographic interviews, with participants' permission. To facilitate my immersion in the data, I transcribed the interviews myself. As outlined by Strauss and Corbin (2008), I began by reading the text (interview transcripts and discussion forum dialogues) and writing memos to develop a dialogue between myself and the data. I then uploaded both these transcripts and the participants' discussion-forum dialogues to R using RQDA, a qualitative analyses software (Estrada, 2017). This software allows text components to be tagged and organized into descriptive (lower level) categories. Through the software, these descriptive categories and their associated textual components can then be grouped into interpretive (higher level) categories.

After uploading the text, I began the next stage: building theory-driven logic models. I coded the text in RQDA, applying one-or-two-word descriptive labels. These basic categories were based on the theory-driven propositions included in the proposed logic model (Figure 10). These categories included participants' listening resources, broken down into the various resources and strategies that the course aimed to impart: noise management, requesting accommodation, social support, preventing breakdown, repairing breakdown, as well as improved management attitudes towards hearing loss. Also among these basic categories were the various elements of workplace engagement and wellbeing described in the introduction: job satisfaction, turnover intention, self-efficacy, and need for recovery after work. Performance was the final basic category included in this closed-coding set. I then analyzed the textual components tagged to these descriptive categories, as well as participants' questionnaire outcomes, to build within-case logic models (see Appendix AD) that mirrored the proposed logic model in Figure 10. Because I was also interested in the outcomes of the program, I colour-coded each category as either ‘no indication of improvement’ (black), ‘some indication of improvement’ (grey), or strong indication of improvement’ (white). I wrote my rationale for these judgements within the models themselves. While this theory–based coding process may appear to limit the inductive nature of my analysis, it must be emphasized that I performed this step to initially orient myself to the data using the pre-existing theoretical framework. My goal in this stage was not to build new theories; theory building occurred in the second stage.

In the second stage, I followed a more inductive approach. I followed an open coding process in which descriptive categories were developed flexibly, and constructed into interpretive categories using axial coding. From these interpretive categories, I developed data-driven, within-case logic models for each participant. I will now describe this process in greater detail. In each case, I developed descriptive labels to identify descriptive categories. In identifying these descriptive categories, I drew on theory-based concepts from the proposed logic model, but for text data that did not lend itself to these pre-existing concepts, I developed new descriptive categories. As I moved from data source to data source, I coded using the theory-based propositions, as well as with new codes for the new descriptive categories that emerged. To support me in this second stage, my supervisor Dr. Mary Beth Jennings coded two of the cases: one which I believed yielded the richest data, and one which I believed yielded the poorest. We met to compare our coding of descriptive categories, and the interpretive categories emerging from the codes. I calibrated future coding based on our discussion. In addition, Dr. Jennings’ understanding of these cases allowed her to provide guidance and insight across cases.

Throughout the coding process, I prepared to build the logic model by searching for changes and processes within the data. The use of memos throughout this process allowed me to track and manage emerging ideas. Once coding was complete, I then performed axial coding to identify and formalize the relationships between descriptive categories. This axial coding resulted in interpretive categories which contained descriptive categories and expressed the relationships between the descriptive categories they contained. I reiterated this process multiple times for each participant, returning to the interviews, self-report scales and discussion forum comments to search for new information, and refine interpretive categories to more closely reflect the data. These within-case interpretive categories are labelled in the data-driven logic models in Appendix AD.

In the final stage, I built an across-case logic model summarizing how the 12 participating nurses interacted with the program and the outcomes of these interactions. I searched for trends in the interpretive categories across the twelve cases. However, to avoid homogenizing the twelve nurses' experiences, I engaged in constant comparative analyses. This involved an ongoing process of searching for similarities and differences between the within-case interpretive categories. I then performed axial coding again to identify the relationships between interpretive categories that were common across the cases. This led to a precursor of the final program logic model. I then re-read the interviews and discussion forums a final time and revised the model to yield a final program logic model that better reflected the sources of data. In this final step, I performed selective coding, whereby I pruned the logic model such that the interpretive categories all related back to a single key idea.

Results

Participants

Twenty-two nurses contacted me with an interest in participating. Of these, 19 met the inclusion criteria, completed the intake interview and gained access to the online course. Thirteen completed the 'Technology to help you hear' module, 12 completed the 'Telephone and hearing aids' module, 10 completed the module on accommodation, and nine completed the module on listening strategies. Of the nineteen participants who completed the intake interview, seven did not complete the post-course interview. I removed these participants from the study and the remaining 12 comprised my final sample.

Of the 12 in my final sample, eight completed all four modules' lessons with the remaining completing either two or three of the modules. One of these participants declined to complete the three-month follow-up assessment and two participants completed the three-month follow-up interview but did not complete the associated questionnaire. These three participants were not removed from the study; the data from all 12 who completed the baseline and post-course assessment was retained analyzed and included in the results.

The seven nurses who were removed from the study did not complete the program for various reasons. Two did not have personal laptops and had hoped to complete the course using their smartphones, but both found the interface to be incompatible. One participant completed the intake but failed to start the course due to a busy work schedule. Another participant left due to a serious health incident and hospitalization after having completed the first two modules of the online course. Finally, three participants left the course after completing the intake but did not provide an explanation or respond to follow-up emails. Of these, two never logged on after the intake, and one completed the first two modules.

The following section will describe the characteristics of the included participants, or 'cases'. Of the 12 participants who completed the post-course assessment, all were female and over the age of 35, with eight being over the age of 51. Four nurses had been diagnosed with hearing loss. An additional three participants had a score of 28 or above on the Quick Hearing Check; with such results, the tools' interpretation guide suggests that a moderate hearing loss is likely. The remaining five participants scored between 6 and 13 on the Quick Hearing Check, suggesting that they experienced more limited hearing concerns and potentially have a mild or very mild hearing loss. It should be noted that three participants completed the Quick Hearing Check and also submitted their audiograms. In these three cases, I found the audiograms to indicate better hearing than that suggested by the Quick Hearing Check, calling into question the validity of the Quick Hearing Check's interpretation scale among my program participants.

Participants came from two Canadian provinces, Ontario (n=10) and Manitoba (n=2). Four worked in rural locations and did not have an audiologist in their community. Participants worked in one of a variety of health care settings: (a) as office nurses working in clinics, (b) liaising with community groups from a public health unit or as telephone advisory nurses working from home, (c) in a call centre, (d) in a cancer centre, or (e) in a public health unit.

Clinic nurses used the phone between four and six hours each week to speak to clients about appointments, test results, medication, and preventative care needs. Because they moved back and forth between providing face-to-face client care and making phone calls, they made calls in busy areas, such as hallway workstations or rooms with other staff. If they did have a private office, they left the door open.

One participant worked in a public health unit where she provided health education to the community through city council and other organizations. Her work involved conference calls with multiple parties, where table microphones or individual headsets picked up colleagues' voices. She worked part of the time from home, and part of the time from a public health office with an open-concept floor plan.

The remaining eight telepractice nurses worked either from home or in a call-centre-like environment. The three nurses working from home had each a room with a lockable door set aside for their work. These nurses worked with Ontario's telehealth lines, triaging symptoms, providing counselling, and making service referrals. Another three telephone advisory nurses worked in call-centre-like environments associated with either their provincial health care provider or with a local public health unit. Of these, one made outbound calls, promoting self-management of chronic conditions, one performed telephone triage as part of a provincial telephone-health advisory line, and one took inbound calls to provide health education (e.g., breastfeeding support). Finally, two telepractice nurses took inbound calls in a cancer centre, performing telephone nursing assessments on symptoms, answering questions about cancer care, helping clients navigate the health care system, and providing health teaching.

Of all the nurses, the calls of nurses performing tele-triage on provincial health lines received the most monitoring. Monitoring was performed through the dialing systems whereby managers had access to statistics, such as their average call times, and evaluators would listen to the calls and use checklists to rate the nurses ‘call quality’ on a 98-point scale. Discussions around the challenges of meeting metrics while still staying true to nursing values arose during interviews with three of these four nurses. The remaining nurses, working in clinics, the cancer centre, or making outbound health promotion calls, did not report this level of monitoring. Figure 11 outlines how the workplace characteristics differed across locations as determined by subscales of the Amsterdam Checklist for Hearing and Work. In my sample, working in call centres presented the most background noise, while working from home presented the least. The three telepractice nurses working from home reported the highest job demands and lowest job control. However, they matched the three clinic nurses in reporting high levels of job support. Overall, the single public health nurse reported the highest job satisfaction, with clinic nurses reporting comparably high levels, and telepractice nurses working from home reporting the lowest levels of career satisfaction.

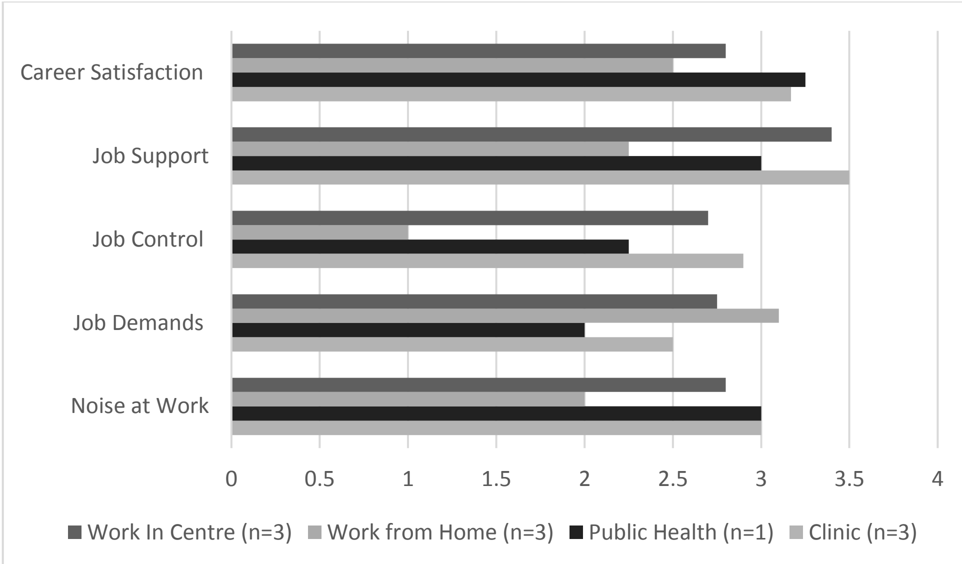

Figure 11. Job characteristics by workplace as measured by the Amsterdam Checklist; possible ratings ranged from 1 (almost never) to 4 (almost always).

Within Case Findings

The within-case logic models for each participant (both theory-driven, and data-driven) are provided in Appendix AD. As an example, the reader will find one participant's theory-driven logic model below (Figure 12). This participant is represented through the pseudo-initials 'BL'.

To provide context, BL performed telephone triage. The Quick Hearing Check suggested she was experiencing a moderate to severe hearing loss. She had her hearing tested and while she was not able to send in the audiogram from her audiologist, she reported a unilateral loss.

BL's outcomes, in terms of the a priori performance and wellbeing categories are summarized in the theory-driven logic model below (Figure 12). Outcomes for which there are strong indications for improvement are in white, those with some indication of improvement are in grey, and those with no indication of improvement are in black. The evidence for these judgments is provided next to the categories included in Figure 12.

As shown in this figure, after the course BL demonstrated an improved ability to prevent communication breakdowns, as well as improved workplace engagement and wellbeing in the form of job satisfaction, self-efficacy and reduced need for recovery after work. She also rated her performance more favorably after the course. However, as represented by the ‘rival explanation’ arrow, some of these changes may have been due to training programs she participated in concurrently with the Listening Shift. In addition, some of these changes may also have been linked to her reacclimatizing to work after having taken time off (i.e. work hardening).

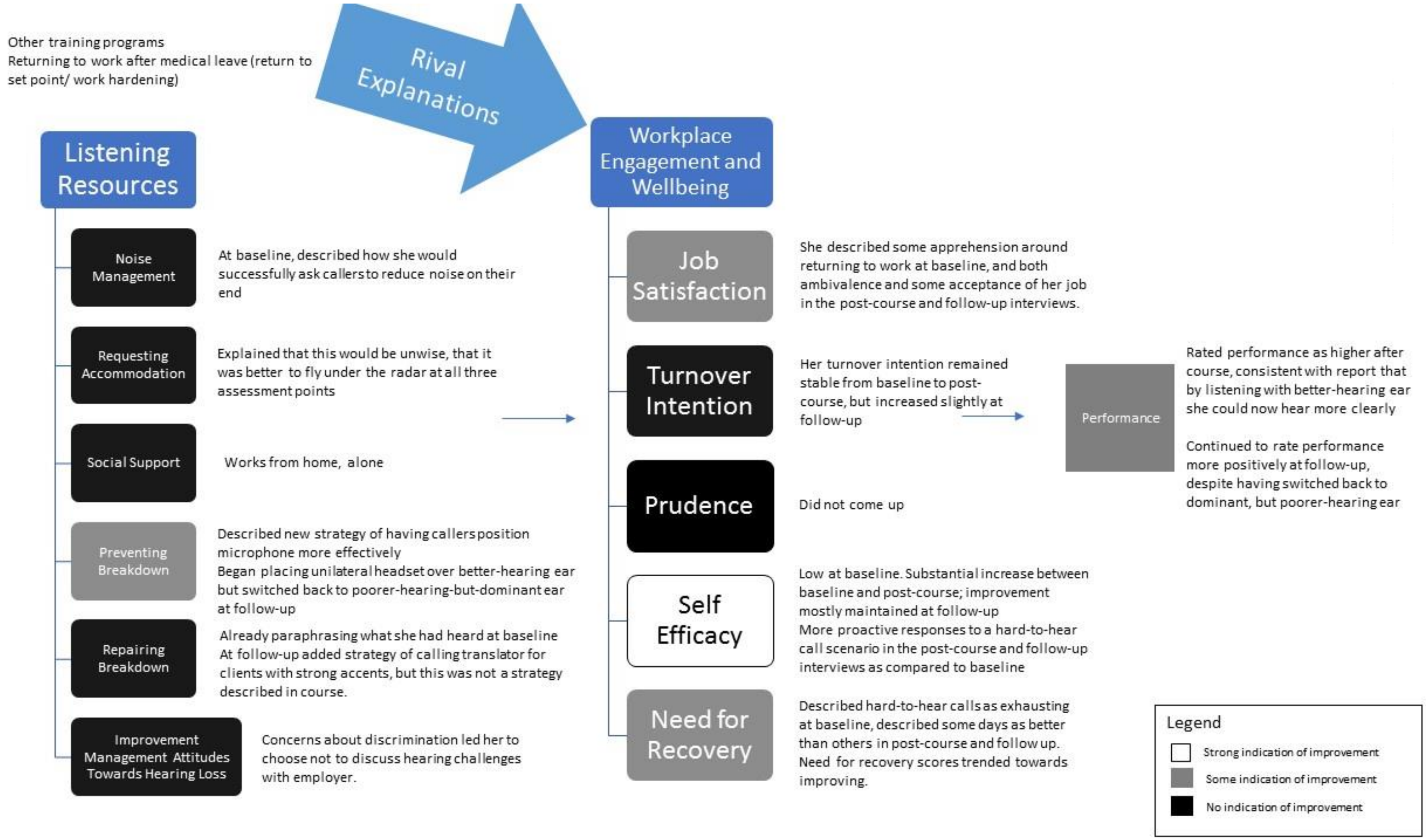

Figure 12. Sample within-case, theory-driven logic model (BL).

Next, the reader will find BL's data-driven logic model in (Figure 13). BL's data-driven logic model only contained one interpretive category: *The problem-solving cycle.* This was composed of three repeated steps: consider a tactic, identify real or potential obstacles to its implementation, and then identify an alternative. BL exited this cycle by implementing strategies immediately and successfully, taking a hiatus from the process after identifying an obstacle, or successfully working through an obstacle.

At baseline, BL was already using some of the strategies presented in the Listening Shift. After the intervention, she began to use some of these (e.g. paraphrasing) more frequently. Other strategies, however, required a protracted problem-solving process. For example, it was recommended that she switch to using her unilateral headset with her better-hearing (albeit non-dominant) ear. She tried this initially and reported, with satisfaction, that it improved intelligibility. However, at follow-up she reported that due to discomfort she had returned to using the headset with her poorer-hearing but dominant ear. This did not represent the end of the problem-solving process as she had identified an alternative. At follow-up she was considering procuring a binaural headset. However, procuring a bilateral headset required further problem-solving. She worried about the ramifications of requesting a headset as an accommodation from her employer, particularly after having just taken time off due to health concerns. She looked into finding a connector that would allow her to use a dual-ear headset she already owned with her dialing system, but finding this connector proved difficult. Ultimately, and she decided to wait for her otolaryngology appointment to make a decision about a headset. In doing so, she took a temporary hiatus from the problem-solving cycle. She had also needed to do this previously. Before the course, BL had been encouraged to see an audiologist by her family physician, but other priorities had led her to delay help-seeking. In summary, across various strategies BL considered the tactic and implemented it only if she perceived no barrier to implementation. In the case of barriers, she either temporarily paused the cycle or persisted in either working through the barrier or identifying an alternative. As demonstrated in appendix AD, this process was common among the participants who were moderately or very much satisfied with the course.

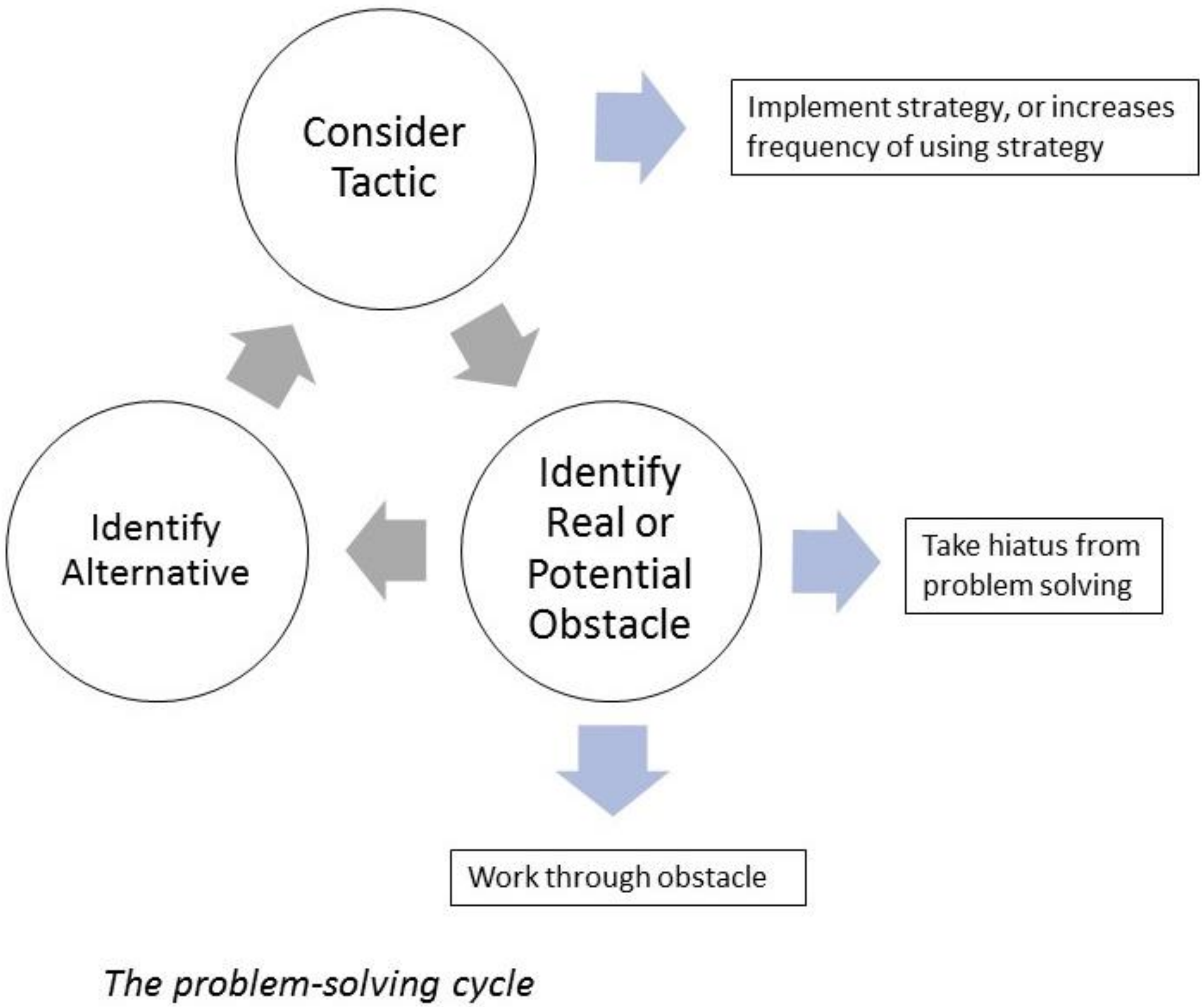

Figure 13. Sample within-case, data-driven logic model (BL).

Across-Case Findings

The following section will present findings which emerged across the twelve cases. I will describe both the quantitative outcomes of the self-report assessments and the interpretive categories developed across multiple cases. I will first present results from participants' self-report assessment scales using statistics, tables, and graphs. These outcomes will then be interpreted in the context of participants' interviews and discussion-forum comments, as organized into interpretive categories. These results will then be presented using text and the final across-case logic model. I will begin with a discussion of the self-report questionnaires in which participants evaluated the course.

Course Evaluation. In the Course Evaluation questionnaire, a single question asked participants to rate their satisfaction with the whole program. One participant reported slight satisfaction, four reported moderate satisfaction, and seven reporting being very satisfied. A single question asked participants to rate their benefit from the course: two endorsed a slight benefit, seven endorsed a moderate benefit, and three endorsed having very much benefited from the program.

The Course Evaluation questionnaire also asked participants to rate the degree to which the course met the principles of andragogy and self-efficacy development. I present the results in Tables 18 (principles of andragogy), and 19 (best practices in building self-efficacy). In both cases, participants rated their agreement with the statements on a scale of one to five, with one representing *not at all* in agreement, and five representing *completely* in agreement. They evaluated the program as 'moderately' to 'very much' meeting the principles of andragogy. On average, the participants found the program to 'slightly' to 'very much' meeting its goals in following the principles of self-efficacy, depending on the item.

Table 18.

Participants' Course Evaluation ratings of the degree to which the course met principles of andragogy.

Item	Mean	SD
Did you find the learning modules and activities interesting and engaging?	3.7	0.8
Did you find the learning modules and activities engaging?	3.6	0.7
Were the learning modules and activities relevant to your hearing challenges at work?	3.4	0.7
Were you comfortable sharing your ideas and experiences on the modules' discussion boards?	3.75	1.0
Were the strategies taught in the course useful when working in telepractice?	3.4	0.5

Note. Possible responses included: not at all (1), slightly (2), moderately (3), very much (4), and completely (5).

Table 19

Participants' Course Evaluation ratings of the degree to which the course met principles of self-efficacy.

Item	Mean	SD
Did reading about others' experiences with the strategies on the discussion boards make you feel more confident in managing calls?	2.6	0.9
Did encouragement from your instructor increase your confidence in managing difficult-to-hear calls?	3.3	0.7
Relative to other popular websites (e.g., YouTube, Facebook), did you find the OpenLearning website and Listening Shift modules easy to use?	3.9	1.0

Note. Possible responses included: not at all (1), slightly (2), moderately (3), very much (4), and completely (5).

International Outcomes Inventory – Alternative Intervention (IOI-AI). A second tool was used to evaluate the course: the IOI-AI (Hickson, Worrall, and Scarinci, 2006). Participants completed this self-report scale as post-course and follow-up. In doing so they reported on the degree to which they were satisfied with the course, used of the strategies, and benefitted from doing so, and provided a sense for how such outcomes persisted over time (see Table 20). At both post-course and follow-up, scores were lowest (least favorable) for participants' benefit from strategies (2.83 at post-course; 2.78 at follow-up), and use of strategies (2.92 at post-course; 2.56 at follow-up). Scores were highest (more favorable) for the limited impact of their hearing challenges on others (4.67 at post-course; 4.22 at follow-up) and their limited residual participation restrictions (4.00 at baseline; 4.11 at follow-up). From the post-course assessment to the three-month follow-up, the beneficial outcomes of the program diminished in five of these seven outcome items, and increased in one. In each case, the change was smaller than the scores' standard deviation. This inventory compliments the course evaluation by providing a tool of comparison by which readers can compare the current intervention to other alternative audiological interventions from around the globe.

Table 20

Post-course and follow-up assessment scores on the International Outcomes Inventory-Alternative Intervention.

Item	Likert-type Scale	Mean Score (SD) Post-Course	Mean Score (SD) Follow-Up
Use of strategies	1 (0 hrs) 2 (1 hr) 3 (1-4 hrs) 4 (4-8 hrs) 5 (8+ hrs)	2.92 (0.67)	2.56 (1.19)
Benefit from strategies	1 (not at all) to 5 (very much)	2.83 (0.72)	2.78 (0.88)
Residual activity limitations	1(very much) to 5 (not at all)	3.75 (0.45)	3.56 (0.52)
Satisfaction	1 (not at all) to 5 (very much)	3.83 (1.72)	3.56 (0.46)
Residual participation restrictions	1 (very much) to 5 (not at all)	4.00 (0.43)	4.11 (0.83)
Impact of hearing on others	1 (very much) to 5 (not at all)	4.67 (0.49)	4.22 (0.46)
Quality of life	1 (worse) 2 (no change) 3 (slightly better) 4 (quite a lot better) 5 (very much better)	3.00 (0.89)	3.00 (0.76)

***Repeated measures of performance and wellbeing*.** Repeated measures of performance and wellbeing included: the Need for Recovery after Work Scale, the Self-Efficacy for Difficult-to-Hear Calls Questionnaire, The Conversation Tactics Checklist, the Turnover Intention Scale-6, and the presenteeism questions from the WHO Short Health and Work Performance Questionnaire. Due to the small sample size, non-parametric statistical tests were performed. For each of these questionnaires, Wilcoxon Signed Rank tests were performed using a significance cutoff of 0.006 (reduced from 0.05 using Bonferroni correction for multiple comparisons). No significant differences were identified between participants' scores on any self-report measures between baseline and post-course, or between baseline and follow-up (see Tables 21 and 22).

Table 21.

Wilcoxon sign rank test on measures of workplace wellness and performance at baseline and post-course

	N	Corrected N[a]	Baseline Mean (SD)	Post-Course Mean (SD)	Difference	W Test Statistic[b]
Need for recovery after work	11	8	5.0(2.3)	4.3(2.6)	-0.7	9
Self-Efficacy for Difficult to Hear Calls	11	11	40.4 (32.6)	67.1 (29.1)	21.3	4*
Conversation Tactics Checklist, Meta-Communication	11	9	2.08 (0.71)	1.89 (0.59)	-0.19	11
Conversation Tactics Checklist, Hearing Repair	11	11	1.76(0.47)	1.53(0.50)	-0.23	19.5
Conversation Tactics Checklist, Avoid	11	10	1.3(0.69)	0.89(0.67)	-0.41	6*
Turnover Intention	11	8	-0.06(0.87)	-0.15(0.79)	-0.9	10.5
Self-rated Performance	11	10	85.6(6.09)	90.8(7.13)	5.2	8*
Peer's Performance	11	11	79.1(10.9)	85.8(8.0)	6.7	10.5
Relative Performance	11	11	1.10 (0.15)	1.06(0.11)	-0.04	25.5

[b]*Participants with the same scares at baseline and post-course could not contribute to the Wilcoxon signed rank test and were removed from the count*

[b]*W is computed from the Wilcoxon signed rank test.*

**indicates a Wilcoxon test statistics significant at a cut off of $p \leq 0.05$. No values were significant at the Bonferroni corrected cut off of $p \leq 0.006$.*

Table 22.

Wilcoxon sign rank test on measures of workplace wellness and performance at baseline and follow-up

	N	Corrected N[a]	Baseline Mean (SD)	Follow-Up Mean (SD)	Difference	W Test Statistic[b]
Need for recovery after work	9	8	5.0(2.3)	3.4(3.6)	-1.6	8.5
Self-Efficacy for Difficult to Hear Calls	8	8	40.4 (32.6)	52.6 (30.5)	12.2	10
Conversation Tactics Checklist, Meta-Communication	8	8	2.08 (0.71)	1.93 (0.36)	-0.15	1.5*
Conversation Tactics Checklist, Hearing Repair	8	6	1.76(0.47)	1.54(0.43)	-0.22	4
Conversation Tactics Checklist, Avoid	8	8	1.3(0.69)	1.11(0.72)	-0.19	5
Turnover Intention	8	7	-0.06(0.87)	0.34(0.94)	0.4	9
Self-rated Performance	7	7	85.6(6.09)	91.6(3.28)	6	3
Peer Performance	8	8	79.1(10.9)	87.1(5.7)	8	6.5
Relative Performance	7	7	1.10 (0.15)	1.06(0.04)	-0.04	11

[b]*Participants with the same scares at baseline and follow-up could not contribute to the Wilcoxon signed rank test and were removed from the count*
[b]*W is computed from the Wilcoxon signed rank test.*
** indicates a Wilcoxon test statistics significant at a cut off of $p \leq 0.05$. No values were significant at the Bonferroni corrected cut off of $p \leq 0.006$.*

One might expect these null findings given the multiple comparisons made and the small sample size. However, trends do exist, and while no conclusions can be drawn from these trends in isolation, case-study methodology allows for them to be drawn upon as triangulation points to support findings from other sources of data. While I identified no trends in the Need for Recovery after Work Scale, the Turnover Intention Scale, Conversation Tactics Checklist, almost all participants demonstrated improved scores on the two remaining self-report scales. This trend was seen in the Self-Efficacy for Difficult-to-Hear Calls Questionnaire and the self-report performance question from the WHO Short Health and Work Performance Questionnaire. These trends will be described next. Note that due to missing data points, each participant did not provide data at each time point. Participants who were left out of the figures due to missing data points are identified in the figure captions.

Self-efficacy for Difficult-to-Hear Calls. Between baseline and post-course, the average scores on the Self-Efficacy for Difficult-to-Hear Calls Questionnaire increased from 40.4 to 67.1 on a 100-point scale. As shown in Figure 14, nine participants reported higher self-efficacy after the intervention, compared to two who demonstrated a decrease. This trend was less pronounced at the three-month follow-up, where five participants demonstrated higher scores than they had at baseline, as compared to three whose scores were lower (Figure 15).

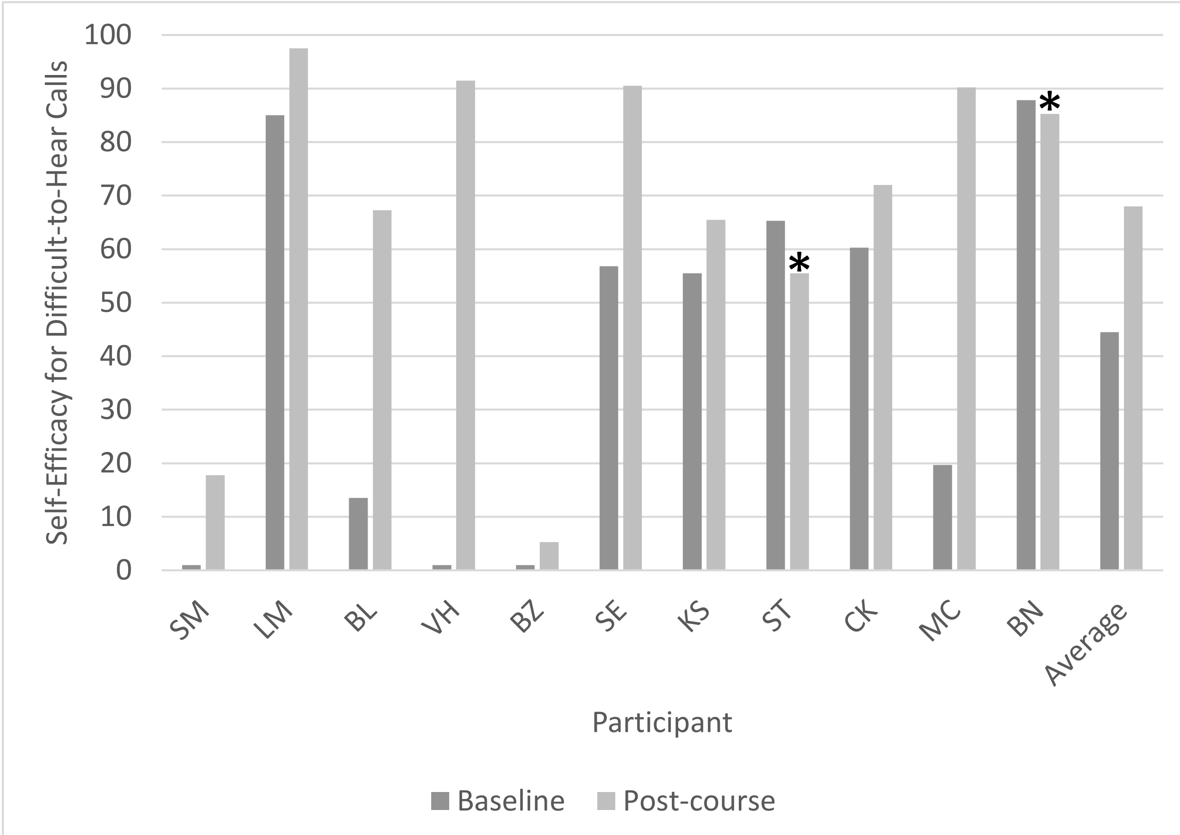

Figure 14. Mean score on the Self-Efficacy for Difficult-to-Hear Calls Questionnaire at baseline and post-course. Asterisks represent unexpected worsening after intervention. All other participants moved in hypothesized direction. Note that baseline scores for this metric was missing for SF.

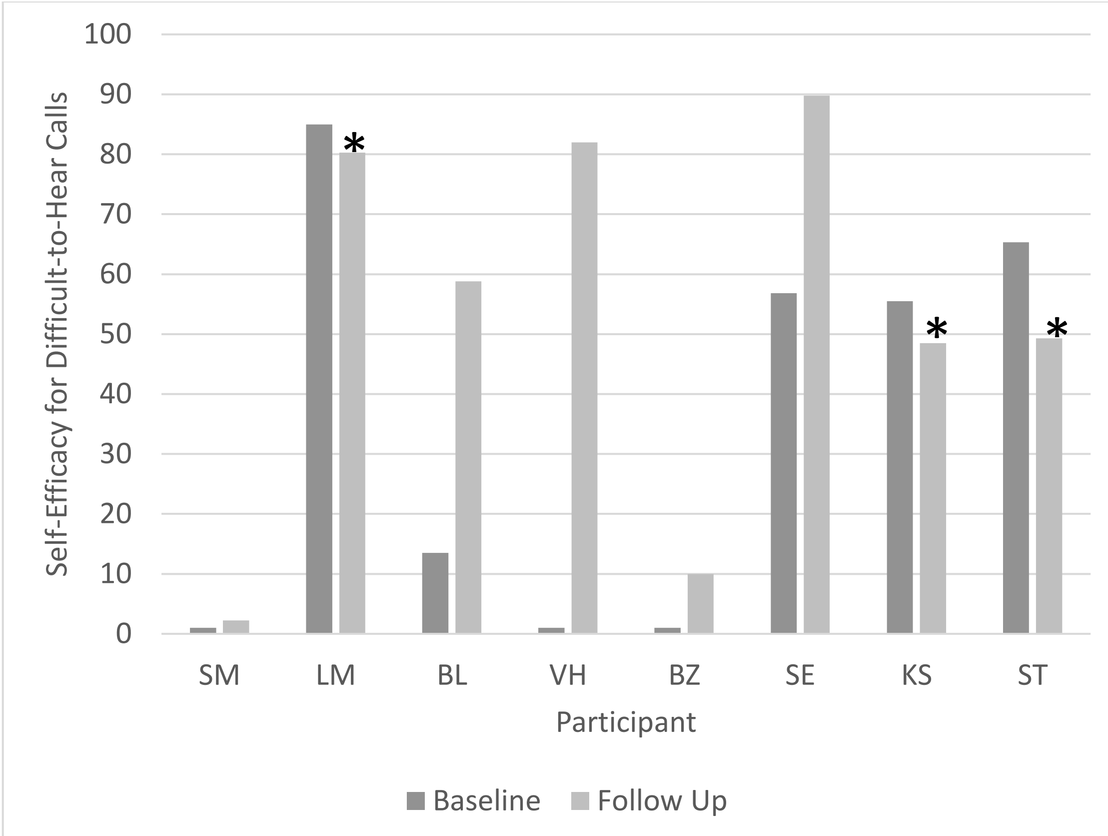

Figure 15. Total score on the Self-efficacy for Difficult-to-Hear Calls Questionnaire at baseline, and follow-up. Asterisk represents unexpected worsening between baseline and three-month follow-up. All other participants moved in hypothesized direction. Note that baseline score for this metric was missing for SF, and follow-up scores for this metric were missing for SF, BN, MC, and CK.

