Post-Secondary Deaf or Hard of Hearing Students' Experiences of Fatigue

by

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Abstract

Fatigue can have a long-lasting impact on psychosocial, cognitive, and educational outcomes for students who are Deaf or hard of hearing (D/HH). Unfortunately, fatigue itself and the importance of educational supports to minimize its impact on D/HH students is poorly understood by many educational stakeholders. Additionally, students often struggle to recognize fatigue symptoms, internalize the causes, and have limited coping strategies. The purpose of this study was to explore the experiences of post-secondary D/HH students (LSL and ASL users) about fatigue in educational and social settings.

Utilizing purposeful sampling, the present study was conducted through focus group interviews with three post-secondary students from MacEwan University who identify as D/HH (with hearing levels ranging from moderate, moderate-to-severe, to profound). Students were asked about their fatigue experience, impacts on their education, fatigue triggers, coping mechanisms. The aim of this study was to capture the unique experiences of D/HH students and move beyond their description. Thus, I used Strauss and Corbin's (1998) systematic procedures approach to analyze data and situate my study themes.

Four themes emerged from the interview and focus group transcripts: (a) fatigue contributors (causal conditions and situational determinants that fatigue arise from, including environment, educational task characteristics, and assistive hearing devices); (b) fatigue consequences (adverse impacts of fatigue on learning, relationships with others, and leisure time after school); (c) fatigue manifestations (fatigue symptoms, including physical, cognitive, and social-emotional); and (d) coping with fatigue (actions and strategies to mitigate fatigue). Findings also indicated that there is not enough awareness among educators and students themselves about fatigue contributors and manifestations, resulting in more adverse

consequences. Thus, improving awareness of fatigue for D/HH students and others in their educational and social networks will help in identifying and managing fatigue. Findings from this study and implications for teachers, researchers, parents, and students themselves were discussed.

This study provides unique insight and knowledge about the perceptions and experiences related to fatigue through the D/HH students' point of view, particularly for post-secondary educational settings and retrospectively on participants' K-12 experiences. In the future, these results can be used and published by students, teachers, parents, and specialists in the context of Deaf education.

Preface

The work presented in this thesis was conducted, analyzed, interpreted, and compiled by myself, and was fully reviewed and supervised by Dr. Denyse Hayward in the Department of Educational Psychology at the University of Alberta and Dr. Natalia Rohatyn-Martin in the Department of Human Services and Early Learning at MacEwan University. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name “Deaf and Hard of Hearing Students’ experiences of fatigue”, No. Pro00098505, June 22, 2020

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Chapter One: Introduction

"I remember the first day. I went to my class and gave the teacher the FM system to wear. I tried to teach him how to wear the FM, but he stopped me and said 'no'. I told him I need the teacher to wear the FM because it helps me to learn. He told me 'No' again because I don't like wearing necklaces or earrings or stuff like that" (Rohatyn-Martin, 2017, p. 94).

It is unbelievable that a teacher calls a technical device essential for a student to learn in the class a decorative accessory. Such experiences are too often for students who are Deaf or Hard of Hearing (D/HH) during their education (Rohatyn-Martin & Hayward, 2022). For these students, more visual and auditory effort is required to simultaneously watch and listen as information is presented by several overlapping sources for almost six hours per a day every weekday (Rohatyn-Martin & Hayward, 2016). Currently, recognizing the impact of fatigue for D/HH students in educational settings is poorly understood by many educators, parents, and students themselves (Rohatyn-Martin & Hayward, 2022). As shown in the opening vignette, some educators are not aware of the necessity of assistive hearing technology as an educational support to learning and in reducing fatigue, while others misinterpret student actions related to fatigue as disinterest in school activities (Oyler & McKay, 2008), laziness, or a behavioral problem (Bess & Tharpe, 1986, as cited in Dalton, 2013).

