Executive Functioning for Students with Educationally Significant Hearing Impairment Who Use the Auditory-oral Approach: Program Development

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EXECUTIVE FUNCTIONING FOR STUDENTS WITH EDUCATIONALLY SIGNIFICANT HEARING IMPAIRMENT WHO USE THE AUDITORY-ORAL APPROACH: PROGRAM DEVELOPMENT

By Lauren Walker

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Psychology

April 2019
DISSESTATION APPROVAL

This is to certify that the thesis presented to us by Lauren A. Walker on the 15th day of March, 2019, in partial fulfillment of the requirements for the degree of Doctor of Psychology, has been examined and is acceptable in both scholarship and literary quality.

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Abstract

Research has suggested that children with hearing impairment have delays and difficulties with several areas of executive function. These deficits are believed to be related to delays in language development and other areas of cognitive functioning impacted by impaired access to language, particularly in the early years of childhood. However, ongoing impaired access in students who access auditory information with cochlear implants may also contribute to these deficits. In order to address these skills, existing research addressing executive functioning in students with hearing impairment was reviewed, and a program was formulated to address the common areas of deficit in these students, taking into account the specific needs of this population. The program was designed to target students in Grades 4 through 12 who are identified as having an educationally significant hearing impairment. This program was then distributed to teachers (i.e., mainstream, special education, and hearing support) of students in a supplemental hearing support program in Delaware County, Pennsylvania, for review. The teachers were then provided with a survey to gather data on the program’s perceived feasibility and utility, as well as the perceived need for the program. The students in the program used hearing aids or cochlear implants to access auditory information, and their primary form of communication was speaking and listening.

Keywords: executive function, hearing impairment, cochlear implants, hearing aids
# Table of Contents

List of Tables ........................................................................................................... ixx

Chapter 1: Introduction .......................................................................................... 1

Overview ................................................................................................................. 1
Statement of the Problem ......................................................................................... 1
Purpose of the Study ................................................................................................. 2
Summary of the Methodology ................................................................................. 3
Hypotheses ............................................................................................................... 3
Introduction Summary ............................................................................................. 4

Chapter 2: Literature Review ................................................................................. 5

Executive Functioning ............................................................................................ 5
Students Who Are Deaf/Hard of Hearing .............................................................. 9
Executive Functioning and Hearing Impairment in Children and Adolescents .......... 19
Executive Functioning Skills and Academic Performance ................................... 25
Existing Executive-Functioning Intervention Programs .......................................... 28
Integration with Language and Auditory Verbal Supports .................................... 32
Conclusions and Summary ................................................................................. 33

Chapter 3: Methods ............................................................................................... 35

Overview ................................................................................................................. 35
Participants ............................................................................................................. 35
Apparatus and Materials ...................................................................................... 35
Procedure .............................................................................................................. 36

Chapter 4: Results .................................................................................................. 40
List of Tables

Table 1: Survey Response Rates by Grade Level Bands .................................................40
Table 2: Respondent Roles, Content Areas, and Education ...........................................42
Table 3: Respondent Experience with Hearing Impairment ........................................42
Table 4: Perceptions of Feasibility ..................................................................................44
Table 5: Perceptions of Utility .......................................................................................46
Table 6: Perceptions of Need .........................................................................................47
Table 7: Open-Ended Responses ..................................................................................49
Overview

Executive-functioning skills are crucial to many areas of academic success for school-aged children, particularly in the middle and upper grades. Research has shown that these skills can be more difficult for students with hearing impairment as a result of differences in language development and other areas of neurological input and function. While many executive-functioning curricula and programs exist to help promote these skills in typically hearing children, an equivalent program catered to the needs of students who are deaf or hard-of-hearing and use speaking and listening as their primary mode of communication does not exist. This study seeks to develop such a program and determine its feasibility of implementation and its perceived effectiveness within a supplemental-level hearing support program.

Statement of the Problem

Students with hearing impairment have more difficulty than their typically hearing peers with several areas of executive functioning. These deficits are believed to be the result of impaired access to language at early ages and underdevelopment in certain areas of the brain based on this lack of access. These challenges may not be detected in traditional inclusive academic settings until these students are having significant difficulty with these skills. While many overarching interventions and programs exist to target deficits in global executive-functioning skills, none of these are designed to address the specific difficulties of students with hearing impairment who use speaking and listening as their primary mode of communication. Because these students have deficits rooted in or exacerbated by language deficits and difficulties accessing
auditory information, the etiology of their difficulties is different from that of typically hearing students with challenges in this area. As such, intervention must be adjusted to appropriately address both the skill deficit and the root of the problem. Thus, a current need exists for such a program to address these skills directly for students with educationally significant hearing impairment both to prevent larger gaps in skills from forming over time and to address difficulties that already exist based on this impaired access.

**Purpose of the Study**

The current study sought to use existing research identifying deficits in specific executive-functioning skills and the basis for those deficits in auditory oral students who are deaf to formulate an executive-functioning skills program catered to the needs of this population. The study sought to determine whether a program designed specifically to target the skills that are typically difficult for these students is feasible to implement based on teacher feedback after a review of the generated program materials. This study also sought to evaluate the perceptions of teachers regarding whether the program would be useful in executive-functioning skills within a population of students with hearing impairment. Perceived need for various components of the program were also assessed. The overarching goal of the program development was to better meet the needs of children with hearing impairment so that difficulties with executive functioning can be addressed more proactively and to reduce the impact of these skill deficits on the classroom performance and learning of these students.
Summary of the Methodology

Executive-functioning curricula and existing programs were reviewed to assess effectiveness of implementation style and relevance of content. Research also was reviewed regarding the specific areas of executive-functioning need associated with students with educationally significant hearing impairment who use speaking and listening as their primary mode of communication. Effective supports and accommodations for students with hearing impairment were outlined and incorporated. A program was formulated based on the needs of this population and existing executive-functioning research. Ease of implementation was strongly considered in the development plan to ensure that the program could be used in various educational settings for students who are oral deaf in a manner that would not impact other supports and interventions necessary for this population. This program then was presented to teachers who worked with students in a supplemental hearing support program; perceptual data on feasibility of implementation, utility, and perceived need were measured.

Hypotheses

It is hypothesized that a program specifically developed and targeted to the executive-functioning needs of children with hearing impairment will be well received by teachers and that they will recognize the benefit of such a program at the late-elementary-, middle-, and high-school levels. Because the goals of development are feasibility and utility, it is hypothesized that the teachers also will perceive the program as useful and feasible in its implementation.
Introduction Summary

Research has shown that executive-functioning skills can be more difficult for students with hearing impairment because of differences in language development and other areas of neurological input and function. Many programs address various areas of executive functioning. However, no programs exist to specifically address the difficulties that arise for students with hearing impairment. This study sought to develop such a program based on research identifying the areas that have been found to be particularly difficult for students with hearing impairment. The program development was completed based on the research base regarding executive functioning, as well as on patterns and instructional strategies that have been shown to be effective with students with hearing impairment. Once the program was developed, it was presented to teachers who worked with students in this population, and information was gathered from those teachers regarding its feasibility of implementation and its perceived effectiveness for students within a supplemental-level hearing support program.
Executive Functioning

Executive functions are broadly and variably defined. However, research suggests that executive functioning includes cognitive processes that support goal-directed behavior and that these processes are directed by activity in the prefrontal cortex of the brain (Best & Miller, 2010). A large portion of the research base on the development of executive functioning focuses on small age ranges, as different components of these skills arise and form at varying times during childhood and adolescence (Best & Miller, 2010). While an exhaustive review of literature on executive functioning alone is beyond the scope of the current study, defining relevant components of executive functioning and developmental trajectory is necessary in order to appropriately target interventions within the proposed program.

Executive-functioning components. In reviewing the literature on executive functioning, one must consider the varying viewpoints on whether executive functions are independent components or a single unitary construct. One prevailing current view is based on the theory that executive functioning is made up of interrelated but independent skills or components (Mikaye et al., 2000). Many different components of executive functioning have been named as independent skills. However, others have proposed several core or “foundational” executive functions. These often include inhibition, information updating, monitoring (working memory), and shifting (Hughes, 1998; Huizinga, Dolan, & Van der Molen, 2006; Miyake et al., 2000).

Several key executive-functioning skills are more difficult for students with hearing impairment than for typically hearing students. The most impacted skill is
working memory. (Additional complications for students with hearing impairment with regard to executive functioning are discussed later in this review.)

**Working memory.** While working memory has been defined in varying ways and has component skills within it (Best & Miller, 2010), it is generally considered to include tasks that require an individual to hold and manipulate a set of information for a brief period of time. This maintenance and manipulation are expected to occur without the assistance of external aids or cues (Alloway, Gathercole, & Pickering, 2006). The literature suggests that working-memory abilities in typically hearing individuals develop in a linear fashion over time. While distinctions are often made between verbal working memory and visual working memory, these skills were found to develop both in a linear fashion and side-by-side throughout development and into early adulthood (Best & Miller, 2010). For typically developing individuals, the complexity of the information held and manipulated apparently dictates the level of performance, rather than the mode of the content (i.e., verbal vs. visual-spatial; Conklin, Luciana, Hooper, & Yarger, 2007). However, differences have been noted in the storage methods for verbal versus visual-spatial information (Alloway et al., 2006).

One should also note that development of working memory appears to allow for the development of other executive-functioning processes. For example, some studies have suggested that working memory and inhibition skills may be necessary for the development of shifting (Garon, Bryson, & Smith, 2008). Thus, difficulties in working memory alone may lead to later difficulties with shifting and more complex executive skills. This progression of difficulties is notable given the goals of the current program development.
Executive-function development. As these aforementioned skills develop, concurrent changes have also been noted within related neural networks (e.g., Posner & Rothbart, 2007). Structural imaging studies have shown that the development of the prefrontal cortex includes changes that are both progressive (e.g., myelination, neuron proliferation, synaptogenesis) and regressive (e.g., synaptic pruning, cell death; Casey, Amso, & Davidson, 2006; O’Hare & Sowell, 2008). While many major neurological changes occur in childhood, the prefrontal cortex continues to develop through adolescence. These neurological developments have been shown through changes in gray matter during this period of development (O’Hare & Sowell, 2008). These neurological changes are believed to be significantly impacted by the experiences and input that a child or adolescent receives (O’Hare & Sowell, 2008). As is discussed later in this review, this neurological development may differ in students with hearing impairment, as their access to input is believed to impact or change this development.

Other factors also have been suggested as contributing to executive-function development in typically hearing individuals. Among these are practice (McNamara, DeLucca, & Berg, 2007), language (Bell, Wolfe, & Adkins, 2007; Kray, Eber, & Lindenberger, 2004), and theory of mind (Hughes & Ensor, 2007). While other additional factors have been shown to impact executive-skill development (Best & Miller, 2019), the aforementioned three (practice, language, and theory of mind) are the most relevant to the current program development. The impact of practice suggests that programs designed to target these skills with specific practice may be beneficial in supporting adequate development.
Language has also been connected to development of executive functioning. One major area of impact is the use of language for inner speech to mediate task completion. Kray et al. (2004) suggested that inner speech and the ability to use language are important modulators for effective executive functioning, particularly as an individual’s skills become more advanced. Bell and Wolfe (2004) also showed connections between physiology, temperament, and language and executive-functioning skills in young children. In this study, the measure of language used targeted vocabulary knowledge. The results of that study may suggest that increases in vocabulary may be a helpful component for intervention in students struggling with executive-function skills.

Language is an area that is commonly difficult for students with any degree of hearing impairment. Therefore, the impact of language in this specific population may impact the development of age-appropriate executive-functioning skills. As such, the developed program should take these language deficits into consideration and build in supports in this area, both for overall language development and for the targeted use of language within executive-functioning skills.

Theory of mind is an additional area that is often difficult for students with hearing impairment. As with the previous factors, these deficits should be taken into consideration and also targeted for development in order to further facilitate appropriate executive-functioning skills. Work by Hughes and Ensor (2007) suggested a relationship between these two sets of skills. While their research only partially supported the presence of theory of mind as a prerequisite skill for executive function, their data also showed a potential mediating factor between the two skills, suggesting deficits in executive function may impact students’ ability to exhibit theory-of-mind skills.
Students Who Are Deaf/Hard-of-Hearing

Students with hearing impairment have a wide range of difficulties and needs for supports in multiple areas of functioning. Many of the difficulties they experience stem from their impaired access to language as well as from subsequent difficulties with language development (Macaulay & Ford, 2013). These difficulties occur even in the presence of intact and average nonverbal intelligence (Macaulay & Ford, 2013). However, other difficulties also emerge from this lack of access. These additional challenges include academic skills (Pisoni, Conway, Kronenberger, Henning, & Anaya, 2010), social and emotional skills and awareness (Eriks-Brophy et al., 2006), and executive skills (Michael & Attias, 2016). While the major focus of the current program development is based in the area of executive skills, establishing background information regarding the difficulties of this population of students is important. This background will provide context for the adaptations and adjustments that are made to existing executive-functioning curricula to be more appropriate for this unique population.