Performance. A question from the WHO Short Health and Work Performance Questionnaire had participants self-rate their performance over the previous four weeks. Based on this question, nine participants showed an increase in self-rated performance from baseline to post-course, one showed no change, and one demonstrated a decrease (Figure 16). This trend persisted at follow-up where one rated their performance as poorer while five participants rated their performance more favorably, as compared to baseline (Figure 17).

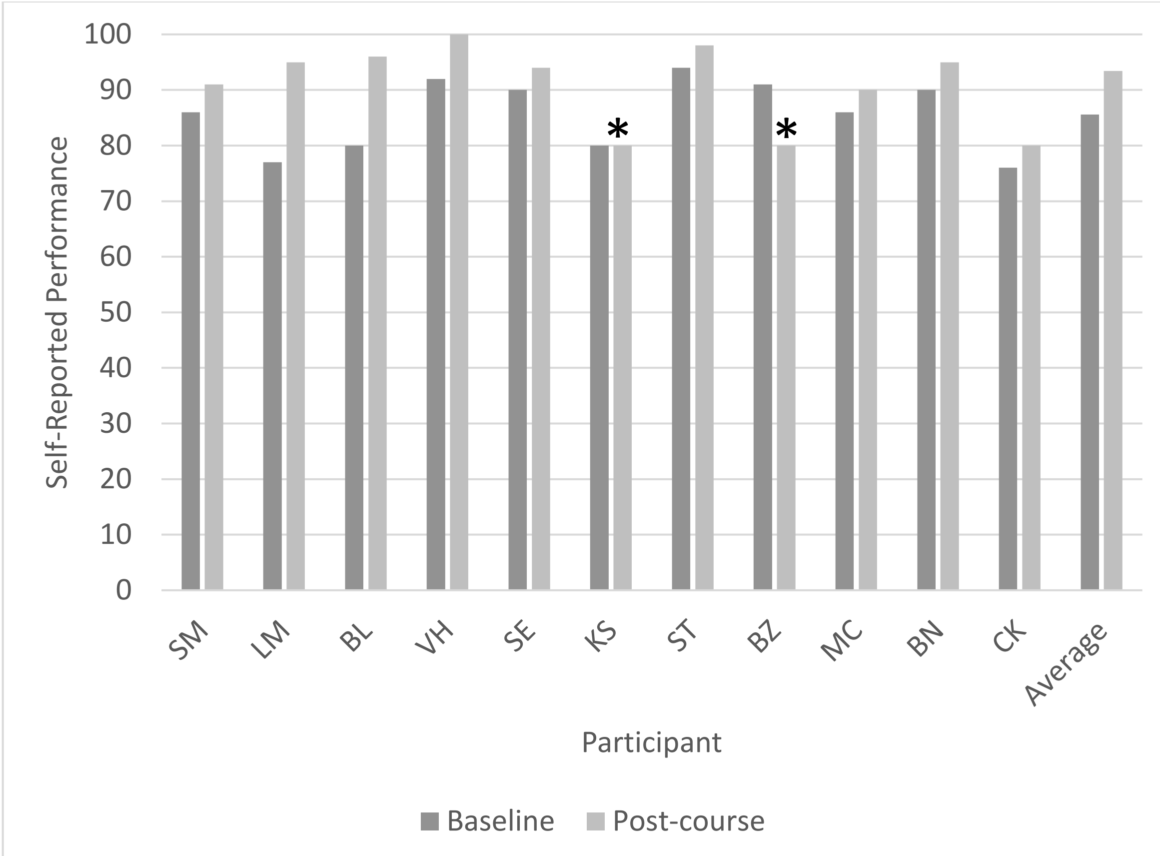

Figure 16. Self-rated performance over four weeks prior to completing questionnaire, from the WHO Short Health and Work Performance Questionnaire. Scores from baseline and post-course. Asterisks represent no change or unexpected worsening after intervention. All other participants moved in anticipated direction. Note that baseline scores for this metric were missing for SF.

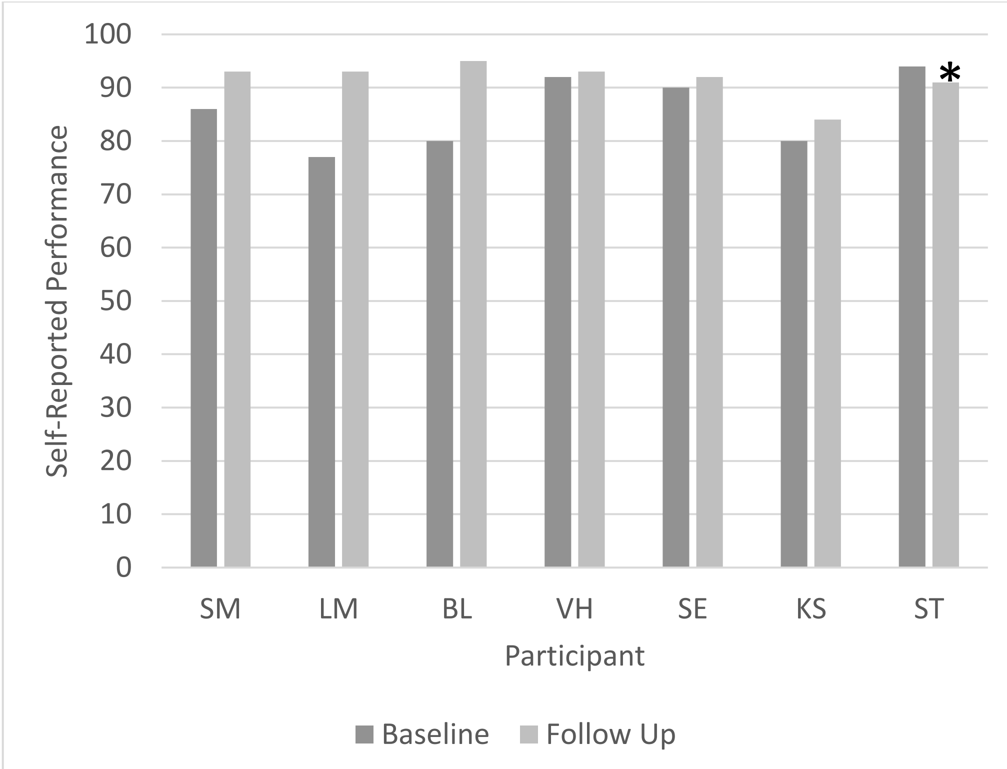

Figure 17. Self-rated performance over past four weeks, from the WHO Short Health and Work Performance Questionnaire at baseline, and follow-up. Asterisks represent no change or unexpected worsening after intervention. All other participants moved in anticipated direction. Note that the baseline score for this metric was missing for SF, follow-up scores for this metric were missing for SF, BN, MC, and CK.

Alone, no conclusions can be drawn from these non-significant findings. However, within the context of a multiple case study, these findings can be triangulated with the qualitative analyses of interviews, and forum discussions. This triangulation will be included in the following section, where I will describe across-case findings through a qualitative approach, presenting my findings through a logic model and supporting text.

Final program logic model. In the final program logic model, presented below in Figure 18, interpretive categories emerging from the grounded theory analyses are presented under ‘Outcomes’. Interpretive categories are titled using participants’ language to remain “experience near” (Wikan, 1991, p. 285) and reflect the participants’ conceptualization of their experiences. Following this logic model comes a description of these interpretive categories, supported by quotes and results from self-report assessment scales. As recommended by Becker (1970), descriptions of the interpretive categories include simple counts of the number of cases in which the relationship or outcome was identified. I include these descriptive values to provide readers with a better understanding of the cases, not to suggest statistical inferences about the population.

Finally, I ask the reader to remember that the logic model and the interpretive categories within it represent the results of my observations and my interpretations of participants' interviews, discussion forum comments, and results from self-report assessment scales. The period I spent working in a call centre informs these interpretations; however, while personal experience can lead to more in-depth interpretations, no observer can step outside her own experiences and claim that her interpretations do not depend on her as an observer. While these findings have been drawn from the data, another researcher could have used the data to produce a valid though different logic model from that which I have presented (Maxwell, 1992).

The final program logic model outlines 'Inputs', 'Activities', 'Outputs', and 'Outcomes'. As stated previously, 'Outcomes' in the final program logic model include the interpretive categories which emerged from grounded theory analyses and yielded the interpretive categories in the within-case logic models. The grounded theory methods of axial coding, selective coding, and constant comparative analyses were then applied to these within-case logic models to develop the across-case program logic model below (Figure 18). The outcomes of this program are described in terms of a problem-solving process in which participants took part.

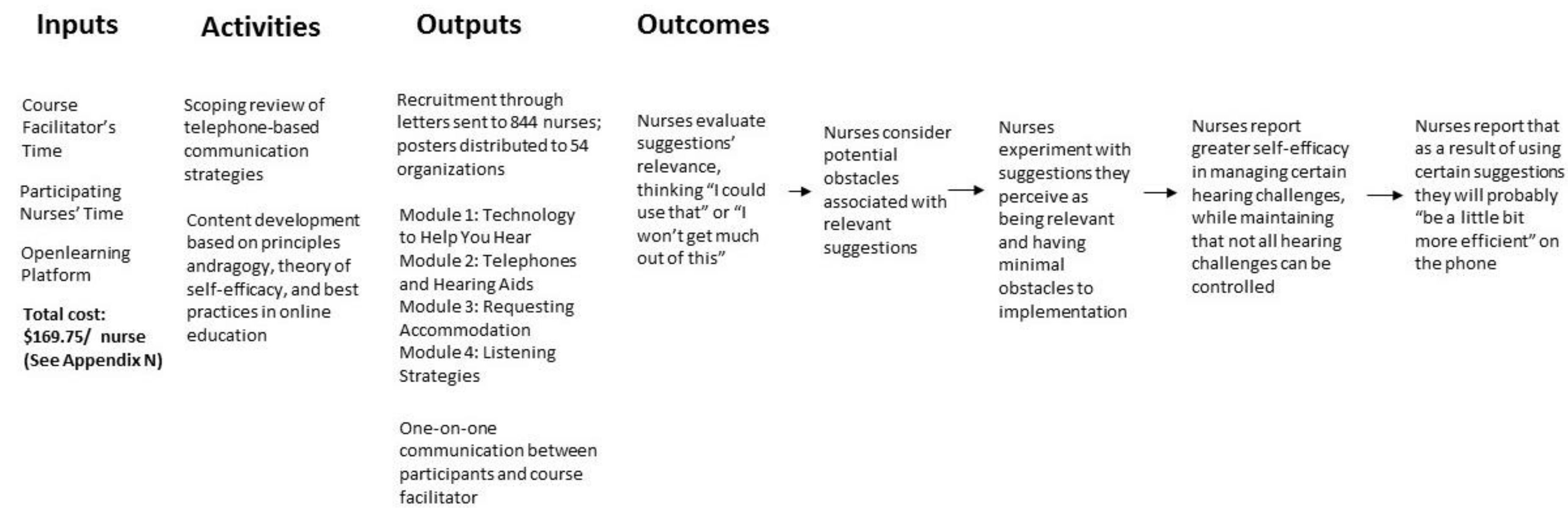

Figure 18. Program logic model, with outcomes corresponding to interpretive categories.

Outcomes of the across-case logic model: the problem-solving process. Participants engaged in problem-solving process by which they sought to implement strategies suggested in the course. The process included five interpretive categories. It began with *evaluating suggestions' relevance, thinking "I could use that" or "I won't get much out of this"* and was followed by *considering potential obstacles associated with relevant suggestions.* Many participants then moved on to *experimenting with suggestions they perceived as relevant and having minimal obstacles.* As a result, many nurses *reported greater self-efficacy in managing certain hearing challenges, while maintaining that not all hearing challenges can be controlled.* Finally, those nurses who persisted with the problem-solving process *reported that as a result of using certain suggestions, they will probably be a little bit more efficient on the phone.* While all participants started the problem-solving process, versions of this completed process are only included as a within-case interpretive category for five of the twelve cases. These five were characterized by higher satisfaction and engagement with the course. The remaining participants began the problem-solving process but struggled to identify relevant strategies, or did not persist due to obstacles. Their models include interpretive categories relating to the limited overlap between course content and their needs. I will describe each of these across-case interpretive categories in greater depth.

Nurses evaluate suggestions' relevance, thinking "I could use that" or "I won't get much out of this." Positive participant outcomes evolved when strategies taught in the course matched the participants' hearing challenges. When participants appraised a strategy to be relevant, they would give the tactic further consideration. A positive appraisal was more likely when the strategy had been endorsed by other course participants working in a similar environment. For example, one participant made the informed decision to use her full name in the course instead of a pseudonym. This allowed a coworker to recognize her as a coworker with a common employer and as a result, the colleague reported paying more attention to her comments:

> "It was good that I knew who she was because then I thought 'oh yeah, I could use that' because I know we're in the same business, right?... Particularly

> because I knew she worked for the same place, I'd really be thinking 'what does she have to say about this?'" (BZ, Post).

Likewise, when KS was given permission to order a binaural, circumaural headset, she did not need to try different models because a coworker with hearing loss had already experimented and could provide a recommendation.

Five participants reported the course to have poor overlap with their needs, as represented by the interpretive categories in their within-case logic models. These participants adopted few strategies. For example, BN was interested in participating because of hearing challenges due to poor acoustics in her workspace. The hearing challenges came from "many reasons, not always that the nurse has a hearing issue" (BN, Baseline). In keeping, BN had a low score on the Quick Hearing Check, suggesting minimal or no hearing loss. In her follow-up interview, she explained how the course strategies failed to overlap with her concerns: "right from the beginning, I thought perhaps I wasn't going to get much out of this… it was totally geared to more people with hearing loss" (BN, Post). In a similar example of poor overlap, SF was motivated to participate in the program by a desire to promote advocacy efforts for workers with hearing loss, a goal her organization seemed to be prepared to support her in. Unfortunately, the course did not directly involve educating employers and colleagues. While it did discuss employees' rights around requesting accommodation, SF had already done this successfully on her own. Moreover, because she was alone in her cohort, SF had no opportunity to use the discussion forums to connect with others who shared her experiences and discuss ways to raise awareness. Ultimately, the course only somewhat met her expectations and only minimal changes were found in her adoption of strategies, workplace wellness, and performance.

Nurses consider potential obstacles associated with relevant suggestions. After considering the recommended strategies, all 12 participants identified perceived and/or objectively encountered obstacles to the implementation of one or more of the strategies. As an example, a perceived obstacle described by two of the 12 participants was the belief that requesting accommodation would draw negative attention from their employer: “I really wouldn’t want to ask for an accommodation because they can be very- they can make life difficult for you” (BL, Post). CK also described her reticence to request a headset from her employer: “There’s been a whole bunch of bumping going on. They shut down our urgent care and so the urgent care nurses are coming into our area, and you think I want to ask for a $300 headset?” (CK, Post).

Nurses experiment with the suggestions they perceive as being relevant and having minimal obstacles to implementation. In three of the theory-driven, within case logic models, problem-solving is presented as a cyclic process, in which nurses experiment with a strategy, and then modify it or find alternatives in order to manage the obstacles they encounter. Participants had been experimenting with solutions for their listening challenges before the program began, and continued to do so in response to strategies presented in the course, adapting them to fit their needs. For example, while LM could not always procure a quiet office from which to make calls, she had overcome this obstacle by making calls later in the day, or early in the morning. “By that time the office is quiet. This is a huge relief and I do not feel distracted by background noise, voices etc.” (LM, Discussion forum). ST reported that in using the NATO alphabet: “There’s some stuff that doesn’t apply to the group of people that call, sometimes they would say ‘What?’” (ST, Follow-up). She problem solved by altering the strategy to be more appropriate “I would rather say F as in Frank” (ST, Follow-up). Sometimes, this experimentation process revealed that an obstacle was in fact surmountable. CK described how during a social event, the topic of hearing loss was raised by a coworker and the benefits of a noise-attenuating headset emerged in conversation. To her surprise, her manager explained that funds had been set aside for such an accommodation, leading her to change her perspective:

> “I learned a little bit more to be proactive and assertive actually with approaching the powers that be- networking and not being ashamed or embarrassed to have the confidence to go forward and to just mention it

> casually to my boss. In this time of fiscal restraint he actually said 'well, we have a budget for it!'" (CK, Post)

Experimentation was not always successful. For example, the course advised participants to seek the services of an audiologist. BL tried to use this strategy, however, the audiologist could do little for her unilateral loss before she first saw an otolaryngologist. In addition, BL found that she could not acclimatize to the strategy of listening to the telephone with her better-hearing ear because she had always used the telephone on the other side. In addition, some participants did not have sufficient time to engage in this process fully. KS reported "it just went a bit quickly, in terms of my ability to really absorb it and experiment with the suggestions" (KS, Post).

Nurses report greater self-efficacy in managing certain hearing challenges, while maintaining that not all challenges can be controlled. Nine of the eleven participants who completed the Self-Efficacy for Difficult-to-Hear Calls Questionnaire at both baseline and post-course demonstrated score improvements. In interviews, 9 of the 12 participants somewhat or strongly indicated that their levels of self-efficacy had increased across the course. This was determined through participants' responses to a hypothetical situation in which their headset was producing static, making all calls difficult to hear. BL's changing responses provides a good example. When faced with this scenario at baseline and asked about her confidence, BL responded 'I'd have to shoot myself! Hahaha, it would be very, like, I would want to rip my- not literally but I'd feel like I'd be so frustrated that I couldn't deal with it" (BL, Baseline). While she had concerns about the situation after the intervention, she had a more proactive response: "I don't know that I'd want to do that, haha, I'd have to complain. I would tell them that my equipment wasn't working properly, and that I was afraid of not hearing the callers properly and, then they send me out a new headset or whatever" (BL, Post). At follow-up, when asked about her confidence for this hypothetical situation she answered: "I'd probably say pretty confident, it would be exhausting, but, you know I'd do it" (BL Follow-Up). The majority of participants shared BL's trajectory of responding to the hypothetical situation with more self-efficacy in post and follow-up interviews as compared to baseline.

This greater self-efficacy expressed itself in an increased willingness on the part of the nurses to advocate for their need to hear clearly, while still taking a client-centred approach. CK demonstrated what this might look like when she explained how she made requests of callers after the course: “Would you mind taking me off speakerphone because it’s really echo-ey, I want to make sure this call is to your satisfaction” (CK, Follow-up). In another post-course example, VH described how she would respond to a headset with degraded signal quality:

> “Yeah, yeah like its 100%, it’s ‘I’m not going to work like this’. It’s just not- that’s not acceptable to me anymore. It’s so funny, I really feel this course did that like ‘that’s not acceptable’…for my patient too. I’m going to spend a whole day with call times at double the amount because they can’t hear me because my headset’s not working – that needs to be rectified immediately.” (VH, Post)

The course’s validation of looking out for one’s own needs may also explain why those nurses who communicated more assertively already at baseline, including SM and MC, rated their performance more favorably after the program, despite having adopted few new strategies. In the words of SM in the post-course interview: “I think what it affected most is just reminding me, and actually probably, um, confirming that I’m doing some of the right things” (SE, Post). The course may have validated the assertive strategies they already used.

Some nurses felt more confident asking for repetition and clarification after learning they had normal hearing. The course encouraged nurses who suspected a loss to have their hearing tested; three participants did so, and all learned they had normal thresholds. As an unintended consequence, three nurses reported feeling less ‘at fault’ for their hearing challenges, and less willing to tolerate the negative consequences of hearing loss on themselves, their clients, and their organization. ST explained:

> “I thought that it was my hearing, but it’s not my hearing, it’s just the telephone – the system that we’re using or the people that are calling in- their phone…I guess now that I know it’s not my hearing, I just feel better about asking questions, or how I ask people to repeat themselves or clarify, just more confident” (ST, Follow-up)

Despite this improvement in self-efficacy, 11 of the 12 participants also described the limits of what they could accomplish with strategies. LM explained: “there’s other factors that we can control, and some we can’t” (LM, Follow-up). SE provided examples of how strategies were limited:

> “You try all your strategies and someone has a really bad phone connection…or they’ll say, like ‘I’m sorry I’ve got a really sore throat, I can’t talk any louder’ sometimes I’ve had to say ‘can you send me an email’ but that’s not possible for everybody, not everybody has an email.” (SE, Post)

BN described how strategies allowed her to manage, but at a cost “it’s much more difficult and it’s going to be frustrating for both people. So, it’s just going to take longer and are you getting accurate information? - it depends on what the issue is” (BN post). Likewise, KS explained:

> “If you’re constantly having to have people spell things out, or clarify things, or repeat things, I do think you are missing some of the connection with the client…I think there’s only so much compromising the quality of my work that I would tolerate before I would look for another position.” (KS, Follow-up)

Nurses report that as a result of using certain suggestions they will probably be a little bit more efficient on the phone. Eighty percent of participants rated their performance on the WHO Short Health and Work Performance Questionnaire more favorably in the post-course and follow-up questionnaires, as compared to the baseline questionnaire. Likewise, eight of the twelve participants indicated improved performance during interviews, although in none of the cases was the evidence direct or strong. For example, KS reflected on the impact of her headset, describing how due to the noise attenuation and increased clarity “I have to think I’m a little more present for listening”. SE described the course’s impact on her performance, saying it “maybe allowed me to continue getting the correct information and ensuring that I’m doing my job properly” (SE, Post). Likewise, VH explained how she felt the program might contribute to shorter call times:

> “What I would always do is paraphrase back, right? Use an active listening skill to like ‘did I catch you right?’ and then they have to confirm or not confirm. Which made the calls longer, right? So now being able to just say ‘I need you to be able to hold the phone here’ [referring to course strategy of guiding callers to position the phone closer to their mouths] … I haven’t seen a drop in my call times because I’m also doing all these new programs and training so it’s really hard to see if it would, but I can see that just the sheer facts of not asking…I can see that being much more helpful.” (VH, Post)

In this way, the majority of participants hypothesized that the course had modestly improved their performance. Such comments were consistent with participants’ improved self-reported performance on the WHO Health and Work Performance Questionnaire.

Comparison to proposed logic model. The program’s logic model (Figure 18) represents a reworking of the initially proposed logic model (Figure 10) with four major differences.

First, the initial model presents each of the course elements as contributing to a participant’s outcomes. In practice, participants only adopted tactics which they (a) were not already using, and (b) overlapped with their priorities and needs. For example, nurses who were not candidates for hearing aids could not implement strategies from the module on pairing hearing aids with the telephone. Participants found other strategies irrelevant because they used them already. For example, four nurses who reported strong call control skills at baseline were already comfortable requesting clear communication and did so regularly. Thus, guidance around requesting clear communication could only validate their current behaviors.

Second, the course was proposed to contribute to changes in managerial attitudes, but this was not the case. While the course did lead CK, KS and LM to discuss strategies with their employer, six others made statements that suggested they would have benefited from greater course-workplace integration. Specifically, four participants asked for information from the course to be provided to their employer.

Third, while the proposed model portrays the tactics shared in the course as directly impacting the balance between participants' demands and resources, this straightforward adoption of strategies was not seen in practice. Rather, participants engage in a problem-solving process. A direct arrow inaccurately represents this transition. The arrow has been replaced in the across-case logic model (figure 18) with a multi-part process problem-solving process: a series of arrows connect considering the strategy, identifying real or potential barriers, and experimenting before gaining benefits.

Third, the initial logic model proposed that job engagement, as measured by the Turnover Intention Scale-6 (TIS-6), contributed to job performance. However, the TIS-6 scores did not appear to be representative of the job engagement nurses described in interviews. The four telephone triage nurses reported the highest levels of turnover intention. According to my original conceptualization, this would result in lower engagement with their work, employer and clients. However, their commitment was evidenced by their willingness to participate, unpaid, in the Listening Shift program. As described previously, the appropriateness of the turnover intention as a proxy of job engagement was further undermined by a lack of any shared trend between the Turnover Intention Scale, and the participants' presenteeism scores on the WHO Short Health and Work Performance Questionnaire. Rather, the telephone triage nurses' explained their turnover intention as a result of attempting to reconcile the organization's goals with their clients' needs. BZ described how she would prefer to listen and empathize with clients, rather than controlling the call in order to reduce its length. This tension impacted her negatively "I feel like I'm not doing a good job, it's really, it's not good for me" (BZ, Post). This discomfort may explain their turnover intentions better than low job engagement. Thus, the term 'job engagement' has been removed as a mediating variable from the logic model.

Finally, rival explanations served to guide me in searching for alternative explanations for the relationships identified during analyses. I accounted for these rival explanations in the in the analyses process (see Appendix AD), thus these are not included in the final program logic model.

Discussion

Through the multiple case study, I sought to understand how participating nurses' telephone performance and workplace wellbeing changed in response to an online communication-strategies training program. Using self-report questionnaires, interviews, and discussion forum comments from multiple cases, I developed a logic model outlining how individual participants' interactions with the program were characterized by a problem-solving process. This logic model emphasized how nurses experimented to adapt strategies to their unique needs and context. In this discussion, I explore the broader implications of these findings and opportunities for future research.

Strategy Uptake

Despite tailoring strategies to the workplace, profession, and communication task of my participants, telepractice nurses still rated the course as moderately relevant. I knew strategy relevance to be an issue at the start of my research. Gussenhoven et al. (2015) found that even after a multidisciplinary team personalized recommendations to specific workers, workers failed to adopt them 69% of the time. Workers described these neglected strategies as impractical to implement, not useful, or too expensive. Despite building my intervention around a specific work task performed by all participants, not all strategies mapped onto participants' hearing challenges. Relevant strategies still needed to be modified for the participants' unique context. I conclude that this process of experimentation and adaptation is, to a degree, a necessary part of managing hearing challenges. Castle recognized this in the forward for her 1988 book on telephone strategies. She wrote:

> Not all strategies and technologies discussed in this book will work for all hard-of-hearing people, all of the time. What will work, however, is to keep an open mind. Anyone with a persevering spirit who takes the time to experiment with the suggestions in this book will break through the sound barrier more often than not (p. vi).

Southall, Gagné, and Jennings (2010) found that the motivation required for long-term management of hearing challenges was precipitated by either overwhelming positive energy or negative stress. My research clarifies the need for this motivation. I found that participants needed to work and experiment in adopting strategies. Without motivation, nurses to abandoned seemingly relevant tactics.

Participants in my study did not implement all strategies, and only invested in modifying and adapting those strategies they believed could be deployed successfully. The interpersonal nature of these strategies suggests that this phenomenon can be explained through Bandura's theory of social cognition (1986; 1997). According to Bandura, an individual's social behaviors can be understood as the outcome of their personal characteristics (e.g., cognitions), combined with both the behaviors they see modelled by others and specific variables in their situation or environment. Lidderdale, Croteau, Anderson, Tovar-Murray, and Davis (2007) have applied Bandura's theory to a theoretical model of how minorities manage their identity in the workplace. Here, an individual's previous learning experiences and self-efficacy, combined with their outcome expectations, predicts the range of identity-management strategies they will employ. In keeping with this model, my study's participants did not attempt to use all strategies recommended to them. Rather, they invested time in experimenting with and modifying those strategies for which they had high expectations of success. Requesting accommodation provides a specific example of a strategy of which participants had low expectations.

In the current research, participants' reticence to request accommodation was linked to their belief that it would lead to negative consequences. Ten of the 12 participants reported that they did not adopt the recommendation to request accommodation. Southall, Jennings, and Gagné (2011) found that workers with hearing loss engaged in a cost-benefit analyses in determining whether to disclose their hearing loss. Similar to participants in this study, if they perceived the costs to be too high, they chose not to use the strategy. However, predicting costs and benefits may be difficult. As described in the results section, CK believed negative consequences might arise if she made the request, even though the organization had funding for that purpose. Her experience with the difficulties of anticipating cost and benefits within the power-differential between employee and employer has parallels with Kafka's short story, 'Before the Law' (1915). In this allegory, a man travels to access justice and the law. He arrives to find the door to the edifice open, but a doorkeeper waiting there speaks of the greatness and power of those that who inside. In hearing this, the man does not dare try to enter without the doorkeeper's express permission. The man waits his whole life, and only in his old age does the doorkeeper tell him that the door was there for him to go through all along. This story captures the intimidation and uncertainty CK and other program participants expressed at the prospect of requesting accommodation, despite the existence of accessibility legislation. It captures how the problem-solving and experimentation process can be blocked by power differentials and employees' lack of information.

The problem-solving process may be supported through a solution-centered intervention process, as described by Gagné and Jennings (2009). These authors have encouraged audiologists to select and address a key activity limitation (e.g., the ability to use the phone independently) together with their client. During a two to three month period, the provider and client select a strategy (e.g., the use of an amplified telephone), determine desired outcomes (e.g., needing to forward less than one out of every 20 calls to a colleague), implement, and then evaluate the success of various strategies. The clinician and client aim to address the specific activity limitation; in addition, the clinician mentors the clients in the problem-solving process, promoting their independence in managing other communication barriers. Moreover, the process shifts the client's focus. The hearing loss (and by extension the individual with the loss) no longer presents the problem. Rather the activity limitation presents the problem. The client no longer aims to 'overcome the hearing impairment', an unrealistic expectation that places an undue burden on the individual, but rather to resolve the specific barriers to communication.

The Listening Shift was designed to support a group of individuals in overcoming a shared activity limitation; as such it did not follow the one-on-one intervention described above. However, even without mentorship, nurses engaged in a problem-solving process, and many nurses emerged with a greater sense of their right to ask for others to make changes, instead of believing they needed to manage the challenges alone.

Self-Efficacy and Performance

Self-efficacy increases the likelihood of using effective strategies (Lidderdale et al., 2007). However, the relationship between self-efficacy and prudence was important. Many participants in the current multiple case study suggested that the intervention increased their self-efficacy for managing difficult-to-hear calls, but these same nurses also outlined the limits of what could be accomplished through the use of strategies. This seeming dichotomy may be adaptive. Csikszentmihalyi (1997) reported that individual's possessing slightly elevated self-efficacy learn, gain experience, and handle setbacks most effectively. On the other hand, a large overestimation of abilities can lead to poor decision making. For example, foreign language students who reported being good at languages also reported lower levels of motivation to study (Kafka, 2004). Most Listening Shift participants reported higher levels of self-efficacy after the intervention, but they also recognized that adopting the hearing strategies did not resolve all of their hearing challenges. To be licensed, nurses with health conditions must demonstrate an understanding of their professional accountability as it relates to their health conditions (CNO, 2014). The nurses who participated in this intervention demonstrated an awareness of their limits, as summarized in the interpretive category: *Nurses report feeling more confident in managing certain hearing challenges, while maintaining that not all challenges can be controlled*.

Participants' improvements in self-efficacy paralleled increases in self-reported job performance. Two mechanisms may explain this relationship. First, research suggests that high self-efficacy leads to greater overall job performance through the mediating variable of job crafting, wherein self-efficacious individuals expand their roles around the job tasks they perform well, while stepping back from those in which they perform more poorly. The course did encourage nurses to craft their method of communicating with clients, suggesting emailing rather than calling, for example; however little evidence of such job crafting arose in the interviews. Thus, we turn to the second mechanism connecting self-efficacy and job performance. Stajkovic and Luthans (1998) found that for simple tasks, such as brainstorming, self-efficacy correlates strongly with third-party-rated performance of discrete job tasks. Thus, teaching the nurses the relatively simple tasks of improving their listening environment and requesting clear communication likely led nurses to manage these calls and their resulting performance with greater competence.

Future Research

Future research must address the challenge of both providing participants with more applicable strategies and supporting them in the problem-solving process still required to implement strategies. Client-centered supportive practices, such as motivational interviewing (Rollnick, Miller, Butler, & Aloia, 2008), goal attainment scaling (Kiresuk, & Sherman, 1968), and self-efficacy building (Bandura, 1997), may be appropriate. In addition, providing such interventions as part of an organization's workplace wellness programming, rather than independently, may improve outcomes.

Organizational involvement (i.e., provision) of communication-strategies training to those employees who need it comes with three benefits. First, workers are looking for it. Participants in the Listening Shift described their desire to connect with colleagues and managers about the program's content and benefitted when this occurred either intentionally or by chance. Second, organizational involvement can facilitate networking between employees who experience similar hearing challenges in a similar environment. As was found in the current intervention, when a worker finds strategies appropriate to a specific work environment, they can share with colleagues, supporting their colleagues' problem-solving process, and even circumventing their colleagues' need to engage in this process. Finally, the involvement of management could reduce the sense of intimidation and confusion some workers feel at the prospect of requesting accommodation.

Employers and researchers seeking to take a next step in support workers with hearing loss can start by providing an online communication-strategy training program like the one described in this chapter. However, as described above, the intervention may have better outcomes if deployed within an environment that follows the best practices in workplace-wellness delivery (Hind &Rouse, 2014), and supporting aging employees (Buyens, van Dijk, Dewilde, & De Vos, 2009; Naumanen, 2006, von Schrader, Bruyere, Malzer & Erickson, 2013; World Health Organization, 1993). Future investigations of communication-strategies training programs delivered in partnership with organizations should seek to incorporate five contextual components.

First, employers should create more accessible work environments through changes in policy, environment and culture. For example, certain types of background noise impair most workers in the performance of certain tasks (Smith, 1989), but noise presents a particular problem for employees with hearing loss (Festen & Plomp, 1990). Repairing noisy ventilation systems can improve communication and concentration for all (Canadian Hard of Hearing Association, 2008). Nurses in the current intervention described the noise they experienced in their workplaces, and how the opportunity to work from home would make their telephone calls easier to hear. Organizations might consider such a set-up.

Second, in an employee's disability management team, supervisors have the greatest impact (Dyck, 2006, p.119). Their support predicts older workers' interest in remaining at work (Buyens et al., 2009), and influences employees on disability leave to return to work (Gates, 1993). Managers can prepare to respond through a seminar similar to the 90-minute training program provided by McLellan, Pransky, and Shaw (2001). Here, supervisors learned to respond to employees and their disabilities with warmth, support and ongoing engagement. This program increased supervisors' confidence in managing their employees' disabilities, and at a one year follow-up, participating supervisors more frequently endorsed a relationship-oriented approach to management, over a medical- or protocol-based approach. Nurses in the current intervention hesitated to ask their employers for accommodations that might allow them to more effectively serve clients. They did not want to risk a negative reaction from their employer. Training managers may reduce concerns from preventing productivity-enhancing requests.

Third, organizations should provide confidential screenings for hearing loss and other chronic conditions. The importance of confidential health risk assessments, including screenings for vision, musculoskeletal and hearing problems, has been established in the workplace wellness literature (Goetzel et al., 2008; Neumanen, 2006; World Health Organization, 1993). Risk assessments and counselling promote health, particularly when followed by tailored programming (Huskamp & Rosenthal 2009). Within the current intervention, the Quick Hearing Check proved ineffective at discriminating between normal hearing and clinical levels of hearing loss among telepractice nurses. Because levels of hearing distress should determine who receives communication-strategies training, future interventions may benefit from using a hearings distress questionnaire, such as one developed by Gussenhoven et al., (2012). Workers who report a high level of distress could be invited to participate in the online communication-strategies training program, and referred to an audiologist for assessment.