Fatigue is a phenomenon that can happen when mental engagement or physical activity is needed over a long period of time. Fatigue refers to feelings of exhaustion, lack of energy, or desire to continue a task (Boksem & Tops, 2008; Chaudhuri & Behan, 2000; Hornsby et al., 2016). Individuals who experience fatigue often report difficulties with sustaining attention, concentration, motivation, and increased anxiety (Boksem et al., 2005, 2006, as cited in Boksem & Tops, 2008; Chaudhuri & Behan, 2000; Hornsby et al., 2016).

Fatigue is complex and multidimensional so defining it in a standard and universally accepted way has proven difficult (Bess & Hornsby, 2014a; Hornsby et al., 2016). To better understand fatigue and its consequences on different aspects of an individual's life, some researchers define it based on physical, cognitive, and social-emotional factors: (a) *Physical fatigue* refers to a decreased ability or desire to complete a physical task (Chalder et al., 1993; Chaudhuri & Behan, 2000; Hornsby et al., 2016), resulting in muscle strain, pain or injury due to protracted activity (Hicks & Tharpe, 2002); (b) *Cognitive fatigue* refers to a decreased ability or desire to execute mental or cognitive tasks (Boksem et al., 2005; Van der Linden & Eling, 2006, as cited in Ackerman, 2011), difficulties sustaining attention and ignoring distractions (Boksem et al., 2005) resulting in reduced cognitive performances (Boksem et al., 2005, 2006, as cited in Boksem & Tops, 2008; Hornsby et al., 2016; Van der Linden et al., 2003; Van der Linden & Eling, 2006); (c) *Social-emotional fatigue* refers to the reduced ability or desire to perform physical or mental tasks; "this reduced ability or desire is the result of emotional or psychological demands on the individual" (Hornsby et al., 2016, p.5) that may require sustained emotional effort, leading to feeling "overwhelmed, drained, and used up" (Barnes & Van Dyne, 2009, p.75) or "worn out and empty" (Michielsen et al., 2004, p.223).

Studies show that fatigue is a long-established problem with many negative cognitive, physical, and social-emotional effects among students in general. For example, in the general student population Mizuno et al. (2011) found that elementary and junior high school students reported experiencing fatigue at a rate of 16.2% and 34.3% respectively. The prevalence of fatigue in junior high school students was approximately two times more than that in elementary school students. In addition, Mizuno et al. (2011) found that self-reports of severe fatigue were

associated with reduced cognitive functions and working memory impairments, leading to poor academic performance.

While fatigue is a common experience for many students, there is growing evidence suggesting that D/HH students may experience more fatigue throughout their school day compared to their hearing peers (Bess & Hornsby, 2014a; Bess et al., 2016; Gustafson et al., 2013; Hicks & Tharpe, 2002; Hornsby et al., 2014; Werfel & Hendricks, 2016). This is due to the increased auditory effort (McGarrigle et al., 2014; Moore et al., 2017) and visual effort (Mather & Clark, 2012) to attend to, comprehend, and learn in educational settings (Rohatyn-Martin & Hayward, 2016). Seldom do educators pay attention to the cognitive, audio-visual, and attention demands D/HH students encounter daily (Rohatyn-Martin & Hayward, 2022). Such findings highlight the necessity of improving awareness, early identification, and interventions to prevent the cumulative effects of fatigue in D/HH students.

Statement of Purpose

D/HH students often struggle to recognize fatigue symptoms, underestimate how their learning is affected by fatigue, have limited coping strategies, and frequently internalize the causes of their fatigue (Rohatyn-Martin & Hayward, 2016). Moreover, as shown in the opening vignette, some teachers still refuse to use amplification devices. Rejecting the use, or improper use, of amplification technology by educators denies D/HH students' access to equitable education and as a result, increases the likelihood of fatigue which in turn impacts student learning (Government of Canada, 2021; Rohatyn-Martin & Hayward, 2022). Furthermore, as previously stated, fatigue in students who are D/HH is often misinterpreted by teachers as inattentiveness, or disinterest in school activities (Oyler & McKay, 2008).