Auditory access. Typically hearing individuals experience language through a complex physical and neurological process known as auditory processing. Sound travels through mechanical processes in the outer, middle, and inner ear. When sound reaches the inner ear, it is transduced into a signal that then travels to the auditory centers of the brain (Bailey, 2010). Because the process is complex, it can break down at multiple levels, producing different types of hearing impairment and varying difficulties in access to sound.

There are various types of hearing impairment, and all types interfere with the processing of auditory information as compared to typical hearing. Normal hearing
allows for complex processing to occur without significant effort on the part of the typically hearing listener. The American Speech-Language and Hearing Association (ASHA, 2005) reported that seven major auditory-processing mechanisms in the brain contribute to individuals’ understanding of incoming sound. These processes are sound localization, lateralization, discrimination, pattern recognition, temporal aspects (integration, discrimination, gap detection, ordering, masking), performance in competing acoustic signals, and performance with degraded signals (ASHA, 2005). The complexity of the auditory system provides many areas for the process to break down. Additionally, in order for the higher order systems of language to be effective, a strong and clear signal is necessary. This clear signal is impaired in students with hearing impairment, even with ongoing developments in technology. Research has suggested that children with hearing impairment are more likely to miss components of presented information even with the assistance of technology (Marschark & Hauser, 2008).

Further, one should note that the technology does not restore hearing to the levels of an individual without hearing impairment. Accessing sound in any level of noise is difficult for individuals with hearing impairment (Jacobs et al., 2016). Additionally, soft or low-level speech is often more difficult for these individuals to access (Jacobs et al., 2016).

These difficulties accessing speech in noise and low-volume speech are important for school-aged students. Classrooms, particularly those for students of early ages, are often noisy environments. These early years are also the most important for language development, so this noise impacts the development of language in students with hearing impairment.
Auditory development. The auditory system is one of the earliest to develop and mature in a growing fetus. While in the womb, fetuses have been shown to respond with movement when they hear sounds (Bailey, 2010).

The development of the auditory system as a whole, however, is somewhat complex, with different skills and components of the system maturing at different times (Musiek & Baran, 2007). Thus, while some auditory skills are well developed at birth and while children can access sounds immediately, additional components of the auditory system continue to develop until late adolescence (Bailey, 2010). Some of these skills that continue to develop include learning distinctions between certain high- and low-frequency sounds, separating sound foreground from sound background, and managing competing auditory signals (Bailey, 2010).

Technology. Newborns now undergo hearing screenings at birth to detect hearing impairment and ensure adequate support is given to families whose children are deaf or hard of hearing. Many children who are deaf or hard of hearing are born to typically hearing parents. While parents of students with hearing impairment have choices in terms of mode of communication, current technology is allowing many speaking and listening families to choose oral communication methods for their children who are deaf or hard of hearing (Marschark & Spencer, 2015). Thus, these children with hearing impairment who use oral communication are now most often educated in mainstream schools alongside typically hearing peers (Jones et al., 2016). The three primary types of hearing technology that allow students with varying degrees and forms of hearing impairment to access sound alongside their typically hearing peers are hearing aids, cochlear implants, and remote microphone technology (previously termed FM systems).
**Hearing aids.** When an educationally significant hearing impairment is identified, children are often fit with hearing aids to assist in their access to sound. Hearing aids can be programmed to amplify specific frequencies based on the profile of hearing impairment of any given child or individual, and they are designed to provide access to the broad-frequency range of speech (Tharpe & Gustafson, 2015). The most common type of hearing aid used by children is a behind-the-ear (BTE) hearing aid. In-the-ear devices, which house all electronic components in a small plastic case that fits inside the ear canal or pinna of the ear, are also available. However, because of swallowing risk, these are not commonly recommended for younger children (Tharpe & Gustafson, 2015).

Although hearing aids improve a child’s access to sound, one should note that the device does not restore hearing to that of a typically hearing individual (Penna, Lemos, & Alves, 2015). Use of a hearing aid or hearing aids must be complemented by other supports and interventions in order to ensure appropriate language and speech development (Penna et al., 2015). Professionals in the field of oral deaf education recommend that therapy begin as early as possible, and the identification of hearing impairment in a child is crucial at birth to ensure adequate development of speech, language, and communication skills (Penna et al., 2015). Children with hearing impairment should wear their hearing aids for the maximum amount of time possible during waking hours to ensure that they are accessing adequate auditory experience to build the auditory and language pathways within the brain (Tharpe & Gustafson, 2015).

**Cochlear implants.** For individuals who are profoundly deaf or have a severe hearing impairment, cochlear implants provide significantly greater access to sound than
do traditional hearing aids (Bianchin, Tribi, Formigoni, Russo, & Polizzi, 2017). A cochlear implant is a device that consists of two components. The first is a microphone and microprocessor that is worn externally, typically over the ear (Boons et al., 2013). This microphone and microprocessor detects sound, including the intensity, frequency, and timing cues from any given auditory signal. The processor then converts these signals into an electrical code that is transmitted through a magnet worn on the outside of the head (Boons et al., 2013). This processor connects to a surgically implanted internal receiver. The receiver then passes the electrical code to an array inside the cochlea that stimulates auditory neurons in place of the typically present hair cells (Boons et al., 2013).

Research shows that cochlear implantation improves overall language learning in many recipients (Ganek, McConkey Robbins, & Niparko, 2012). This finding is based on a comparison of learning rates pre and post implantation (Ganek et al., 2012).

Recent research has also shown an advantage to bilateral implantation over unilateral implantation. That is, two implants provide binaural hearing and greater access to sound and overall hearing functioning than does a single implant (Tait et al., 2010). This ability to access sound in both ears has been shown to improve speech understanding in noise and increase sound localization skills in individuals who are deaf (Dietz & McAlpine, 2015; Tait et al., 2010). In addition, stronger outcomes were noted in those who were bilaterally implanted simultaneously rather than sequentially (Basura, Eapen, & Buchman, 2009; Lopez-Torrijo, Mengual-Andres, & Estelles-Ferrer, 2015). Despite the stronger outcomes for earlier, simultaneous implantation, research has also supported the benefit of adding a second implant, even if a significant amount of time has
passed after the initial implant was placed (Bianchin et al., 2017). One should note that shorter durations of time between implants have also shown more favorable outcomes than longer durations of time (Bianchin et al., 2017).

Because of these recent developments in technology and research, an increasing number of children with severe to profound hearing impairment are receiving bilateral cochlear implants at an early age (Boons et al., 2013). This early bilateral access to sound has allowed for more positive outcomes in the speech and language development of these children, as well as in their overall auditory development and functioning (Litovsky & Gordon, 2016; Peterson, Pisoni, & Miyamoto, 2010, Ramsden et al., 2012).

While the research just described shows great improvements in cochlear implant technology and its ability to assist in greater language access and learning in children, cochlear implants do not restore hearing to normal. As such, while improvements are noted, students with cochlear implants still perform below the level of typical peers in many areas, including understanding of morphological structures (Le Normand, Ouellet, & Cohen, 2003), grammatical structures (Spencer, Barker, & Tomblin, 2003), overall spoken language (Le Normand et al. 2003), vocabulary, and narrative language (Boons et al., 2013). These deficits necessitate individualization of educational supports and interventions to target the specific needs of children with hearing impairment.

**Remote microphone technology (RMT).** When a child is using amplification to improve access to speech and auditory input, the amplification also increases the amount of background noise that they experience. Thus, they often have more difficulty accessing speech in background noise (Tharpe & Gustafson, 2015). RMT, such as frequency modulation (FM) systems, improves the signal-to-noise ratio of a speaker’s or teacher’s
voice, thus allowing for better access to auditory input (Tharpe & Gustafson, 2015). Use of RMT requires the speaker or teacher to wear a microphone. His or her voice is then transmitted to a receiver either attached to or built into the hearing aids, thus amplifying the speaker’s voice over the background noise to give the student with hearing impairment stronger access to instruction (Tharpe & Gustafson, 2015). The RMT can also be connected to a speaker situated close to the listener to facilitate the amplification of this signal to noise-ratio (Tharpe & Gustafson, 2015).

**Incidental learning.** Students with typical hearing learn a great deal of language, thinking skills, and social cues from incidental learning. Incidental learning is unintentional or unstructured learning, and it occurs through overhearing and general experience and input. This unplanned learning is also important for developing thinking skills and executive skills, such as auditory short-term memory, verbal cognition, and narrative skills (Moeller, 2007). It also plays an important role in the development of social skills and understanding perspectives of others in social situations (Moeller, 2007).

As may be expected, students with a higher level of auditory access acquire a greater amount of incidental language from their environment. This discrepancy in access to incidental information has been shown through several studies suggesting that students with bilateral cochlear implants show higher levels of incidental learning than do students with unilateral implantation (Boons, Brokx, Frijns et al., 2012; Boons, et al., 2013b). However, even with bilateral cochlear implantation, outcomes of learning are not equal to those of typically hearing students, and research has shown that students who are deaf or hard of hearing learn less incidentally than do typically hearing peers (Calderon & Greenberg, 2003).
Language. Several different approaches to language learning are available for children who are deaf or hard of hearing. In the past, significant technology did not exist to give children consistent or reliable access to sound and auditory-language input. This lack of access impeded development of spoken language (Jacobs et al., 2016). Therefore, parents more frequently chose sign language for their children with hearing impairment. However, more than 90% of children with hearing impairment are born to hearing parents (Jones et al., 2016). Thus, auditory-oral communication is often preferable for hearing families. Auditory-oral communication facilitates greater communication with parents, greater outcomes for early language development, and ultimately a stronger connection with the larger auditory-oral society. One should note that the choice between sign language and auditory-oral methods is fraught with debates and opinions about appropriateness or moral correctness. A full overview of those opinions and debates is beyond the scope of this literature review. However, the reader is directed to ASHA for further information regarding communication options for parents of children who are deaf or hard of hearing.

The current program was designed for students who are developing language through speaking and listening by using the technologies previously discussed (i.e., hearing aids, cochlear implants, RMT). As such, this review focuses on the language difficulties that persist despite the improvements in hearing technology.

Academics. Students who are deaf or hard of hearing have impaired ability to access the phonology of language (Jacobs et al., 2016). This lack of access to phonology often impairs their reading and phonics skills, because distinguishing and attaching sounds to visual representations of those sounds (i.e., letters) is difficult.
As previously described, students with hearing impairment have difficulty with accessing language and developing overarching language skills. They also have difficulties developing adequate verbal cognitive skills given this limited access to language (Hashemi & Monshizadeh, 2012; Wu, Lee, Hwang, Sun, & Liu, 2008). Students with unilateral cochlear implants often have lower verbal IQs than do students with typical hearing (Hashemi & Monshizadeh, 2012). Students with bilateral cochlear implants score higher than those with unilateral implants, but often still display lower scores than age-matched typically hearing students (Wu et al., 2008).

Almost all academic content requires a high level of language usage and understanding (Jacobs et al., 2016). Even in more abstract content areas, such as math or physics, material is often presented primarily through language, whether oral communication from a teacher or writing in a textbook (Jacobs et al., 2016). Even without the auditory component of impairment, verbal skills and verbal cognition independent of hearing impairment have been associated with later academic success. Thus, without supports, students with hearing impairment who are not developing these language and subsequent language reasoning and thinking skills are at a disadvantage.

A more detailed outline of the specific academic challenges of students with hearing impairment, as well as the supports and accommodations that have been shown to be helpful for them, can be found later in this review of the literature.

Social/emotional. As technology advances, students with hearing impairment have greater access to language, both academically and socially. However, despite improvements in some measures of academic language and access, students with hearing impairment continue to have difficulties with understanding and participating
appropriately in social and emotional interactions. These difficulties are believed to result from lack of adequate access to conversation both in the moment and over time.

Research has suggested that students with hearing impairment who use speaking and listening have difficulty with mental state/theory of mind (Schick, De Villers, De Villiers, & Hoffmeister, 2007). This difficulty was also found to be true of signing deaf students who were not born to parents who were native speakers of sign language, suggesting a strong connection to the importance of language rich environments (Schick et al. 2007).