Finally, comprehensive workplace wellness programming supports workers with hearing loss. Individuals dealing with chronic diseases, such as hearing loss, have an even greater need for the health benefits provided by exercise, stress management and communication training (Lorig et al., 2001). One of the benefits associated with participating in the Listening Shift was a greater engagement in healthy lifestyle choices and self-care. Organizations should be prepared for individuals with hearing challenges to participate in such program by making them accessible to those with hearing loss (e.g., ensuring good lighting to facilitate lip-reading, amplifying the instructor through a sound-system, etc.)

Ultimately, the proactive management of hearing challenges in the workplace can begin with an online communication-strategy training program. However, future research investigating such programs should work with employing organizations to implement the program within a wider workplace-wellness strategy which follows best practices. This includes developing an accessible environment and culture, responsive managers, confidential screenings and access to wellness programming, either at work or in the community. However, even if employers only provide the online intervention described in this chapter, benefits can still be anticipated, and at a reasonable cost.

Organizations and employers could benefit from collaborating in such a research protocol. Eighty percent of nurses who participated in the Listening Shift alone rated their performance higher at post-course as compared to baseline. While within organizations this performance gain would be limited to employees with hearing loss, marginal gains cannot be ignored. The power of such small improvements was demonstrated by Brailsford, who led the underperforming British cycling team to international dominance by identifying all factors that contributed to cycling speed and trying to improve them by 1% (Cavendish, 2010). Organizations interested in following his example would benefit from considering the 11% of employees believed to have hearing challenges (Hasson, Theorell, Westerlund & Canlon, 2010), and the trend towards increased performance found in this multiple case study. A rough estimate of the program's cost suggests that the sustained performance benefits of this program would require an annual investment of $169.75 per nurse (see Appendix N for descriptions of assumptions and calculations). This investment is small relative to the salary of a full time registered nurse working in Canada: 53K to 78K (RNAO, 2018). A full description of the assumptions underlying these calculations is provided in Appendix AE.

Limitations

In evaluating the outcomes of the current intervention, two limitations must be considered. First, while all participants self-reported telephone hearing challenges, only four had an audiometrically confirmed hearing loss. An additional three participants scored in a range that the authors of the Quick Hearing Check (Kochkin & Bentler, 2010) suggested would indicate a moderate loss or greater. However, the validity of the Quick Hearing Check with this population was called into questions when two of these participants had their hearing tested and both submitted normal audiograms. It is possible that telephone work sensitizes people to their hearing challenges, inflating their scores on this measure. The second limitation relates to program completion. Those who dropped out of the intervention may have differed in some important way from those who stayed. Possibly, that those who left felt the program would not benefit them. While most those who left cited non-course related reasons for leaving (lack of home computer, hospitalization due to serious illness, a heavy work schedule), three did not provide any explanation. Still, of these three, two never independently signed into the course, suggesting a more limited understanding of its contents.

Conclusion

Case studies can answer '*how'* questions and evaluate interventions where, due to contextual complexity, there are fewer data points than there are variables to be accounted for. The current multiple case study provided an opportunity to explore the mechanism by which nurses adopt strategies and build the self-efficacy required to manage their hearing challenges in telepractice. Future interventions should support the problem-solving process participants undertake to match strategies to their unique context, and partner with organizations to improve the relevance and instruction of recommended strategies. The assessment of these interventions will continue to benefit from a focus on not only outcomes but the process in which participants engage to reach these outcomes.

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Chapter Five: Conclusion

The purpose of this dissertation was to answer three questions:

1. What strategies exist for making telephone speech more intelligible for health care providers and patients with hearing challenges?
2. How do Canadian newspapers portray workers with hearing loss?
3. How do nurses with hearing challenges change in terms of their telephone performance and workplace wellbeing in response to participating in an online communication strategies training program?

Through the first question, addressed in Chapter Two, I developed content for the training program and organized the literature to promote accessibility in the field of telemedicine. In the third chapter, I described how the media represents workers with hearing loss, that is, the public discourse with which workers associate themselves when they disclose their hearing challenges. I evaluated nurses' interaction with the intervention itself in Chapter Four.

Overall and Key Findings

In performing the scoping review of telephone strategies I aimed to "summarize and disseminate research findings to policymakers, practitioners, and consumers who might otherwise lack time or researches to undertake such work themselves" (Arksey & O'Malley, 2005, p.6). To this end, I followed the Joanna Briggs Institute's methodology. After a systematic search, seventy-seven articles were identified as relevant to the research question: *what strategies exist for making telephone speech more intelligible for health care providers and patients with hearing challenges?* Findings from these articles were extracted, yielding support for specific strategies across 11 categories. These included: (1) telephone amplification, (2) reducing background noise, (3) bilateral listening, (4) providing visual cues through captioned telephone, (5) providing visual cues and additional frequency bandwidth through internet-based telephony, (6) selecting appropriate coupling strategies, (7) optimizing mobile and digital phones, (8) improving user's telephone skills, (9) improving user's telephone communication tactics,

(10) requesting accommodation for telephone work, and (11) accounting for individual differences. These strategies were incorporated into the communication strategies training program described in Chapter Four.

Through the second study, described in Chapter Three, I outlined how Canadian newspapers portrayed workers with hearing loss. I took a critical framing theory approach to the thematic analysis of 26 articles drawn from seven Canadian newspapers. Lower level, *basic* themes were placed under higher level *organizing* themes. Under the first organizing theme, *prominent individuals struggle, take action, and continue despite hearing loss*, came the basic themes of how prominent individuals *struggled to achieve success, took action to maintain success,* and *experimented with strategies.* The second organizing theme, *workers with hearing loss in the community create their best day themselves,* included *managing challenges through technology, managing challenges through a hearing dog,* and their work to *create and advocate.* In the final category, *workers with hearing loss, as a generalized whole, are portrayed as either competent or limited,* I found that *workers who identify as having a hearing loss present this population as competent*, while *those who do not identify as having a hearing loss present these workers as limited.* These themes reflect the way that challenges experienced by workers with hearing loss and described at length in the literature were infrequently discussed in these newspaper articles. More often, these workers were portrayed as striving cheerfully towards normalcy. This was particularly the case when journalists interviewed workers with hearing loss as opposed to those without hearing loss (e.g., audiologists or hearing-industry experts). Such findings warranted an exploration of how workers with hearing loss took action, and created 'their best day'. I provided nurses with such an opportunity through an online communication-strategy training program.

Based on the insights gained from the first two studies, I developed a communication-strategy training program for telepractice nurses with hearing challenges. I used a multiple case study approach to understand *how* the program impacted nurses in terms of their workplace wellbeing and performance. Cases were comprised of the interviews, discussion forum comments, and questionnaire responses of the twelve participating nurses, with each nurse providing data for one case. Increased self-efficacy and performance was seen in most cases, but these improvements were not statistically significant. I was more interested, however, in understanding the mechanisms by which individual cases changed. I used grounded theory analyses to understand *how* these outcomes came to be, guided by the Job Demands and Resources Model of Performance. This model theoretically grounded the initially proposed logic model of how I anticipated nurses to interact with the program. After the analyses, this hypothetical logic model was replaced by a final across-case logic model. This model highlighted the effortful work of experimentation in which participating nurses engaged. These efforts, when successful, allowed nurses to adapt suggested strategies to their unique needs and context (see Figure 18).

Overall Contribution to the Literature

From the scoping review, thematic analyses, and the multiple case study, I derived three insights which contribute to the current understanding of how best to support workers with hearing loss.

Expectations of Independence in an Interdependent Process. The strategies for managing telephone hearing challenges, organized and presented in Chapter Two, require health care providers with hearing challenges to collaborate with others. Not only must telephone users request clear speech from communication partners, but employers and IT departments must be consulted before procuring telephone amplifiers or captioned phones, and audiologists are needed to explore Bluetooth streaming options. The interdependent nature of managing hearing challenges was paralleled in Chapter Four's multiple case study. Here, peers enabled the successful adoption of strategies, and nurses' assertiveness with clients promoted clear communication.

Such findings are to be expected. As described earlier, Caissie and Gibson (1997) found that communication partners' choice of strategies had more influence over successful communication than the strategies employed by the person with hearing loss themselves. This interdependence is consistent with theory. Borg et al. (2008) modelled communication as an ecological system (Borg, 2003). The rehabilitation of hearing loss within the workplace has specifically been modelled as an interdependent process (Cawthon, Fink, Tarantolo-Leppo, Wendel, & Schoffstall, 2017) where the worker's ecological system interacts with supporting personnel's systems to develop communication access strategies, manage resource scarcity, and facilitate collaboration.

In contrast, newspapers emphasized independence in workers' management of their communication disability. Articles portraying prominent individuals made no mention of accommodations made by employers or requests made of communication partners. Community members were portrayed as creating their best day *themselves* through self-reliant strategies such as using technology, or non-human support in the form of hearing dogs. While this narrative has a positive valence within Western society, where individualism is valued (Hoover & Nash, 2016), findings from the multiple case study suggest a less positive implication.

Many nurses in the multiple case study initially felt uncomfortable requesting clear communication from others, believing that the hearing challenges were theirs to manage alone. This is consistent with the literature. While workers might depend on a close colleague, or buddy, to help them manage their hearing loss (Jennings, Southall & Gagné, 2013), workers preferentially adapt to their hearing loss through independent means (Jennings et al., 2013; Shaw, Tetlaff, Jennings, & Southall, 2013). On some levels, this independence and failing to request clearer communication makes sense. Time spent in repairing communication breakdowns reduces satisfaction with conversations overall (Erber & Lind, 1994), an outcome a person would want to spare their conversation partner. However, the expectation to manage independently seems to be more strongly linked to hearing loss specifically than to the hearing challenges that all people experience from time to time. Jennings et al. (2013) found that workers with hearing loss will make requests for clear speech from others, but in doing so they will not disclose their hearing loss unless absolutely necessary. Within the multiple case study, nurses only saw hearing challenges as their responsibility alone when those challenges emerged from a hearing loss. This was evidenced after some nurses in the program had their hearing tested and were surprised to find they had normal thresholds. Only after this realization, did these nurses report feeling confident in talking to their employer about higher quality technology, and requesting clear speech. This presents an irony: within the very disability that requires workers to request clear speech more frequently, it is harder for them to do so. Longmore (1995, as cited by Church et al., 2005, p.16) asserted that workers with disabilities are expected to strive cheerfully towards normalcy. However, my findings suggest that workers with hearing loss are expected to strive not only cheerfully, but independently, an unreasonable expectation within the interdependent context of communication challenges.

Qualitative findings can serve to generate hypotheses. As demonstrated by my analyses of public discourse, society expects workers with hearing loss to be self-reliant in managing their disability. Moreover, in keeping with Cooley's 'looking glass self' (McIntyre, 2006) wherein an individual internalizes others' understanding of them, I found nurses within my intervention to hold this expectation of themselves. Workers with hearing loss have been found to adapt to their challenges independently before making requests of others and disclose only when their ability to work competently is put at risk (Shaw et al., 2013). This expectation is incompatible with the interdependent nature of communication and may contribute to the imbalance workers with hearing loss experience between the job demands placed on them, and the amount of control they have in meeting those demands (Danermark & Gellerstedt, 2004).

The Demands of Problem-Solving. The narrative of problem-solving was seen in the thematic analyses of Canadian newspapers and in the multiple case study. The importance of problem-solving is clear from the organizing themes in the thematic analyses, which included "prominent individuals struggle, take action, and continue despite hearing loss" and basic themes which described workers taking action, experimenting with strategies, struggling to achieve success, and managing challenges. This pattern also emerged in the multiple case study, where participants engaged in experimenting with suggestions, represented by (1) evaluating the suggestion's relevance, (2) considering potential obstacles (3) experimenting with the suggestion (4) experiencing greater self-efficacy, and (5) reporting more efficiency in performance. The logic model proposed at the baseline presented the course as a resource that would counteract demands and ultimately improve job engagement. However, the need for participants to engage in this experimentation process presents a demand rather than a resource, at least in the short run. Because most of the recommendations made in this course, and in others (Gussenhoven et al., 2015), were not adopted, it could be that participants were insufficiently supported in facing this problem-solving demand.

The need for experimentation and problem-solving in the self-management of chronic disability and diseases has been documented in the literature. Bonnet, Gagnayre, and d'Ivernois (1998) described problem-solving to be a key challenge in chronic disease self-management, saying: "patients show the lowest levels of mastery and the highest rates of persisting errors for skills that require them to solve problems involving multiple variables." (p. 146). Communicating with hearing loss involves such multiple variables. Additional complexity is experienced by older workers with hearing loss; adults may struggle to adapt old jobs to a new hearing loss, as suggested by the finding that middle-aged adults with adult-onset hearing loss have lower levels of workplace participation than those who have had the loss since childhood (Verbrugge & Tang, 2002). As a result, when working with this population, Tye-Murray's (2014) stages of communication strategy training should be enriched to include support in the problem-solving process. Such supports have been identified by the literature, and will be described later under 'Future Research'.

Business case for Supporting Workers with Hearing Loss. The business case for workplace wellness programming is growing. Astrella (2017) reviewed three systematic reviews and two studies evaluating the return on investment of such programs. While methodological limitations and inconsistencies between studies made it challenging to interpret results, six of the seven included articles reported a positive financial impact. Similar results have emerged within the Canadian context based on a literature review comprised of eight Canadian workplace wellness studies (Jacobs, Yaquian, Burke, Rouse,

& Zaric, 2017). The review found that organizations generally benefitted from the programs through improvements in employee productivity, although once again, methodological limitations indicated that additional research was required.

Results from the multiple case study analyses suggested a trend, wherein participants' performance scores improved after taking part in the communication-strategies training program. At the projected cost of $169.75/employee (Appendix AE), the average score improved from 85.4 to 92.8 on a 100 point scale from before the course, to the three-month follow-up. This post-course change is consistent with Motowildo, Borman and Schmit's (1997) theory of task performance, where task knowledge (i.e., learning how to manage telephone listening challenges) predicts task performance. Thus, employees and employers may benefit from providing such an intervention as part of a workplace wellness or disability management strategy. Such benefits may be particularly of interest within the realm of healthcare and nursing, where miscommunications are a leading cause of adverse health care events (Joint Commission Center for Transforming Healthcare, 2014).

Practical Implications and Future Research

Employing Organizations. My findings are relevant to organizations who employ workers with hearing loss, and particularly relevant to telephone health-advisory organizations. The recommendations made in Chapter Two, the scoping review, should be distributed to frontline staff managing their own hearing challenges, as well as the challenges of their clients. Human resources professionals might shorten the experimentation process in which participants were found to engage by highlighting those strategies which employees of the organization have used and found relevant in the past. Such a distribution would provide task knowledge, one of three precursors of task performance (Motowildo, Borman, and Schmit, 1997). However, providing the full online course described in Chapter Four would give participants opportunities to develop the remaining two contributors to task performance: task skills and habits. In addition, such an online program would provide social resources by allowing employees with hearing loss to meet and share ideas with colleagues facing similar challenges. Thus, providing a full course may increase the likelihood of organizations seeing the potential performance benefits described in the multiple case study.

Journalists. These findings also have implications for journalists. Newspapers and the media have a responsibility to present workers with hearing loss accurately and responsibly. Canadian newspapers' largely positive portrayal of this demographic suggests that journalists value this goal. However, the findings of Chapter Three are a reminder that journalists must be wary of the two different discourses that emerge when discussing workers with hearing loss as a group. I found that a more positive portrayal emerges from individuals who themselves identify as having a hearing loss. Journalists should give this population more of a voice in positively shaping its own public perception, and can do so by interviewing workers with hearing loss when discussing the issue. Of course, this is not to say that only the heroic aspects of these workers should be described. Communication is an interdependent process, and as demonstrated in the strategies from the scoping review, and the experiences of nurses in the multiple case study, managing communication challenges requires interdependence. Workers with hearing loss may benefit from media narratives which normalize rather than omit the contributions and responsibilities of communication partners, employers, and colleagues in managing workplace challenges associated with the disability.

Nursing Regulatory Bodies. Nurses wishing to register with the College of Nurses of Ontario must declare any conditions that could impact their ability to practice nursing in a safe manner (College of Nurses of Ontario, 2015). The Requisite Skills and Abilities document is used to screen nursing candidates and mandates that nurses be able to "listen… at a level that provides for safe and accurate understanding of words and meanings" (p. 2). Such policies are consistent with the College's mandate to protect the public. However, regulatory bodies may benefit from coupling their requirements for successful listening, with tools for supporting nurses in doing so. One place to start would be developing practice guidelines for managing disabilities within nursing.

Practice guidelines currently outline evidence-based recommendations for various nursing practices. Given the high risk posed by communication errors (Joint Commission Center for Transforming Healthcare, 2014), such a guideline could be developed for nurses managing hearing challenges, whether due to accents, communication disorders on the part of their client, or hearing challenges of their own. My scoping review of strategies for managing hearing strategies in telephone-based healthcare could provide a starting point.

Future Research

Chapter Three, the thematic analyses of Canadian newspapers, included an article on the sudden-onset hearing loss of Rush Limbaugh, a radio talk show host. The journalist explained “[Limbaugh] is experimenting with ways to continue communicating with telephone callers on his show. If that doesn't work, he may do the show without callers”(Associated Press, 2001). Limbaugh’s need to experiment with telephone communication was mirrored by the nurses’ need to experiment with telephone strategies in the multiple case study, and these two findings are explained by the shortage of highly effective, widely applicable strategies for managing telephone hearing challenges, as shown in Chapter Two. For researchers who develop communication-strategies training programs for workers with hearing loss, my findings underline the importance of additional research into more effective communication strategies. Moreover, they speak to the role of problem-solving therapy and the importance of supporting workers with hearing challenges. I will now describe these two domains in greater depth.

Communication Strategies. While the scoping review in Chapter Two identified dozens of evidence-based technical solutions for managing hearing challenges, communication tactics came recommended, almost exclusively, by expert opinion. The empirical data available to guide workers with hearing loss in selecting communication tactics is limited and no research, to my knowledge, has evaluated the relative efficacy of various communication tactics over the telephone.

While this thesis has focused on communication strategies for managing telephone hearing challenges, the dearth of high-quality evidence necessitates examining the tactics available for other mediums, including face-to-face communication. However, even in taking this broader view, the evidence is limited and mixed in its findings. Requesting simple repetition can be helpful; Lunato & Weisenberger (1994) found that requesting verbatim repetition of what had been spoken led to greater success than asking the speaker to provide a synonym. However, requesting repetition is categorized as a non-specific clarification request, and there are better alternatives. Gagné, Stelmacovich, and Yovetich (1991) found that conversation partners gave more favorable ratings to conversations in which the person with hearing loss used specific rather than non-specific requests for clarification. Specific requests included asking for only a certain section to be repeated, requesting confirmation, or asking for communication to be presented slower, more clearly enunciated, or in any more favorable way. Non-specific requests did not give any indication of what had been misunderstood, or why (Gibson & Caissie, 1994). When adults used fewer non-specific requests for clarification, their partner repeated themselves less frequently (Gibson & Caissie, 1994).

Specific requests for clarification may lead a communication partner to rate the conversation more favorably, however, their ability to increase the conversation's overall effectiveness is unclear. Caissie and Gibson's (1997) found that nonspecific clarification requests, requests for certain parts to be repeated, and requests for confirmation were all equally effective in videotaped conversations between persons with hearing loss and normally hearing communication partners. Rather, it was the strategy employed by the communication partner that made a difference. When the normally-hearing partner paraphrased or confirmed the message there was a greater likelihood of successful breakdown repair as compared to when they elaborated on the message. Caissie and Gibson (1997) concluded that it was conversation partners, rather than individuals with hearing loss, who controlled conversation fluency.

Thus, no empirical articles are available to guide workers with hearing loss in communication strategies for using the telephone more effectively and the few articles that evaluate communication strategies broadly are mixed in their outcomes. Nurses who were confident communicators at baseline reported that they were already using many of the communication tactics suggested in the Listening Shift. More research is needed to provide tactics relevant to this more confident subgroup. Together, the scoping review, thematic analyses of newspaper articles, and multiple case study draw attention to the need for more evidence-based and sophisticated communications strategies to share with adults with hearing loss.

Supporting the Problem-Solving Process. Elements supporting participants' experimentation with suggestions should be incorporated into future strategy-training programs for workers with hearing loss. Hill-Briggs' (2003) model of chronic illness self-management behaviors outlines factors that support effective problem-solving in the management of chronic conditions, such as diabetes and hearing loss. They include seeing the problem as an opportunity to succeed, and taking the rational approach to solving the problem rather than engaging in avoidant or impulsive behavior. In addition, the author draws on learning theory to support the importance of ensuring that the individual not only has a sufficient understanding of their condition but is appropriately applying lessons from past experiences to the current self-management challenge.

Problem-solving can be supported within the context of communication-strategies training through the addition of problem-solving therapy, wherein clients are trained to appraise problems as opportunities or challenges that can be solved with time and systematic effort (Nezu, 2004). In problem-solving therapy, clients are guided in developing a set of rational problem-solving skills, including identifying, defining and understanding problems, setting goals, generating alternative solutions, selecting and implementing an alternative, and evaluating the effectiveness of that alternative (D'Zurilla & Nezu, 1999). Such an approach has been described by Gagné and Jennings (2007). They recommend a client-centred approach, in which the client is guided in identifying and selecting a key activity limitation. Over a period of two or three months, the clients and the clinician work together in selecting, a strategy, implementing it, and evaluating its effectiveness in meeting a systematically articulated desired outcome.

A meta-analysis of the efficacy of problem-solving therapy for managing mental and physical health problems found that it provided significantly more effective management tool than no treatment, treatment as usual, or time and attention alone (i.e., an attention placebo) (Malouff, Thorsteinsson, & Schutte, 2007). This style of training has been applied in vocational rehabilitation settings with positive outcomes. In a study of workers on leave for lower back pain, the participants who received problem-solving therapy were more likely to return to work than the participants who received the control treatment of group education. They also reported fewer sick days (van den Hout, Vlaeyen, Heuts, Zijlema, & Wijnen, 2003). Incorporating aspects of problem-solving therapy into future communication-strategies training programs for workers with hearing loss may increase participants' success in overcoming barriers to strategy uptake.

To support the problem-solving process, it would be wise to retain two evidence-based components of the current intervention: self-efficacy building and respect for the principles of andragogy. Self-efficacy supports problem-solving and persistence in the face of adversity (Csikszentmihalyi, 1997). The elements of self-efficacy building included in the current intervention (see Table 12) can provide a starting point. Second, according to the principles of andragogy, the adult participants in these programs are motivated to problem solve by internal factors. In the current intervention, I found that nurses engaged in the process automatically, provided they found the recommended strategy to be relevant. This is supported by the theory of andragogy, which posits that adults find problem-solving around relevant real-life challenges to be most meaningful. In the current intervention, program engagement improved after I started guiding nurses towards the elements of the program most relevant to them, while allowing them to skip over less relevant parts. Future researchers may find that such tailoring supports engagement with the material and the problem-solving process.

Strengths and Limitations

Strengths. The evaluation of the Listening Shift, as described in Chapter Four and supported by the understandings built in Chapter Two and Three, has two main strengths. First, by taking a multiple case study approach, I was able to develop logic models outlining each case's unique interactions with, and outcomes from, the program. This allowed me to, for the first time, develop an over-arching theory of the demanding problem-solving process workers with hearing loss must to adapt and adopt communication strategies. Second, by narrowing the focus of my intervention to a specific communication task performed by a specific profession, I was able to explore the challenge of strategy relevancy, as identified by Gussenhoven et al. (2015). This approach reinforced the finding that problem-solving and experimentation were required to adapt strategies to specific environments, even when the recommended strategies were already tailored to the participants' work.

Limitations. When interpreting the outcomes of the multiple case study analyses, readers should consider two limitations. First, while the intervention described in the multiple case study was designed for those with hearing loss, only four participants in the multiple case study had a confirmed hearing loss. This calls into question the degree to which my findings from this study (i.e., the need for strategies to be adapted) is representative of interventions designed for and provided to workers with diagnosed hearing loss. Still, my decision to include all those experiencing hearing challenges was based on best practices; it has been recommended that aural rehabilitation is provided based on self-reported hearing problems rather than the results of an audiogram (Stephens & Kramer, 2009). Moreover, the same strategies for managing hard-to-hear listening situations are used by both those with and without hearing loss (Hallam & Corney, 2014). The second limitation stems from the attrition rate in the multiple case study. Nineteen participants started the program, but seven did not complete it. The mechanism by which the course impacted those who left may have differed in important ways from those who stayed. While four participants provided non-course-related reasons for leaving, three provided no reason at all. Had their data been included, the across-case logic model may have looked different.

Conclusion

This body of work has identified strategies for managing hearing challenges in telemedicine, analyzed the portrayal of workers with hearing loss in Canadian media, and developed a logic model outlining nurses' experiences in an online communication-strategies training program. The findings, when taken together, highlight the tensions workers experience. These include the expectation to manage communication breakdowns independently, despite the interdependent nature of communication, and the demands workers face in adapting strategies to their unique context. I have argued that organizations are uniquely positioned to both support their employees with hearing loss, and can benefit from doing so. Future research should implement and evaluate programs through organizational partnerships, develop more evidence-based communication tactics, and incorporate problem-solving supports into programs for workers with hearing loss.

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Appendices

Appendix A

Texts included in the scoping review

Authors	Year	Publication Specifications
Experiments (=29)		
Stoker, R.	1981	A comparative evaluation of four telephone coupling methods for the hearing impaired in the presence of background noise. *The Journal of the Acoustical Society of America*, *69*(S1), S111-S111.
Lowe, R. G., & Goldstein, D. P.	1982	Acoustic versus inductive coupling of hearing aids to telephones. *Ear and hearing*, *3*(4), 227-234.
Holmes, A. E., Frank, T., & Stoker, R. G.	1983	Telephone listening ability in a noisy background. *Ear and hearing*, *4*(2), 88-90.
Holmes, A. E., & Frank, T.	1984	Telephone listening ability for hearing-impaired individuals. *Ear and hearing*, *5*(2), 96-100.
Holmes, A. E.	1985	Acoustic vs. magnetic coupling for telephone listening of hearing-impaired subjects. *The Volta Review*.
Stoker, R. G., French-St, M. G., & Lyons, J. M.	1986	Inductive coupling of hearing aids and telephone receivers. *Journal of rehabilitation research and development*, *23*(1), 71-78.
Terry, M., Bright, K., Durian, M., Kepler, L., Sweetman, R., & Grim, M.	1992	Processing the telephone speech signal for the hearing impaired. *Ear and hearing*, *13*(2), 70-79.
Plyler, P. N., Burchfield, S. B., & Thelin, J. W.	1998	Telephone communication with in-the-ear hearing aids using acoustic and electromagnetic coupling. *Journal of the American Academy of Audiology*, *9*, 434-443.
Sorri, M., Piiparinen, P., Huttunen, K., Haho, M., Tobey, E., Thibodeau, L., & Buckley, K.	2003	Hearing aid users benefit from induction loop when using digital cellular phones. *Ear and hearing*, *24*(2), 119-132.
Lidestam, B., Danielsson, H., & Lönnborg, T.	2006	Mobile phone video as an aid to speech understanding for persons with hearing impairment. *Technology and Disability*, *18*(3), 99-105.
Nakao, T., Horie, S., Tsutuis, T., Kawanami, S., Inoue, J.	2008	Earplug-type earphone with built=in microphone improves monosyllable intelligibility in noisy environments. *Journal of occupational health,* 50(2), 194-196
Zekveld, A. A., Kramer, S. E., Kessens, J. M.,	2008	The benefit obtained from visually displayed text from an automatic speech recognizer during listening to speech presented in noise. *Ear and hearing*, *29*(6), 838-852.

Vlaming, M. S., & Houtgast, T.		
Desjardins, J. L., & Doherty, K. A.	2009	Do experienced hearing aid users know how to use their hearing aids correctly?. *American Journal of Audiology*, *18*(1), 69-76.
Mackersie, C. L., Qi, Y., Boothroyd, A., & Conrad, N.	2009	Evaluation of cellular phone technology with digital hearing aid features: effects of encoding and individualized amplification. *Journal of the American Academy of Audiology*, *20*(2), 109-118.
Zekveld, A. A., Kramer, S. E., Kessens, J. M., Vlaming, M. S., & Houtgast, T.	2009	User evaluation of a communication system that automatically generates captions to improve telephone communication. *Trends in amplification*, *13*(1), 44-68.
Brault, L. M., Gilbert, J. L., Lansing, C. R., McCarley, J. S., & Kramer, A. F.	2010	Bimodal stimulus presentation and expanded auditory bandwidth improve older adults' speech perception. *Human factors*, *52*(4), 479-491.
Ferguson, S. H., Jongman, A., Sereno, J. A., & Keum, K.	2010	Intelligibility of foreign-accented speech for older adults with and without hearing loss. *Journal of the American Academy of Audiology*, *21*(3), 153-162.
Mantokoudis, G., Kompis, M., Dubach, P., Caversaccio, M., & Senn, P.	2010	How internet telephony could improve communication for hearing-impaired individuals. *Otology & neurotology*, *31*(7), 1014-1021.
Julstrom, S., Kozma-Spytek, L., & Isabelle, S.	2011	Telecoil-Mode Hearing Aid Compatibility Performance Requirements for Wireless and Cordless Handsets: Magnetic Signal-to-Noise. *Journal of the American Academy of Audiology*, *22*(8), 528-541.
Picou, E. M., & Ricketts, T. A.	2011	Comparison of wireless and acoustic hearing aid-based telephone listening strategies. *Ear and hearing*, *32*(2), 209-220.
Mantokoudis, G., Dubach, P., Pfiffner, F., Kompis, M., Caversaccio, M., & Senn, P.	2012	Speech perception benefits of internet versus conventional telephony for hearing-impaired individuals. *Journal of medical internet research*, *14*(4).
Picou, E. M., & Ricketts, T. A.	2013	Efficacy of hearing-aid based telephone strategies for listeners with moderate-to-severe hearing loss. *Journal of the American Academy of Audiology*, *24*(1), 59-70.
Campos, P. D., Bozza, A., & Ferrari, D. V.	2014, February	Hearing aid handling skills: relationship with satisfaction and benefit. In *CoDAS* (Vol. 26, No. 1, pp. 10-16). Sociedade Brasileira de Fonoaudiologia.
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Kim, M. B., Chung, W. H., Choi, J., Hong, S. H., Cho, Y. S., Park, G., & Lee, S.	2014	Effect of a Bluetooth-implemented hearing aid on speech recognition performance: subjective and objective measurement. *Annals of Otology, Rhinology & Laryngology*, *123*(6), 395-401.
Smith, P., & Davis, A.	2014	The benefits of using Bluetooth accessories with hearing aids. *International journal of audiology*, *53*(10), 770-773.
Ferguson, M., Brandreth, M., Brassington, W., Leighton, P., & Wharrad, H.	2016	A randomized controlled trial to evaluate the benefits of a multimedia educational program for first-time hearing aid users. *Ear and hearing*, *37*(2), 123.
Wittich, W., Southall, K., & Johnson, A.	2016	Usability of assistive listening devices by older adults with low vision. *Disability and Rehabilitation: Assistive Technology*, *11*(7), 564-571.
Kam, A. C. S., Sung, J. K. K., Lee, T., Wong, T. K. C., & van Hasselt, A.	2017	Improving mobile phone speech recognition by personalized amplification: application in people with normal hearing and mild-to-moderate hearing loss. *Ear and hearing*, *38*(2), e85-e92.
Experiment, Assistive Devices (n=2)		
Fikret-Pasa, S., & Garstecki, D. C.	1993	Real-ear measures in evaluation of frequency response and volume control characteristics of telephone amplifiers. *Journal of the American Academy of Audiology*, *4*(1), 5-12.
Stinson, M. R., & Daigle, G. A.	2014	Effect of handset proximity on hearing aid feedback. *The Journal of the Acoustical Society of America*, *115*(3), 1147-1156.
Qualitative (n=5)		
Harris, M., Thomas, A., & Lamont, M.	1981	Use of environmental aids by adults with severe sensorineural hearing loss-An exploratory study. *British journal of audiology*, *15*(2), 101-106.
Pichora-Fuller, M. K.	1981	Use of telephone amplifying devices by the hearing-impaired. *The Journal of otolaryngology*, *10*(3), 210-218.
Holmes, A. E., Kaplan, H. S., & Yanke, R.	1998	Tell us your telephone troubles: using open-ended questionnaires to explore telephone use. *Journal –Academy of Rehabilitative Audiology*, *31*, 87-96.
Iezzoni, L. I., O'Day, B. L., Killeen, M., & Harker, H.	2004	Communicating about health care: observations from persons who are deaf or hard of hearing. *Annals of Internal Medicine*, *140*(5), 356-362.
Ng, S. L., Phelan, S., Leonard, M., & Galster, J.	2017	A Qualitative Case Study of Smartphone-Connected Hearing Aids: Influences on Patients, Clinicians, and Patient-Clinician Interactions. *Journal of the American Academy of Audiology*, *28*(6), 506-521.
Survey (n=9)		
Kepler, L. J., Terry, M., & Sweetman, R. H.	1992	Telephone usage in the hearing-impaired population. *Ear and Hearing*, *13*(5), 311-319.

Scherich, D.L.	1996	Job accommodations in the workplace for persons who are deaf or hard of hearing: Current practices and recommendations. *Journal of Rehabilitation*, *62*(2), 27.
Geyer, P. D., & Schroedel, J. G.	1999	Conditions influencing the availability of accommodations for workers who are deaf or hard-of-hearing. *Journal of Rehabilitation*, *65*(2), 42.
Bowe, F. G.	2002	Deaf and hard of hearing Americans' instant messaging and e-mail use: A national survey. *American Annals of the Deaf*, 6-10.
Yoder, S. & Pratt, S.	2005	Audiologists who have hearing loss: Demographics and specific accommodations needs. *Journal of the Academy of Rehabilitative Audiology*, *38*, 11-29.
Kaplan, H. S., & Holmes, A. E.	2010, May	“Can You Hear Me Now?” The Validation of a Self-assessment Scale for Telephone Abilities through Structured Conversation Ratings. In *Seminars in hearing* (Vol. 31, No. 02, pp. 140-153). © Thieme Medical Publishers.
Iwahashi, J. H., Jardim, I. D. S., & Bento, R. F.	2013	Results of hearing aids use dispensed by a publicly-funded health service. *Brazilian journal of otorhinolaryngology*, *79*(6), 681-687.
Maiorana-Basas, M., & Pagliaro, C. M.	2014	Technology use among adults who are deaf and hard of hearing: A national survey. *Journal of deaf studies and deaf education*, *19*(3), 400-410.
Ruppel, E. K., Blight, M. G., Cherney, M. R., & Fylling, S. Q.	2016	An exploratory investigation of communication technologies to alleviate communicative difficulties and depression in older adults. *Journal of aging and health*, *28*(4), 600-620.
Expert Opinion (n=35)		
Johnson, E. W.	1982	Hearing prostheses and communication aids for the elderly. *Medical instrumentation*, *16*(2), 93-94.
Martin, M. C.	1983	Aids to hearing of a different kind. *International rehabilitation medicine*, *5*(2), 67-72.
Castle, D.	1994	Telecommunications Visual Technology. In M. Ross (Ed), *Communication access for persons with hearing loss: Compliance with the Americans with Disabilities Act* (145) Toronto: York Press.
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Holmes, A.	1994	Telecommunications Acoustic Technology. In M. Ross (Ed), *Communication access for persons with hearing loss: Compliance with the Americans with Disabilities Act* (167) Toronto: York Press
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Palmer, C. V.	2001	Ring, ring! Is anybody there? Telephone solutions for hearing aid users. *The Hearing Journal*, *54*(9), 10-12.
Yanz, J. L., & Preves, D.	2003	Telecoils: Principles, pitfalls, fixes, and the future. *Seminars in Hearing* 24(1) 29-42.