Children who are deaf who use speaking and listening have been shown to use and understand less emotional and mental-state vocabulary than do age-matched typically hearing peers. This deficit in emotional vocabulary has been linked to their lack of incidental-learning access to others’ discussions of emotions and intentions (Huttunen & Ryder, 2012). However, Schick et al. (2007) suggested that these deficits are also connected to level of vocabulary knowledge and ability to understand specific grammatical structures. Other researchers have also connected language levels to theory-of-mind skills in typically hearing students (Milligan, Astington, & Dack, 2007). However, these connections were found to be stronger when related to general language than when related to vocabulary alone in the students with typical hearing (Milligan et al., 2007).

Morgan et al. (2014) examined the exposure of young children who are deaf to mental-state discussion and emotional vocabulary when these children were born to hearing parents. Their study found that parents of children who are deaf use less cognitive mental-state language with their children than do parents of typically hearing
children. Their results also showed more effective conversational turn taking between mothers and typically hearing children (Morgan et al., 2014). These results suggest that students with hearing impairment not only may have difficulty accessing the language around them, but also may be exposed to less language because of their parents do not provide a language-rich environment (Morgan et al., 2014).

**Factors that impact outcomes.** Several important factors influence outcomes for students with hearing impairment. These factors include age of identification (Korver et al., 2010), age of amplification (if the family chooses to pursue amplification), age of implantation (when the child is an appropriate candidate for implantation; Boons, Brokx, Dhooge et al., 2012), and monolingualism (Boons, Brokx, Dhooge et al., 2012).

The age that hearing impairment is diagnosed has a significant impact on a child’s outcomes in many areas, including those previously outlined (Korver et al., 2010).

**Executive Functioning and Hearing Impairment in Children and Adolescents**

Reviewing the literature on many different aspects and assessments of students who are deaf and hard of hearing can be difficult, as this population varies greatly. This heterogeneity is caused by differences in degree of hearing impairment, type and degree of access to auditory information, and communication methods (Maller, 2003; Mason, 2005; Pollard, 2002).

Additionally, recent and ongoing improvements and changes in technology for students with hearing impairment (e.g., hearing aids, cochlear implants) have led to changes in the way children who are deaf and hard of hearing access and develop language (Kronenberger, Colson, Henning, & Pisoni, 2014). This change in access and development is important because language development has been suggested to impact
development of executive-functioning skills (Convertino, Borgna, Marshark, & Durkin, 2014; Kronenberger et al., 2014; Oberg & Lukomski, 2011). Because of the heterogeneity of the population and this consistent change of technology over time, the body of research addressing potential executive-function needs of students with hearing impairment is currently small. However, several researchers are beginning to address questions pertaining to various executive-functioning difficulties in this population of students. This research is important, as many areas of deficit on neuropsychological assessments of students who are deaf and hard of hearing have been shown in the area of executive function. Figueras, Edwards, and Langdon (2008) showed that students who are deaf and hard of hearing had more difficulties than matched typically hearing peers in inhibition, planning, set shifting, working memory, and attention. As such, this area for support is important in this population.

**Impact of language.** When children have impaired access to adequate communication with parents and others around them during critical periods of development, their language development can suffer. Impaired communication in turn leads to deficits in the development of other neurological factors (Kronenberger et al., 2014). Earlier access to adequate communication with parents and family members also facilitates age-appropriate social development and regulation skills. However, additional research has suggested that students with cochlear implants, even if implanted early, continue to have difficulty matching hearing peers in these social and executive skills (Kronenberger et al., 2014). These deficits in social and executive skills have been shown to persist into secondary school (Convertino et al., 2014).
Hintermair (2013) also suggested correlations between communicative competence and executive skills among students who are deaf and hard of hearing, further supporting the connection between language and executive functioning in this population.

Kronenberger et al. (2014) studied the relationship between speech and language development and several domains of executive functioning in students using cochlear implants, as well as students with typical hearing. The primary domains examined included working memory, fluency-speed, and inhibition-concentration. They found differences in the relationship patterns of executive skills and speech and language skills in the cochlear implant sample as compared to the typically hearing sample. Verbal working-memory skills and fluency skills were found to be more significantly related to speech and language in the cochlear implant group, while spatial working-memory skills and inhibition were more related to speech and language in the typically hearing sample. Based on these relationships, the researchers hypothesized that differences in cognitive development exist for students with hearing impairment who access spoken language with technology when compared to typically hearing students. Thus, while cochlear implants and other forms of hearing technology allow children who are deaf and hard of hearing to develop receptive and expressive spoken-language skills (Geers & Sedey, 2011), this access does not replace typical auditory access and leads to differences in cognitive development that may give rise to executive-functioning difficulties (Kronenberger et al., 2014).

**Domain-specific challenges.** Impaired access to auditory signal and/or auditory deprivation created by hearing impairment and deafness has extensive impacts on several
areas of the brain (Kral, Kronenberger, Pisoni, & O’Donoghue, 2016). Difficulties arise in a variety of higher order processing skills and in individuals’ abilities to process information beyond the auditory system (Kral et al., 2016). Because the goal of current program development is to provide support in multiple areas of executive functioning, the current research must be examined in both overall higher order impacts and more domain-specific executive impacts of hearing impairment.

**Overall.** Oberg and Lukomski (2011) examined the impact of hearing impairment on students’ executive-functioning performances on the Behavior Rating Inventory of Executive Function (BRIEF). They used other assessments of executive functioning as well, including the Wisconsin Card Sorting Test, the Children’s Color Trails Test, and the Woodcock Johnson Writing Fluency subtest. Their sample was small ($n = 22$) and included predominantly students using sign language as their primary communication method. While they found consistency across measures of executive functioning, they also found that students with what they termed “genetic deafness” (i.e., having at least one parent who was deaf) had lower levels of difficulty with executive functioning than did students with “other” causes of deafness. They suggested that the differences they saw may have been the result of different perceptions of children who are deaf by their parents who are deaf or hearing. They also indicated that the differences may be the result of the students’ levels of access to effective communication and language acquisition from an early age (Oberg & Lukomski, 2011).

**Working memory.** One of the primary and most impactful areas of executive-functioning difficulty in students with hearing impairment, based on completed research to date, is working memory (Edwards, Aitkenhead, & Langdon, 2016). Edwards et al.
(2016) examined the auditory and visual working-memory capacities of adolescents with and without hearing impairment. The students in this study used cochlear implants to access auditory information and language. Findings suggested poorer auditory working-memory capacity in the sample of students who used cochlear implants as compared to students with typical hearing. Poor auditory working memory was further connected to deficits in reading ability (Edwards et al., 2016).

Research has also connected short-term memory and working memory to speech and language outcomes in students with cochlear implants. Harris et al. (2013) completed a study that suggested the short-term memory and working memory of students with cochlear implants was significantly lower than those of typically hearing students. These lower memory abilities were found to be connected to speech and language outcomes (Harris et al., 2013).

**Behavior and attention.** Several research studies suggest that attention and behavioral components of executive-functioning skill should be incorporated into executive-functioning interventions for students with hearing impairment (Hoffman, Tiddens, Quittner, & CDaCI Investigative Team, 2018).

A study completed by Hintermair (2013) examined the executive skills and related behavioral and attention difficulties of school-aged students in German-speaking schools. In this study, most of the sample (89%) used spoken language as the primary mode of communication. The sample also included students in schools for the deaf, as well as in general or mainstream schools. Results suggested that students with hearing impairment, as a whole, showed weaker executive-functioning skills than those of their hearing peers. Among the students with hearing impairment, however, those in schools
for the deaf displayed significantly poorer executive skills than did those in mainstream schools. The difference in executive skills between these two groups suggests that while mainstreamed students with hearing impairment still have difficulty displaying typical levels of executive functioning, these students fare better than those who are more isolated and use predominantly sign language more (Hintermair, 2013).

Researchers have also shown that visual selective attention is impacted in students with hearing impairment when compared to typically hearing peers (Hoffman et al., 2018). Deficits in visual selective attention have been associated with behavioral and attention difficulties as reported by parents, as well as within the school environment, and suggests the importance of considering these skills when providing intervention and support for students with hearing impairment (Hoffman et al., 2018).

**Summary.** While the research just reviewed is somewhat diverse in the different populations of students who are deaf and hard of hearing, several common themes are notable for the purposes of developing a program to adequately support these students. One primary result reported in the literature is that students who are deaf and hard of hearing are shown to have greater difficulties with executive functioning than do their typically hearing peers (Convertino et al., 2014; Hintermair, 2013). Another recurrent suggestion in the research is that deficits in executive-functioning skills of students who are deaf and hearing impaired may be related to deficits in language development, as students who are deaf and hard of hearing often have impaired access to early language input that begins to form their overall organization of the world and interaction with it (Convertino et al., 2014; Oberg & Lukomski, 2011). Further, Kronenberger et al. (2014)
suggested differences in cognitive development based on the relatively degraded access to sound of these students as compared to typical peers.

**Executive-Functioning Skills and Academic Performance**

The executive-functioning difficulties presented by students with hearing impairment impact multiple areas of academic functioning. The most prevalent academic tasks that have been impacted as shown by current research patterns are based on reading, narrative language, and incidental learning. However, one should note that these skill deficits can impact other areas, as well.

**Reading.** Daza, Phillips-Silver, Ruiz Cuadra, and Lopez-Lopez (2014) evaluated both language and noncognitive factors, such as working memory, attention, and other components of executive functioning, to assess the impact of these skills on reading comprehension in children who are deaf. Their study included both oral and signing children who were deaf. Results from their work suggest that stronger vocabulary and strengths in several components of executive-functioning skills are associated with higher reading comprehension in children who are deaf (both those who sign and those who use speaking and listening). This finding, they argued, further supports the importance of targeted supports for students who are deaf in both vocabulary development and in the executive skills referenced (i.e., working memory, task preparation/organization, shifting, attention mediation). The researchers also suggested the development of these executive skills as a potentially compensatory tool for deficits in phonological processing that arise from lack of adequate access to the auditory signal (Daza et al., 2014).

One area of executive function that has been found to be related to reading is working memory. A study by Edwards et al. (2016) showed that adolescents with
cochlear implants had poorer auditory working-memory capacity and poorer reading skills when compared to typically hearing peers. The researchers suggested that their results supported the importance of working-memory skills in reading and literacy development.

**Narrative language.** In a study completed by Boons et al. (2013), narrative language was examined in students whose cochlear implants were implanted before the age of 5 years. The results suggested that, despite early implantation, students with cochlear implants demonstrated severe delays in narrative language compared to expectations for their chronological age and when compared to age-matched typically hearing children (Boons et al., 2013). The researchers noted that the difference was not in the quantity of language produced by the students with cochlear implants, but rather in the quality and the accuracy of the information produced (Boons et al., 2013). Additionally, the group of students with cochlear implants demonstrated lower numbers of subordinate clauses, shorter utterance lengths, and higher numbers of errors within utterances than typically hearing peers (Boons et al., 2013).

Interestingly, the authors also created a subgroup of the sample with cochlear implants that they deemed to have a higher potential based on several factors that were hypothesized to generate stronger outcomes. These factors included the following: implantation of first cochlear implant before the age of 2 years, bilateral cochlear implants, no additional disabilities, and one spoken language. Outcomes from this higher potential group were more comparable to the control group of typically hearing children, suggesting that these factors provide an advantage in language development for students with profound hearing impairment (Boons et al., 2013).
Worsfold, Mahon, Yuen, & Kennedy (2010) also examined narrative skills in children with early- or late-identified permanent hearing impairment. Their findings also suggested that earlier identification led to more positive outcomes in narrative language. However, their sample of students with hearing impairment performed below the level of typically hearing peers.

Further research completed by Jones et al. (2016) examined both macrostructures and microstructures of narrative language in children who were deaf and used spoken English. These students were compared to age- and nonverbal-intelligence-matched hearing peers. This study found that the children who were deaf were comparable to hearing peers in the macrostructures of narrative. That is, they were able to identify the bigger concepts and ideas. One should note, however, the method of presentation of the story to the students in this study. The story was presented as a video in a nonverbal format. Thus, this mode of presentation did not place any demand on the deaf students’ auditory memory. This finding suggests that students who are deaf or hard of hearing are capable of performing on the level of typically hearing peers in identifying bigger concepts and macrostructures when presented with tasks that do not tax auditory working memory (Jones et al., 2016).

In the Jones et al. (2016) study, however, the students who were deaf performed more poorly on the microstructures, or the finer details of grammar and language (Jones et al., 2016). Errors included overgeneralization of verb rules, omission of articles, omission of prepositions, and omission of verb inflections. Students in the study who were deaf also used fewer conjunctions and subordinate clauses, and they introduced
EXECUTIVE FUNCTION AND HEARING IMPAIRMENT

characters with ambiguous references and some errors in pronoun usage (Jones et al., 2016).

**Incidental learning.** Incidental learning was previously discussed as an important method of learning for students without hearing impairment. A great deal of information is taken in by students in this fashion, so one should note the executive skills that may impact this area. Dang, Braeken, Colom, Ferrer, and Liu (2013) suggested that individuals must work to develop phonological systems and short-term memory for these systems in order to access this type of learning. They proposed that, for students with cochlear implants, specific and targeted work needs to be completed with these skills after implantation to ensure that the cochlear implants are effective in this area. Additional information about listening-skill development, specifically auditory verbal therapy, is discussed in the Intervention section. Auditory verbal therapy is designed to develop students’ abilities to use hearing technology to the greatest extent possible by practicing listening skills, building and strengthening neuronal pathways and processing of auditory information, and building working-memory skills and the ability to apply those skills (Estabrooks, MacIver-Lux, & Rhoades, 2016; Percy-Smith et al., 2018).

**Existing Executive-Functioning Intervention Programs**

As previously discussed, executive functioning as an umbrella term consists of many different component skills (Kral et al., 2016). While hearing impairment and use of assistive technology, such as hearing aids or cochlear implants, have been shown to impact many of these skills in some capacity (Arfé, 2015; Edwards et al., 2016; Hintermair, 2013; Hoffman et al., 2018; Kral et al., 2016; Kronenberger et al., 2014), supportive interventions must be designed to tailor to the needs and patterns typically
associated with students with hearing impairment (Kral et al., 2016). As with any intervention, the educational team also must keep in mind the individual needs of the student because outcomes have also been shown to vary within population of students with hearing impairment (Kral et al., 2016; Van Weering & Wouters, 2015). This variation is likely caused by the variability in this population, as the population of students with hearing impairment is heterogeneous in nature (Maller, 2003; Mason, 2005; Pollard, 2002).

Some researchers have suggested that existing executive-functioning interventions designed for students with typical hearing can be utilized to support auditory-oral students with hearing impairment (Kral et al., 2016). Jacobs et al. (2016) hypothesized that training and development of short-term memory would be beneficial for students with hearing impairment, but this benefit was believed to be more needed for students in deaf education (i.e., using sign language). Jacobs et al. (2016) suggested that an adaptive program, such as CogMed, could be utilized. The CogMed program is supported by several studies (Gray et al., 2012), but other researchers and practitioners have questioned whether the results of the intervention frequently carry over into school functioning in a practical fashion or transfer to other areas of functioning (Gray et al., 2012). Kronenberger, Pisoni, Henning, Colson, and Hazzard (2011) completed a pilot study using this program with students with cochlear implants. While their results indicated some initial improvements in several areas of working memory, these effects generally faded over time, decreasing 1 month post treatment and decreasing more substantially 6 months post treatment. Additionally, one should note that the sample size
was very small \((n = 9)\) in the study completed by Kronenberger et al. (2011). The researchers indicated a need for further exploration in this area.

For the purposes of the current program development, the designed intervention had to cater to the individual needs of students with hearing impairment (Kral et al., 2016).

Several research studies have supported existing executive-functioning interventions in their effectiveness with typically hearing students (Diamond, 2012; Diamond, 2013). A review of existing executive-functioning interventions that have been shown to be effective for students with typical hearing include computer-based interventions (Diamond, 2012; Jaeggi, Buschkuehl, Jonides, & Shah, 2011; Klingberg, 2010), instructional- or teaching-based interventions (Diamond, 2012), activity-based interventions (Diamond, 2012; Lakes & Hoyt, 2004), and parent- and family-based interventions. While all of these types should be acknowledged, the current program development focuses on a school-based instructional intervention with accompanying accommodation support. As such, existing interventions that use this type of approach are discussed in greater detail.

Several programs have been developed that address executive-functioning difficulties for typically hearing children in a school-based setting. These programs include Tools of the Mind, Promoting Alternative Thinking Strategies (PATHS; Riggs, Greenberg, Kusche, & Pentz., 2006), The Chicago School Readiness Project (CSRP), the Thirty Million Words Project, and the Rush Neurobehavorial Center Executive Functioning Notebook. In addition to these programs, multiple publications provide executive-functioning strategies and lessons to be used in the school setting.
Tools of the Mind. The Tools of the Mind curriculum is designed for early-childhood education, and its goals are to improve development of both self-regulation skills and academic skills. The program defines and targets self-regulation skills as involving control of attention, behavior, and executive functions (Baron, Evangelou, & Malmberg, 2017). It also seeks to teach children how to exhibit goal-directed action. Reports indicated that it has increased in popularity of use within the last several years in the United States, Chile, and Canada. While research to date supporting the effectiveness of the Tools of the Mind program has not been significant, some research has shown positive outcomes (Baron et al., 2017). Blair, McKinnon, and Daneri (2018) examined the impact of this program in kindergarten students. Their findings suggested positive impacts on social and emotional development, as well as reduced aggression sustained into first grade.

Promoting Alternative Thinking Strategies (PATHS). The PATHS program has been shown to be effective in part because of the neurocognitive training that the program provides. Riggs et al. (2006) suggested that the integration of executive-functioning skills and improvement in those skills allowed for improvements in overall academic functioning and executive functioning. Specific skills discussed and addressed by Riggs et al. (2006) included inhibitory control and verbal fluency.

The Chicago School Readiness Project (CSRP). The CSRP has been shown to improve academic skills through increases in self-regulation and executive-functioning skills. This program is targeted specifically toward preschool and Head Start students. Research completed by Raver et al. (2011) assessing the effectiveness in skill development showed gains in children’s attention and impulse control, as well as in
overall executive-functioning skills. It indicated that partial supportive evidence was found to connect the improvement in executive and self-regulation skills to improvements in academic skills (Raver et al., 2011).

**The Thirty Million Words Project.** The Thirty Million Words Project is based on a theory presented by Dana Suskind, in which she suggests that parents must talk to their children consistently to develop appropriate auditory connections in their children’s brains (Suskind, Suskind, & Lewinter-Suskind, 2015). This project has been shown to be effective for children who are typically hearing and has been referenced as potentially useful for students with hearing impairment (Kral et al., 2016). While this project has received support from some researchers, others have emphasized that talk alone does not build children’s vocabularies in order to help them adequately access and organize instruction. Wasik and Hindman (2015) suggested that children also need opportunities to talk themselves, use vocabulary in meaningful contexts, and receive feedback on what they are saying in order to develop adequate vocabulary and organization of language.

**Integration with Language and Auditory Verbal Supports**

Students with educationally significant hearing impairment who use technology benefit from auditory verbal therapy (Percy-Smith et al., 2018). Auditory verbal therapy is an intervention and support designed to give students with hearing impairment targeted practice with listening skills, whether the students are using cochlear implants or hearing aids (Percy-Smith et al., 2018). This therapy is designed to build the pathways in the students’ auditory cortex to facilitate listening and spoken-language goals, and this practice transcends both home and school environments to promote practice in all settings (Estabrooks et al., 2016; Percy-Smith et al., 2018).
Several research studies have shown the positive impact and effectiveness of auditory verbal therapy for students with hearing aids and cochlear implants (Dettman, Wall, Constantinescu, & Dowell, 2013; Dornan, Hickson, & Murdock, 2010). Dettman et al. (2013) examined the impact of several different programs for young children with hearing impairment, including auditory verbal, auditory oral, and bilingual-bicultural methods. Their results revealed that students receiving consistent auditory verbal therapy yielded better listening and spoken-language outcomes than those who were not receiving consistent therapy. Dornan et al. (2010) similarly found benefits for use of auditory verbal therapy. Their results suggested improved outcomes in speech, language, and self-esteem, as well.

Given the positive impact of this auditory verbal support for students with hearing impairment using speaking and listening as their primary mode of communication, the proposed program incorporates listening and spoken language strategies associated with auditory verbal therapy in its implementation. It is believed that the incorporation of these strategies will lead to stronger benefits and access for the students using the program.

**Conclusions and Summary**

Multiple researchers have concluded their studies by emphasizing the need for integrated supports for students who are deaf and hard of hearing (Hintermair, 2013; Kronenberger et al., 2014). While the studies address various age groups and different samples of students who are deaf and hard of hearing, much of the research suggests the need for integrated supports that emphasize language (Kronenberger et al., 2014), communicative competence (Hintermair, 2013), social skills, and executive-functioning
skills (Hintermair, 2013; Kronenberger et al., 2014) in order to promote success of students who are deaf and hard of hearing.

The program developed for the current dissertation seeks to provide a specialized system of support for executive skills for students who are deaf and hard of hearing working within an auditory oral inclusive environment. Researchers have suggested that programs and supports cannot simply be taken directly from interventions designed for students with typical hearing but must be catered to the specific needs of students with hearing impairment who use spoken language (Kronenberger et al., 2014).

The current program not only is tailored to the needs of the student, but also is designed to be used as part of an integrated system of support for these students. As suggested by the previously reviewed research, students who are deaf and hard of hearing find success most adequately when academic, social, executive, and behavioral-skills supports are integrated (Kronenberger et al., 2014).
CHAPTER 3: METHODS

Overview

Existing research and programs addressing executive-functioning skills in school-aged students were reviewed. Extensive information was also gathered regarding specific areas of executive functioning that have been shown to be difficult for students who are deaf or hard of hearing. This information was integrated to develop an executive-functioning program catered specifically to the needs and common executive deficits of students with hearing impairment. The program was then presented to teachers who worked with students in a supplemental hearing support program, and information was gathered regarding teacher perceptions of feasibility of implementation, utility of the program, and perceived need for the program overall.

Participants

Participants in this study included teachers who instructed students in Grades 4 through 12 of a supplemental-level hearing support program in southeastern Pennsylvania. These teachers included those who were certificated Teachers of the Deaf, as well as the special-education teachers and mainstream regular-education teachers who worked with these students.

Apparatus and Materials

Based on a review of the research and existing executive-functioning programs, a new program was developed targeted specifically to the needs of school-aged children who exhibit an educationally significant hearing impairment (See Appendix A). It was designed for students who use technology (e.g., hearing aids, cochlear implants, FM systems) and speaking and listening as their primary mode of communication. The
program was presented for review to a total of 66 teachers who worked with these students. These teachers were given several weeks to review the program, and they were then asked to complete a survey to gather their impressions of the program. Perceptions of the utility of the program and perceptions of the feasibility of implementation of the program were assessed through Likert-scale responses on the surveys. Perceived need for the program was also addressed in the survey, and several open-ended questions were also provided to allow for additional feedback. The survey included both Likert-scale and open-ended questions to gather information from the teachers.

**Procedure**

**Program development.** The first goal of the study was to develop the proposed executive-functioning program for students with educationally significant hearing impairment. In order to effectively do so, a review of existing executive-functioning curricula was performed to determine which components of the curricula would be most useful for the specialized program. Research was completed on the areas of executive functioning that are commonly the most difficult for students with hearing impairment. Effective strategies, supports, and accommodations were also reviewed to ensure that the presentation of content was effective.

Several different approaches have been taken to improve executive functioning in school-aged children. Some programs are computer based, providing direct training in certain areas of executive functioning through individual games. The cognitive demand of these games increases as students improve and build skills, further promoting additional improvement. Perhaps the most popular of these is CogMed, which specifically targets working memory. Other developed programs have targeted curricula
or lessons that involve direct instruction with students. These programs require time during a school day for students to be taught a lesson on some aspect of executive-functioning skill. They are then supported in the generalization of the taught skills into their academic demands and tasks across the rest of their school day. Still other programs involve extensive teacher training in order to facilitate the infusion of executive-functioning skills development into existing lessons and curricula. This integration eliminates the need for direct instruction time, and for certain populations, particularly younger children, appears to be moderately effective. Programs with this structure include Promoting Alternative Thinking Strategies (PATHS) and The Chicago School Readiness Project (CSRP; Diamond & Lee, 2011).

This researcher reviewed the structures of the existing programs to evaluate the types of program structure and modes of implementation that might be most effective, reviewed the literature to determine the most recent research suggestions regarding the specific areas of executive-functioning difficulty for oral deaf students and the modes of implementation that have been shown to be most effective for them. This understanding of the difficulties and modes of implementation was used to inform program development design.