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Hamlin, L.	2017, Jan/Feb	Let's make internet protocol captioned telephone service available to everyone who needs it! *Hearing Loss Magazine,* pp.38
Hearing Loss Association of America	2017, September 8	*Hearing aid compatibility for wireline and wireless telephones.* Retrieved from https://www.fcc.gov/consumers/guides/hearing-aid-compatibility-wireline-and-wireless-telephones
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Appendix B

Design of Experimental Studies

Author (year)	Sample Size	Hearing Status	Independent Variables	Dependent Variables
Stoker (1981)	300	100 moderately impaired 100 severely impaired 100 normal	Coupling method: amplified handset vs magnetic vs acoustic vs tube microphone adaption Level of background noise	Speech intelligibility in noise
Lowe & Goldstein (1982)	10	Bilateral, moderately-severe sensorineural hearing loss	Phone-hearing aid coupling method: acoustic vs. inductive	Speech intelligibility
Holmes, Frank, Stoker (1983)	30	Normally hearing	Sidetone: present vs. absent Background noise: multi-talker vs. white noise; intensity Other ear: occluded vs. not occluded Transmitter: occluded with hand to reduce sidetone vs. not occluded	Speech intelligibility in noise
Holmes & Frank (1984)	45	15 with precipitous loss; 15 with gradually sloping loss; 15 with flat loss	Listening condition: earphone vs. unaided telephone, hearing aid acoustically coupled to telephone Amplitude: 86 dB SPL vs MCL	Speech intelligibility
Stoker, French-St. George, & Lyons (1986)	36	12: moderate loss with precipitous drop 12: moderate loss with gradual slope 12: severe loss	Type of hearing loss Telephone signal level Phone position relative to telecoil	Speech intelligibility
Terry et al. (1992)	16	Average loss was mild sloping to moderately-severe	Telephone signal with vs. without frequency shaping; with vs. without compression	Speech intelligibility
Holmes (1985)	19	Bilaterally mild to moderately-severe	Listening level: 86 dB SPL (comparable to standard handset) vs. participant's most comfortable level Coupling: unaided acoustic, aided acoustic, aided magnetic	Speech intelligibility
Plyler, Burchfield, & Thelin (1998)	8	Mild to moderate hearing loss	coupling method: acoustic vs electromagnetic	Speech intelligibility Noise tolerance
Sorri et al. (2003)	32	Moderate to moderately-severe hearing loss	Telephone strategy: landline vs. cell phone vs. cell phone with induction loop	Speech intelligibility Subjective evaluation

Lidestam, Danielsson, & Lonnborg (2006)	10	Hearing impaired	Mode of speech presentation: visual, vs. auditory vs. audiovisual Visual contextual cues: present vs. absent	Speech intelligibility
Nakao et al. (2008)	20	Normal hearing	Type of earpiece: in-ear earphone with and without earplug; supra-aural headset Level of background noise	Signal to noise ratio required for speech intelligibility Attenuation of background noise in the ear
Zekveld, Kramer, Kessens, Vlaming, & Houtgast (2008)	Exp 1: 24 Exp 2: 14 Exp 3: 25	Normally hearing	Exp 1: presence vs. absence of automatic speech recognition (ASR) text output Exp 2: presence vs. absence of ASR 'confidence' indicator Exp 3: Degree of text delay	Speech intelligibility in noise Readability of ASR output
Desjardins & Doherty (2009)	50	Experienced hearing aid users	Age	Scores on the practical hearing aid skills test (PHAST)
Mackersie, Qi, Boothroyd, & Conrad (2009)	14	Mild to moderately-severe	Standard phone setting vs. individualized amplification of phone signal	Phoneme recognition Listening Effort Sound quality
Zekveld, Kramer, Kessens, Vlaming, Houtgast (2009)	20	Average hearing loss: mild sloping to severe-profound	Automatically generated captions along with telephone speech: present vs. absent Captions 60-70% accurate with log vs. 90% accurate with no lag	Task load Narrative comprehension
Brault et al. (2010)	Exp 1: 31 Exp 2: 28	Mild hearing loss Normally hearing (controls)	Exp 1: Hearing status Lip-reading proficiency Audio alone vs. audio and video Telephone bandwidth or broad bandwidth Time lag Exp 2: In white noise vs. in quiet	Speech intelligibility Recall errors
Ferguson, Jongman, Sereno, & Keum (2010)	60	20 normally hearing young adults; 20 normally hearing older adults; 20 older adults with hearing loss	Accent: speaker with vs. without Signal: presented in quiet vs. in background noise Telephone frequency bandwidth	Speech intelligibility
Mantokoudis et al. (2010)	31	Cochlear implant users; hearing aid users; normally hearing controls	Internet telephone signal (under ideal network conditions) vs conventional telephone signal Internet telephone signal (under ideal network conditions) vs frequency constricted, uncompressed, cd grade signal	Speech intelligibility in quiet and in noise

Julstrom, Kozma-Spytek, & Isabelle (2011)	57	moderate to profound hearing loss	level of interfering noise (s/n ratio) in telephone signal transmitted to hearing aids via telecoil induction	Subjective usability of signal
Picou & Ricketts (2011)	20	Mild sensorineural hearing loss	Telephone listening condition: bilateral vs. unilateral signal presentation noise level in open ear occluding vs non-occluding hearing aid dome	Speech intelligibility
Mantokoudis et al. (2012)	30	Cochlear implant users; hearing aid users with moderate bilateral sloping losses, normally hearing control group	Hearing status Signal to noise ratio Telephone signal: traditional telephone vs. VoIP at 0%, 5%, 10%, and 20% packet loss	Speech intelligibility
Picou & Tivkryyd (2013)	18	Moderate to severe sensorineural hearing loss	Telephone strategy in noise: acoustic telephone vs. unilateral telecoil induction vs. unilateral wireless streaming vs. bilateral wireless streaming Non-test ear aided vs. plugged	Speech intelligibility Signal to noise ratio Subjective ratings of ease and comfort
Campos, Bozza, & Ferrari (2014)	74	New and experienced hearing-aid users	New vs. Experienced hearing aid users	Scores on the practical hearing aid skills test (PHAST)
Carioli & Teixeira (2014)	17	2 mild; 13 moderate; 2 severe	Baseline vs. 3 months after being fitted with hearing aids vs. 6 months after being fitted	Ability to perform instrumental activities of daily living
Kim et al. (2014)	30	Bilateral moderate sensorineural hearing loss	Signal from cell phone vs. loud speaker Coupled with cell phone acoustically, or through wireless transmission In quiet vs. in noise	Sentence and word recognition scores Self-report satisfaction
Smith & Davis (2014)	12	Moderately-severe to severe hearing loss	Baseline vs after being provided with Bluetooth devices (streamer, TV adaptor, remote control, and remote microphone)	Hearing disability Hours of use
Ferguson et al. (2016)	Intervention: 103 Control: 100	First time hearing aid users	Grouping: intervention group receiving online training in use of hearing aids vs. control group receiving care as usual Time: baseline vs. post-course	Scores on the practical hearing-aid use test (PHAST). Subjective scores of training modules' usefulness

Wittich, Southall, & Johnson (2016)	35	Hearing and visually impaired; visually impaired with normal hearing	Visually impaired vs. visually and hearing impaired Assistive device user is assigned to operate	Speed Task Success
Kam, Sung, Lee, Wong, & Hasselt (2017)	100	Losses ranging from slight to moderate. Normally hearing control group	Mobile device: with or without personalized amplification	Speech intelligibility Subjective ratings

Appendix C

Design of experiments with devices rather than participants

Author (year)	Device	Independent Variables	Dependent Variables
Fikret-Pasa & Garstecki (1993)	Telephone amplifiers	Type of amplifier	Real ear frequency response curve
Stinson & Daigle (2004)	In the canal, in-the-ear, and behind-the-ear hearing aids hearing aids manufactured by Unitron	Handset proximity	Open loop transfer function (i.e., feedback)

Appendix D

Design of Qualitative Research

Author (year)	**Sample Size**	**Hearing Status**	**Research Question**	**Methodology**
Harris, Thomas, & Lamont (1981)	27	Moderately-severe to profound hearing loss	How far would the proper use of certain aids contribute to a higher quality of life for both the hearing-impaired person and his or her family?	Interviews
Pichora-Fuller (1981)	221	Hearing impaired	Does the informant use the phone and if so, what problems do they have while doing so?	Open-ended mail surveys and telephone interviews
Holmes, Kaplan, Yanke (1998)	19	Hearing loss ranging from 28 to 66 dB SPL in better ear	What are the typical telephone use patterns of the subjects, and what are their comments, both positive and negative, regarding hearing aid compatibility with the telephone?	Open-ended mail surveys
Iezzoni, O'Day, Killeen, & Harker (2004)	26	Hearing impaired	What are the health care experiences of deaf and hard of hearing clients, and what suggestions exist for improving their care?	Semi-structured group interviews
Ng, Phelan, Leonard, & Galster (2017)	8	Hearing aid users	How do new innovations around connected hearing aids (i.e., wireless functioning) influence providers' and clients' experiences?	Collective case study drawing on interviews and grey literature

Appendix E

Design of Surveys

Author (year)	Sample Size	Hearing Status	Variables of interest
Kepler, Terry, & Sweetman (1992)	104	87% report moderate or severe loss 8.7% report profound loss 94% report bilateral loss	Problems encountered by the hearing-impaired population when using the phone and their coping strategies
Scherich (1996)	252	77% hard of hearing 23% deaf	Difficult situations experienced by adults with hearing loss in the workplace Workplace accommodations as reported by employees with hearing loss vs. employers Employer demographics
Geyer & Schroedel (1999)	232	69% deaf; 31% hard of hearing	Availability of workplace accommodations for hearing loss Age, gender, educational level Type of employer, employer size, occupational classification
Bowe (2002)	884	64% deaf; 24% hard of hearing; 8% hearing; 4% no answer	Use of communication technologies (telecommunication devices for the deaf, telephone relay services, email, instant messaging) Age, income, educational level Open ended questions about technology
Yoder & Pratt (2005)	41	Hearing impaired	The use and importance of the telephone among adults with hearing loss Telephone modifications and substitutions used
Kaplan & Holmes (2010)	47	Participants ranged from having a mild to moderately-severe bilateral sensorineural hearing losses	Preferred method of using the telephone among adults with hearing loss
Iwahashi, Jardim, & Bento (2013)	200	mild to moderately-severe bilateral sensorineural hearing loss	Interventions required by clients returning for one-year follow-up after hearing aids dispensed
Maiorana-Basa & Pagliaro (2014)	278	12% mild or moderate 13% severe More than half profound	Technology and websites used by deaf and hard-of-hearing Americans
Ruppel et al. (2016)	1634	Cohort with and without hearing loss	Frequency of contact with adult child (email, phone, face-to-face) Depressive symptoms Communicative difficulties Control variables (e.g., proximity to adult child)

Appendix F

Experts' Discussion of Technology and Strategies

Author (year)	Technology or Strategy Described
Johnson (1982)	Amplified telephones
	Portable handset amplifiers
	Amplified and frequency-appropriate ringers
Martin (1983)	Telephone amplifier
	Counseling from an audiologist
Castle (1994)	Amplified telephone
	Email and fax machine
	Requesting accommodation
Garstecki (1994)	Needs assessments before fitting assistive devices
Holmes (1994)	Amplified telephone handsets
	In-line telephone amplifiers
	Portable telephone amplifiers
	Telephone with built-in amplifier
	Acoustic coupling of hearing aids and telephone
	Telecoil induction coupling of hearing aids and telephone
	Assistive listening devices
Compton (1996)	Remote microphone
	Messaging services
Federal Communication Commission (2000)	Wireline phones and volume control
Palmer (2001)	Telecoil
Yanz & Preves (2003)	Telecoil
Kozelsky (2005)	Counseling from an audiologist
	Telephone demonstration centres
Yanz (2005)	Telecoil
Vanderheiden (2006)	Telephone volume control
	Telecoil induction
	Using speakerphone as an amplifier
	Smartphones
	Captioned phones
	Mobile phones and 'easy-mode'
Myers (2008)	Telecoil
Hernandez & Martin (2009)	Wireless transmission of telephone calls to hearing aids
Endres (2009)	Captioned telephone
Caissie & Tranquilla (2010)	Repair strategies
	Topic switching in conversations
	Clear speech
	Clear speech training
Frazier (2010)	Telecoil
Ingrao (2011)	Bluetooth
	Proprietary dedicated wireless systems
	Telecoil
Hamlin (2011)	Federal Communication Commission, Consumer Advisory Committee and the rules and regulations around communication
Hamlin (2012)	Hearing-aid-compatible mobile phones
	Captioned telephone
	Amplified phones
Hamlin (2013)	Captioned telephones
Ingrao (2013)	Amplified phones
	Voice over Internet Protocol (VoIP)

	Coupling of telephone and hearing aids Communication strategies
Kozma-Spytek (2013)	Telephone relay Stand-alone captioned phones Internet protocol captioned telephone
Nealon (2013)	Amplified analogue telephones
Ingrao (2014)	Google plus (video-conferencing) Amplified headset Captioned phone Wireless transmission of telephone calls to hearing aids Listening and Communication Enhancement (LACE) Requesting workplace accommodation for telephone use
Spangler (2014)	Near field magnetic induction Far field transmission (e.g., Bluetooth)
Atcherson, Franklin, & Smith-Olinde (2015)	Acoustics and telecoil induction coupling of hearing aids and telephone Hearing-aid/ mobile phone compatibility Wire-line phones Wireless streaming from phone to hearing aids Captioned telephone Video calls Digitally enhanced cordless telecommunications
Taylor (2015)	Hearing-aid/smartphone compatibility
Federal Communications Commission (2016)	Hearing-aid-compatible mobile handsets
Hamlin (2017)	Internet protocol captioned telephone
Hearing Loss Association of America (2016)	Hearing-aid-compatible mobile handsets
Federal Communication Commission (2017)	Hearing-aid-compatible wireline and wireless telephones

Appendix G

Amplification, Evidence

Author (year)	Finding or Recommendation
Holmes & Frank (1984)	For participants with hearing loss, listening at the 'most comfortable level' leads to better intelligibility than listening at the standard volume provided by the telephone.
Stoker, French-St. George, & Lyons (1986)	As the level of the telephone signal increases from 5dB below standard telephone output (80 dB SPL) to 20 dB above (105 dB SPL) Intelligibility increases for participants with hearing loss.
Fikret-Pasa & Garstecki (1993)	Different telephone amplifiers provide different levels of amplification from frequency to frequency.
Pichora-Fuller (1981)	12% of 111 interviewed audiology clients reported that hearing aids helped then on the phone, while 60 out of 61 telephone amplifier users found them helpful and 78% of telephone amplifier users reported having no difficulty on the phone because of using the device
Geyer & Schroedel, (1999)	53% of hard of hearing employees surveyed were found to have a phone amplifier
Kepler, Terry, & Sweetman (1992)	Of a sample of 104 people, most of whom experienced a moderate to severe hearing loss, 76% reported that the telephone signal was softer than they would prefer. 55% used hearing aids when speaking on the phone and 73% used a phone amplifier.
Kaplan & Holmes (2010)	Using an amplified phone alone was the second most common phone set up for 47 adults with PTAs between 30 and 70 dB, after just taking the hearing aid out and using the phone normally (but before using the phone acoustically coupled to the hearing aid, or using telecoil induction)
Scherich (1996)	Telephone amplifier was the most frequently provided accommodation in the workplace (66% of hard of hearing employees reported using it)
Martin (1983)	Telephones amplifiers can provide an output sufficient for up to a 70 dB HL loss.
Ingrao (2013)	Amplified phones can allow for personalized frequency tuning
Vanderheiden (2006)	By turning the volume up and switching to speakerphone, users can gain more amplification from their phone
Hamlin (2011)	Amplified phones can provide up to 50 dB of additional amplification. Standards encourage companies to label amplified phones for whether they are appropriate for a mild, moderate, or severe loss.
Nealon (2013)	Amplifiers are designed to be used with analogue phones, but many business places using digital telephones systems with which amplifiers are not compatible
Hamlin (2012)	With the Sorenson CaptionCall® an individual can input their audiogram into the phone to customize the output to their hearing loss
Johnson (1982)	Amplifiers can come built into the phone or be portable (i.e., are clipped onto the handset when needed). Clients can more easily hear the telephone ring through plug-ins that provide a louder or lower frequency ring. Alternatively, a microphone can be set up that when triggered by the sound of the phone ringing, turns a light on.
Holmes (1994)	Various types of telephone amplifiers exist. Amplifying handsets provide between 20 and 40 additional dB. In-line amplifiers can couple with hearing aids electromagnetically as well as acoustically. Built-in amplifiers can have helpful features, such as a low-frequency ringer, or ringer light. In the Unites States, there is a precedent of telephone amplifiers being considered a 'reasonable' workplace accommodation.
Atcherson, Franklin, & Smith-Olinde (2015) Ch.10	Amplified phones generally have tone-specific amplification control (i.e., you can set them to provide more amplification in the high or low frequencies), as well as large buttons and a handset emitting a strong electromagnetic signal for telecoil induction. In addition, some American states provide these amplified phones at a reduced rate through the Telecommunication Equipment Distribution Program
Terry (1992)	20 dB of amplification increases intelligibility by 13%, frequency shaping increases intelligibility by 11%, frequency shaping and amplification increases intelligibility by 25%
Mackersie, Qi, Boothroyd, & Conrad (2009)	Speech intelligibility and subjective ratings are higher in both noise and in quiet when a telephone's signal is tailored to individual's hearing loss, frequency by frequency

Kam, Sung, Lee, Wong, & Hasselt (2016)	Speech intelligibility increases by 8-10% in both quiet and noise when mobile devices telephone-speech output is amplified to match a person's hearing loss. The majority of participants preferred their individualized amplification in forced choice scenarios

Appendix H

Background-Noise, Evidence

Author (year)	Finding or Recommendation
Picou & Ricketts (2011)	Changing noise level in non-test ear did not impact intelligibility
Nakao et al. (2008)	Earplug style earphone led to attenuation of background noise ranging from 13 dB in low frequencies to 25 dB in high frequencies. Led to significantly lower signal to noise ratios required for 505, 90%, and 100% intelligibility (as compared to supra-aural headphones)
Picou and Ricketts (2013)	Intelligibility worse in higher levels of background noise (65 dB HL significantly worse than 55 dB HL). In 55 dB HL background noise, unilateral wireless better than unilateral telecoil induction (perhaps due to orientation challenges). Plugging ear did not improve speech recognition.
Mackersie, Qi, Boothroyd, & Conrad (2009)	Intelligibility decreased in the presence of background noise
Julstrom, Kozma-Spytek, & Isabelle (2011)	Telecoil 'background noise' come from electronics producing interference. Need 21 dB SNR for half to consider acceptable for normal use (30 dB SNR for 85% to report acceptable)
Pyler, Burchfield, & Thelin (1998)	Acoustic no better than electromagnetic in terms of background noise tolerance. However, noise tolerance was significantly improved when sidetone was disabled
Holmes, Frank, & Stoker (1983)	Word discrimination poorer in background noise. Multi-talker babble more problematic for word discrimination than white noise. Disengaging sidetone or occluding transmitter with palm significantly improves intelligibility at high levels of background noise
Holmes, Kepler, & Yanke (1998)	Background noise reported as a problem in hearing on the telephone by 47% of veterans with hearing loss
Kepler, Terry, & Sweetman (1992)	Of a sample of primarily those with moderate to severe less, 94% reported background noise to be a problem encountered when using the telephone
Palmer (2001)	Cell phones created a buzz when using telecoil induction setting, but this has largely been dealt with by hearing aid manufacturers; alternatively, users can get a neck loop that separates phone components from the hearing aids

Appendix I

Bilateral Listening Evidence

Author (year)	Finding or Recommendation
Picou & Ricketts (2011)	Compared to acoustically transmitting the signal from the phone to the hearing aid in one ear (i.e., acoustic coupling) sending the signal from the telephone to the hearing aids in both ears through wireless technology (i.e., bilateral wireless coupling) led to significantly better speech intelligibility. However, this was only seen in clients with hearing aids that did not allow sound to enter the ear naturally (i.e., had occluding ear tips)
Picou & Ricketts (2013)	Bilateral wireless routing results in better speech intelligibility than unilateral wireless routing, acoustic coupling, or telecoil induction

Appendix J

Captioned-Phone, Evidence

Author (year)	Finding or Recommendation
Zekveld, Kramer, Kessens, Vlaming, & Houtgast (2009)	Captioning of phone calls when there was a lag and an accuracy rate of 60-70% did not lead to lower task load than audio alone. When lag was removed and when there is 90% accuracy, the task load is perceived as lower
Zekveld, Kramer, Kessens, Vlaming, & Houtgast (2008)	ASR captioning does improve speech recognition in noise threshold even at low ASR accuracy rates (20%)
Ruppel et al. (2016)	Email can be powerful: worse hearing associated with more depression for those with low frequency of email contact with child, but not with those with high frequency of email contact with child
Bowe (2002)	2002 survey of deaf and HoH found that email and instant messaging used more frequently than TTY or relay. Allows for emoticons which convey emotion, also email is free, unlike TTY. However, they use these technologies less frequently at work, in part due to the nature of their jobs (e.g., teachers)
Maiorana-Basa & Pagliaro (2014)	2014 survey of deaf and hard of hearing found that 88% use email, 75% use text messaging, and 70% rarely or never use TTY
Yoder & Pratt (2005)	Of 41 audiologists with hearing loss, 58.5% used email as a replacement for the telephone but only 2.4% reported that they always use substitutes rather than the phone
Brad Ingrao (2013)	If the phone call fails, try email, text or letter as a backup
Hamlin (2012)	Sorenson CaptionCall® is an internet based captioned phone. Users' audiograms can be input to provide complementary amplification
Kozma-Spytek (2013)	Stand-alone captioned phones look and are used in the same way as regular phones. They connect to the regular telephone network but also connect to the internet (wireless or through wirelines). The internet provides captions, as generated by a communication assistant repeating the party's speech and having it transcribed by automatic speech recognition software. This communication assistant is completely transparent. Minimum service standards ensure that communication assistants must answer 85% of calls within 10 seconds, communication assistants cannot intentionally alter or disclose the content of conversations, and the conversation must be relayed in real time. FCC develops rules for provision of captioned telephone service and oversees a federal fund for it. Telephone relay services are funded by charges on telephone company's subscribers' bills, and tariffs on the company itself. No charge is paid by the person with hearing loss themselves. A spike in the use of captioned phones in 2012 led to emergency rules being implemented to control costs. The FCC made it clear that the service is for the hard-of-hearing and those with normal hearing should turn the caption feature off when using these stand-alone phones.
Hamlin (2017)	More people using captioned phones and less people using landline (funding fee comes from landlines) has led to funding problem for captioned phones. There may be a move away from communication assistants and towards direct automatic speech recognition.
Hamlin (2013)	Captioned phones allow people to use their voice and residual hearing, with the captions as back up
Endres (2009)	Types of CapTel® Two line Outdoing and receiving calls are automatically captioned CA uses ASR (repeats into speaker) CA on second line so the parties are directly connected One line User simply calls out for outgoing calls Incoming calls: caller has to call toll free number, then input number of person with hearing loss Available 24/7 in English Phones available through state assistive equipment distribution programs Web CapTel® Captioned displayed on computer screen, call made through standard or mobile phone

	Mobile CapTel® Captioning on smartphone screen; Use headset to hear people (need headset because have to look at phone at the same time)
Atcherson, Franklin, Smith-Olinde (2015) Ch. 10	CaptionCall® and CapTel® provide captioning services through proprietary phones that work in a manner similar to regular acoustic landline phones but are captioned through a high-speed internet connection

Appendix K

Internet-Based-Telephony, Evidence

Author (year)	Finding or Recommendation
Brault et al. (2010)	Participants presented with extended bandwidth did not perform significantly better than those presented with a telephone bandwidth in the first experiment, but there was a significant improvement in the second. Participants with hearing loss performed significantly better when they had video along with the audio, this was particularly the case for strong lip readers Longer lags between audio and visual led to higher error rates No benefit of bimodal stimulation on working memory performance Bimodal display reduced perceived workload
Mantokoudis et al. (2010)	Better intelligibility in quiet and noise for internet protocol speech (as compared to traditional telephone speech). Internet protocol speech perception not significantly more intelligible than CD grade speech with the same restricted bandwidth as telephone speech.
Mantokoudis et al. (2012)	VoIP provides HA users with the greatest intelligibility when no packets are lost. Intelligibility is significantly better than traditional telephone when no packets are lost. There is no significant difference between traditional telephone and VoIP when there are 5% or 10% packet losses (In the developed world most VoIP is at 1% packet loss or less). Traditional telephone is better when there is severe packet loss (20%)
Lidestam, Danielsson, & Lonnborg (2006)	Telephone videos provided better comprehension than audio alone when the conversation partner provided visual contextual cues (e.g., pointing to watch to indicate time)
Maiorana-Basa & Pagliaro (2014)	Of 278 deaf and hard of hearing surveyed, 40-50% used video conferencing, 72% used smartphones, 71% used PCs
Ingrao (2013)	VoIP allows for the transmission of full spectrum of sound captured by the microphone, and often goes along with visual cues (e.g., Skype
Vanderheiden, 2006	VoIP allows you to communicate through video, text AND speech
Ingrao (2014)	Google plus allows for audiovisual and text, zooms in on speakers mouth to facilitate lip reading, integrates documents to be collaborated on
Atcherson, Franklin, Smith-Olinde (2015) Chs. 10 and 7	Facetime and skype allow for video calling. Dyssynchrony can exist between audio and visual cues, increasing transmission speed is decreasing this problem

Appendix L

Selecting Appropriate Coupling-Strategies, Evidence

Author (year)	Finding or Recommendation
Lowe and Goldstein (1982)	No significant difference between acoustic and telecoil induction
Picou & Ricketts, (2011)	Unilateral wireless routing not better than acoustic
Kim et al. (2014)	Better intelligibility from bilateral wireless than from acoustic in both quiet and noise, as well as higher subjective ratings of quality, less noise, and more naturalness
Picou & Ricketts, (2013)	Unilateral telecoil induction and wireless better than acoustic for speech recognition and listening comfort; some participants did not position phone appropriately
Sorri et al. (2003)	Acoustic cell phone poorer than cell phone with telecoil induction loop
Julstrom, Kozma-Spytek, & Isabelle, (2011)	Half required 21 dB SNR (over induction noise floor) to consider acceptable for normal use
Smith & Davis (2014)	After being fit with wireless technology, participants experienced clearer signal, but phone did not pick up calls 100% of the time, there's a limited battery life when using streamer, and frequently participants had to connect again with their cellphone each time they turned it on
Carol and Teixeira, (2014)	47% report being unable to use telephone before hearing aids, only 12% 6 months after being fit
Stoker, French-St. George, & Lyons (1986)	Telecoil location did not make a significant difference to intelligibility, potentially because participants varied in how they positioned the telephone relative to the telecoil position (despite being told to position phone in such a way as to maximize signal level)
Holmes (1985)	No significant difference between coupling strategy (unaided, acoustic coupling with hearing aid, magnetic coupling with hearing aid)
Pyler, Burchfield, & Thelin (1998)	No difference between acoustic and magnetic in terms of intelligibility or background noise tolerance
Stoker (1981)	Speech intelligibility improved in the following order: acoustic, magnetic, telephone amplifier
	High variability between individuals' coupling preferences suggests the need to be respectful of individual differences
Stinson & Daigle (2004)	Feedback due to proximity of handset can get reach 20 dB HL but by keeping handset 2 cm from pinna you get quite close to the maximum reduction in feedback
Pichora-Fuller (1981)	Only 12% of participants reported benefitting from using their hearing aid on the telephone (5% used Telecoil, 7% used acoustic)
Ng, Phelan, Leonard, & Galster (2016)	Wireless connection with smartphones a good fit for heavy smart phone users and those looking to hear better over the phone, for example at work
Kepler, Terry, & Sweetman (1992)	55% of hearing aid users keep them in when speaking on the phone, 10% report the coupling is problematic. Of those using telecoil induction (57%) about half report issues with interference from electric fields. Those using acoustic report discomfort in having to hold phone in odd position to avoid feedback.
Kaplan & Holmes (2010)	Removing hearing aid to use phone is the most common 'coupling option' followed by using the amplified phone, and then acoustically coupling phone to hearing aid, in last: telecoil induction with and without amplifier
Yoder & Pratt (2005)	Coupling issues frequently associated with accommodations (e.g., amplified phones don't couple well with hearing aids)
Palmer (2001)	Need to turn hearing aids all the way up when using telecoil induction – telecoils need to be programmed to provide sufficient amplification
Martin (1983)	Telephones amplifiers can provide an output sufficient for up to a 70 dB HL loss. However, telecoil induction coupling is recommended because you can get feedback if you use the amplifier with a hearing aid

Appendix M

Mobile and Digital Phones, Evidence

Author (year)	Finding or Recommendation
Ng, Phelan, leonard, & Galster (2016)	Linking the cell phone with hearing aids creates a more socially acceptable perception of hearing aids. Phone-hearing aid integration can convince some people to get hearing aids who otherwise wouldn't. However, clients' hopes for perfect hearing are generally not met.
Sorri et al. (2003)	Out of acoustic cell phone, telecoil induction cell phone, and landline, lowest intelligibility and subjective ratings found when cell phone was used acoustically; however, when cell phone was used with a telecoil induction loop it yielded similar results to those found with the landline
Federal Communication Commission (2016)	Federal communication commission requires that consumers with hearing loss have access to the voice technology options to which other consumers have access
Hearing Loss Association of America (2016)	The Federal Communication commission mandates that 85% of wireless phones be hearing aid compatibly by 2021
Federal Communication Commission (2017)	Hearing aid compatible wireline phones must provide a sufficiently strong electromagnetic signal to allow for telecoil induction coupling, provide a volume range, and be labelled hearing aid compatible (HAC) Hearing aid compatible wireless phones must have a T3 or T4 telecoil ratings and M3 or M4 RF emission ratings. Consumers must be able to try them before purchasing them at retail outlets Hearing aids are also given M and T ratings to reflect their telecoil coupling strength and resistance to RF emissions. When adding the telephones ratings with the hearing aids rating, the sum should be 6 or higher to allow for the best listening conditions.
Federal Communication Commission (2018)	HAC compatible wirelines phones must be able to increase their volume by 12 dB at least
Vanderheiden (2006)	Smart phones allow for text messaging, text messaging while talking, and using video with voice. Can also be put on easy mode to make the phone very easy to operate
Hamlin (2012)	CDMA preferable to GMA, at least for iPhone 5. Need data and a phone plan to access captioned calls
Hamlin (2011)	Federal Communication Commission writes rules and regulations around communication. The Consumer Advisory Committee (CAC) which includes the Hearing Loss Association of America makes recommendation to the FCC
Atcherson, Franklin, Smith-Olinde (2015) Ch. 10	Important to try before you buy a mobile phone. Experiment with the microphone, ask about hearing aid compatibility. Phonescoop.com allows you to search for relevant features (e.g., telecoil accessibility). Features of interest include vibrate mode, maximum volume, Bluetooth compatibility, video chat, senior mode (additional amplification in high frequencies) or text-only phones. Jitterbug is M4 T4 rated. Some American states can help with the purchase of compatible mobile phones through their telecommunication equipment distribution program. ** DECT phones are Bluetooth enabled to transmit the signal directly to hearing aids. This presents less opportunities for interference (no conversion from electric to acoustic to electric to acoustic) and also eliminates the concerns about feedback. Not all hearing aids are currently compatible. Similar to the way that cell phones can be connected to some hearing aids.
Smith & Davis (2014)	After being fit with wireless technology, participants experienced clearer signal, but phone did not pick up calls 100% of the time, batteries drained more quickly, and frequently participants had to connect again with their cellphone each time they turned it on
Kozma-Spytek (2013)	Mobile phones can access captioning through an app that costs $75 for new users

Appendix N

Improving User's Telephone Skills, Evidence

Author (year)	Finding or Recommendation
Ferguson et al. (2015)	Online modules lead to significantly better telephone handling skills
Picou and Rickets (2013)	Participants do not consistently position phone optimally when using telecoil induction, even when reminded to do so
Campos, Bozza, & Ferrari (2014)	No significant difference between new and experienced hearing aid users in their practical hearing aid skills, lowest scores found in using telecoil induction
Wittich, Southall, & Johnson (2016)	Instruction and simple repetition led to significantly better skills in managing an amplified telephone (but could not bring success to 100%)
Desjardins & Doherty, (2009)	Years of hearing aid use not linked with practical hearing aid skills, among all participants, telephone task (correctly using phone program, and positioning phone appropriately) was the lowest skill
Holmes, Kaplan, & Yanke (1998)	26% report that they cannot use the phone with hearing aids
Iwahashi, Jardim, & Bento (2013)	At one year follow-up 31.5% of new hearing aid users needed explanation of phone use (most common form of counselling needed)

Appendix O

Improving User's Telephone Communication Tactics, Evidence

Author (year)	Finding or Recommendation
Ferguson, Jongman, Sereno, & Keum, (2010)	Both over the telephone and face-to-face intelligibility scores decrease dramatically when the speaker is not a native English speaker.
Iezzoni, O'Day, Killeen, & Harker (2004)	In interviews with 12 clients who were hard of hearing and used hearing aids, participants recommended that… Health care providers review automated telephone menus and consider alternatives for persons with hearing loss Providers ask about clients preferred communication approach; make appropriate effort to adhere to preferred approach Periodically ask clients about effectiveness of communication; request suggestions to rectify unsatisfactory situations periodically ask clients to summarize their understanding to identify miscommunications
Harris, Thomas, & Lamont (1981)	Interviews with 27 adults with moderately-severe to profound hearing loss it was found that these adults: Rely on family members and neighbors to manage phone calls Do better if telephone communication partners don't speak too quietly or shout and are willing to repeat/ rephrase Are limited in the time they can spend on the phone by fatigue
Holmes, Kaplan, & Yanke (1998)	26% of 19 participating veterans with hearing loss mentioned using communication strategies to improve phone calls in open-ended questionnaires
Scherich (1996)	Survey of 201 deaf and hard of hearing employees found that 56% reported having others handle their calls
Ingrao (2013)	Tips for making a call when you have a hearing loss Prepare who you want to talk to, have their extension before hand Disclose your hearing loss Example: "Hello, I'm calling for Joe Smith, but want to tell you that I have a hearing loss and understand much better when people speak slowly and distinctly, spell names and repeat numbers twice. Thanks." Leave voice menus by saying 'operator' or 'representative' Identify what works well in successful calls and try to replicate it
Caissie & Tranquilla (2010)	"What", "pardon me", or "huh" etc. don't substantially help to fix communication breakdowns. Better to paraphrase and ask for clarification. Interrupting immediately after you misunderstand will allow the person to repeat the most relevant part. 'Topic shading' moving to peripherally related topics in the conversation, increases miscommunications. It is important to indicate that you will be changing the topic with cues, such as a pause, or a phrase, such as 'by the way'. It may even be wise to confirm the new topic with the person before proceeding. Clear speech is characterized by fully saying each sound (as a result it is somewhat slower), while preserving the natural phrasing of speech. The focus on enunciating makes clear speech somewhat louder, but it is not so much louder that it is distorted. People are best led to use clear speech by being instructed to "enunciate consonants more carefully and avoid slurring words together". The quality of clear speech improves with practice and conversation partners should be triggered to use it by the common nonspecific requests for repetition, such as "what?".
Castle (1994)	Workers can manage the phone by adopting strategies used by operators and airline agent, for example, the NATO alphabet, and breaking numbers into their single digit components

Appendix P

Requesting Accommodation for Telephone Work, Evidence

Author	Finding or Recommendation
Ingrao (2014)	When requesting accommodation, change the narrative from “help me” to “help us”. Learn more about what conditions are facilitators and barriers to good telephone communication and determine what works for you and what doesn’t. Use this information when making a request for accommodation. Frame the request as a way to increase your productivity and the quality of customer service. You might ask for things, such as an acoustically favorable office space, an amplified headset, a captioned phone (and training so others know how to use it). If you can’t use the phone, you need to honestly admit that. You can offer to do other jobs, move to department that uses the phone less, or manage clients who prefer email, leaving phone work to colleagues Identify what parts of your job are problematic List job functions and the environment for each job function Rate your ability to understand speech in each function and environment Approach your manager with this as a clear argument for doing the tasks and working in the environment favorable to you.
Castle (1994)	When requesting accommodation, the worker with hearing loss needs to explain their preferred method of communicating, the cost, and how it will help them do their job. It may be advisable to bring in an assistive device one has purchased on their own for 30 days to demonstrate benefit to employer. It may be reasonable for employee and employer to share the cost.
Holmes (1994)	In the Unites States, there is a precedent of telephone amplifiers being considered a ‘reasonable’ workplace accommodation.