Children with hearing impairment often have difficulty generalizing skills and knowledge not directly taught to them. As such, these students will likely exhibit a greater benefit when at least some portion of an executive-function program is presented directly to them. Because many of the executive-functioning difficulties experienced by students with hearing impairment are the result of a lack of access to verbal communication, language, and direct interaction, the computerized method is not
believed to be the most effective for improving their skills. Teacher training methods, however, are believed to be more feasible to implement, as children with educationally significant hearing impairment already receive support and consultation from a Teacher of the Deaf. Specifically training these educators to infuse strategies and support across content areas, while also providing direct instruction in skills to be developed, is hypothesized to be an effective method for supporting these students in the development of these skills.

In order to develop the content of a specialized program for developing executive functioning in children with hearing impairment, the research was reviewed regarding trends in specific areas of executive-functioning skills that are most difficult for students with hearing impairment. With these needs in mind, existing executive-functioning curricula and programs were consulted for materials, strategies, and instructional activities that would be of use. After reviewing the learning needs, approaches, and strategies that have been shown to be effective in instructing students with hearing impairment, this researcher further screened and adapted the collected activities and strategies to be optimally taught to students with hearing impairment.

The collection of materials and strategies was then organized into age-appropriate activities, as research shows that students with hearing impairment exhibit difficulties with varying areas of executive functioning depending on grade level. Once organized and targeted, the program was presented to the Teachers of the Deaf working with the students in Grades 4 through 11. The teachers were instructed on the strategies associated with the executive-functioning content. They also received support in using these strategies across the program pilot.
**Teacher feedback and feasibility determination.** After the program was developed, it was presented to teachers who worked with the students in Grades 4 through 12 of a supplemental hearing support program for review. A survey was completed by the participating Teachers of the Deaf, as well as by the special-education teachers and mainstream teachers working with the students. Their perceptions of the feasibility and overall benefits of the program were thoroughly analyzed, as was the perceived need for the program. Results were used to make any necessary changes to the existing program to improve its impact moving forward.
CHAPTER 4: RESULTS

The distributed survey yielded a total of 12 responses. Respondents included teachers from the elementary target grade levels (i.e., 4 and 5), the middle-school target grade levels (i.e., 6 through 8), and the high-school target grade levels (i.e., 9 through 12). More surveys were completed by middle-school teachers than by teachers at the other two target levels. Table 1 displays the number of responses and response rates for each level. Grade levels were banded as elementary, middle, and high because several respondents taught at several grade levels within the given banded intervals. Additionally, the low numbers of total responses rendered analysis by individual grade level somewhat less constructive than banded interpretation. However, even with these bands, the small sample size of responses should be considered when interpreting the overall results.

Table 1
Survey Response Rates by Grade Level Band

<table>
<thead>
<tr>
<th>Grade band</th>
<th>Number of respondents polled</th>
<th>Number of surveys completed</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary school (Grades 4 &amp; 5)</td>
<td>10</td>
<td>1(^a)</td>
<td>10%</td>
</tr>
<tr>
<td>Middle school (Grades 6-8)</td>
<td>29</td>
<td>8</td>
<td>27.6%</td>
</tr>
<tr>
<td>High school (Grades 9-12)</td>
<td>27</td>
<td>3(^b)</td>
<td>11.1%</td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>12</td>
<td>18.2%</td>
</tr>
</tbody>
</table>

\(^a\)This respondent was excluded from data analysis, as it was indicated in the survey that he did not review the program.

\(^b\)One respondent of this group was excluded from data analysis, as it was indicated in the survey that he did not review the program.

Response rate was the strongest for middle-school teachers surveyed. High-school and elementary-school teachers responded at comparable rates. In total, middle-school teachers represented 66% of the total respondent pool.
Exclusion Criteria

The distributed survey (see Appendix B) included a question to probe for whether the respondents had reviewed the provided program in order to offer feedback. Two of the respondents who completed the survey indicated that they did not review the program. These respondents are noted in Table 1. As such, their responses are excluded from subsequent data presentation and analysis.

Respondent Information

Respondents for the survey included regular-education teachers, special-education teachers, and teachers of the hearing impaired. Teachers of several content areas were represented in the sample. Content areas included social studies, math, and language arts. Resource room teachers and learning-support teachers were also included in the sample. Information about the respondents, grade levels taught, and content areas taught can be found in Table 2.

Experience with Students with Hearing Impairment

Survey respondents had varying degrees of experience working with students who were deaf or hard of hearing. Table 3 provides information on respondents’ years of experience, as well as on whether the respondents were currently teaching students with hearing impairment when the program was reviewed.
Table 2
**Respondent Roles, Content Areas, and Education**

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Grade level(s)</th>
<th>Content area</th>
<th>Role</th>
<th>Highest degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6, 7, 8</td>
<td>Learning support: math</td>
<td>Special-education teacher</td>
<td>Master’s</td>
</tr>
<tr>
<td>2</td>
<td>6, 7, 8</td>
<td>Hearing support</td>
<td>Teacher of the deaf Regular-education teacher</td>
<td>Master’s</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>Language arts</td>
<td>Master’s</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9, 10, 11, 12</td>
<td>Hearing support</td>
<td>Teacher of the deaf Special-education teacher</td>
<td>Master’s</td>
</tr>
<tr>
<td>5</td>
<td>9, 10, 11, 12</td>
<td>Reading/language arts</td>
<td>Master’s</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>Learning support: reading &amp; language arts</td>
<td>Master’s</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>6, 8</td>
<td>Language arts</td>
<td>Bachelor’s</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>6, 8</td>
<td>Language arts</td>
<td>Master’s</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6, 7, 8</td>
<td>Hearing support</td>
<td>Teacher of the deaf Regular-education teacher</td>
<td>Master’s</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>Language arts</td>
<td>Master’s</td>
<td></td>
</tr>
</tbody>
</table>

All respondents had experience with teaching students with hearing impairment. Experience ranged from 1 year to 26 years of experience. Only one respondent who
completed the survey was not currently teaching a student with hearing impairment at the time of survey completion, and one respondent had not worked with students with hearing impairment prior to the current school year.

**Perceptions of Feasibility**

On the Likert-scale portion of the survey, respondents indicated the perceived feasibility of implementation of several components of the provided program on a scale of 1 to 5. On this scale, 1 was indicated to represent *not at all feasible*, while 5 was indicated to represent *completely feasible*. Table 4 displays the mean and median responses of the respondents by grade band. Mean and median ratings are also provided for respondent groups by teaching category (i.e., regular education, special education, Teacher of the Deaf).

Rating means and medians for all areas were at or above 3.00 for respondents’ perceptions of program feasibility. These ratings suggest that the respondents felt that all aspects of the program were moderately feasible to implement in their classrooms, at minimum. The feasibility was rated more highly across areas for the high-school teachers sampled. The lowest ratings provided were given by special-education teachers in their ratings of the Basic Approaches component of the provided program. With the exception of this area, all targeted areas of the program received mean and median ratings of 4.00 and higher.

**Perceptions of Utility**

On the Likert-scale portion of the survey, respondents also indicated the perceived utility of several components of the provided program on a scale of 1 to 5. On this scale, 1 was indicated to represent *not at all useful*, while 5 was indicated to represent *extremely useful*.
Table 4  
*Perceptions of Feasibility*

Survey prompt: On a scale of 1 to 5, with 1 being not at all feasible and 5 being completely feasible, please rate the following aspects of the program with respect to your perceptions of its feasibility of implementation in your classroom.

<table>
<thead>
<tr>
<th></th>
<th>Classroom wide support options</th>
<th>Auditory verbal strategies</th>
<th>Quick reference sheets</th>
<th>Basic approaches</th>
<th>Additional targeted lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle school</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N = 8)</td>
<td>Mean rating</td>
<td>4.25</td>
<td>4.25</td>
<td>4.25</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>4.50</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>High school</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N = 2)</td>
<td>Mean rating</td>
<td>5.00</td>
<td>5.00</td>
<td>4.50</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>5.00</td>
<td>5.00</td>
<td>4.50</td>
<td>5.00</td>
</tr>
<tr>
<td>Teacher of the Deaf</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N = 3)</td>
<td>Mean rating</td>
<td>4.33</td>
<td>4.67</td>
<td>4.33</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>5.00</td>
<td>5.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Regular education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N = 4)</td>
<td>Mean rating</td>
<td>4.75</td>
<td>4.50</td>
<td>4.25</td>
<td>4.75</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>5.00</td>
<td>4.50</td>
<td>4.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Special education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N = 3)</td>
<td>Mean rating</td>
<td>4.00</td>
<td>4.00</td>
<td>4.33</td>
<td>3.67</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>
useful. Table 5 displays the mean and median responses of the respondents by grade band. Mean and median ratings are also provided for respondent groups by teaching category.

Ratings across areas and respondents indicated a high level of perceived usefulness of various aspects of the program. The lowest ratings for perceived utility were provided by special-education teachers for the Quick Reference Sheets and the Targeted Lessons & Supports provided in the program. Regular-education teachers perceived the program to be the most useful, with the exception of the Targeted Lessons & Supports section. Ratings from high-school teachers were slightly higher as a whole than were ratings from the middle-school teachers.

Perceptions of Need

Likert-scale responses were also collected to evaluate respondents’ perceptions of the need for components of the provided program on a scale of 1 to 5. On this scale, 1 was indicated to represent *not at all needed*, while 5 was indicated to represent *extremely needed*. Table 6 displays the mean and median responses of the respondents by grade band. Mean and median ratings are also provided for respondent groups by teaching category.

Response patterns suggested that high-school teachers perceived the program as slightly more needed across areas than did the middle-school teachers. Middle-school teachers indicated the highest level of perceived need in the area of Planning & Time Management. The least amount of perceived need was noted for the Goal Setting components of the program for the middle-school teachers. These components, however, were rated as extremely needed at the high-school level.
Table 5
Perceptions of Utility

Survey prompt: On a scale of 1 to 5, with 1 being not at all useful and 5 being extremely useful, please rate the following aspects of the program based on your perceptions of their usefulness when working with students with hearing impairment.

<table>
<thead>
<tr>
<th></th>
<th>Overview of executive function</th>
<th>Executive function &amp; hearing loss explanation</th>
<th>Classroom wide support options</th>
<th>Auditory verbal strategies</th>
<th>Quick reference sheets</th>
<th>Targeted lessons &amp; supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle school</td>
<td>Mean rating</td>
<td>4.00</td>
<td>4.50</td>
<td>4.25</td>
<td>4.25</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>4.50</td>
<td>5.00</td>
<td>4.50</td>
<td>4.50</td>
<td>4.00</td>
</tr>
<tr>
<td>High school</td>
<td>Mean rating</td>
<td>4.50</td>
<td>4.50</td>
<td>5.00</td>
<td>5.00</td>
<td>4.50</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>4.50</td>
<td>4.50</td>
<td>5.00</td>
<td>5.00</td>
<td>4.50</td>
</tr>
<tr>
<td>Teacher of the Deaf</td>
<td>Mean rating</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>3.67</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Regular education</td>
<td>Mean rating</td>
<td>4.50</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>4.75</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Special education</td>
<td>Mean rating</td>
<td>3.67</td>
<td>4.33</td>
<td>4.00</td>
<td>4.00</td>
<td>3.67</td>
</tr>
<tr>
<td></td>
<td>Median rating</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>
Table 6
Perceptions of Need

Survey prompt: Please rate the perceived need for the provided lessons in each executive functioning skill area on a scale of 1 to 5. 1 represents not at all needed/useful and 5 represents extremely needed/useful.