Appendix Q

Accounting for Individual Differences, Evidence

Author	Finding or Recommendation
Garstecki (1994)	Before providing assistive devices, audiologists should consider User's capabilities and preferences Situational needs (e.g., travelling or on the job) Lifestyle considerations (communication demands, successes, failures) Environment (noise, need for electrical outlets) Independent management abilities Costs of the device Alerting needs (loud enough, acceptably unobtrusive, visual or vibro-tactile)
Kozelsky (2005)	People are ready for a telephone hearing solution when Accepted hearing loss Frustrated at not being able to hear well on the phone Critical dependence on the telephone Lacking a high-power amplified phone Frustrated by the need to fumble, adjust and position the phone Benefitting from hearing aids during telephone use, Have adequate manual dexterity Providing a telephone demonstration centre can allow people to successfully try and adopt amplified phones

Appendix R

Standardized and Objective Design Criteria for Evaluating Web-Based Learning Platforms (Hsu et al., 2009).

Indicator	F1	F2	F3	F4
32. The words frequently convey information	0.812			
31. The texts can be clearly read	0.774			
34. The graphics and text complement and support comprehension improvement	0.758			
33. The images clearly communicate information	0.746			
38. The video transmission is smooth and does not lag	0.718			
39. The interface design is pleasing and artistic	0.699			
36. The animation design increases learning desire	0.675			
35. The animation design clearly communicates information	0.675			
37. The video quality is clear and good	0.628			
40. The interface design is creative	0.594			
13. The teaching material paragraph is clear		0.736		
12. The teaching material is objective		0.734		
15. The teaching material scheme is appropriate and materials correlate		0.703		
17. The teaching material quality is appropriate and meets learners' capabilities		0.694		
19. The teaching material organizational structure is clear and systematic		0.693		
16. The teaching material quantity is appropriate and meets learners' needs		0.691		
14. The teaching material induces learning motivation		0.683		
20. The teaching material cases and situations meet learners' cognitive abilities		0.649		
11. The teaching material is accurate		0.648		
18. The teaching material unit topic is clear and definite		0.624		
1. It clearly indicates the instruction goal		0.537	0.371	
5. It provides cases and situations to improve students' understanding			0.762	
6. It applies various learning facilitation medias			0.741	
7. It applies novel and challenging strategies to increase motivation			0.740	
9. It effectively integrates learners' past learning experience and knowledge.			0.735	
4. It provides Frequently Asked Question (FAQ)			0.687	
8. The presented content is correct in its instructional goal			0.684	
10. It provides learner communication and interaction opportunities (e.g. online discussion)			0.630	
3. It assigns evaluation practice for the class			0.571	
2. It indicates knowledge and techniques to be learned			0.496	
22. It provides search functions				0.684
24. It provides learning records				0.669
25. The menu linkage displays normally				0.633
28. It provides quick error instruction				0.609
21. It provides practical learning tools (e.g. online notebook)				0.603
23. It provides related software for downloading				0.591
29. It provides the mechanism to ask for systematic manager help				0.577
30. The navigation is clear and easily understood				0.568
27. It provides learner process management				0.559
26. The category is appropriate				0.532
Percentage of variance	19.327	18.817	15.959	13.394
Cumulative %	19.327	38.144	54.103	67.497

Appendix S

Semi-Structured Interview Protocol

Baseline

Guiding statement: “My goal in this interview is to understand any hearing challenges you are currently facing at work, and any impact this has on your wellbeing, and performance on the job.”

Program Experience

Tell me about your experiences with the program, from hearing about it, to arriving at this interview?

Work-Related Demands	**Personal and Work-Related Resources**
Walk me through any hearing challenges you experience during your typical work shift, starting with opening the front door of the call centre at the start of your shift and ending with walking out at the end of the day.	What helps you (or could help you) manage these challenges? *Probes:* *Communication strategies* *Personality traits* *Perspective* *Resources provided by workplace (e.g. technology)* *Social support*

Performance	**Work-related Wellbeing**
Can you tell me about a few recent calls where you had trouble hearing? What did you do? Some believe that their hearing challenges makes it harder to succeed at work, others say	Over the last couple weeks, how have you felt at the end of your shifts? [Need for recovery] Imagine that someone takes your headset and the only one that’s left is really hard to

that it doesn't make a difference. What's your experience in the job you're in now?	hear through. A replacement won't come until tomorrow. Can you tell me about how confident you'd feel in managing this situation? How would you feel? What thoughts would run through your head? [Self-Efficacy for managing difficult-to-hear calls] When you think about going in to work, how do you feel? What do you think about? What do you do? [Burnout] When you've finished with a call and it's time to move on to the next one, how do you feel? What do you think about? What do you do? [Burnout]

Rival Explanations

What led you to participate in this program?

Earlier you mentioned helpful resources and supports, which of these do you have access to?

Post-Intervention

Guiding statement: "My goal is to understand how this program impacted you, if at all. It's just as important that you tell me about the negative or neutral outcomes of the program, as it is that you tell me about the positive outcomes."

Program Experience

Tell me about your experiences with the program, from hearing about it, to arriving at this interview?

Work-Related Demands	**Personal and Work-Related Resources**
Walk me through the hearing challenges you experience during your typical work shift, starting with opening the front door of the call centre and ending with walking out at the end of the day.	What helps you manage these challenges? *Probes:* *Personality traits* *Perspective* *Communication strategies* *Resources provided by workplace (e.g. technology)* *Social support* *Program*

Performance	**Work-related Wellbeing**
Can you tell me about a few recent calls where you had trouble hearing? What did you do? What effect, if any, did the course have on your performance at work? How did the course have this effect?	Over the last couple weeks, how have you felt at the end of your shifts? [Need for recovery] Imagine that someone steals your headset and the only one that's left is really hard to hear through. A replacement won't come until tomorrow. Can you tell me about how

Have you requested accommodation? Why or why not? Have you begun using assistive devices at work? Why or why not?	confident you'd feel in managing this situation? How would you feel? What thoughts would run through your head? [Self-Efficacy for managing difficult-to-hear calls] When you think about going in to work, how do you feel? What do you think about? What do you do? [Burnout] When you've finished with a call and it's time to move on to the next one, how do you feel? What do you think about? What do you do? [Burnout]

Rival Explanations

Other than the program, what else has contributed to how you are now managing your hearing challenges? To your performance and wellbeing at work?

Probes:

Manager Changes

Policy Changes

Different job duties

More Experience

Personal Stressors

Other Training

Participating in research project (beyond intervention)

Seeing an audiologist in the community

Returning to normal after experiencing a low point

Follow-Up

Guiding statement: “My goal is to understand how this program impacted you, if at all. It’s just as important that you tell me about the negative or neutral outcomes of the program, as it is that you tell me about the positive outcomes.”

Program Experience

Tell me about your experiences with the program, from hearing about it, to arriving at this interview?

Work-Related Demands	**Personal and Work-Related Resources**
Walk me through the hearing challenges you experience during your typical work shift, starting with opening the front door of the call centre and ending with walking out at the end of the day.	What helps you manage these challenges? *Probes:* *Personality traits* *Perspective* *Communication strategies* *Resources provided by workplace (e.g. technology)* *Social support* *Program*

Performance	**Work-related Wellbeing**
Can you tell me about a few recent calls where you had trouble hearing? What did you do?	Over the last couple weeks, how have you felt at the end of your shifts? [Need for recovery]
What effect, if any, did the course have on your performance at work?	
How did the course have this effect?	Imagine that someone steals your headset and the only one that’s left is really hard to hear through. A replacement won’t come until tomorrow. Can you tell me about how

If interviewee indicated that they requested accommodation in the previous interview:

Walk me through the process of your request for accommodation, from deciding to make the request, to the point in the process that you are at now.

If not:

In the last interview you indicated that you had chosen not to request accommodation because ________ , do you have any updates, or is there anything you'd like to add?

If interviewee indicated that they were using assistive devices in the previous interview:

What have your experiences with your assistive device been like?

If not:

In the last interview you indicated that you had chosen not to use an assistive device because ________, do you have any updates, or is there anything you'd like to add about that decision?

confident you'd feel in managing this situation? How would you feel? What thoughts would run through your head? [Self-Efficacy for managing difficult-to-hear calls]

When you think about going in to work, how do you feel? What do you think about? What do you do? [Burnout]

When you've finished with a call and it's time to move on to the next one, how do you feel? What do you think about? What do you do? [Burnout]

Rival Explanations

Other than the Louder than Words, what else has contributed to how you are now managing your hearing challenges? To your performance and wellbeing at work?

Probes

Manager Changes

Policy Changes

Different job duties

More Experience

Personal Stressors

Other Training

Participating in research project (beyond intervention)

Seeing an audiologist in the community

Returning to normal after experiencing a low point

Appendix T

Demographic Questions

Within what range does your age fall?

- ☐ 18-34
- ☐ 35-50
- ☐ 51+

What is your OpenLearning profile name?

I identify my gender as:

How many hours do you spend on the phone each week, approximately?

What does your job require you to do over the phone?

Have you been formally diagnosed with a hearing loss?

If so, would you be willing to mail in a hearing test?

Do you use hearing aids when on the telephone at work?

If yes, do you use any of the following technologies when on the telephone at work? (Select all those that apply.)

- ☐ Bluetooth streamer connecting phone/dialing system to your hearing aid
- ☐ FM system connecting phone/dialing system to your hearing aid
- ☐ Telecoil
- ☐ Other (please specify) ____
- ☐ None

Do you use any of the following assistive-listening devices when using the phone at work? (Select all those that apply.)

- ☐ Telephone with volume control
- ☐ Amplified telephone (amplifier built into telephone)
- ☐ Telephone amplifier (amplifier plugged into phone)
- ☐ Around-ear headset covering both ears
- ☐ None

Appendix N

Better Hearing Institute Quick Hearing Check

Quick Hearing Check

BETTER HEARING INSTITUTE

Introduction

The following hearing loss check is based on the Revised American Academy of Otolaryngology-Head & Neck Surgery (AAO-HNS) five-minute hearing test*. It is a means of quickly assessing if you possibly have a hearing loss requiring referral for an objective hearing test and possible hearing solution. This screener is related to objective measures of hearing loss using audiological equipment. In step #1 you are asked to respond to 15 items related to your hearing. In step #2 you will score your hearing and in step #3 you will be able to compare yourself to 2,304 adults with hearing loss.

Instructions — Step 1

With respect to your hearing, please think about your experiences with each of the following WITHOUT the use of hearing aids or other devices designed to help you hear better. For each item, indicate the degree to which you agree or disagree (select one number for each item).

	STRONGLY DISAGREE ←				→ STRONGLY AGREE
I have a problem hearing over the telephone	0	1	2	3	4
I have trouble following the conversation when two or more people are talking at the same time	0	1	2	3	4
I have trouble understanding things on TV	0	1	2	3	4
I have to strain to understand conversations	0	1	2	3	4
I have to worry about missing a telephone ring or doorbell	0	1	2	3	4
I have trouble hearing conversations in a noisy background such as a crowded room or restaurant	0	1	2	3	4
I get confused about where sounds come from	0	1	2	3	4
I misunderstand some words in a sentence and need to ask people to repeat themselves	0	1	2	3	4
I especially have trouble understanding the speech of women and children	0	1	2	3	4
I have trouble understanding the speaker in a large room such as at a meeting or place of worship	0	1	2	3	4
Many people I talk to seem to mumble (or don't speak clearly)	0	1	2	3	4
People get annoyed because I misunderstand what they say	0	1	2	3	4
I misunderstand what others are saying and make inappropriate responses	0	1	2	3	4
I avoid social activities because I cannot hear well and fear I will reply improperly	0	1	2	3	4
Family members and friends have told me they think I may have a hearing loss	0	1	2	3	4

Instructions — Step 2

Add up scores in each column scored 1-4 ___+___+___+___=___

Continued on reverse side ...

Instructions **Step 3**

How Does Your Hearing Loss Score Compare to Adults with Hearing loss?

In adding up your responses to the 15 items you are now able to compare your scores to adults who have a hearing loss. The National Council on the Aging (NCOA) collected this information based on the responses from a representative sample of 2,304 people with hearing loss, ages 50 and above, using the National Family Opinion Panel in 1999.

First, locate your total score in column 1; Column 2 tells you how your hearing loss compares to adults with hearing loss; Column 3 tells how your significant other views the hearing loss; Column 4 tells you what hearing solution action is needed.

1 What is your hearing loss score?	2 How does your hearing loss compare to others?	3 How does your significant other describe your hearing loss?	4 Hearing Solution Action Needed
0-4	Lower 5%	Very Mild	None
5-9	Lower 10%	v	v
10-13	Lower 15%	Majority mild with some moderate	Hearing test may be necessary to monitor your hearing.
14-17	Lower 20%	|	|
18-19	Lower 25%	v	v
20-21	Lower 30%	Majority moderate with about a third mild	Hearing test recommended; hearing solution based on lifestyle
22-23	Lower 35%	|	v
24-25	Lower 40%	v	Hearing test recommended; hearing solution probably needed in many situations.
26-27	Lower 45%	Majority moderate with some mild	|
28-29	Middle 50%	|	|
30-31	Upper 45%	v	v
32-33	Upper 40%	Majority moderate to severe	Extensive communication difficulty requiring testing and hearing solution.
34-35	Upper 35%	|	|
36-37	Upper 30%	|	|
38-39	Upper 25%	|	|
40-42	Upper 20%	v	|
43-45	Upper 15%	Majority severe to profound	|
46-50	Upper 10%	|	|
51-55	Upper 5%	|	|
56-60	Upper 1%	v	v

**Source: Koike , J.; Hurst, M.K.; and Wetmore, S. J. Correlation between the American Academy of Otolaryngology- Head and Neck Surgery five-minute hearing test and standard audiological data, Otolaryngology – Head and Neck Surgery, Volume 111 (5), pp. 625-632.*

Appendix V

Amsterdam Checklist for Hearing and Work

Section 1 (Included)

1. What is your job title?

2. How many hours per week do you work?

3. Do you have a temporary or a permanent job?

4. During the past 12 months, how many days have you been on sick-leave? (number of days, reasons)

5. What are your main activities at work? Please select maximally three activities that you need to perform during a regular day at work:

a. be on the telephone

b. conversations (up to 3 persons)

c. meeting and conversations with more than 3 persons

d. desk activities at the reception or door keeping activities

e. teaching and instructing

f. selling products and services

g. medical care

h. *serving and assisting (waiting)*

i. administrative desk jobs

j. ict (information computer technology)

k. craft-work, trade

l. working with heavy machinery

m. driving (truck, bus or car)

n. making music

o. other...

6a. Do you perceive environmental noise at work? (no, a little, much, very much)

6b. Is your workplace reverberant? (no, a little, much, very much)

Section 2 (Not Included)

7a. How frequently do you have to detect sounds (warning signals) at work?

7b. How much effort and concentration do you need to detect sounds?

8a. How frequently do you have to follow a conversation in noise at work?

8b. How much effort and concentration do you need to follow a conversation in noise?

9a. How frequently do you have to follow a conversation in quiet at work?

9b. How much effort and concentration do you need to follow a conversation in quiet?

10a. How frequently do you have to distinguish between sounds (voices, signals, tones) at work?

10b. How much effort and concentration do you need to distinguish between sounds?

11a. How frequently do you have to localize sounds at work?

11b. How much effort and concentration do you need to localize sounds?

Answer categories:

almost never, sometimes, often, almost always

no effort, a little effort, much effort, very much effort

Section 3 (Included)

Job demand (Alpha Coeff = 0.72)

Is your work mentally demanding?

Is your work more demanding for you than for your normally-hearing colleague?

Do you often have a shortage of time to get the job done?

Do you feel worn out by the end of the working day?

Job control (Alpha Coeff = 0.85)

Can you interrupt your work whenever wanted?

Can you yourself determine the content of your activities at work?

Can you organize your own activities at work?

Can you determine the beginning and the end of your working day and the timing of taking breaks?

Support (Alpha Coeff = 0.79)

Do you enjoy your job?

Do you consider the atmosphere at work to be generally good?

Do you get enough support concerning your work from your direct supervisor(s)?

Are you content with your present job?

Career Satisfaction (Alpha Coeff = 0.76)

Can you develop your abilities at work?

Do you have a lot of monotonous tasks at work?

Can you take decisions about things that have to do with your work?

Do your activities at work correspond to your educational level?

Answer categories: *almost never, sometimes, often, almost always*

Appendix W

Need for Recovery after Work Scale

Please circle yes or no for the following questions.

I find it hard to relax at the end of the day.

At the end of a working day I am really feeling worn-out.

My job causes me to feel rather exhausted at the end of a working day.

Generally speaking, I’m still feeling fresh after supper.

Generally speaking, I am able to relax only on a second day off.

I have trouble concentrating in the hours off after my working day.

I find it hard to show interest in other people when I just came home from work.

In general it takes me over an hour to feel fully recovered after work.

When I get home, people should leave me alone for some time.

After a working day I am often too tired to start other activities.

During the last part of the working day I cannot optimally perform my job because of fatigue sometimes.

Response options:

Yes No

Appendix X

Self-Efficacy for Difficult-to-Hear Calls

We are interested in how confident you feel in successfully managing calls that are difficult to hear, we are also interested in understanding what you would do manage various types of listening challenges over the phone (e.g. a speaker with a strong accent).

Please read the following scenarios.

For each scenarios described below, please rate your confidence in managing the call and describe what you do to better understand your customer.

You answer the phone and the line has a lot of **static/poor reception**. You hear the following sentence, but you can't make out some words (indicated by dashes):
"Hello, ----- to know how this ------ headset works, I bought it from Best buy and I'm ------ trouble. It's a Plantronics Marqué 2----- and I have an ----- 4S"

How confident do you feel in successfully managing a call with a lot of static or poor reception, like the one described above?

What would you do to better understand your customer on this call?

You answer the phone and the **speaker's voice is quiet**. You hear the following sentence, but you can't make out some words (indicated by dashes):
"Hello, I ordered a big fight but my ----- ---- ----- -----. My serial number is 310 ----- ------"

How confident do you feel in successfully managing a call with a quiet speaker, like the one described above?

What would you do to better understand your customer on this call?

You answer the phone and the caller has **music playing loudly in the background**. You hear the following sentence, but you can't make out some words (indicated by dashes):
"Hello, I'd like to ma-- ---- ------- for two tickets from Toronto to New York. I'd like to leave December -- and return Ja----- -."

How confident do you feel in successfully managing a call with noise in the background, like the one described above?

What would you do to better understand your customer on this call?

You answer the phone and the speaker has a **strong accent**. You hear the following sentence, but you can't make out some words (indicated by dashes):
"Hello, EMS? I need an ---------ce. I live at 3--- 3-- st in east Calgary. My father tripped and -- ---- --- -----, he can't get up."

How confident do you feel in successfully managing a call with a speaker who has a strong accent, like the one described above?

What would you do to better understand your customer on this call?

Answer options for each question *i:*

0 10 20 30 40 50 60 70 80 90 100

ii questions to answered in sentence format

Appendix Y

Conversation Tactics Checklist

Although the items had been constructed to be meaningful for all participants, some are not generally applicable, in which case the subject has the option of checking 'never use'.

In certain situations (like a noisy party) it is much more difficult to hold a conversation with another person. There are various ways of coping with these situations when it becomes difficult to hear and talk. These "conversation tactics" are listed below. Please indicate with a tick how frequently you employ these tactics when holding a conversation becomes difficult. These difficulties are more likely to arise if you or your conversational partner has a hearing impairment but everyone experiences them at one time or another. Just indicate on the questionnaire how often you use the tactic (Never, Rarely, Sometimes, and Usually) when conversation becomes difficult.

0 = Never 1 = Rarely 2 = Sometimes 3 = Usually

All of these items refer to your behaviour.

Meta-communication Subscale

Replay in your mind what you have just heard and try to piece together the sounds

Keep calm and unflustered when you miss one thing, so as not to miss the next

Take note of what the person is doing or looking at

Repeat back to the talker

Organize what you want to say in your mind before saying it

Avoid talking about unimportant things

Ask a 'reverse question' to check that you have heard correctly

Mentally fill in the gaps or guess when you miss parts of the conversation

Phrase a question so that only a few answers are possible

Hearing Repair Subscale

Remind a talker that shouting doesn't help

Ask the talker to say something in a different way

Ask the talker to speak more clearly

Ask a partner or friend who is with you in a group to summarize the conversation or tell you what people are talking about

Ask the talker to speak more slowly

Ask the talker to repeat what they said

Ask the talker to speak more loudly

Ask a quietly-spoken talker to speak more loudly

Mention to others your difficulty in hearing when you cannot understand what they are saying

Avoid Subscale

Give up trying to understand and switch off

Pretend to understand what the talker is saying

Make the minimum amount of effort and withdraw into your own thoughts

Try to look interested when you are not hearing clearly

End the conversation if the other person looks irritated

Avoid having the conversation altogether if you think it will be difficult

Decide that what you are saying is not important enough to keep repeating it

Give up and leave if conversing is too difficult

Just keep on talking so you don’t have to listen

Keep quiet to avoid the effort of conversing

Appendix Z

Turnover Intention Scale – 6

The following section aims to ascertain the extent to which you intend to stay at the organisation.

Please read each question and indicate your response using the scale provided for each question:

How often have you considered leaving your job?

(Never) 1 2 3 4 5 (Always)

To what extent is your current job satisfying your personal needs?

(To no extent) 1 2 3 4 5 (To a very large extent)

How often are you frustrated when not given the opportunity at work to achieve your personal work-related goals?

(Never) 1 2 3 4 5 (Always)

How often do you dream about getting another job that will better suit your personal needs?

(Never) 1 2 3 4 5 (Always)

How likely are you to accept another job at the same compensation level should it be offered you?

(Highly Unlikely) 1 2 3 4 5 (Highly Likely)

How often do you look forward to another day at work?

(Never) 1 2 3 4 5 (Always)

Appendix AA

World Health Organization Short health and Work Performance Questionnaire – Presenteeism

On a scale of 0 to 10, where 0 is the worst job performance anyone could have at your job and 10 is the performance of the top worker, how would you rate the usual performance of most workers in a job similar to yours?

Using the same 0-to-10 scale, how would you rate your usual job performance over the past year or two?

Using the same 0-to-10 scale, how would you rate your overall job performance on the days you worked during the past four weeks (28 days)?

Answer categories*: 0-10*

0	1	2	3	4	5	6	7	8	9	10
Not confident at all				Moderately confident					Very confident	

Appendix AB

International Outcome Inventory – Alternative Intervention

1. Think about how much you used communication strategies over the past 2 weeks. On an average day, how many hours did you use them?	☐ None	☐ less than 1 hour per day	☐ 1-4 hours per day	☐ 4 - 8 hours per day	☐ More than 8 hours per day
2. Think about the situation where you most wanted to hear better, before training on communication strategies. Over the past 2 weeks, how much have communication strategies helped in that situation?	☐ Helped not at all	☐ Helped slightly	☐ Helped moderately	☐ Helped quite a lot	☐ Helped very much
3. Think again about the situations where you most wanted to hear better. When you use communication strategies, how much difficulty do you STILL have in that situation?	☐ Very much difficulty	☐ Quite a lot of difficulty	☐ Moderate difficulty	☐ Slight difficulty	☐ No difficulty
4. Considering everything, do you think using communication strategies is worth the trouble?	☐ Not at all worth	☐ Slightly worth it	☐ Slightly worth it	☐ Quite a lot worth it	☐ Very much worth it
5. Over the past 2 weeks, using communication strategies, how much have your hearing difficulties affected the things you can do?	☐ Affected very much	☐ Affect quite a lot	☐ Affected moderately	☐ Affected slightly	☐ Affected not at all
6. Over the past 2 weeks, using communication strategies, how much were other people bothered by you hearing difficulties?	☐ Bothered very much	☐ Bothered quite a lot	☐ Bothered moderately	☐ Bothered slightly	☐ Bothered not at all
7. Considering everything, how much has using communication strategies changed your enjoyment of life?	☐ Worse	☐ No change	☐ Slightly better	☐ Quite a bit better	☐ Very much better

Appendix AC

Course Evaluation

Please answer the following questions as they relate to *The Listening Shift*.

1: Did you find the learning modules and activities interesting and engaging?

Not at all	Slightly	Moderately	Very	Completely

2: Did you enjoy doing the learning modules and activities?

Not at all	Slightly	Moderately	Very	Completely

3: Were the learning modules and activities relevant to your hearing challenges at work?

Not at all	Slightly	Moderately	Very	Completely

4: Were you comfortable sharing your ideas and experiences on the modules' discussion boards?

Never	Rarely	Sometimes	Often	Always

5: Were the strategies taught in the course useful when working in telepractice?

Not at all	Slightly	Moderately	Very Much	Extremely

6: Did reading about others' experiences with the strategies on the discussion boards make you feel more confident in managing calls?

Not at all	Slightly	Moderately	Very Much	Completely

7: Did encouragement from your instructor increase your confidence in managing difficult-to-hear calls?

Not at all	Slightly	Moderately	Very Much	Completely

9: Relative to other popular websites (e.g. YouTube, Facebook), did you find the *Openlearning* website and *Listening Shift* modules easy to use?

Not at all Slightly Moderately Very Much Completely

10: How satisfied were you with the course overall?

Not at all Slightly Moderately Very Much Immensely

11: How much did the course benefit you overall?

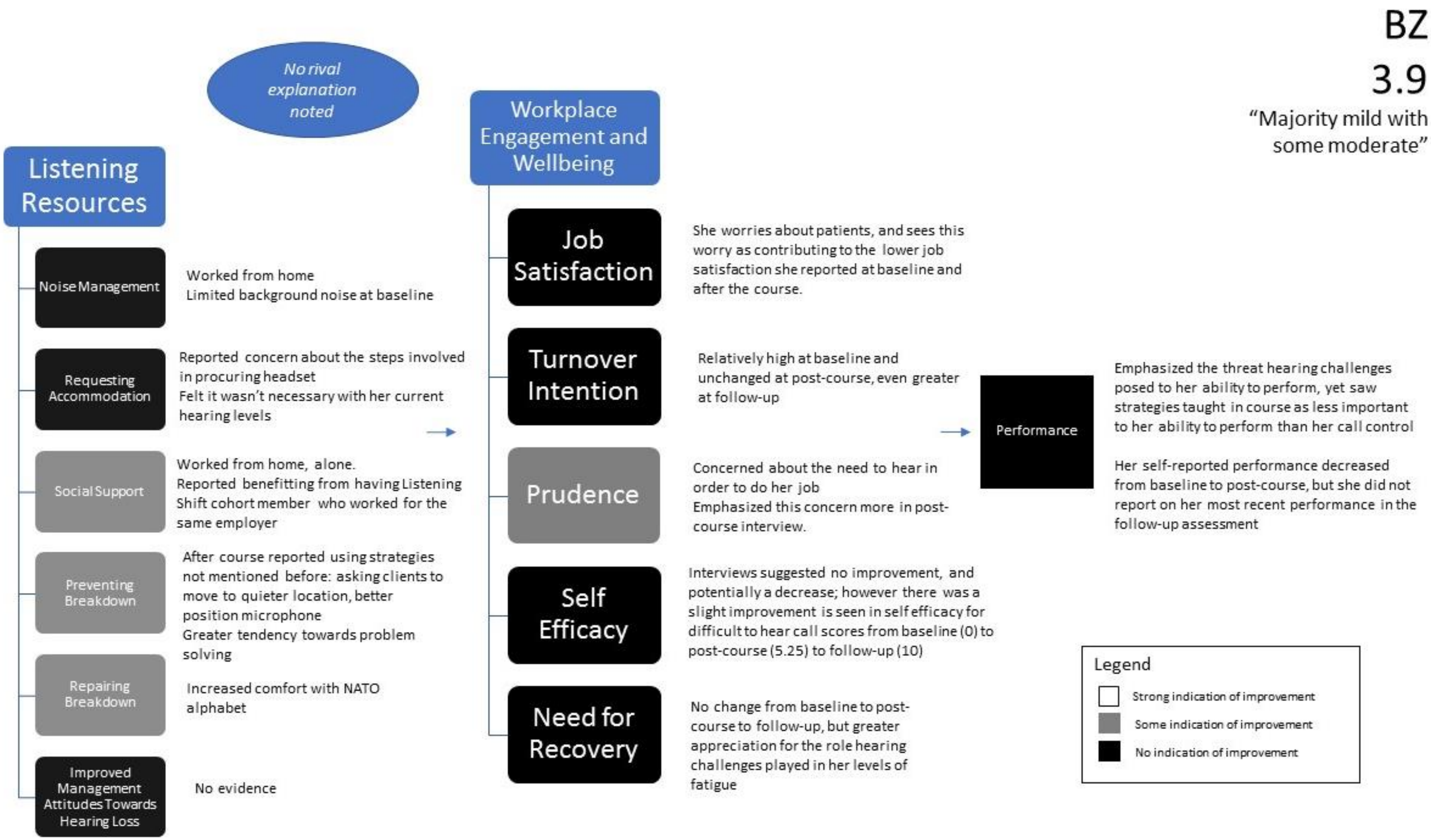
Not at all Slightly Moderately Very Much Immensely

Appendix AD

Within-Case Logic Models: Theory-Driven and Data-Driven.

Here I provide the theory-driven and data-driven logic models for each case. Each model is followed with a brief description. The theory-driven logic models were built following the proposed logic model for the program (Figure 10). A legend indicates the level of evidence supporting improvement in each of the categories of interest, with black indicating no evidence of change, grey indicating some evidence of improvement, and white indicating strong evidence of improvement. The evidence itself is described in the caption next to each of the models' concepts. A summary of these findings is provided below each theory-driven logic model. The data-driven logic models contain basic categories joined to form interpretive categories. These interpretive categories are labelled in italics and described below the models. These interpretive categories contributed to the across-case logic model (Figure 18). The top right hand corner of each model indicates, from top to bottom, the participant's pseudo-initials, their satisfaction with the course (on a scale of 1 to 5), and their level of hearing loss, as assessed by the Quick Hearing Check and if provided, by audiometric testing.

BZ: Theory-Driven Logic Model



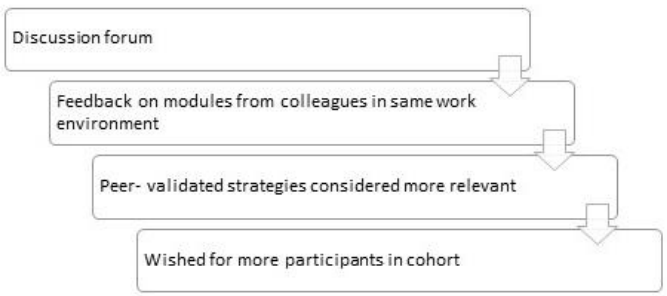
BZ performed telephone triage. Her score on the Quick Hearing Checklist suggested a mild hearing loss and she rated her the course at 3.9 out of 5 on the course evaluation. According to the proposed logic model (Figure 10), the introduction of listening resources in the form of strategies balances the additional listening demands nurses with hearing challenges face, leading to increased performance, as mediated by improved job engagement. BZ demonstrated an increase in listening strategies, but improvements in job engagement and wellbeing did not follow from this, neither did improved performance.

BZ: Data-Driven Logic Model

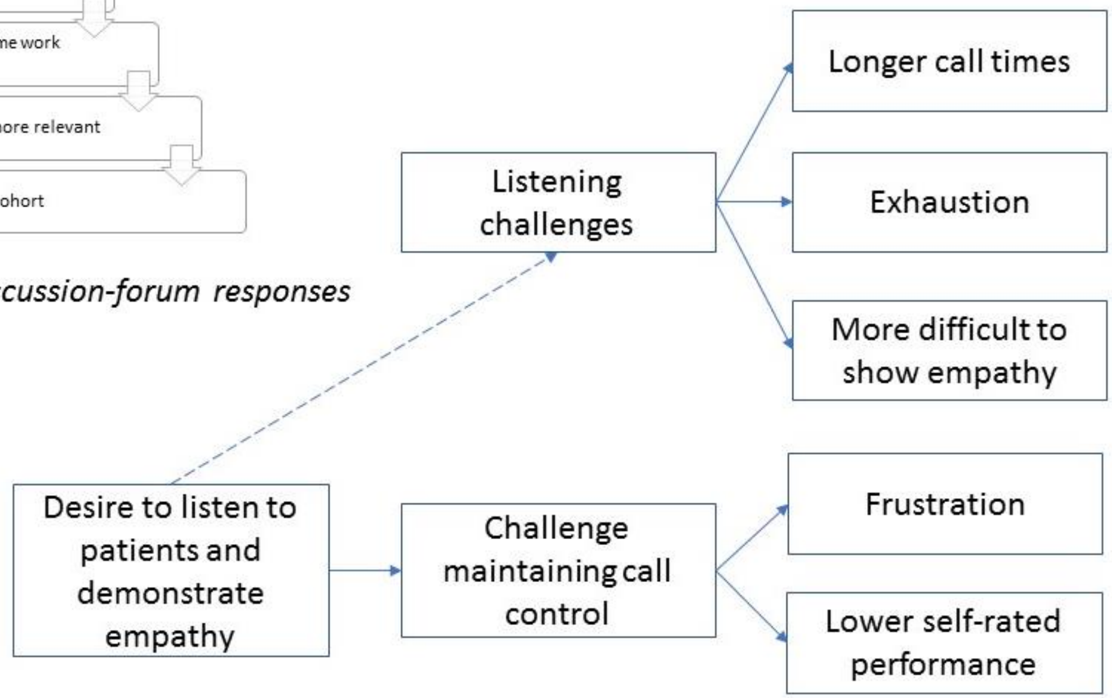
BZ

3.9

"Majority mild with some moderate"



Benefits from coworkers' discussion-forum responses



Wishes to listen and be empathetic, finds this to be inconsistent with call control and the management of hearing challenges. Tensions harms wellbeing and performance

Description of Interpretive Categories

Desire to listen and be empathetic make call control and the management of hearing challenges more difficult; this harms wellbeing and performance

At baseline, BZ described a strong commitment and tendency towards listening to clients and expressing kindness and empathy. Unfortunately, this limited her ability to maintain the call control required to work efficiently within a call-centre. This need to perform call control, and act in a way that was inconsistent with her values and personality led to frustration on her part and led her to self-rate her performance as lower than her peers.