<table>
<thead>
<tr>
<th></th>
<th>Goal setting</th>
<th>Working memory</th>
<th>Categorizing &amp; organization</th>
<th>Planning &amp; time management</th>
<th>Self-monitoring &amp; attention</th>
<th>Emotional regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle school</td>
<td>Mean rating</td>
<td>3.50</td>
<td>3.75</td>
<td>3.75</td>
<td>4.50</td>
<td>4.00</td>
</tr>
<tr>
<td>(N = 8)</td>
<td>Median rating</td>
<td>3.50</td>
<td>4.00</td>
<td>4.00</td>
<td>4.50</td>
<td>4.00</td>
</tr>
<tr>
<td>High school</td>
<td>Mean rating</td>
<td>5.00</td>
<td>4.00</td>
<td>4.50</td>
<td>4.50</td>
<td>4.50</td>
</tr>
<tr>
<td>(N = 2)</td>
<td>Median rating</td>
<td>5.00</td>
<td>4.00</td>
<td>4.50</td>
<td>4.50</td>
<td>4.50</td>
</tr>
<tr>
<td>Teacher of the Deaf</td>
<td>Mean rating</td>
<td>4.33</td>
<td>4.00</td>
<td>4.33</td>
<td>4.67</td>
<td>4.33</td>
</tr>
<tr>
<td>(N = 3)</td>
<td>Median rating</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>5.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Regular education</td>
<td>Mean rating</td>
<td>3.75</td>
<td>3.50</td>
<td>3.50</td>
<td>4.50</td>
<td>4.25</td>
</tr>
<tr>
<td>(N = 4)</td>
<td>Median rating</td>
<td>3.50</td>
<td>3.50</td>
<td>3.50</td>
<td>4.50</td>
<td>4.50</td>
</tr>
<tr>
<td>Special education</td>
<td>Mean rating</td>
<td>3.33</td>
<td>4.00</td>
<td>4.00</td>
<td>4.33</td>
<td>3.67</td>
</tr>
<tr>
<td>(N = 3)</td>
<td>Median rating</td>
<td>3.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
</tbody>
</table>
Regular-education teachers gave lower ratings, as a whole, than those offered by special-education teachers and Teachers of the Deaf. Teachers of the Deaf rated the program as the most needed across the provided areas. Overall, Planning & Time Management appeared to be the component of the program that was perceived to be the most needed by the sampled teachers.

**Open-Ended Responses**

Respondents provided additional feedback on their perceptions of the program through open-ended questions at the conclusion of the survey. Responses are shown as they were written in Table 7. (One should note that response components with nonspecific praise and/or expressions of gratitude for the program were not included as written in the additional feedback item.)

Many different aspects of the program were specifically noted as potentially feasible and useful by various respondents. Goal-setting, planning, and time management were noted most frequently in the open-ended portions of the survey responses. However, other sections and components of the provided program were also noted to be both feasible and likely to be used.

Respondents also provided additional suggestions for sections or items that were not included in the current program. Suggestions for inclusion included additional worksheets, materials to support self-advocacy skills, and additional guidance on leveling of lessons and topics by grade.
Table 7
Open-Ended Responses

| What portions of the program do you believe will be the most feasible for you to use? | • Quick reference sheets. Self-monitoring and attention. Planning and time management. Paraphrasing activity.  
• Goal setting and planning and time management.  
• Hands on activities.  
• I think the self-monitoring piece will be extremely beneficial.  
• Any of the portions are feasible to use with a little adaptation for high school level kids.  
• Auditory verbal strategies; Metacognition strategies.  
• We have an executive functioning program that we use in learning support that uses many of the same types of activities for middle school students. Portions of this program may be better for 6th graders than 7th and 8th.  
• Goal setting and categorizing and organization.  
• Goal setting.  
• Paraphrasing activity, categories activity, planning and scheduling 1, assignment planner, study strategy plan. |
| Which parts of this program can you see yourself using in the most in the future? | • Planning and scheduling activities.  
• Goal setting and planning & time management.  
• Same as previous.  
• The goals sheets.  
• Self-regulation.  
• I could see myself using various portions with some adaptations due to the age of my students. However, the portions I could see using the most are Goal Setting and Emotional Regulation.  
• Auditory verbal strategies; metacognition strategies; organization strategies and working memory strategies.  
• Some of the classroom wide supports for the hearing impaired.  
• Emotional regulation.  
• Study strategy plan, assignment planner, and planning/scheduling 1  
• It was very thorough.  
• It would be important to include self-advocacy, perhaps as a part of the self-monitoring section, especially as students grow older. My most successful hearing-impaired students have been great self-advocates, asking for something to be repeated or clarified when needed.  
• None.  
• I feel that it is too wordy for classroom teachers to use as an intervention tool. Possibly use a checklist for teachers on key points to highlight skills or instructed areas.  
• I don’t think anything is missing.  
• The program looks good, but, if I were to want anything else it would be more ready to use sheets or activities.  
• Nothing that I can think of!  
• More age-appropriate activities for 8th graders.  
• An outline of what is most effective for what grade level.  
• Nothing at this time. |
| What is missing from the program? What do you wish it included? | • I think many of the strategies sound useful for students with EF needs who do not have a hearing impairment as well. |
CHAPTER 5: DISCUSSION

While the number of survey responses collected was small, the results suggest positive perceptions about the overall feasibility, utility, and need for the executive-functioning program generated. Some variation in responses was found across the grade bands of respondents, as well as variation among the different types of teachers polled. However, the information gathered suggests that teachers perceive the program as generally feasible, useful, and needed in their current line of work with students with hearing impairment. The open-ended questions also allowed for further information to be gathered regarding areas of the program that may need improvement and additional resources or materials that may be useful to add to the program as it currently stands. Specific results and component specific information are discussed in the following sections.

Perceptions of Feasibility

Overall, the ratings provided for teacher perceptions of feasibility of the various components of the program were strong. Mean and median ratings fell at a minimum of 3.00, which represents *moderately feasible* on the survey scale. The majority of the ratings fell between 4.00 and 5.00, suggesting higher levels of perceived feasibility of implementation in classrooms. This was true across areas of the program probed in this component of the survey. Ratings from middle-school teachers and high-school teachers did not appear to vary greatly. Similarly, ratings in each area from different types of teachers (i.e., regular education, special education, and Teachers of the Deaf) did not appear to vary greatly. These elevated ratings suggest that all areas of the program were
perceived as moderately feasible to extremely feasible to implement across different
types of classrooms at different grade levels.

**Classroom-wide support options.** Mean and median ratings of feasibility of
implementation for the Classroom-Wide Support Options component of the program fell
between 4.00 and 5.00, suggesting perceptions of strong feasibility of implementation.
This section contains supports that are designed to be used in all classroom settings, and
many of the strategies presented in this section are applicable across grade levels.
Strategies presented included verbal prompts, reminders, and repetitions; visual cues;
schedules; lists; self-monitoring check-ins; visual organizers; rubrics; modeling; effective
grouping; debriefing and questioning; and the use of technology or applications.

Each of the strategies in the Classroom-Wide Support Options section has been
shown to be effective in supporting executive-functioning deficits or promoting
development in these skills (Dawson & Guare, 2010). However, the introduction of each
strategy within the context of the current program contains particular notes specific to the
needs of students with hearing impairment. This provision of context allows these
overarching supports to be targeted and explained in terms of importance for this
particular population of students. Teacher responses supported the feasibility of
implementation of these strategies across classroom settings.

The high ratings for this section from teachers in both middle and high school are
encouraging. The high ratings suggest that the strategies included are seen as feasible in
both the middle- and high-school settings. Additionally, feasibility of these supports were
rated highly by Teachers of the Deaf, regular-education teachers, and special-education
teachers.
**Auditory verbal strategies.** Mean and median ratings of feasibility of implementation for the Auditory Verbal Strategies included in the program also fell between 4.00 and 5.00, suggesting perceptions of strong feasibility of implementation. This section of the program contains supports and accommodations gleaned from the work of auditory verbal therapy, a specialized support for students with hearing impairment who are working to use technology to access spoken language and auditory information in the classroom. While these supports are not suggested to replace a student’s need for separate auditory verbal therapy, they provide information to the teachers so that some of the underlying strategies of auditory verbal therapy can be carried over into instruction across a student’s day. Strategies included asking the student to repeat what was said, focusing on audition first, and encouraging students to specify which parts of instructions were unclear or were missed. These strategies are correlated with growth of auditory working-memory and language understanding (Estabrooks et al., 2016). They are thus connected to the development of executive-functioning skills.

The strategies presented in the program were rated as highly feasible to implement across middle- and high-school grades. Ratings were also consistently high across the types of teachers polled. This portion of the program should thus remain and perhaps be expanded upon in future iterations.

**Quick reference sheets.** Mean and median ratings of feasibility of implementation for the Quick Reference Sheets included in the program fell between 4.00 and 4.50. While these ratings were slightly lower than those provided for the previous two sections discussed, these ratings nonetheless suggest perceptions of strong feasibility of implementation. The section provided reference sheets for multiple areas of
executive functioning. These sheets provided information about the skill, why it may be difficult for students with hearing impairment, and options for support, including targeted questions to help the student develop language associated with the given skill. The sheets were designed to provide strategies that allow for implementation across settings, grade levels, and types of classroom environments. Ratings suggest that the design of these sheets was successful in this regard.

**Basic approaches.** Mean and median ratings of feasibility of implementation for the Basic Approaches section of the program fell between 3.00 and 5.00. While these ratings suggest perceptions of moderate to strong feasibility of implementation across settings, more variation among the responses for this section of the program was found from different types of teachers.

The Basic Approaches section was designed to outline strategies for overarching integration of executive-functioning skills and self-talk. While these strategies are widely used, notes were provided to explain why these strategies are difficult and important for students with hearing impairment.

This section was rated most highly by regular-education teachers. The high ratings may be the result of its overarching academic application, as the provided frameworks can be applied to projects and assignments that may be part of a general-education curriculum. The overarching nature of these strategies would allow regular-education teachers to apply them without significant differentiation or interference in classroom content and curriculum. Teachers of the Deaf also rated the feasibility of this segment of the program as having strong feasibility potential. However, their ratings were not as strong as those of regular-education teachers. This difference may be the result of
variations in students’ ability levels and whether the students have sufficient language to work through the provided strategies.

The lowest ratings for this section were provided by special-education teachers. One should note that while these ratings were the lowest in comparison to the other two groups of teachers, they still indicated moderate feasibility of implementation. The populations of students with whom these teachers worked may have impacted the use of these strategies. Upon further investigation of individual response patterns, it was noted that the high-school special-education teacher in this sample rated the section as completely feasible, while the two middle-school special-education teachers rated this section as moderately feasible. While the sample from which to draw conclusions was small, this pattern may suggest that this section is more appropriate for students at higher levels if it is going to be applied or used in a learning-support setting (all three special-education teachers polled taught learning-support classes).

**Additional targeted lessons.** Mean and median ratings of feasibility of implementation for the Additional Targeted Lessons provided within the program fell between 3.88 and 5.00. These ratings suggest perceptions of moderate to strong feasibility of implementation across settings. While very little variability was found between the overall ratings of different teacher types, a difference was found between the overall ratings of middle-school versus high-school teachers.

The Additional Targeted Lessons sections were created for use in developing areas of executive function that are commonly difficult for students with hearing impairment. While implementation of these lessons was expected to be more feasible for special-education teachers and Teachers of the Deaf, ratings for feasibility were
consistently high across all teacher types. This increase in feasibility may be partially the result of the design of the lessons, as they were constructed with the goal of providing ways to integrate instructional and relevant content. This option of integration may have increased the feasibility for regular-education teachers.

The high-school ratings may be higher than the middle-school ratings because of the lack of regular-education teacher representation in the high-school sample. However, the regular-education teacher sample also rated these lessons as feasible. The ratings suggest that the structure of the lessons and the option to integrate classroom concepts and content into the lesson may help mainstream teachers more readily incorporate these lessons into the lessons that they are already teaching. Future developments and improvements in this program should continue to make lessons that are sufficiently flexible to incorporate this content.

**Perceptions of Utility**

Overall ratings provided for teacher perceptions of utility of the various components of the program were strong. Mean ratings fell at a minimum of 3.67, and median ratings fell at a minimum of 3.00. On the provided scale, 3.00 represents *moderately useful*. The majority of the ratings fell between 4.00 and 5.00, suggesting higher levels of perceived utility in classrooms. Some of the lowest perceived utility ratings came from special-education teachers. However, one should note that the lowest mean and median ratings fell at 3.00, still indicating a moderate level of utility. Ratings from middle-school teachers and high-school teachers did not appear to vary greatly. Ratings from different types of teachers (i.e., regular education, special education, and Teachers of the Deaf) varied somewhat, with regular-education teachers suggesting the
highest levels of utility. Overall, ratings suggest that all areas of the program were perceived as moderately useful to extremely useful across different types of classrooms at different grade levels.

**Overview of executive function.** Mean and median ratings for perceptions of utility of the Overview of Executive Function included in the program fell between 3.67 and 5.00. These ratings, as a whole, suggest perceptions of strong utility for this section of the program. This introductory explanation provides a brief overview of executive function, including a summary of why executive-functioning difficulties can impact students’ academic and social functioning.