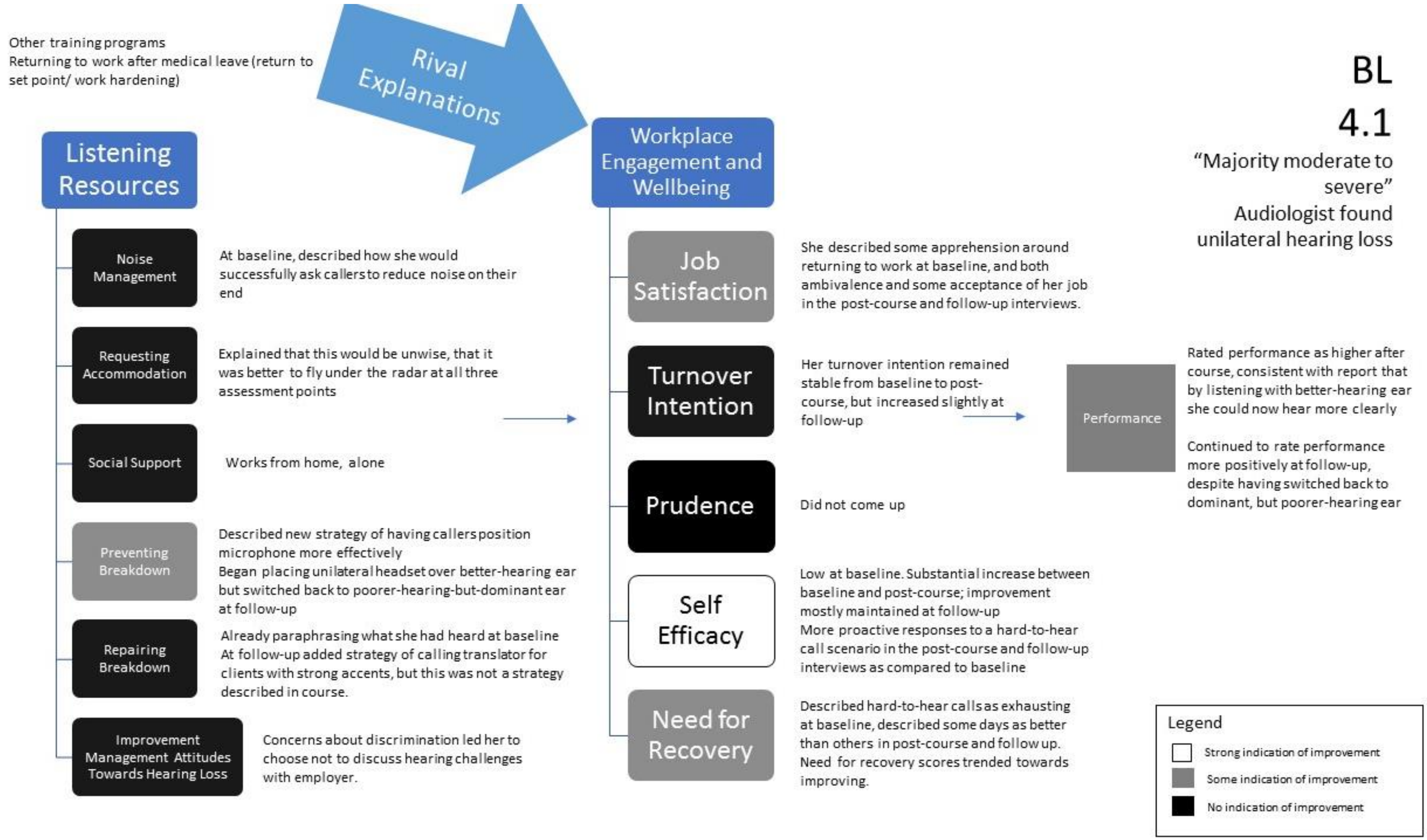
In a similar way, BZ's desires to treat clients with care made it harder for her to use certain communication strategies (e.g. interrupting clients to ask for clearer speech). The hearing challenges she faced extended her call times, created fatigue, and taxed her empathy.

The connection between BZ's 'desire to listen to patients and demonstrate empathy' and her 'listening challenge' is represented by a dashed line. This dashed line reflects the weak evidence supporting how her desire to listen and show empathy interfered with her ability to assertively guide clients towards clearer communication.

Benefits from coworker's responses to strategies

BZ reported valuing comments made by a work colleague of hers that also participated in her Listening Shift cohort. As a result of their shared job description, she felt that she could better rely on the comments and elements of the course endorsed by her peer. The positive outcomes of the discussion forum are represented by the vertical flowchart on the top left.

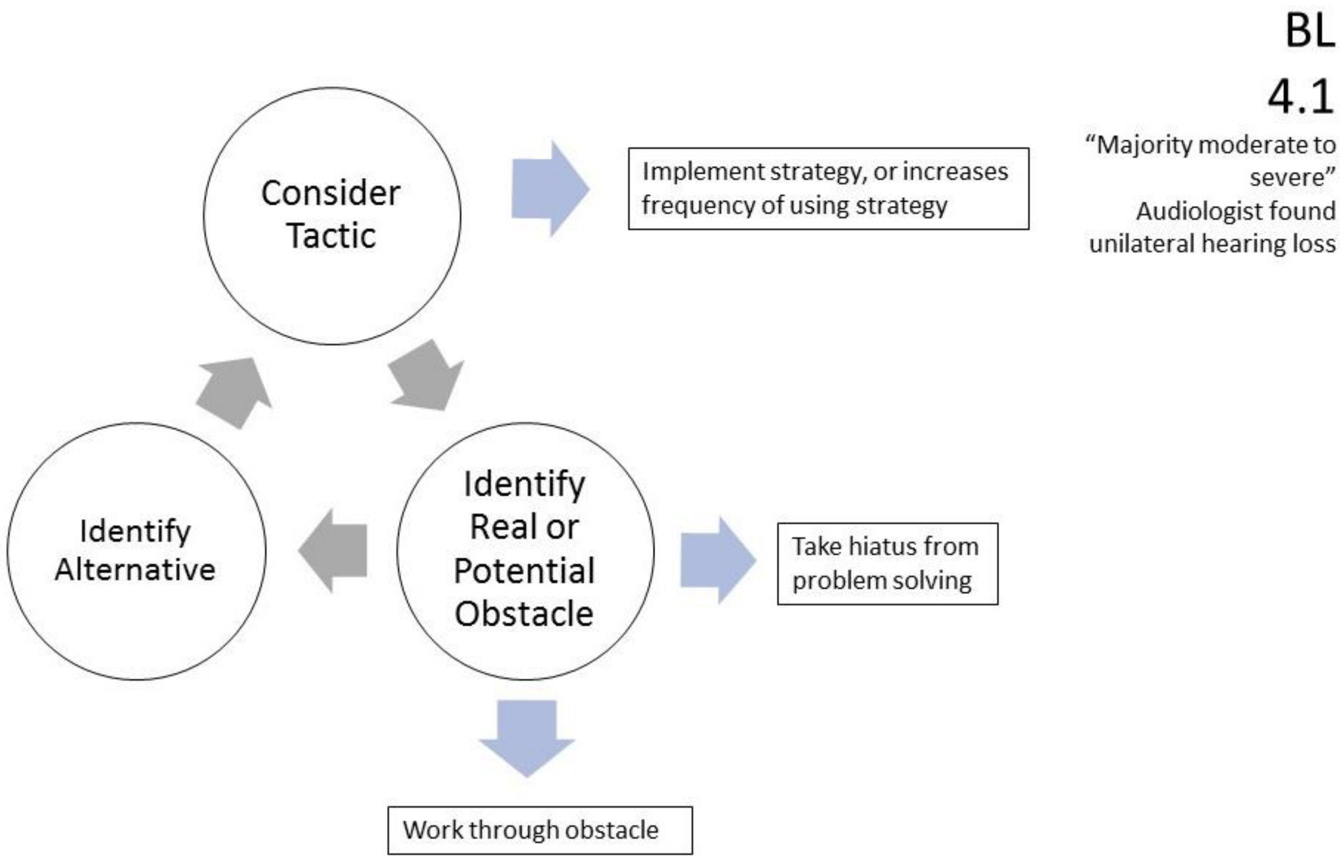
BL: Theory-Driven Logic Model



BL performed telephone triage and rated the course as 4.1 out of 5 on the course evaluation. The Quick Hearing Check suggested a moderate to severe hearing loss, and while she was not able to pass long her audiogram from her audiologist, a hearing test revealed that she had a unilateral hearing loss.

After the course, BL demonstrated an improved ability to prevent communication breakdowns, as well as improved workplace engagement and wellbeing in the form of job satisfaction, self-efficacy and reduced need for recovery after work. She also rated her performance more favorably after the course. However, some of these changes may have been due to other workplace training programs she participated in concurrently. Some of these changes may also have been linked to her reacclimatizing to her work after having taken time off (i.e. work hardening).

BL: Data-Driven Logic Model



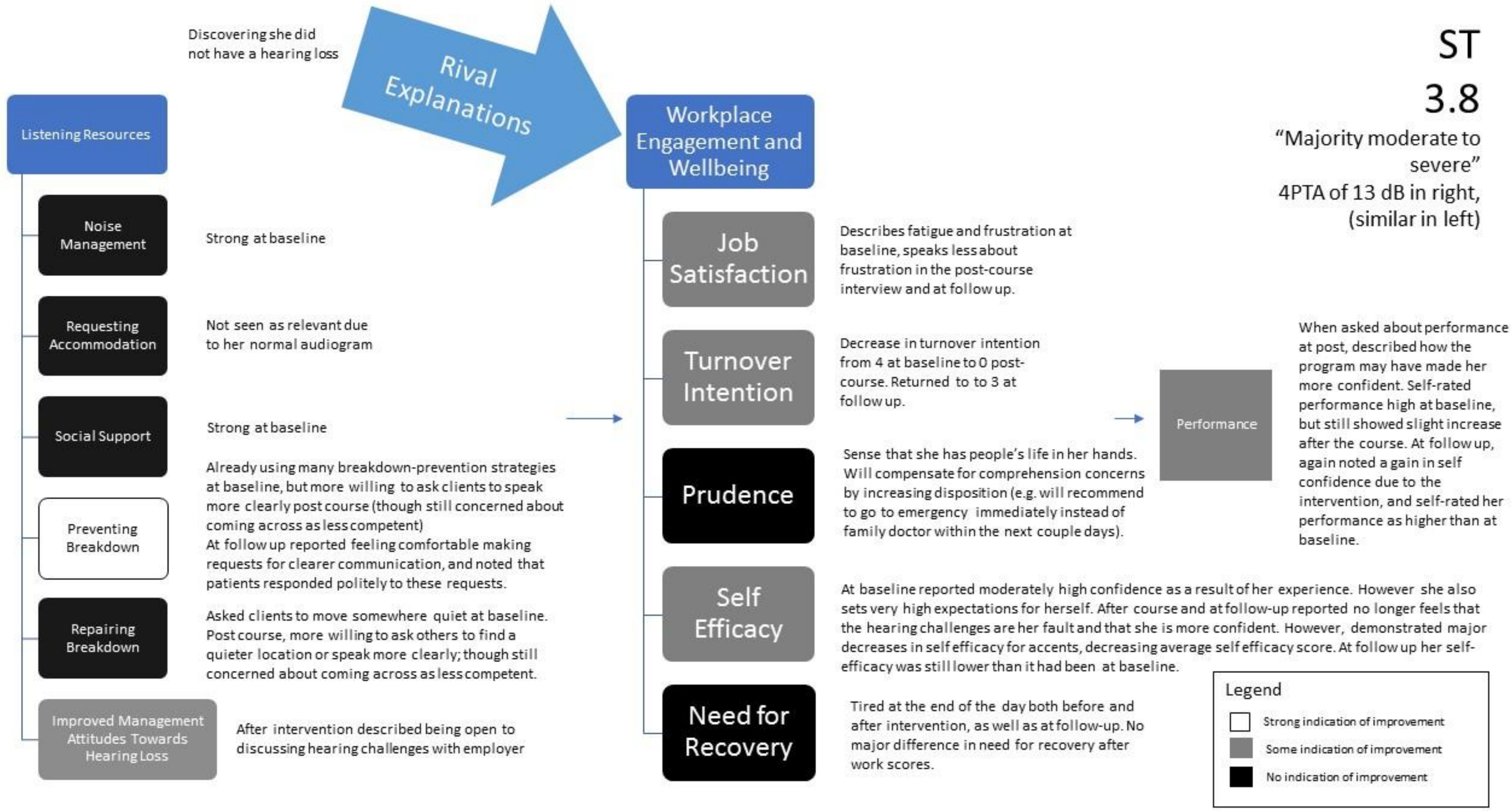
The problem-solving cycle

Description of Interpretive Category

The problem-solving cycle

At baseline, BL was already using some of the strategies taught in the course. After the intervention, she began to use some of these (e.g. paraphrasing) more frequently. Other strategies, however, required a protracted problem-solving process. For example, it was recommended that she switch to using her unilateral headset with her better ear. She tried this initially and reported, with satisfaction, that it improved intelligibility. However, at follow-up, she reported that it felt so odd to her that she returned to using her poorer-hearing but dominant ear. This did not represent the end of the problem-solving process as she had identified an alternative. At that point, she was considering procuring a binaural headset, depending on the outcome of her upcoming ENT appointment. However, procuring a bilateral headset required further problem solving. She worried about the ramifications of requesting a headset as an accommodation after having just returned to work. She looked into finding a connector that would allow her to use a dual-ear headset she already owned with her dialing system. Finding this connector proved difficult. She decided to wait for the ENT appointment to make a decision about a headset. Across various strategies, BL considered the tactic and implemented it only if she perceived no barrier to implementation. In the case of barriers, she persisted in either working through the barrier or identifying an alternative. At times, however, she would dismiss the tactic and leave the problem-solving cycle temporarily. For example, before the course, BL had been encouraged to see an audiologist by her family physician, but other priorities had led her to delay help-seeking.

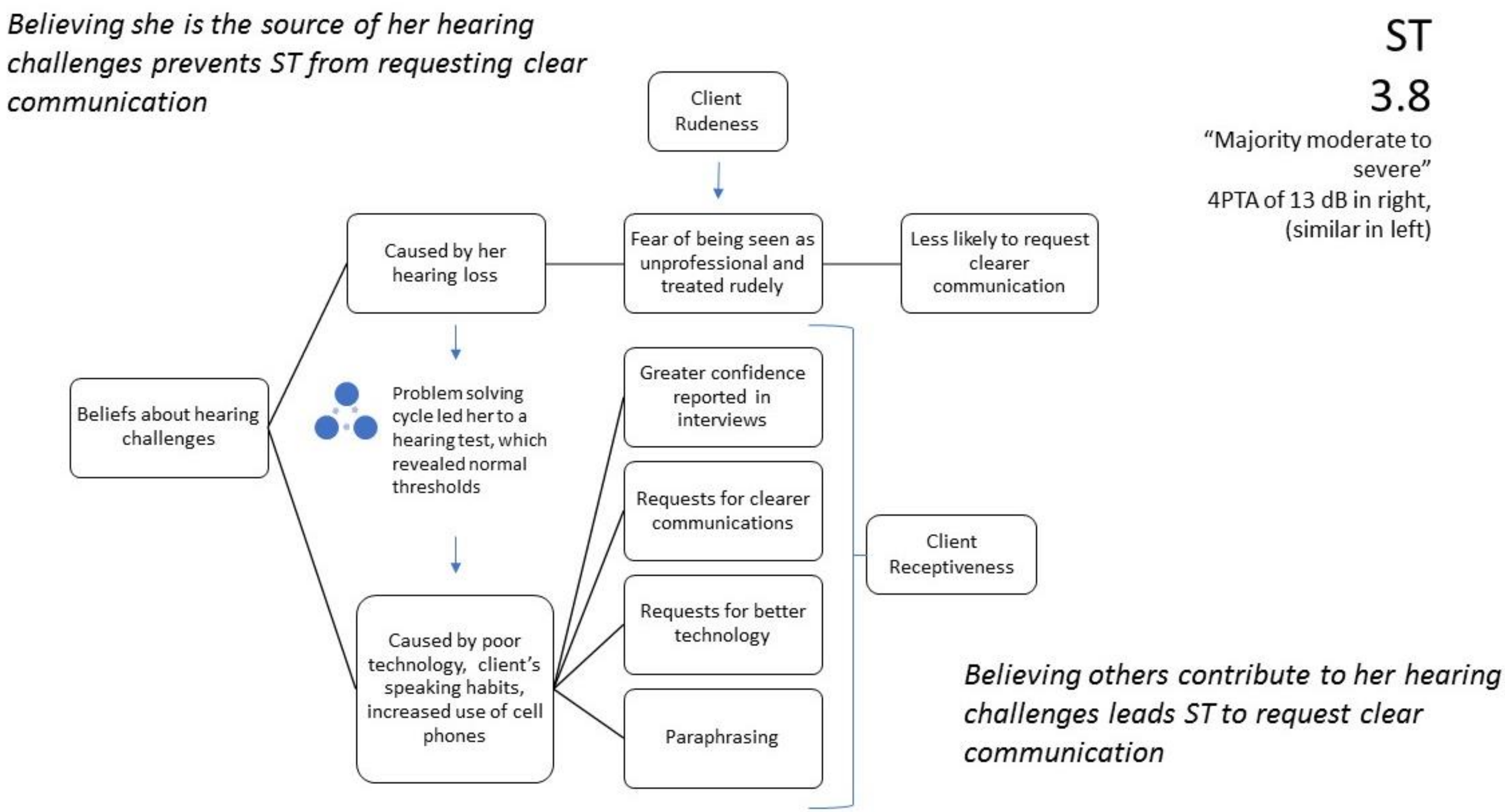
ST: Theory-Driven Logic Model



ST performed telephone triage and rated the course as 3.8 out of 4 on the course evaluation. The Quick Hearing Check suggested she was experiencing a moderate or severe hearing loss, but audiometric testing revealed thresholds within the normal range.

After the course, ST demonstrated an uptake of strategies for preventing breakdown and the potential for improved management attitudes towards hearing loss. She also, in turn, gave some indication of improved job satisfaction, reduced turnover intention, and increased self-efficacy. Her interviews and self-reported performance on the WHO Work and Health Performance Questionnaire also provided some indications of performance improvements (although it was already high at baseline) after the intervention. Having her hearing tested as part of the course and learning that she did not have a hearing loss contributed to her increased confidence in using communication strategies, and her self-efficacy in managing hard-to-hear calls. This discovery may also have contributed to changes seen in her job satisfaction, turnover intention, and performance.

ST: Data-Driven Logic Model



Description of Interpretive Categories

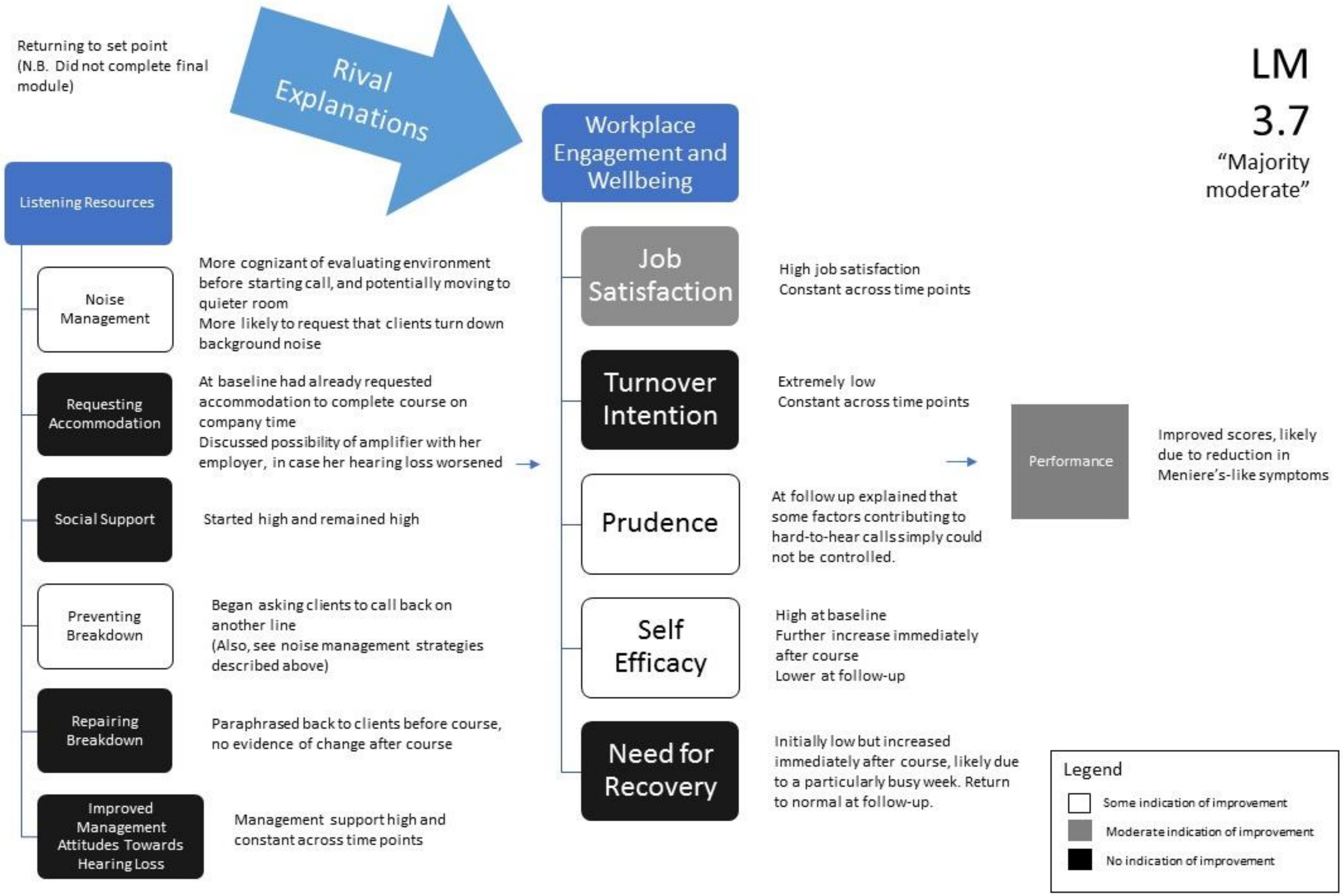
Believing she is the source of her hearing challenges prevents ST from requesting clear communication

ST joined the program with an interest in managing the rudeness she sometimes faced in response to misunderstanding her callers. She had originally believed that she was losing her hearing and seen these misunderstandings as being caused by her alone. She was reticent to ask callers to communicate differently in order to accommodate what she perceived as a limitation on her part. This belief and its implications are represented on the upper branch of the 'Beliefs about hearing challenges' flow chart.

Believing others contribute to her hearing challenges leads ST to request clear communication

As part of the intervention, ST saw an audiologist to have her hearing tested. The test revealed that her thresholds were well within the range of normal. This led her to feel more confident in making a variety of different requests for clear communication. In the follow-up interview, she reported that patients responded politely to her current strategies for managing telephone hearing challenges, in contrast to her original experiences where they were rude. This changed belief and its implications are represented on the lower branch of the flowchart.

LM: Theory-Driven Logic Model



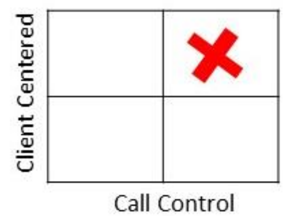
LM worked as a health promotion nurse, performing outbound health promotion calls. She rated the course as 3.7 out of 5 on the course evaluation and the Quick Hearing Check suggested she was experiencing a moderate hearing loss. LM struggled with aural fullness and repeated audiometric testing identified fluctuating hearing thresholds.

After the course, LM adopted strategies for managing noise and preventing communication breakdown. She also reported higher self-efficacy for managing hard-to-hear calls after the intervention. She also demonstrated a greater degree of prudence after the intervention; in her follow-up interview she described to me how some listening challenges simply could not be controlled, even with strategies. She did report higher levels of performance after the program, however, this improvement may be due to improvements in her auditory symptoms over the same period.

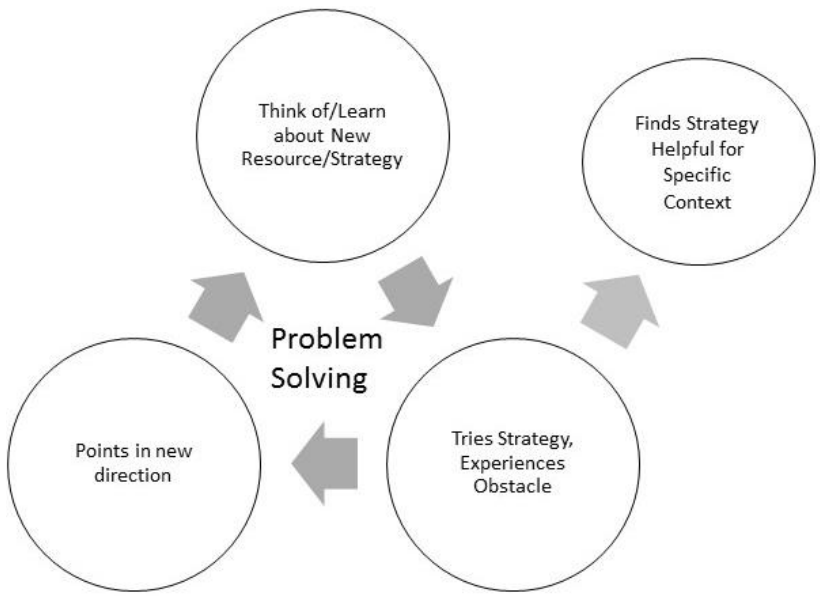
LM: Data-Driven Logic Model

LM
3.7
"Majority moderate"

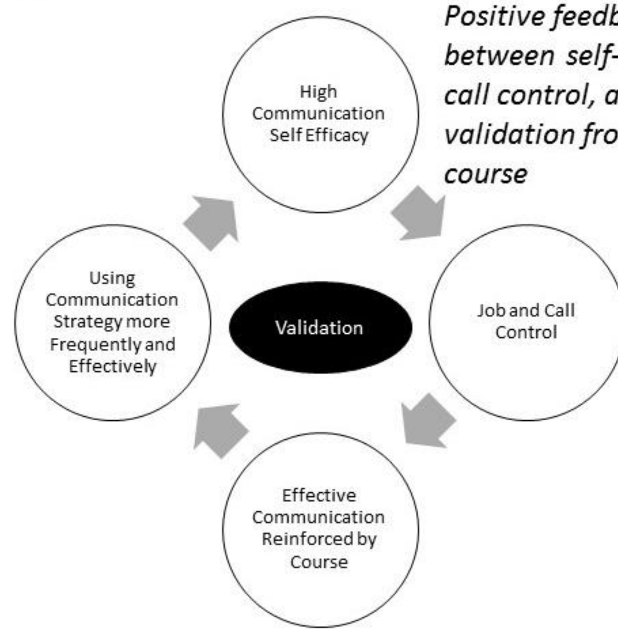
Client-centred call control



Problem solving cycle



Positive feedback loop between self-efficacy, call control, and validation from the course



Description of Interpretive Categories

Problem-solving cycle

LM's efforts to implement recommended strategies were not immediately met with success. She needed to find ways to adapt these strategies to her unique situation, and this involved a problem-solving cycle. For example, as recommended by the program she saw an audiologist to have her hearing assessed. However, as her hearing fluctuates, the test did not find a significant loss. It was not until she was tested later as part of an ENT appointment that the loss was noted. This cyclic nature of testing strategies, and needing to persist in trying alternatives when the strategies did not work is represented through the problem-solving cycle on the left.

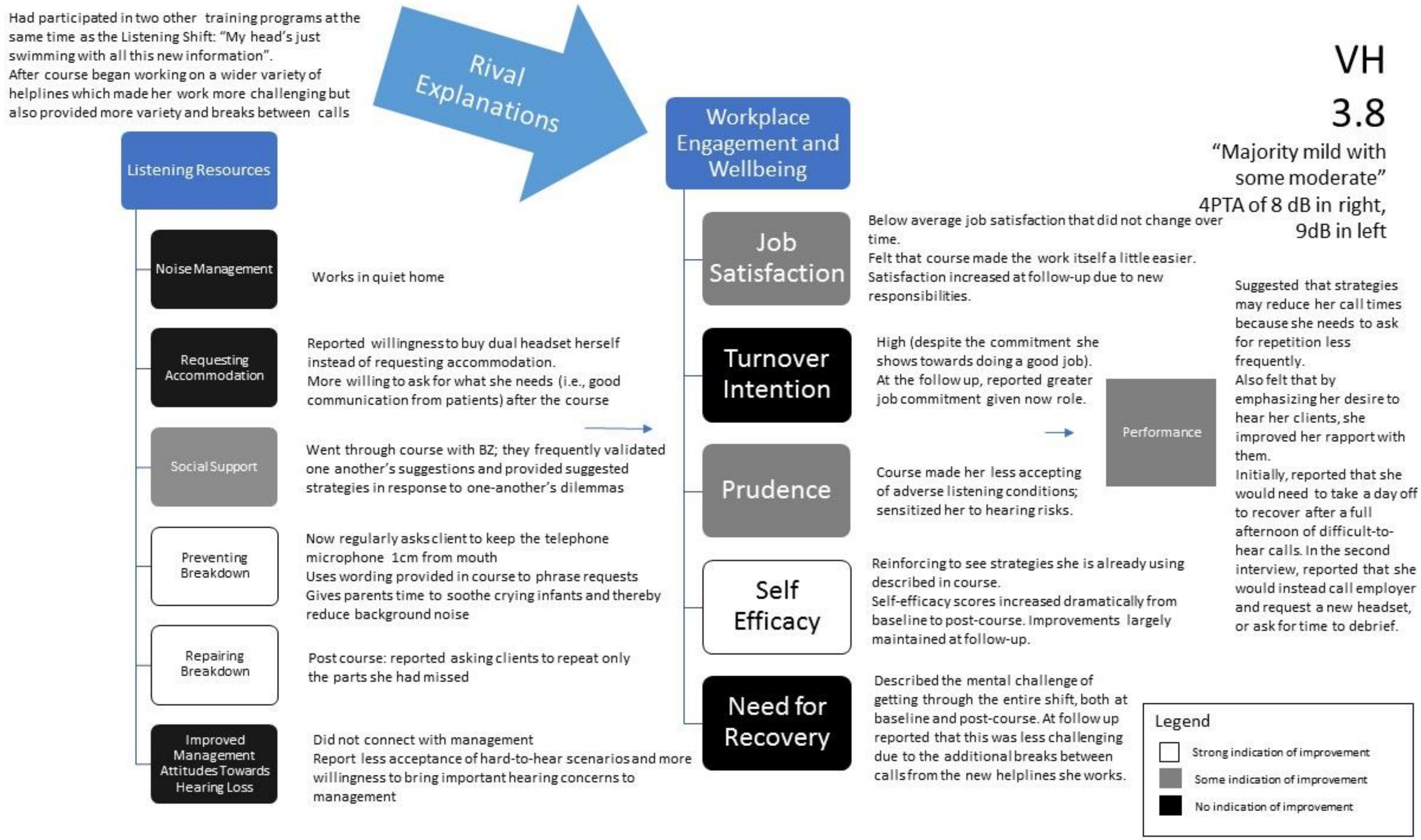
Positive feedback loop between self-efficacy, call control, and validation from the course

LM's self-efficacy may have contributed to her persistence in finding and implementing additional effective strategies. At baseline, LM already had high communication self-efficacy. This self-efficacy was further reinforced by discovering that she was already implementing many of the strategies recommended by the program. Her confidence and skill in communicating procured for her greater call control. Her employer gave her free reign in developing health promotion programs, this in turn, gave her control and flexibility in how she spent her time, allowing her to optimize her performance and wellbeing at work. The respect she had with her colleagues also helped her manage her Meniere's-like symptoms. When she comes to work on a bad day, her manager and colleagues told her to go home; she did not need to request to take the day off. This virtuous cycle is represented by the validation cycle on the right.

Client-centred call control

LM's strong communication skills centre on motivational interviewing, where she leads the call but the client is the decision maker. This leads to a form of call leadership represented by the position of the red 'x': high along both the client-centred axis and the call control axis.

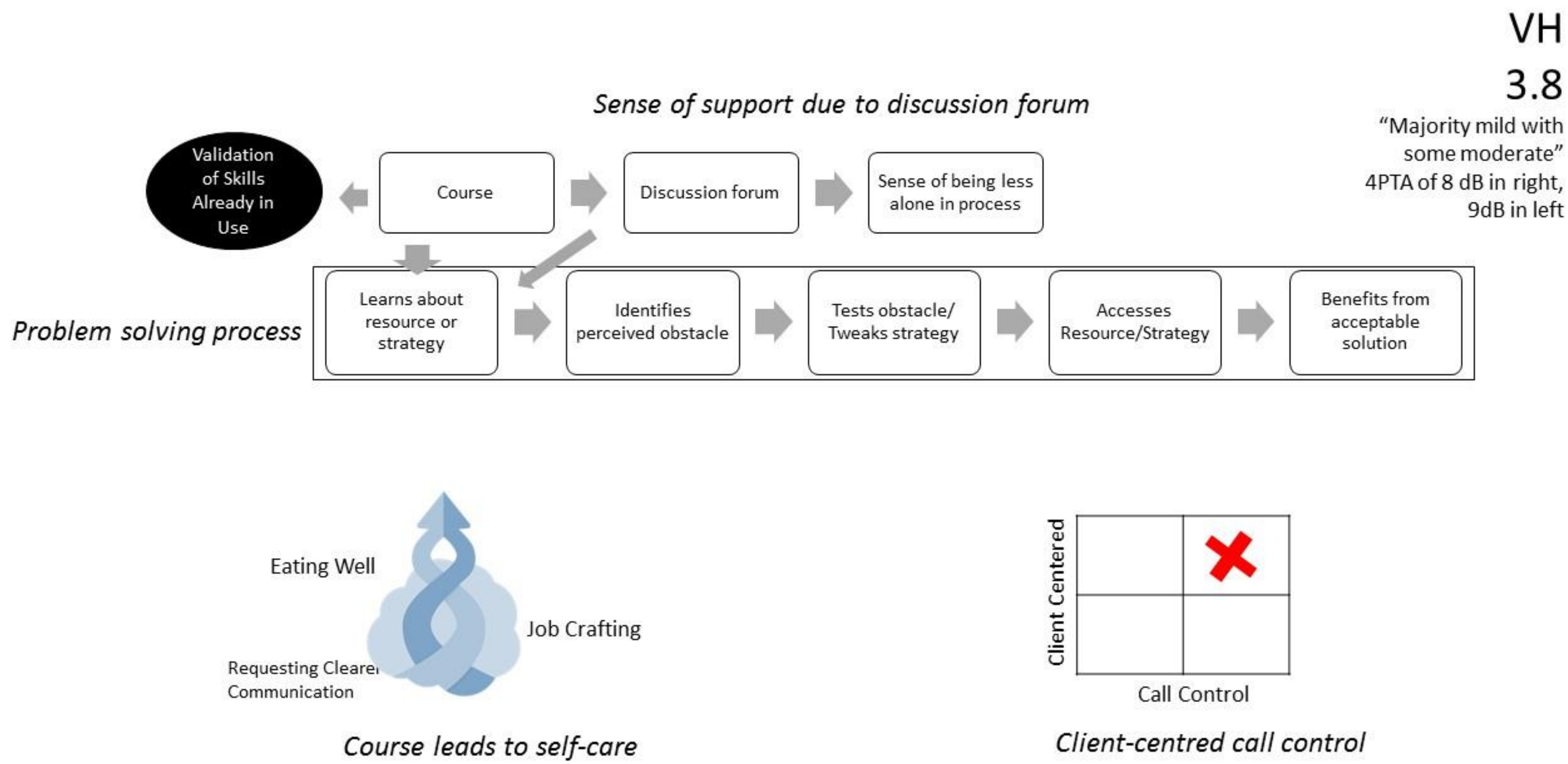
VH: Theory-Driven Logic Model



VH worked on a variety of nursing helplines, including crises lines and telephone triage. She rated the course at 3.8 out of 5 on the course evaluation. The Quick Hearing Check suggested she experienced a mild or perhaps moderate hearing loss, but audiometric testing revealed normal thresholds bilaterally.

After the course, VH adopted a variety of strategies for preventing and repairing communication breakdowns. She also benefitted from the social support associated with having another nurse with hearing challenges in her cohort. She reported higher self-efficacy for hard-to-hear calls but reported that while the communication strategies she had learned made the work easier, they didn't change her satisfaction with the work itself. Rather, her satisfaction with the work improved as a result of her taking on more responsibilities between post-course and follow-up, which provided her with more challenges, variety, and opportunities for short breaks between calls. She did, however, believe that the strategies positively contributed to her performance and demonstrated this when asked how she would respond to a hypothetical situation in which her headset was not working. At baseline, she explained that she would need to take time off after such an experience to recover. After the intervention, she described using more proactive strategies, including requesting a new headset.

VH: Data-Driven Logic Model



Description of Interpretive Categories

Problem-solving process

VH, like the other participants, had to engage in a problem solving in order to match strategies to her needs. However, her process more reliably led to successful outcomes than the processes of her peers. While the problem-solving process of other participants was represented as circular, hers is represented as a linear chain of events. While other participants saw the strategies as prescriptions, VH saw them as a source of inspiration. She invested time in finding ways to modify strategies and apply them to her life, despite perceived obstacles. For example, the course described the benefits of a telephone amplifier. An amplifier had been provided to her through her employer and she had been using it for years, but she took time to re-read the manual, used what she learned to modify the amplifier to make her own voice clearer to patients, and then shared this strategy on the forum. VH's process required a greater investment of personal time, but VH (and the fellow participants who read her comments) benefitted as a result. VH suggested that the course had made her more efficient, and her work easier.

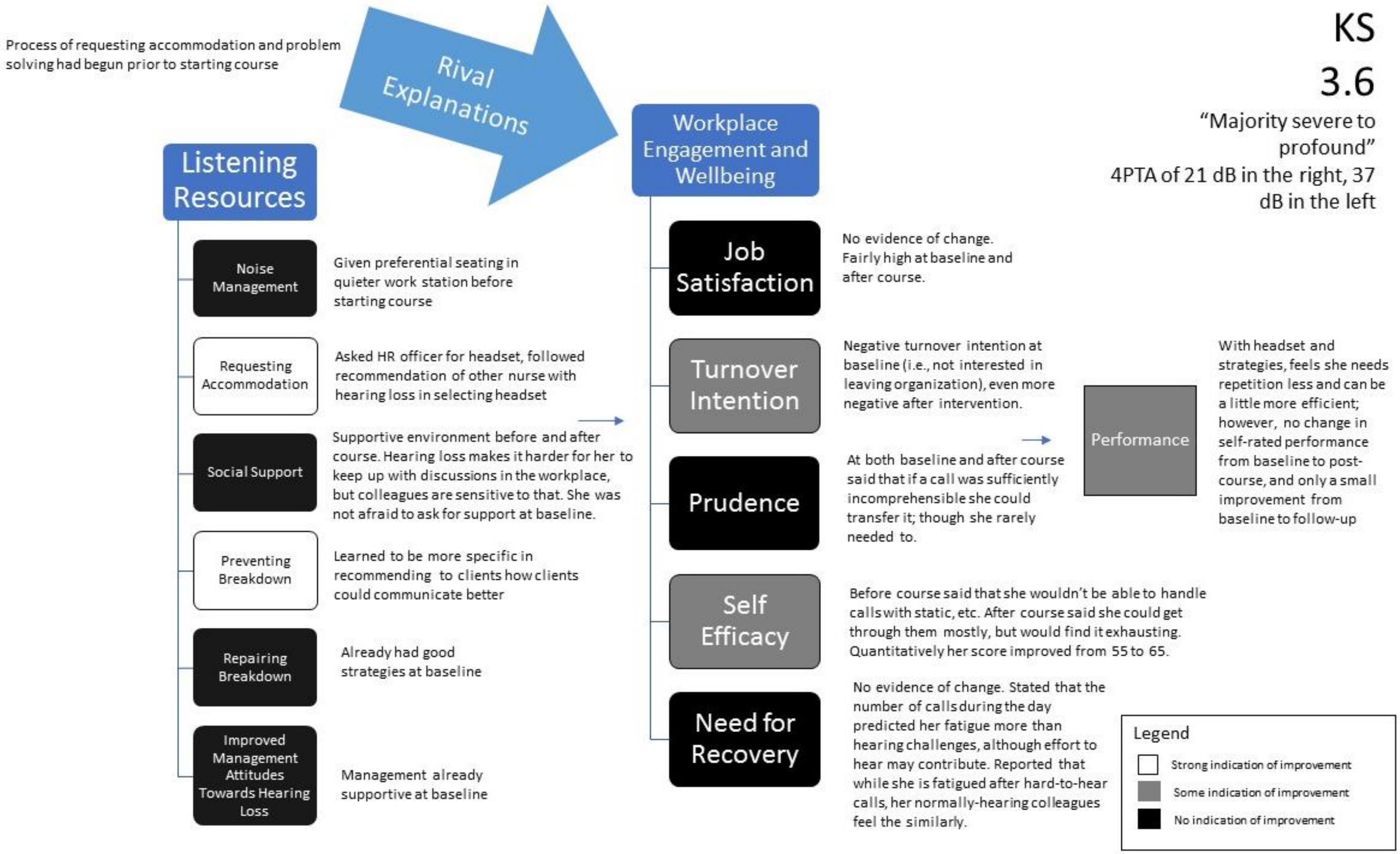
Client centered call control

VH also described a new sense of purpose around hearing challenges. She explained that they were no longer acceptable to her and that she now advocates in order to rectify them. Thus while it is in the interest of the organization and clients, as well as nurses like VH to advocate for clear communication, VH is willing to take a leadership role to advocate for what everyone needs to for successful telephone advising: clear speech. Her style is characterized by telling clients: "I want to help, hearing you matters to me", thereby giving the client the sense that "ahhh, somebody wants to hear...listen and is going to be there for me". She looks for win-win solutions to hearing challenge, such as giving the mother time to soothe her baby when the infant's cries are making the mother's speech less intelligible. She treats the caller as an intelligent equal, by for example asking if they have the television on in order to soothe their fussy infant, before asking them to turn it off for intelligibility reasons. Her expressed goals are patient centered: ensuring that patient’s feel heard, and that they don’t need to repeat themselves while sick. She meets these goals by taking leadership in the call.

Course leads to self-care

VH reported that as a result of the course she was not only making more requests for clear communication, but she was also engaging in other self-care activities, such as eating better and drinking more water. She described how the course had led her to think about the next 15 years in her career and how she needed to take care of herself in order to be able to continue working. During the period of the course, VH also took on new job roles, taking responsibility for different call lines (crises lines, palliative care lines etc.) in addition to the traditional telephone triage calls. Having made this change provided more diversity, challenge, and meaning in her work. This improvement in the management of her hearing challenges, physical health, and the nature of her work is represented through the intertwined upward arrow.

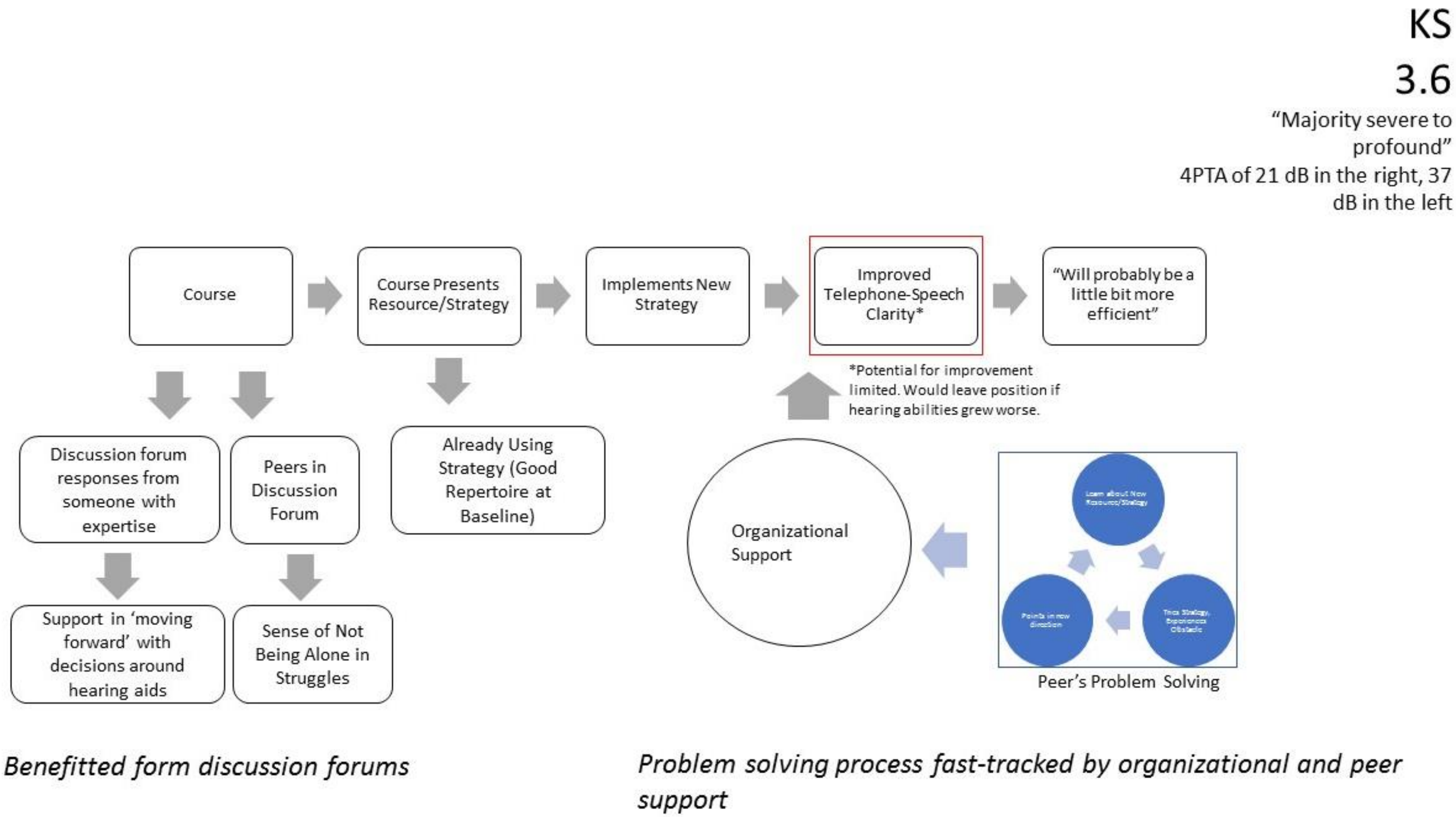
KS: Theory-Driven Logic Model



KS took calls as a public health nurse, answering questions about immunization, breastfeeding, etc. She rated the course 3.6 out of 5 on the course evaluation. The Quick Hearing Check suggested a severe degree of hearing loss. However, audiometric testing revealed a slight hearing loss in the right ear and a moderate hearing loss in the left.

After the intervention, KS described providing clients with more specific guidance in how to communicate more clearly. She also requested and was granted a binaural, noise-attenuating headset. This was associated with small decreases in her turnover intention and small increases in her self-efficacy for difficult-to-hear calls. She also indicated a small increase in self-reported performance from post-course to follow-up (the period in which she began using her new headset). She could not provide concrete evidence that the headset improved her performance, but hypothesized that by increasing clarity and reducing background noise it allowed her to be more present with her callers.

KS: Data-Driven Logic Model



Description of Interpretive Categories

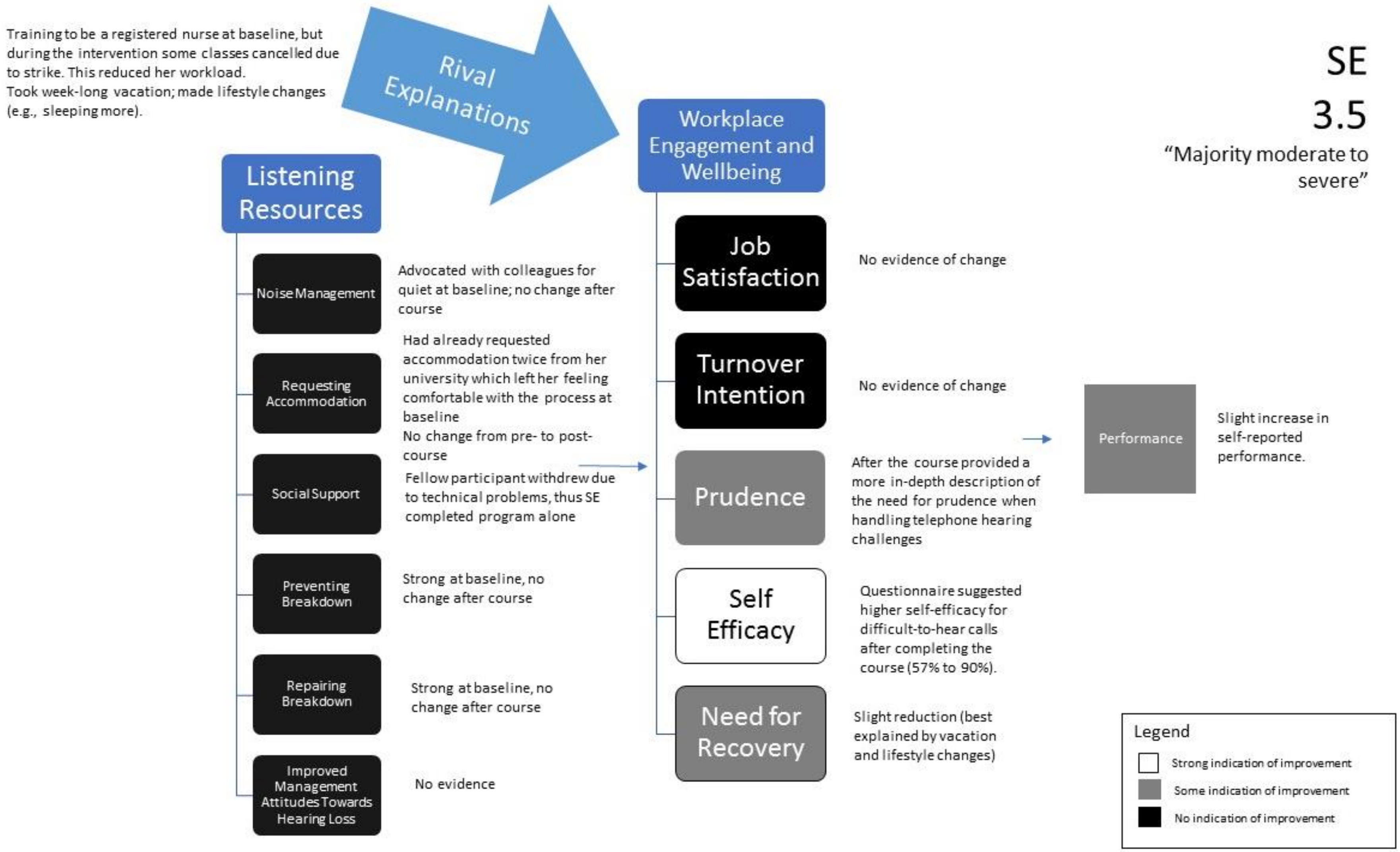
Problem-solving process fast-tracked by organizational and peer support

KS entered the program having already gained an important win. Her employer and coworkers knew that she had a hearing loss and when workstations in the office were rearranged, she requested and was granted a quieter location against the wall rather in the centre of the room. Further to this, she requested and was granted permission to complete The Listening Shift on company time. This is represented through the circle labelled ‘organizational support’. KS had already undertaken many of the strategies described in the ‘listening strategies’ module herself. However, after learning about the benefits provided by a binaural noise-reducing headset, she contacted her human resources officer and her company agreed to purchase the headset for her. At this point, she learned that another employee was facing similar telephone challenges. This employee had already engaged in the problem-solving cycle, and had unsatisfactory results with various headsets before settling on a certain model. This more effective model was recommended to KS and she was satisfied with the outcome. The contribution of her colleague is represented by her peer’s problem-solving cycle contributing to the organization support KS experienced. This outlines the way the problem-solving cycle can be circumvented, saving time and money, when hearing challenges are managed organization-wide and individuals with similar challenges are connected. As a result of the headset and strategies, KS reported requesting repetition less frequently and is somewhat more efficient in her work. Her turnover intention also decreased from baseline to post-course. However, she still explained that the strategies could help, but they could not resolve her hearing challenges completely. Thus, if her hearing worsened she would choose to find another position within her health unit rather than allowing it to impact her performance.

Benefitted from discussion forums

KS also reported benefitting from interactions with peers within the course. The comments of peers in discussion forums allowed her to feel less alone. Being able to ask questions within the same forum, and receive answers from a facilitator with training in hearing sciences allowed her to prepare for future decisions around hearing aids. Hearing aids had been recommended to her previously, but she had not procured them at the time of her participation in The Listening Shift.

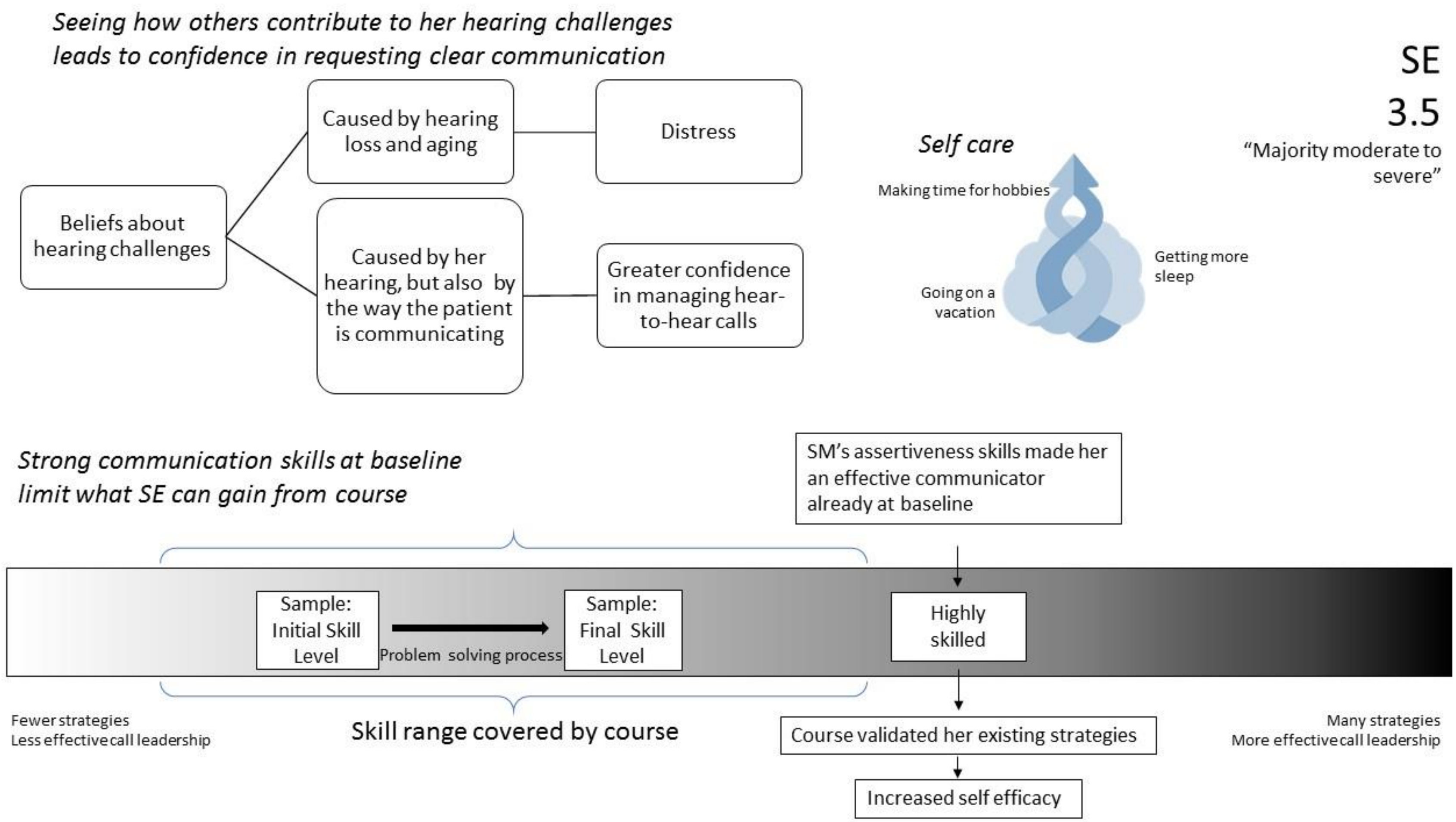
SE: Theory-Driven Logic Model



SE worked as an HIV clinic nurse and manager. She rated the course at 3.5 out of 5 on the course evaluation. The Quick Hearing Check predicted her loss to be moderate to severe, but she had normal thresholds. Rather, audiometric testing had identified auditory processing disorder.

SE already used assertive communication strategies to manage her hearing challenges at baseline, and there was little indication that the course supported her in adopting additional strategies and resources. However, she did report higher self-efficacy and performance after the intervention, perhaps because the course validated strategies she was already using. SE’s need for recovery decreased after participating in the course, but this is better explained by lifestyle changes that co-occurred with the intervention.

SE: Data-Driven Logic Model



Description of Interpretive Categories

Strong communication skills at baseline limit what SE can gain from course

At baseline, SE was already an assertive communicator, and she was already using many of the strategies taught in the course. A comparison of strategy use, as well as performance and wellbeing revealed few changes from baseline to post-course. However, SE did demonstrate a dramatic increase in her self-reported self-efficacy for managing difficult to hear calls. The range of skill levels for managing hearing challenges is represented through the gray-scale bar, SM's ability level is positioned further towards the end of the bar labelled 'Many strategies; More effective call leadership', representing how her competence exceeded that taught by the course (a range represented through the blue double bracket).

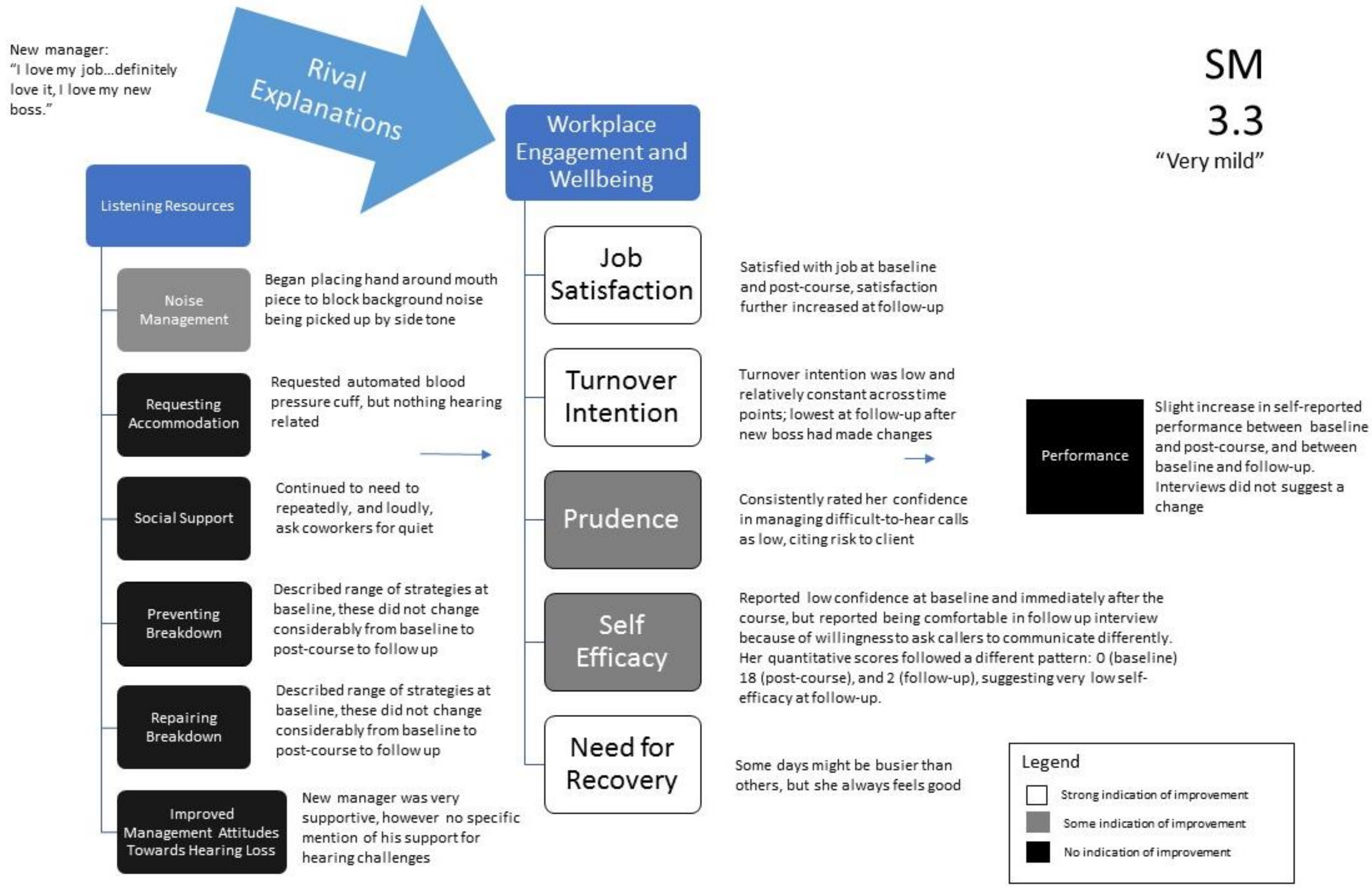
Seeing how others contribute to her hearing challenges leads to confidence in requesting clear communication

SE also provided insight into the cognitions that can come with hard to hear calls: worries that one is aging and losing their hearing. She reported that after the course these worries concerned her less. The course had given her an opportunity to consider and identify external sources of her hearing challenges, which in turn gave her more confidence in requesting clear communication to many these sources of hearing challenges.

Self-care

SE demonstrated positive self-care changes in areas of her life beyond her hearing challenges. She took the time to go on vacation and prioritized making time for hobbies and sufficient sleep.

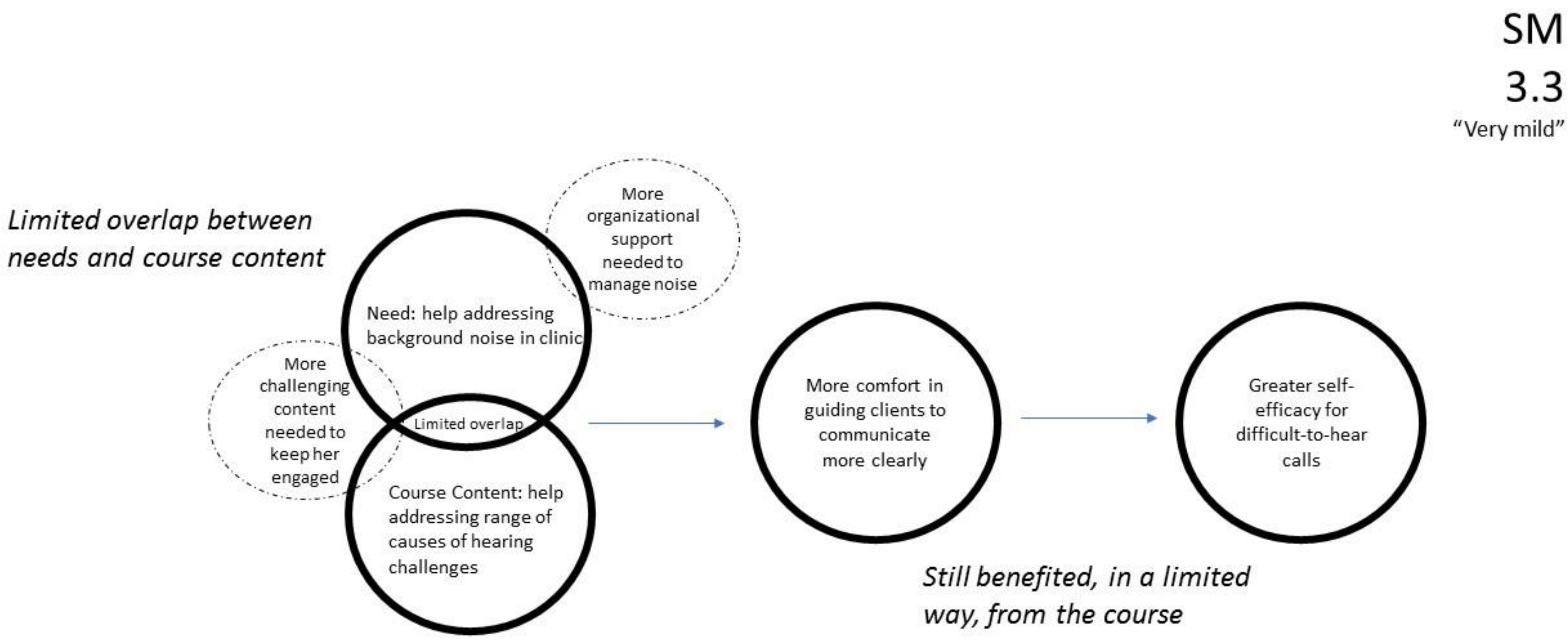
SM: Theory-Driven Logic Model



SM worked as a clinic nurse, calling patients about appointments, lab or imaging results, and their preventative care needs. She rated the course as 3.3 out of 5 on the course evaluation, and the Quick Hearing Check predicted any hearing loss to be very mild. The majority of SM's hearing challenges were related to background noise within her clinic.

According to the proposed logic model (Figure 10), the introduction of listening resources, in the form of strategies, balances the additional listening demands nurses with hearing challenges face, leading to increased performance, as mediated by improved job engagement. SM demonstrated a range of improvements in her workplace engagement and wellbeing, including improved job satisfaction, reduced turnover intention, and reduced need for recovery after work. These changes, however, were not linked to her adoption of new strategies, as she was already using a range of good strategies at baseline, and adopted few new listening resources during the course. Rather, these improvements were connected to a change in management. However, SM's self-efficacy for difficult-to-hear calls did improve from baseline to post-course, perhaps due to the course's validation of her pre-existing strategies for managing hard-to-hear calls. While her self-reported performance did increase from baseline to post-course, and from baseline to follow-up, the improvement was small and not reinforced by data from the interviews.

SM: Data-Driven Logic Model



Description of Interpretive Categories

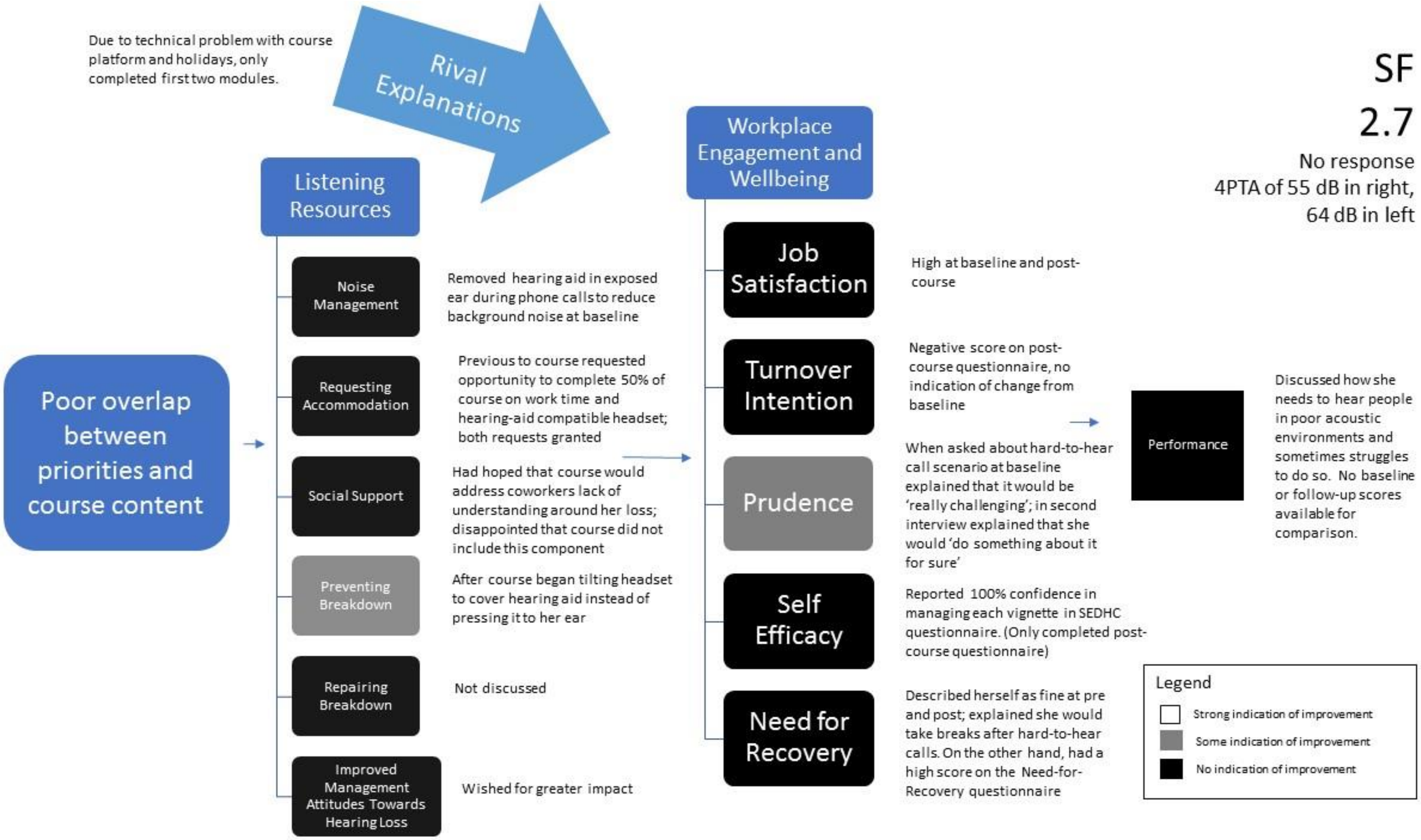
Limited overlap between needs and course content

SM's hearing challenges stemmed largely from the noisy clinic in which she worked. The program described a wide range of strategies relevant to telephone hearing challenges, but of these, only a limited number addressed background noise. Moreover, the strategies that were provided focused predominantly on what the individual could do to manage her hearing challenges. As the background noise was frequently caused by others talking loudly around her, heedless of her requests for silence, these recommendations were less relevant to her needs and priorities. This limited overlap between SM's needs and course content are represented by the Venn diagram. This case provides an example of why workers with hearing loss need organizational support as well as strategies. In addition, SM found the content insufficiently challenging. This could be in keeping with other participants' reports that they were already using the strategies described in the program.

Still benefited, in a limited way, from the course

As represented by the circle following the Venn diagram, SM did adopt some strategies for managing background noise, and she reported feeling more confident in guiding clients to communicate more clearly after the course. She demonstrated a quantitative improvement in self-efficacy at the post-course assessment although this finding did not persist follow-up.

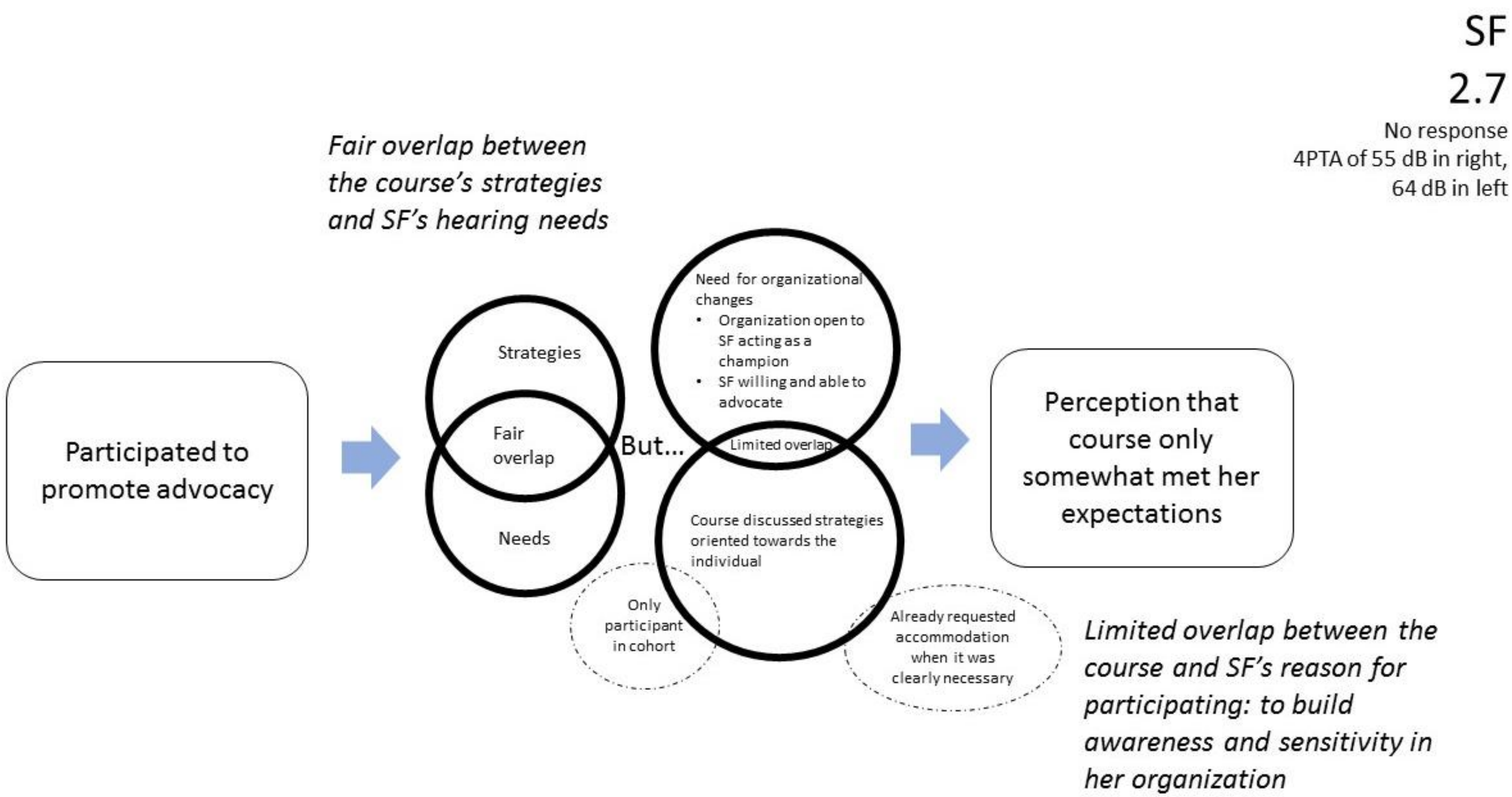
SF: Theory-Driven Logic Model



SF worked as a public health nurse, using the telephone to interact with colleagues and external organizations in meeting the community's health promotion needs. She rated the course as 2.7 out of 5. While she did not complete the Quick Hearing Check, she submitted an audiogram which demonstrated a moderate hearing loss bilaterally.