Ratings of utility for this section of the program were consistently high across middle- and high-school teachers. Ratings were slightly more variable among different types of teachers. Regular-education teachers indicated the highest level of perceived utility of this section of the program. These high utility ratings may be because this section provides a concise resource and definition that will allow them to better understand students in their classes who may have these difficulties, with or without hearing impairment. Teachers of the Deaf provided slightly lower ratings but still indicated strong utility of this section. Special-education teachers provided the lowest mean rating, suggesting a moderate level of utility possibly because many of these teachers already had a basic understanding of executive-functioning difficulties as special educators. Thus, this section may not have been perceived as useful or new information that they did not already possess and use on a frequent basis in their existing practice.

While this section may not provide information that is absolutely necessary for all readers or professionals using it, it provides an important introduction to later sections of
the program. As such, overall ratings suggest that the overview should continue to be included in potential edits or future versions of the produced program.

**Executive function and hearing impairment explanation.** Mean and median ratings for perceptions of utility of the section entitled, “Why are Executive Functioning Skills Difficult for Students with Hearing Impairment?” fell between 4.00 and 5.00. These ratings, as a whole, suggest perceptions of strong utility for this section of the program. This section summarizes why executive-functioning skills are particularly difficult for students with hearing impairment, given the input of language and access to incidental learning. This section also briefly addresses the neurological impact of hearing impairment and the way auditory input changes brain development.

Provided ratings for the utility of this background information on executive difficulties in students with hearing impairment were consistently high across teachers of different grade levels and different teacher types. Regular-education teachers found this section the most useful, as all regular-education teachers polled indicated this section to be *extremely useful*. Special-education teachers and Teachers of the Deaf may already have a better working understanding of the pertinent difficulties of students with hearing impairment. As such, their ratings did not indicate this level of extreme utility. However, ratings suggest that this condensed explanation was highly useful to regular-education teachers as a reference for understanding the difficulties that their students with hearing impairment face in terms of executive skill.

Ratings suggest that this section will be an important focus for regular-education teachers who use this program. If the program is further developed in the future, this area
might be built upon to help regular-education teachers and all of those working directly with students with hearing impairment understand the difficulties of these students.

**Classroom-wide support options.** Mean and median ratings for perceptions of utility of the Classroom-Wide Support Options section of the program fell between 4.00 and 5.00. These ratings, as a whole, suggest perceptions of strong utility for this section. As previously discussed in the feasibility analysis, this portion of the program contains supports that are designed to be used in all classroom settings, and many of the strategies presented in this section are applicable across grade levels.

Ratings provided suggest strong perceived utility for both middle- and high-school teachers. Additionally, ratings were consistently high across teacher types. As with the section explaining the impact of hearing impairment on executive function, ratings were highest from the regular-education teachers polled. These higher ratings suggest that regular-education teachers perceived this information to be the most useful, possibly because the use of the given supports may not be a standard practice for them and may provide a new resource that they did not typically access previously. Such resources as the current program may provide useful and needed supports to regular-education teachers instructing students with hearing impairment. This section will be an important ongoing component if the program is further developed in the future.

**Auditory verbal strategies.** Mean and median ratings for perceptions of utility of the Auditory Verbal Strategies included in the program fell between 4.00 and 5.00. These ratings, as a whole, suggest perceptions of strong utility for this section. As previously discussed in the feasibility analysis, this portion of the program contains supports and accommodations gathered from the goals and strategies of auditory verbal
therapy, a specialized support for students with hearing impairment who are working to use technology to access spoken language and auditory information in the classroom.

Mean and median ratings for this section were identical to those received for the previously discussed Classroom-Wide Support Options. Responses suggest strong perceived utility for both middle- and high-school teachers. Additionally, ratings were consistently high across teacher types. Again, ratings were highest from the regular-education teachers polled. These ratings suggest that regular-education teachers perceived this information to be the most useful. These strategies and supports are likely not commonly known or used by regular-education teachers. Thus, this section may provide a new resource that these teachers would not typically have accessed prior to the provision of this program. Resources such as these within current programs may provide useful and needed supports to regular-education teachers instructing students with hearing impairment. This section will be an important ongoing component if the program is further developed in the future. Given the positive response to this section, expanding and providing further information to teachers in this area may be prudent in the future.

**Quick reference sheets.** Mean and median ratings for perceptions of utility of the Quick Reference Sheets included in the program fell between 3.00 and 5.00. These ratings suggest perceptions of moderate to strong utility for this section. As previously discussed in the feasibility analysis, this portion of the program provides reference sheets for multiple areas of executive functioning. These sheets provide information about each skill and why it may be difficult for students with hearing impairment. Options for support are also provided, including targeted questions to help the student develop language associated with the given skill.
Ratings for this section of the program were relatively consistent across middle- and high-school teachers. Greater variability was noted for different types of teachers. The greatest perceptions of utility were noted by regular-education teachers. This pattern is similar to previously discussed ratings of other sections of the program. This pattern again suggests that this program may be the most useful to those teachers who are not otherwise regularly exposed to these strategies or provided with input on developing these skills in mainstream classrooms. The lowest ratings were received from special-education teachers. While these teachers still indicated a moderate level of utility, they might have perceived these reference sheets as containing information that may already be a part of their repertoire.

While special-education teachers may perceive this information to be a replication of strategies to which they have previously been exposed, they may need additional support or professional development in applying these strategies to students with hearing impairment. Some studies have suggested that teachers may have an awareness of the term *executive function*, but they may need further instruction and education on the impact of executive skills on learning in the classroom (Gilmore & Cragg, 2014). Future expansion of the program or possible trainings provided in conjunction with the program introduction may assist in allowing these teachers to further understand the nuances of students with hearing impairment and their acquisition of executive skills. Future developments of the program may need to make this distinction and applied importance of the application to students with hearing impairment more clear and direct in its presentation of information.
**Targeted lessons and supports.** Mean and median ratings for perceptions of utility of the Targeted Lessons and Supports included in the program fell between 3.00 and 4.00. These ratings suggest perceptions of moderate to mildly strong utility for this section. As previously discussed in the feasibility analysis, the Additional Targeted Lessons and Supports section was created for use in developing areas of executive function that are commonly difficult for students with hearing impairment.

This research initially hypothesized that implementation of these lessons would be more feasible and useful for special-education teachers and for Teachers of the Deaf than for general-education teachers. However, ratings of both feasibility and utility did not directly follow the expected pattern. In terms of utility perceptions, this section of the program was rated as slightly less useful by middle-school teachers than by the high-school teachers polled. This difference may be because the high-school teachers are more readily able to adapt content to use the provided lessons. Middle-school teachers may have more difficulty taking content that may be already more structured as a curriculum and using the frameworks provided in the program generated.

An examination of the response pattern of different types of teachers again suggests that regular-education teachers indicate a higher degree of perceived utility than do their special-education counterparts and Teachers of the Deaf. This response pattern continues to support the possibility that these teachers may have found this resource more useful because it was not within their typical set of resources. Special-education teachers again provided the lowest ratings. As previously discussed, these lower ratings may be the result of a lack of clarity regarding the importance of these skills for students with hearing impairment. The strategy differences that are necessary for students with hearing
impairment should be augmented and better explained in future iterations of the program, and professional development or training opportunities may also allow for more clarity to be established.

**Perceptions of Need**

In addition to the ratings of feasibility and utility perceptions, information was also gathered about the specific areas where targeted lessons were provided in the program. Teacher responses regarding the perceived need for these components were assessed to determine future needs and potential areas of development for the program.

Overall ratings provided for teacher perceptions of need for the various components of the program fell between moderate need and strong need. Mean ratings fell at a minimum of 3.33, and median ratings fell at a minimum of 3.00. On the provided scale, 3.00 represents *moderately needed/useful*. While lower ratings in previous areas came primarily from special-education teachers, many of the lowest perceived utility ratings came from regular-education teachers when evaluating the need for specific areas of targeted lessons. However, one should note that the lowest mean and median ratings fell at 3.00, still indicating a moderate level of need.

Ratings from middle-school teachers and high-school teachers did not appear to vary greatly, with the exception of those provided for the goal-setting lessons. Ratings from different types of teachers (i.e., regular education, special education, and Teachers of the Deaf) varied somewhat, but no consistent trend was noted across all skill areas. Overall, ratings suggest that all areas of the program were perceived as moderately needed to extremely needed across different types of classrooms at different grade levels.
**Goal setting.** Perceptions of need for the Goal Setting lessons of the program varied from moderately needed to extremely needed. Mean and median ratings for perceptions of need for this segment of the program fell between 3.00 and 5.00. The high-school teachers polled indicated a high level of need for these lessons, while the middle-school teachers indicated slightly above a moderate need. Regular-education teachers and special-education teachers indicated a moderate need, while Teachers of the Deaf indicated a slightly higher level of need for this area.

The difference between the ratings of the high-school teachers and those of the middle-school teachers in this area may be the result of disparities in the need for independent execution of these skills at varying grade levels. High-school students might be expected to execute these skills more frequently and more independently than are middle-school students, thus creating a higher demand for the skills in the opinion of high-school teachers.

Differences in ratings by teacher type may result from the level of experience with students with hearing impairment. While ratings from the Teachers of the Deaf were only slightly higher than those of the other two teacher groups, Teachers of the Deaf might have a greater level of awareness of the need for skill development in this area than do regular-education and special-education teachers. Despite the differences in ratings, the lowest ratings indicated a moderate level of need. While these ratings may not indicate an area of focus that needs to be significantly developed within the program, it will continue to be a needed piece in future improved versions.

**Working memory.** Perceptions of need for the Working Memory lessons of the program were consistent across raters. Mean and median ratings for perceptions of need
for this segment of the program all fell between 3.50 and 4.00. These ratings suggest a moderate to high level of need for this segment of the program. Working memory is an area of weakness that is significantly supported by research on students with hearing impairment who use speaking and listening (e.g., Edwards et al., 2016; Harris et al., 2013). Lessons in this section should continue to be a focus for development within the program, and additional training or professional development completed in conjunction with the program may help teachers better use these lessons to promote working-memory development in students with hearing impairment.

**Categorizing and organization.** Perceptions of need for the Categorizing and Organization lessons of the program were relatively consistent across raters. Mean and median ratings for perceptions of need for this segment of the program all fell between 3.50 and 4.50. These ratings suggest a moderate to high level of need for this segment of the program. Ratings from high-school teachers were slightly higher than those expressed by middle-school teachers. As noted in previous analysis, this difference may be the result of greater demands for independence in executing these skills at the high-school level. However, helping teachers to understand the importance of developing the building blocks of these skills will be important for future success, particularly with students with hearing impairment. As noted in the program, as well as in the review of the literature, deficits in organizational language arise from a lack of incidental learning on the part of students with hearing impairment (Moeller, 2007). These skills and the language components of the skills need to be taught at an earlier age to reinforce understanding and generalization of those skills as students progress through grade levels.
While rating patterns for this component of the program did not vary greatly, regular-education teachers expressed a lower level of need for this component than did Teachers of the Deaf or special-education teachers. This difference may be because the regular-education teachers polled were all middle-school teachers. As such, they may not yet see the impact of deficits in this skill arise in academic work. Additionally, the structure of their lessons and classroom content may already incorporate supports in this area to mitigate the perceived need for additional activities to develop these skills.

Research suggests that these categorizing and organizational skills are difficult for students with hearing impairment (Kral et al., 2016). These skills are important for organizing information and content in the classroom. As such, they should continue to be included in the program, perhaps with further development to increase the perceived need for these skills in the middle-school setting and the regular-education setting as a whole.

**Planning and time management.** Perceptions of need for the Planning and Time Management lessons of the program were consistently high across raters. Mean and median ratings for perceptions of need for this segment of the program all fell between 4.00 and 5.00. These ratings suggest a high level of perceived need for this segment of the program. Ratings for this segment of the program were exactly consistent across middle- and high-school raters. Additionally, minimal variation was noted based on the type of teacher polled.

This section of the program was rated to have one of the highest levels of perceived need when compared to other components of the program. This response pattern suggests that this area is a strong area of focus for the teachers polled in this study. While the sample in this study was small, the high ratings in the responses
provided suggest that this area should be a continued area of focus for improvement and expansion in supporting teachers working with students with hearing impairment in the future.

**Self-monitoring and attention.** Perceptions of need for the Self-Monitoring and Attention lessons of the program were consistent across raters. Mean and median ratings for perceptions of need for this segment of the program all fell between 3.67 and 4.50. These ratings suggest a moderate to high level of perceived need for this segment of the program. Ratings for this segment of the program were relatively consistent across middle- and high-school raters. Additionally, only small amounts of variation were noted based on the type of teacher polled.