SF adopted few new strategies and there was no clear indication of improvements in her workplace wellbeing and engagement, nor were there clear improvements in her performance. This may have been due to a poor overlap between SF's expressed priorities, and the course content. It may also have been due to two problems which came up during her interactions with the program. First, a potential participant dropped out at the last minute, leaving SF was alone in her cohort. Second, technical difficulties with the platform prevented her from using the interactive components of the course. Perhaps for these reasons, SF only completed the first two modules of the course.

SF: Data-Driven Logic Model



Description of Interpretive Categories

In the problem-solving cycle seen in other participants' cases, the individuals try out strategies (e.g. seeking help from audiologists and physicians) and frequently discover obstacles which prevent these professionals or strategies from fully addressing their problem. SF provides an example of where The Listening Shift itself was sought out but could not provide the help needed.

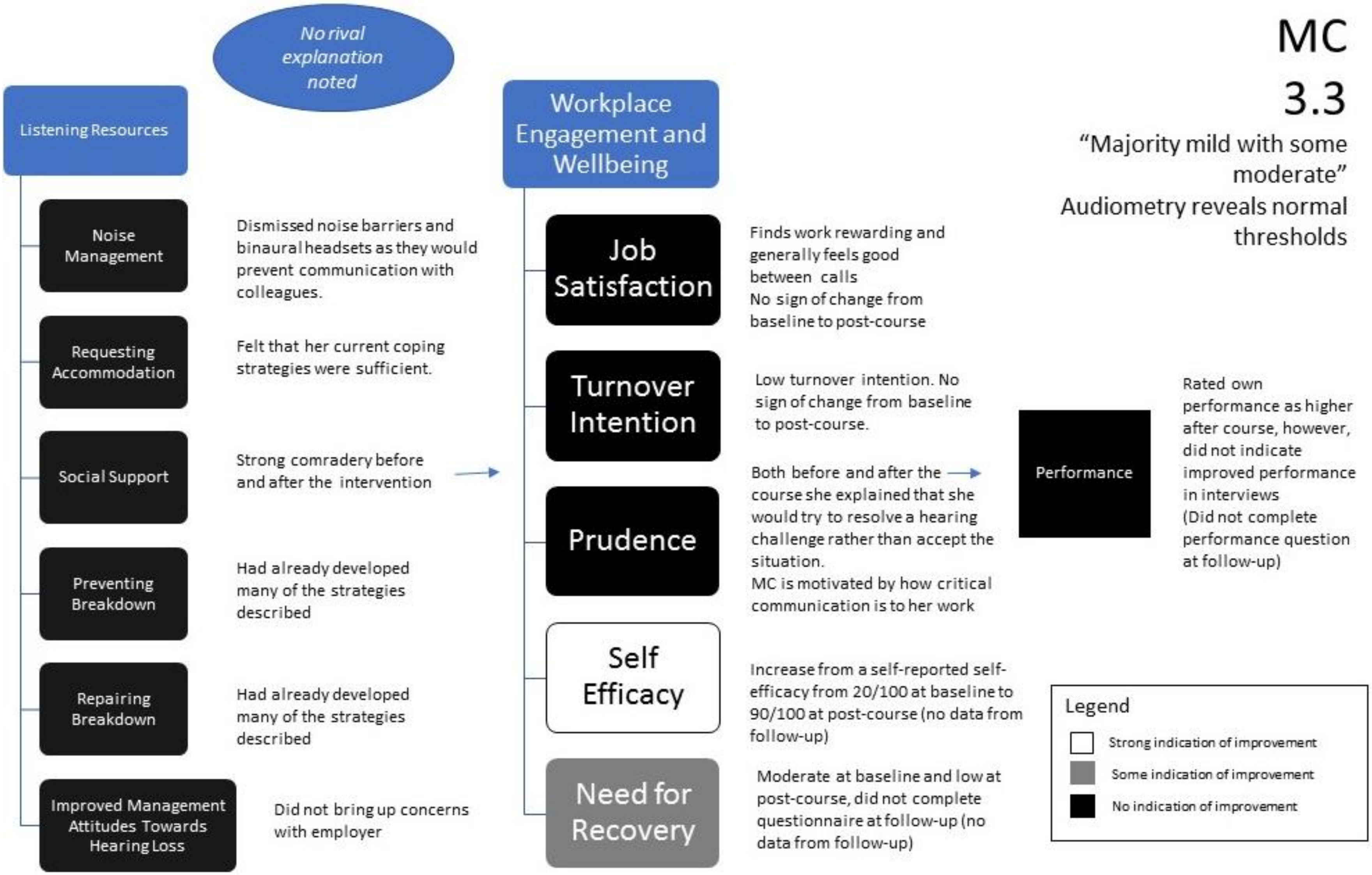
Fair overlap between the course's strategies and her hearing needs

The course's content did provide a fair overlap with the hearing challenges SF faced, and she did adopt certain strategies described in the course. SF was struggling with insufficient amplification on her phone, and challenges coupling her hearing aid to her telephone. Strategies for such problems were addressed in the course. This is represented by the first Venn diagram.

Limited overlap between the course and her reason for participating: to build awareness and sensitivity in her organization

The concerns most salient to SF was her colleagues' ignorance surrounding her hearing loss. She was motivated to participate in the program by a desire to advocate and educate within her workplace, and her organization seemed to be prepared to support her in this goal. SF had hoped the course would support her, but the course did not directly involve educating employers and colleagues. While it did discuss requesting accommodation, SF had already done this successfully on her own. Moreover, because she was alone in her cohort, SF had no opportunity to use the discussion forums to discuss ways to raise awareness and sensitivity towards hearing loss in the workplace. This poor overlap is represented by the second Venn diagram, with aggravating factors overlapping the bottom circle. Ultimately, the course only somewhat met SF's expectations and only minimal changes were found in her adoption of strategies, workplace wellness, and performance.

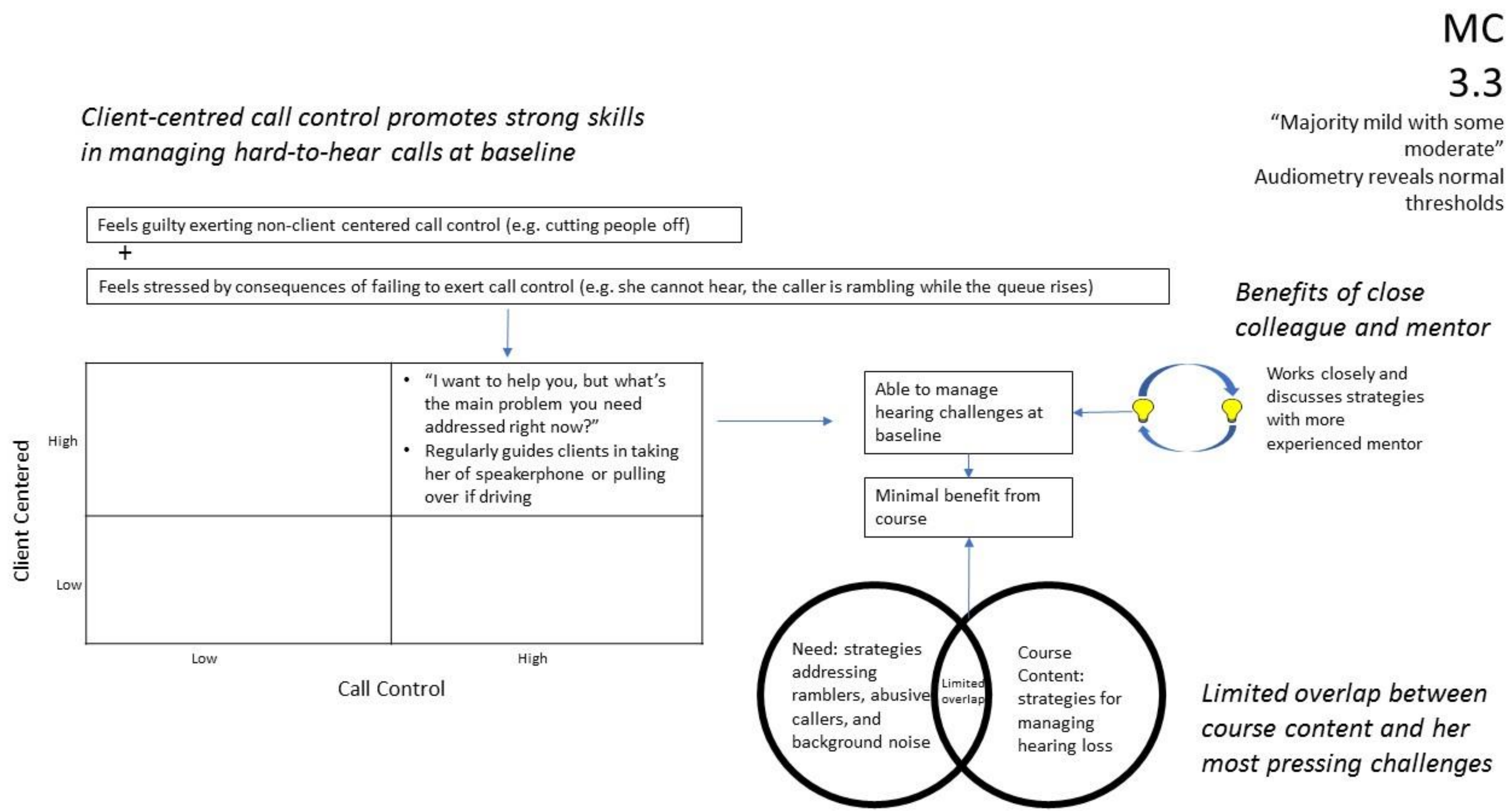
MC: Theory-Driven Logic Model



MC performed telephone triage in a cancer centre, assessing patients' symptoms and concerns, as well as providing education and support. She rated the course as 3.3 out of 5 on the course evaluation, and the Quick Hearing Check predicted her to have a mild or perhaps moderate hearing loss. MC had her hearing tested, and while she did not send in her audiogram she described the results as normal with a slight loss in the high frequencies. MC also experienced tinnitus.

At baseline, MC already demonstrated a range of effective strategies for managing hard-to-hear calls. The only metric on which there was a strong indication of improvement was her self-efficacy for managing difficult-to-hear calls. The course may have contributed to this by validating the strategies she was already using.

MC: Data-Driven Logic Model



Description of Interpretive Categories

Limited overlap between course content and her most pressing challenges

While MC did describe hearing challenges at baseline, the challenges she faced in managing callers who rambled or were abusive presented a more pressing concern to her. Thus, the course addressed her concerns in only a limited way. This is represented through the Venn diagram.

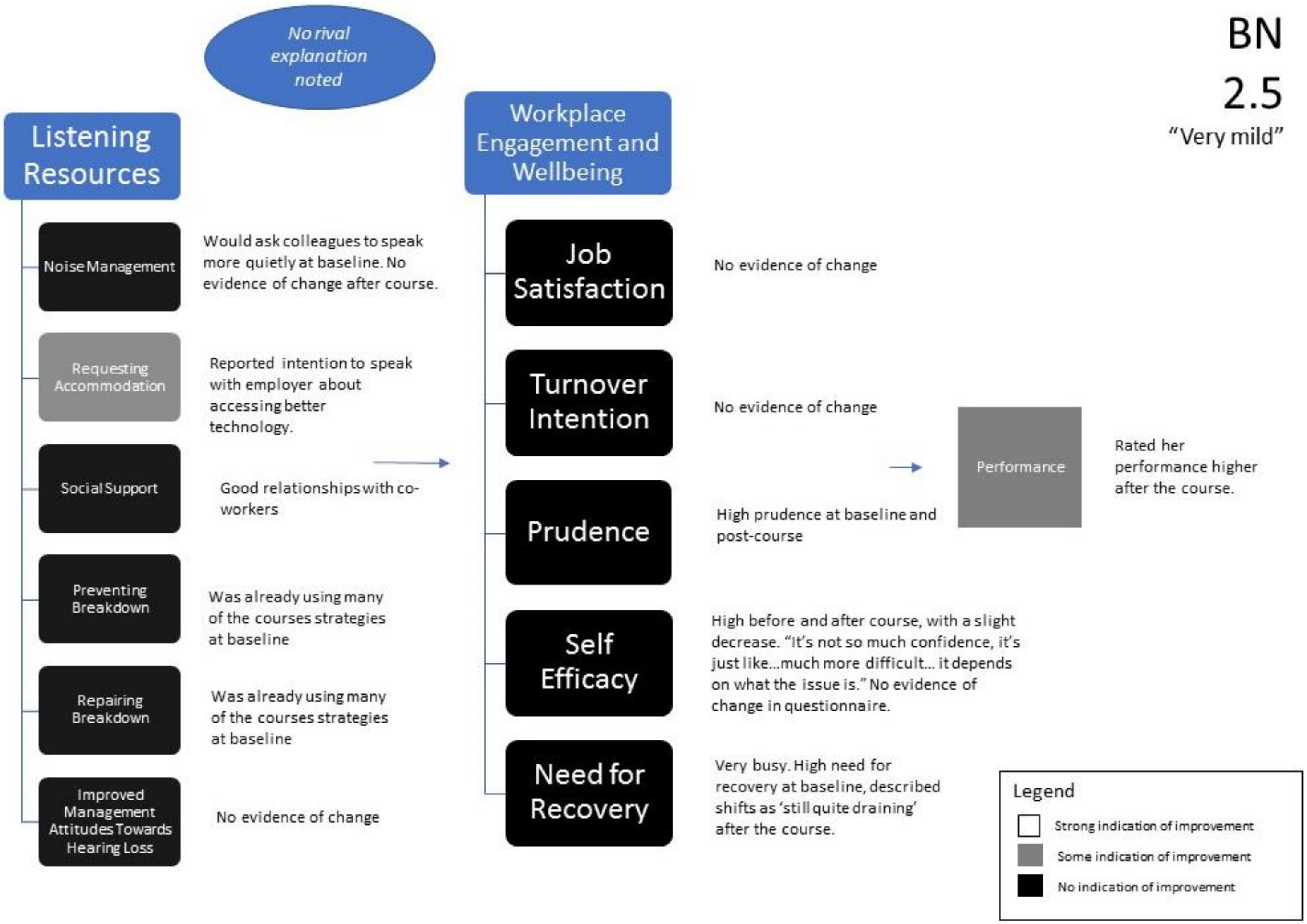
Client-centred call control promotes strong skills in managing hard-to-hear calls at baseline

MC described an array of effective strategies for managing the hearing challenges she did face. The same call control that allowed MC to keep callers on topic also allowed her to ask that they take her off speakerphone. While MC relies on call control, she finds it difficult to cut people off, although she needs to do so to prevent patients from 'rambling' while the queue builds. This leads to her communication style, which is characterized by being both client-centred, and high in call control.

Benefit of close colleague and mentor

At baseline, MC enjoyed a supportive work environment and mentoring from a more experienced colleague. Perhaps for these reasons, she demonstrated a natural resilience to the negative effects of hearing challenges. It should be noted that BN and MC worked together more closely, and discussed their calls more frequently than other telepractice nurses. This is represented by the reciprocal arrows between two light bulbs, and this may have contributed to the more sophisticated strategies they both described at baseline.

BN: Theory-Driven Logic Model

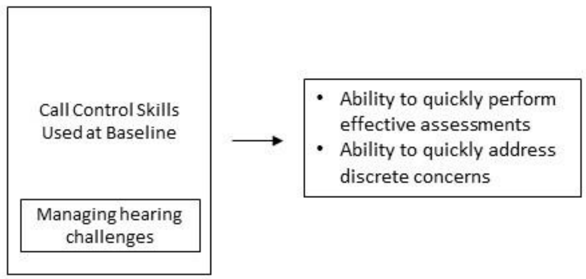


BN worked with MC in performing telephone triage for a cancer centre. BN rated the course at 2.5 out of 5 on the course evaluation. The Quick Hearing Check predicted that any potential hearing loss would be very mild, and BN did not report any hearing loss. Rather, her hearing challenges were associated with the noisy environment in which she worked.

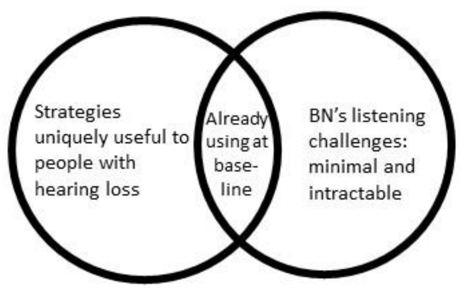
Like MC, BN described a range of effective strategies for managing hard-to-hear calls at baseline. While her self-efficacy for difficult to hear calls was already high at baseline, and remained high after the course, she did rate her performance more favorably after the intervention.

BN: Data-Driven Logic Model

BN
2.5
"Very mild"



Call control promotes efficiency and the management of hearing challenges



Limited overlap between course strategies and BN's listening challenges; BN already using those strategies that do overlap; remaining challenges do not have simple solutions

Description of Interpretive Categories

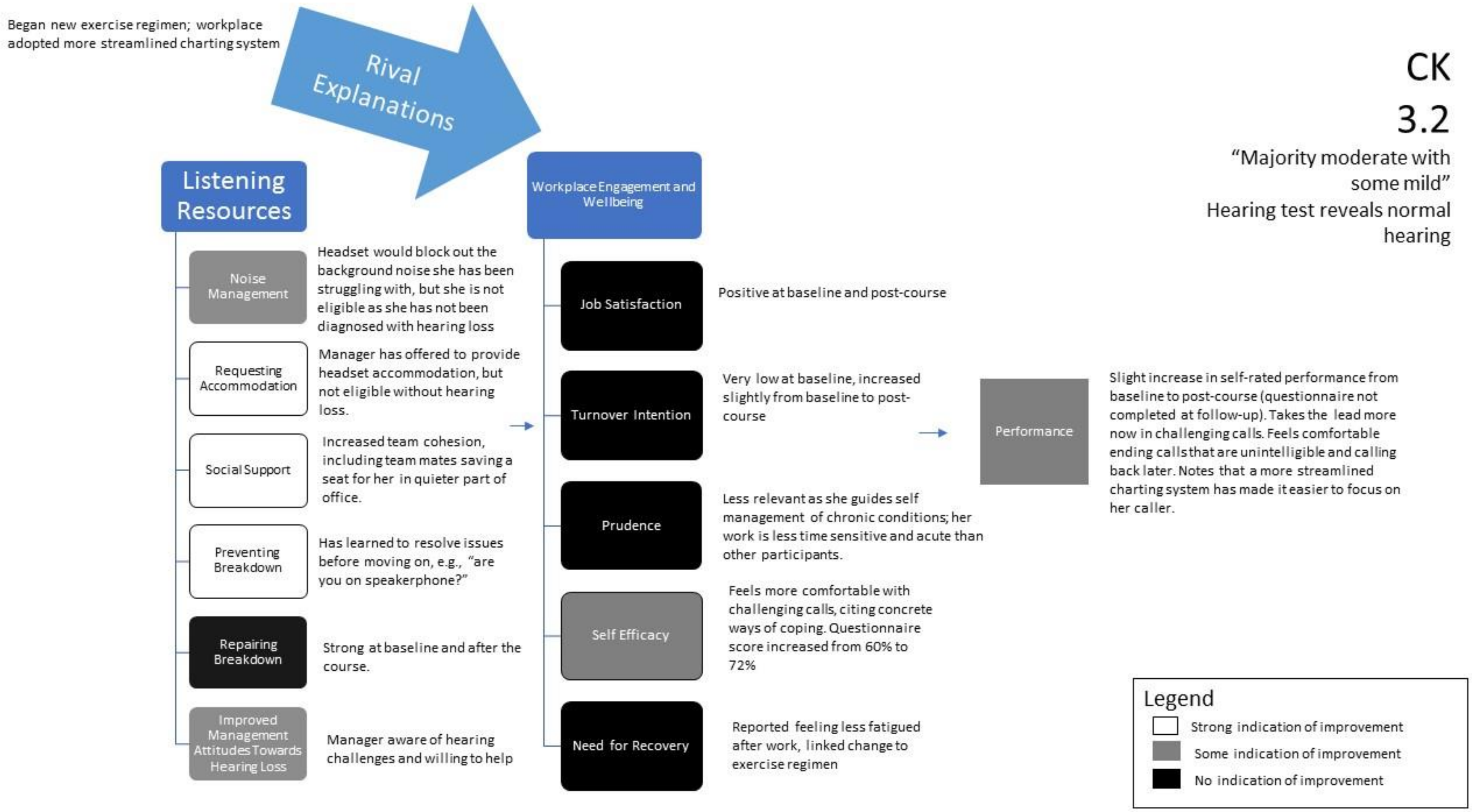
Call control promotes efficiency and the management of hearing challenges

BN's expertise in, and emphasis upon, call control allowed her to successfully complete assessments and better manage hearing challenges. In the same way that she would gently interrupt clients and guide them in providing the precise information she needed, she also regularly interrupted clients and politely asked them to pull over if they were driving, switch from speakerphone to handset, etc. She would also politely remind her coworkers to speak more quietly if they were making it hard to hear. This relationship is represented by the box representing call control, which holds within it the management of hearing challenges. This then leads to positive outcomes for BN and her clients.

Limited overlap between course strategies and BN's listening challenges; BN already using those strategies that do overlap. Remaining challenges do not have simple solutions.

BN demonstrated sophisticated and assertive communication strategies at baseline. Thus, the teaching of such strategies in the course did little to benefit her. As she did not report a hearing loss, the course's discussion of hearing-aid related strategies and methods for requesting accommodation were also less relevant to her. While she did have lingering hearing challenges due to the heavy background noise in her work environment, this noise was necessary. She needed to listen in on colleagues' calls because they worked as a team to meet clients' needs. This limited overlap is represented by the Venn diagram.

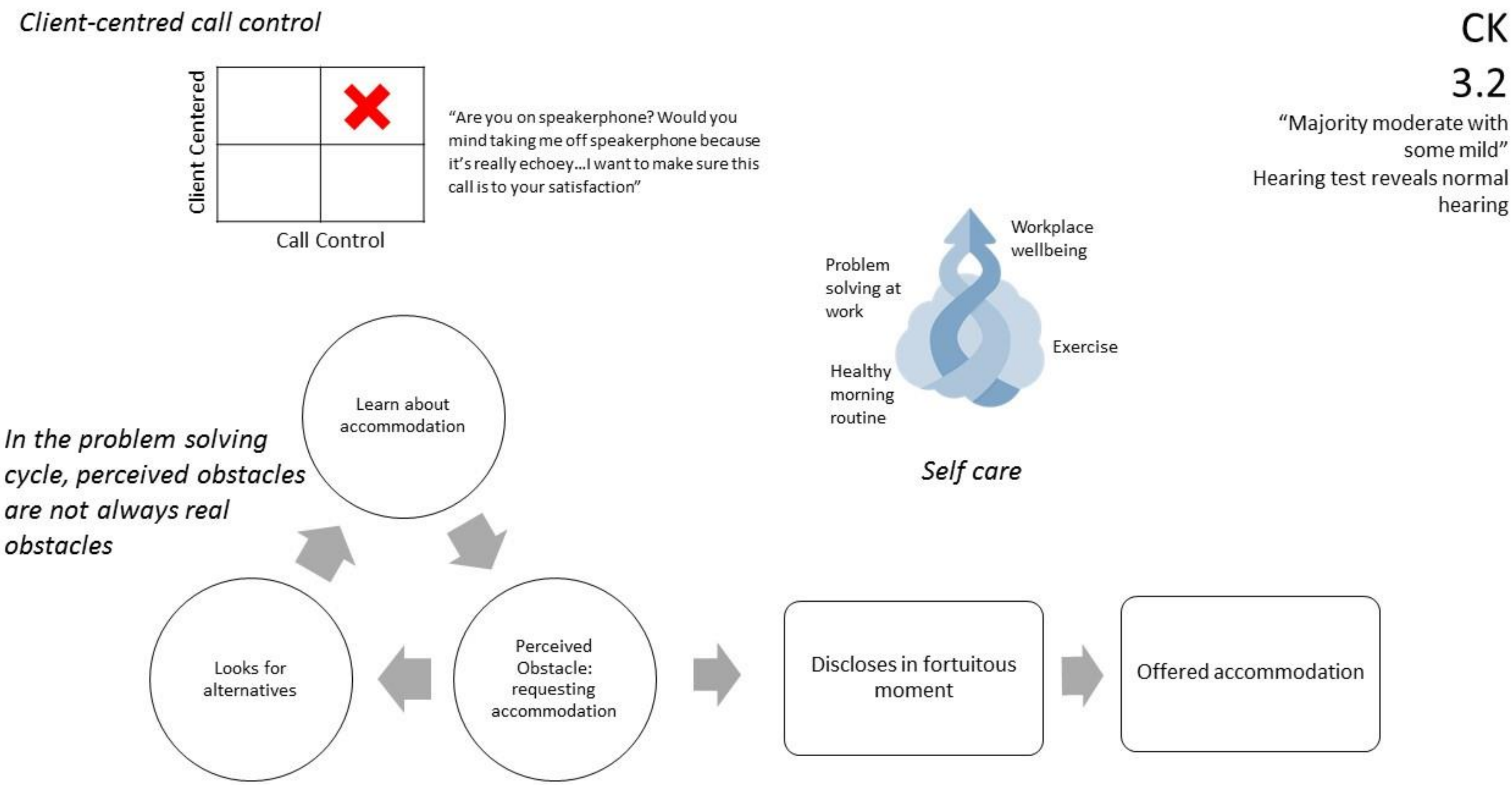
CK: Theory-Driven Logic Model



CK performed outbound health promotion calls. She rated the course as 3.2 out of 5 on the course evaluation and while the Quick Hearing Check suggested a moderate, or perhaps mild hearing loss, audiometric testing revealed normal thresholds.

CK acquired a range of listening resources throughout the program. These included learning that she could have the cost of a high quality, noise-attenuating headset covered by her organization if she submitted an audiogram demonstrating hearing loss. She also began to give clients more specific guidance on how to improve their speech intelligibility. Finally, she arranged for colleagues to save a seat for her in the quieter parts of the call centre. These changes were not associated with improvements in most measures of workplace engagement and wellbeing, but they were associated with increased self-efficacy for managing difficult-to-hear calls, as well as with a sense of improved performance.

CK: Data-Driven Logic Model



Description of Interpretive Categories

In the problem-solving cycle, perceived obstacles are not always real obstacles

CK was interested in the binaural noise-reducing headset, but was concerned about approaching her employer to request a $300 accommodation amid a period of layoffs. However, the topic of her hearing challenges, and the headset came up accidentally during a conversation with her manager seated across from her. To her surprise, he told her that funds were available for such a headset. She was surprised to learn that she could access the accommodation if she had her hearing tested and it demonstrated hearing loss. Thus, CK moved through the problem-solving process of learning about the accommodation and identifying a perceived obstacle. Initially, this led her to consider alternatives, but in a fortuitous moment her manager learns about her concern and offers the accommodation.

Client-centred call control

CK also described how after the course she guided callers in communicating more clearly. She did not see the provision of this guidance on how to communicate more clearly as being at odds with client-centred care. She explained how in motivational interviewing, which forms the basis of her work, the interviewer guides the conversation, but it is entirely based on the client's values and goals. CK's client-centred call control is represented by the red x, which is high on both the call control and client-centred axes of the associated figure.

Self-care

CK's improved ability to manage hearing challenges was intertwined with other improvements. After the course she had begun to exercise regularly, leading to range of benefits to her physical and psycho-social health. With co-workers she had improved upon her workflow, making it easier to focus on clients during calls. She explained that the course was valuable because it reminded nurses to engage in self-care. This synergy between improvements in physical health, hearing self-management, and job crafting is represented through the intertwined upward arrow.

Appendix AE

Cost per Employee per Year, Calculation Methods and Results

To quantify the relationship between this program's impact and its cost, I calculated the program's cost per employee per year. While nine of the 12 nurses in my intervention completed the program on their own time, this calculation assumes that the intervention is provided as part of a workplace wellness program in which employees are given time at work to complete the training. As such, costs include:

- Facilitation cost: My 15 hours spent in facilitating the online program estimated at the average wage of an audiologist, $35/hour, leads to a fixed facilitation cost of $525.
- Participation cost in diverted work hours: The cost of the nurses' four hours spent in training estimated at their average wage, $24/hour for RPNs and $33/hour for RNs, leads to a cost of $96 for each RPN who participates and $132 for each participating RN.

Adding these two costs leads to the following cost function:

Program cost = $96(number of participating RPNs) + $132(number of participating RPNs) + $525

To obtain cost per employee, I divide the value by the number of participants:

Program cost per employee = [$96(number of participating RPNs) + $132(number of participating RPNs) + $525] / number of participating RPNs and RNs

Given the participants in The Listening Shifts, the costs of this intervention are:

Program cost per employee

= [$96(number of participating RPNs) + $132(number of participating RPNs) + $525] / number of participating RPNs and RNs

= [$96(2) + $132(10) + $525] / 12

= $169.75 CAD

While I discuss costs here in a financial sense, I recognize the importance of other costs, particularly those born by participants. The most obvious costs include the energy required to complete the learning modules and associated activities. However, based on the findings of Lalande, Riverin and Lambert (1988), there was also the possibility that focusing on hearing challenges and their implications can cause distress for participants. To mitigate such costs, participants were informed about the counseling and support provided through not-for-profits, including the Canadian Hearing Society, the Canadian Hard of Hearing Association, the Association for Medical professionals with Hearing Loss, and the Western Institute for the Deaf and Hard of Hearing. The associated contact information was included on the course website.

Appendix AF

Ethics Approval

Western Research

Western University Health Science Research Ethics Board
HSREB Delegated Initial Approval Notice

Principal Investigator: Dr. Marybeth Jennings
Department & Institution: Health Sciences\Communication Sciences & Disorders,Western University

Review Type: Delegated
HSREB File Number: 108471
Study Title: The Listening Shift: Implementing and Evaluating an Online Communication Strategies Training Program for Tele-practice Nurses Experiencing Hearing Challenges

HSREB Initial Approval Date: February 17, 2017
HSREB Expiry Date: February 17, 2018

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Revised Western University Protocol	Received February 7, 2017	
Revised Letter of Information & Consent		2017/02/07
Data Collection Form/Case Report Form	Appendix Ci: Course Evaluation	2016/09/08
Data Collection Form/Case Report Form	Appendix Ci: Demographic Questionnaire	2016/09/08
Instruments	Appendix Cii: Hearing Screen	2016/09/08
Other	Appendix A: Logic Model of Program	2016/09/08
Instruments	Appendix B: Self Report Questionnaires	2016/09/08
Instruments	Appendix Dii: International Outcome Inventory	2016/09/08
Data Collection Form/Case Report Form	Appendix E: Participant Tracking Form	2016/09/08
Advertisement	Appendix F: Poster	2016/08/22
Advertisement	Appendix H: Newspaper Advertisement	2016/09/08
Instruments	Appendix I: Semi-Structured Interview Protocol	2016/09/08

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above named study, as of the HSREB Initial Approval Date noted above.

HSREB approval for this study remains valid until the HSREB Expiry Date noted above, conditional to timely submission and acceptance of HSREB Continuing Ethics Review.

The Western University HSREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use Guideline for Good Clinical Practice Practices (ICH E6 R1), the Ontario Personal Health Information Protection Act (PHIPA, 2004), Part 4 of the Natural Health Product Regulations, Health Canada Medical Device Regulations and Part C, Division 5, of the Food and Drug Regulations of Health Canada.

Members of the HSREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB [redacted]

Ethics Officer, on behalf of Dr. Joseph Gilbert, HSREB Chair
EO: Erika Basile ___ Nicole Kaniki ___ Grace Kelly ___ Katelyn Harris___ Nicola Morphet ___ Karen Gopaul ✓

[redacted]

Appendix AG

Permission to Reproduce 'Representations of workers with hearing loss in Canadian newspapers: a thematic analysis'

Our Ref: JB/IIJA/P17/959

17TH July 2017

Dear Raphaelle Koerber

Thank you for your correspondence requesting permission to reproduce the following article published in our journal in your printed thesis and to be posted in your university's repository at the University of Western Ontario.

'Representations of workers with hearing loss in Canadian newspapers: a thematic analysis' by Raphaelle Koerber, Mary Beth Jennings, Lynn Shaw & Margaret Cheesman *International Journal of Audiology* Vol 56:4 pp. 260-266 (2016).

We will be pleased to grant permission on the sole condition that you acknowledge the original source of publication and insert a reference to the article on the Journals website:

This is the authors accepted manuscript of an article published as the version of record in International Journal of Audiology 14th December 2016. http://www.tandfonline.com/http://dx.doi.org/10.1080/14992027.2016.1265155

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Thank you for your interest in our Journal.

Yours sincerely

Jo Bateman

Routledge, Taylor & Francis Group.

Appendix AH

Curriculum Vitae

Name:	Raphaelle Koerber
Post-secondary Education and Degrees:	Trent University Peterborough, Ontario, Canada 2008-2013 B.Sc.
Honours and Awards:	Ontario Graduate Scholarship 2017-2018
	Team Captain, Champion Team, Proteus Innovation Competition 2016
	Finalist, Western's Three Minute Thesis Competition 2015
	National Renewable Scholarship 2008 -2012
	Academic All Canadian Award 2009, 2010
Related Work Experience	Mitacs Intern The University of Western Ontario and Sun Life Financial 2017
	Teaching Assistant The University of Western Ontario 2016/2017 2017
	Research Assistant The University of Western Ontario 2016

Marker
Trent University
2013

Publications

Koerber, R., Jennings M.B., Shaw, L., Cheesman, M. (2017) Representations of working adults with hearing loss in Canadian newspapers: a thematic analysis. *International journal of audiology*, *56(*4), 260-266

Koerber, R., Rouse, M., Stanyar, K., Pelletier, MH (2018). Building resilience in the workforce. *Organizational Dynamics. 4*(2), 124-134

Non-Refereed Report

Koerber, R., Taylor, R. N. & Parker, J.D.A. (October 2013). *Developing social and emotional competencies in adults with intellectual disabilities.* Community Living West Northumberland

Posters

Koerber, R., Jennings, M., Shaw, L., Cheesman, M., (2016, September). Is Visibility Understanding? Representations of Workers with Hearing Loss in Canadian Newspapers. Poster presented at the 33rd World Congress of Audiology, Vancouver, Canada

Koerber, R., Jennings, M.B., Rouse, M., Cheesman, M., (2015, October). Troubleshooting Hearing Loss: a Workplace Support Program for Adults with Hearing Loss. Poster presented at the Canadian Academy of Audiology Conference, 2015, Niagara Falls, Ontario

Taylor, R.N., Koerber, R., Parker, J.D.A. (2013, July). Alexithymia and internet abuse in young adults. Poster presented at the 16th biennial meeting of the International Society for the Study of Individual Differences, Barcelona, Spain