Special-education teachers expressed the lowest level of perceived need for this segment of the program. For attention in particular, this lower level rating may be the result of smaller class sizes, as smaller class size may ameliorate existing attention difficulties. Smaller classes have increased external regulation of students and require less independent attention on the part of the student. This class size difference may have lowered these teachers’ perceived need for additional supports for attention in their classrooms as compared to regular-education teachers. Teachers of the Deaf also reported slightly lower levels of need than those of regular-education teachers. This difference may be the result of existing supports already in place, as well. However, all teachers rated this section of the program as moderately to highly needed.

**Emotional regulation.** Perceptions of need for the Emotional Regulation lessons of the program were relatively consistent across raters. Mean and median ratings for perceptions of need for this segment of the program all fell between 4.00 and 5.00. These
ratings suggest a high level of perceived need for this segment of the program. Ratings for this segment of the program were relatively consistent across middle- and high-school raters. Additionally, only small amounts of variation were noted based on the type of teacher polled.

Detailed examination of ratings revealed that responses from Teachers of the Deaf indicated the highest level of need for this segment of the program. Students with hearing impairment often have vocabulary deficits because of lack of incidental learning. These students also have impaired access to auditory information that is accessed by their typically hearing peers (Moeller, 2007). As such, their emotional vocabulary and regulation skills can also be below that which may be expected when compared to typical peers (Kral et al., 2016). Teachers of the Deaf may have a greater awareness of these difficulties and thus perceive a higher level of need for these components of the program. However, ratings across teachers suggest that the level of need for this component of the program is high. As such, emotional regulation should be an area of focus in the ongoing development of the current program.

**Open-Ended Responses**

The open-ended responses provided an opportunity for teachers to give additional feedback and information about the program, including specific sections and activities that they perceived as the most feasible and those they would be most likely to use. The teachers were also able to give information about topics or activities they believed were missing from the program to allow targeted improvements to be made to the program in the future.
Feasibility. Many teacher responses regarding the components of the program that would be most feasible for them to use referenced sections or topics. Goal setting was the topic most frequently referenced. However, self-monitoring, attention, planning, time management, auditory verbal strategies, metacognitive strategies, categorizing, and organizing were also referenced. The quick reference sheets were also cited as the most feasible by one respondent. Additionally, some teachers chose to discuss specific activities that would be most feasible for them to use in their classrooms. The activities referenced were from various categories of executive functioning. Because information from only 10 respondents was analyzed, the variation in the responses suggests that multiple components of the program were perceived as feasible by the teachers polled. However, additional feedback would need to be gathered to provide additional support for this hypothesis.

In addition to referencing specific areas or topics addressed by the program, some respondents indicated in the feasibility probe that they perceived the provided program as needing adaptation for older students. This feedback should be considered for future edits and improvements of the program. Further investigation should be completed regarding higher level activities for older and more advanced students if so warranted.

One respondent also noted that the “hands-on activities” would be the most feasible. This feedback suggests that future versions of the program may need to provide additional activities and worksheets that teachers could readily transfer into classroom use. This addition of activities would allow them to have premade materials that would facilitate the generation of the skills in question.
Another teacher indicated that the program was perceived as similar to an existing program used in her classroom for executive functioning. Several existing executive-functioning programs and curricula were reviewed prior to the formulation of the current program. However, the current program has details and organization that are specifically catered to students with hearing impairment. The current program might need ongoing development and work in order to make the important factors and differences necessary for students with hearing impairment more clear in its presentation. As was stated in earlier components of the discussion, professional-development opportunities or training in conjunction with the provision of the program may help teachers better recognize and apply the strategies and information being presented (Gilmore & Cragg, 2014).

**Sections most likely to be used.** Teacher responses for sections most likely to be used largely mirrored those sections that they found to be most feasible to use. Several overarching topics or sections, including planning and time management, goal setting, self-regulation, emotional regulation, organization, and working memory, were noted. Some of the strategies, including the auditory verbal strategies, metacognitive strategies, and the classroom-wide support options, were also noted. Still other teachers chose to list specific activities that they would be likely to use in their classrooms. These included the planning and scheduling activities, the goals sheets, the study strategy plan, and the assignment planner.

As with the responses on the feasibility components, the variation in teachers’ answers suggests that multiple areas of the program were perceived as useful to the respondents. The differences in answers may also highlight the variation in areas in which teachers feel that they could use more support in their work with students with...
hearing impairment. Ongoing collaboration with these teachers to ensure adequate support, as well as resources from professionals who understand the needs of students with hearing impairment, are important to help support success in this student population. Future development of the current program may continue to develop the areas cited by teachers as useful. This development would allow for more significant support of teachers, thereby possibly improving student learning and performance.

**Missing components.** Responses from teachers regarding their perceptions of topics that were missing from the program were informative. Several teachers indicated that the program was thorough as it stood and that they perceived no components currently missing (e.g., “It was very thorough”; “None”; “I don’t think anything is missing”; “Nothing at this time”). Other respondents offered areas that would allow for targeted future improvement of the program to further support teachers working with students with hearing impairment. These suggestions included self-advocacy components, clear direction on age-appropriateness of activities, and more ready-to-use activities.

**Self-advocacy.** The suggestion for inclusion of self-advocacy work into the program is valid. Self-advocacy skills are extremely important for students with hearing impairment, as these students must learn to manage their equipment, request repetitions and clarifications, and understand how to convey their needs to access instruction (Luckner & Becker, 2013). While self-advocacy may be viewed as a separate skill (i.e., independent of executive functioning) that should be fostered for any student with hearing impairment, its integration into the current program would further augment the
program and help those working with these students to have additional information about their needs. This skill is also related to planning, self-monitoring, and organization.

**Age-appropriateness.** Several feedback components suggested more direction on the age or grade level appropriateness of the supports and activities contained in the program. The current, initial form of the program did not include age- or grade-specific information on the worksheets with intention. Age- and grade-based information was omitted so that students with language and learning deficits associated with their hearing impairment would not perceive that they were completing an activity clearly below their current grade level. While this subtlety should be maintained to protect the self-esteem and confidence of the students who are completing the activities, future versions of the program should include guidelines for reading levels and approximate grade levels so that teachers can target lessons more appropriately. These guidelines will also allow teachers to be more efficient in their use of the program.

Additional feedback on age-appropriateness of the program indicated a request for more activities for higher level students (i.e., eighth grade and up). While the program was intended to cover this grade range, it should be reexamined to determine whether higher level activities and more challenging activities in various components of the program can be generated to better serve a wider range of teachers and students.

**Activities.** Some respondents noted that the hands-on activities were the most feasible and useful for them in their classrooms. They noted further that more of these activities would be useful for them in terms of teaching these skills and assisting with carry-over in the classroom. The worksheets are designed to be printable and ready to use in the classroom. Further development of the program should include the addition of
supplementary worksheets for each area. Provision of additional activities will allow more options for teachers who are trying to build and address these skills in their classrooms.

**Limitations**

Several limitations to the current study should be acknowledged. These limitations should be taken into consideration when interpreting the results and determining how to use the results moving forward with future versions of the current program and efforts taken to improve it. The teachers who reviewed the program were not allowed opportunities for professional development or training involving the use of the program, possibly impacting their understanding of the components or their perceptions of its utility and feasibility. Additionally, the number of survey respondents was small. Without a larger sample, attaching significant interpretive weight to the survey results is difficult. Finally, the teachers had a limited amount of time to review the program before the survey results were collected. This timeline may have impacted their overall understanding of the program and ability to give a thorough and accurate review.

**Professional development.** The program and the survey for this study were distributed electronically to teachers. They were also provided information through an e-mail regarding the intent of the program and the use of the survey. Hard copies of the program were made available to the teachers in their buildings, as well. A subset of middle-school teachers was presented with the program in person through grade-level team meetings. This face-to-face interaction allowed those teachers the opportunity to ask questions, briefly. However, no formal training or presentation was completed in conjunction with the program distribution.
Additional information, professional development, or training completed in conjunction with the program might have helped facilitate a higher level of understanding on the part of the teachers polled. Provision of this support would give teachers more information on the background of the program, its intent, and its use to support the students with hearing impairment in their current classrooms. Without this training and support, the teachers might have lacked the appropriate understanding of the program during their review. Additional support through this process might have facilitated different perceptions of the program and different survey responses. Future research may be completed giving teachers additional training with the program to determine if doing so would change survey responses.

**Small sample size.** While the program and survey were distributed to 66 teachers, only 12 teachers responded. Among those, two indicated that they did not review the provided program. Thus, the resulting data were based on 10 responding teachers. These teachers were distributed across middle- and high-school grades. A distribution of special-education teachers, regular-education teachers, and Teachers of the Deaf was also represented. However, this small sample size does not allow for significant conclusions to be drawn. Future research should attempt to reach a larger number of teachers in a wider range of locations. Additional feedback from a larger sample of teachers would provide more generalizable information in order to further develop this resource.

**Timeline.** The teachers who completed the survey had 4 weeks to review the program before survey completion. Some teachers elected to complete the survey after only 1 week. The time constraints of the program distribution and survey completion may
have impacted teachers’ abilities to complete a detailed review of the information contained in the program. Additionally, those who completed the survey may have been able to trial certain portions of the program if given more time to do so. Increased time may have also allowed for additional respondents to complete the survey.

The timing during the school year may also have been a factor in program review and survey completion. The program was distributed in January, and the surveys were completed into the month of February. This time of the school year is busy, and teachers may have had lower motivation to take on extra work after the holiday break. Completing this process at the beginning of the school year may have allowed for more receptive teachers, additional time for review of the program, and additional time for survey completion.

**Future Directions**

Results of the survey suggest that the program provides a feasible and useful tool for teachers as it is currently written. However, the feedback provided through the survey also provided additional information and feedback that could help further develop the program for future improvement. Additional components, such as self-advocacy skills instruction and additional worksheets and hands-on activities, could make the program still more useful for teachers. Additionally, the provision of professional development and additional time for teachers to learn how to best incorporate the materials in the program into their classrooms would be beneficial in the future.
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Appendix A

The copyrighted program manual is available upon request from the author.
Appendix B

Executive Functioning Program Survey

1. What grade levels do you currently teach?

2. What content area/subject do you teach?

3. Please check all that apply to you in your current role.
   - Regular Education Teacher
   - Special Education Teacher
   - Hearing Support Teacher/Teacher of the Deaf

4. Highest degree achieved
   - Bachelor’s Degree
   - Master’s Degree
   - Doctorate
   - Other (please specify)

5. Do you currently have students (or a student) with hearing loss in your class(es)?
   - Yes
   - No
6. Have you had students with hearing loss in your classes in years past?

☐ Yes
☐ No

7. Approximately how many years have you had students with hearing loss in your classes?

8. Were you able to review the provided sample program

☐ Yes
☐ No

9. On a scale of 1 to 5, with 1 being not at all feasible and 5 being completely feasible, please rate the following aspects of the program with respect to your perceptions of its feasibility of implementation in your classroom.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Not at all feasible</th>
<th>2</th>
<th>Moderately Feasible</th>
<th>4</th>
<th>Completely Feasible</th>
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<td>Quick Reference Sheets (p. 14)</td>
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<td>Additional Targeted Lessons (p.30-67)</td>
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10. On a scale of 1 to 5, with 1 being not at all useful and 5 being extremely useful, please rate the following aspects of the program based on your perceptions of their usefulness when working with students with hearing impairment.

<table>
<thead>
<tr>
<th>Not at all Useful</th>
<th>1</th>
<th>2</th>
<th>Moderately Useful</th>
<th>3</th>
<th>4</th>
<th>Extremely Useful</th>
<th>5</th>
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<td>Targeted Lessons &amp; Supports (p. 28)</td>
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11. Please rate the perceived need for the provided lessons in each executive functioning skill area on a scale of 1 to 5. 1 represents not at all needed/useful and 5 represents extremely needed/useful.

<table>
<thead>
<tr>
<th>Not at all needed/useful</th>
<th>1</th>
<th>2</th>
<th>Moderately needed/useful</th>
<th>3</th>
<th>4</th>
<th>Extremely needed/useful</th>
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EXECUTIVE FUNCTION AND HEARING IMPAIRMENT

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<td>Emotional Regulation (p. 60)</td>
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12. What portions of the program do you believe will be the most feasible for you to use?

13. Which parts of this program can you see yourself using the most in the future?

14. What is missing from the program? What do you wish it included?

15. Any additional feedback...