The probability that fatigue has serious consequences on psychosocial, cognitive, academic, and literacy outcomes for D/HH students is undeniable (Bess & Hornsby, 2014a; Holman et al., 2021). In my study, I conducted interviews and focus group sessions with post-secondary students who are D/HH to gain a deeper and broader understanding of their perceptions, experiences, and strategies related to mitigating fatigue. The interview and focus group sessions included questions about educational experiences that supported or impeded their learning, fatigue triggers, coping mechanisms, and advocacy strategies. I chose post-secondary students as research participants since these are individuals who have succeeded in highly competitive academic environments despite overwhelming challenges. Knowledge gained from my study participants will hopefully enhance teaching practices to mitigate fatigue for students in K-12 and post-secondary classrooms and provide advocacy strategies for D/HH students and families.

My study is situated within a larger SSHRC-funded study conducted by Rohatyn-Martin and Hayward aimed at developing a survey to identify and describe fatigue symptoms experienced by students who are D/HH and find personal and environmental strategies to moderate fatigue in K-12 educational contexts.

Significance of the Study

The voices of D/HH students have been largely absent or marginalized in the research literature (Rohatyn-Martin, 2017); thus, the findings from my study will add to the understanding of fatigue experiences of D/HH post-secondary students and its impact on cognitive, social-emotional, and physical aspects of their life. Additionally, the information gained from these interviews and focus groups will aid in survey development in the larger study.

Research Questions

1. What are post-secondary D/HH students' experiences of fatigue in educational settings?
2. How has fatigue impacted D/HH students' education?

Study Outline

In Chapter 2 of my thesis, I will provide a brief history of fatigue definitions; a review of the literature that examines fatigue in both the general population and with D/HH adults and students; and a review of findings focused on the consequences of unmitigated fatigue for D/HH students in educational settings. Chapter 3 will provide the methods and procedures utilized for my study. I will present findings and my interpretation of them in Chapter 4, followed by a discussion of the research findings and implications for future research in Chapter 5.

Chapter Two: Review of the Literature

Within this chapter, I will provide a review of the relevant scholarly literature to establish an understanding of the current research in the field of fatigue experiences in Deaf and Hard of Hearing (D/HH) students. I will begin by reviewing how scholars have conceptualized and defined fatigue. Next, I will provide a review of the literature that examines fatigue in both the general population and with D/HH adults and students, focusing on the consequences of unmitigated fatigue for D/HH students in educational contexts. In addition, I will describe the current research-based model of fatigue that is utilized as a theoretical framework in this area and address the implications of using this model to recognize and evaluate fatigue in D/HH students. Finally, I will elaborate on the recent research specifically focusing on management and mitigation of D/HH students' fatigue levels.

Defining Fatigue

Fatigue is a phenomenon that occurs when mental engagement or physical activity is required for a long period of time (Canadian Centre for Occupational Health and Safety, 2021; Van der Linden et al., 2003). It refers to feeling exhausted or a lack of desire or energy to complete a physical or mental task (Hornsby et al., 2016), and includes difficulties in attention, concentration, planning, and motivation (Boksem et al., 2005, 2006, as cited in Boksem & Tops, 2008; Hornsby et al., 2016; Van der Linden et al., 2003, 2006). Many people equate fatigue to tiredness because it shares the same characteristic of low energy. However, tiredness is a feeling informing you that your body needs to rest or sleep after a period of a physical or mental activity. Resting or sleeping helps the body to recover from tiredness. On the other hand, fatigue can

happen with no clear link to physical activity, tends to gradually increase over time and, unlike tiredness, may not decrease after sleep or taking rest (Khambatta & Jevon, 2011, as cited in Nolan et al., 2013).

Fatigue is complicated and multidimensional so defining fatigue in a universally accepted and standard way has been "elusive" (Bess & Hornsby, 2014a; Shen et al., 2006, p.69). Fatigue tends to be classified as acute versus chronic and subjective versus objective in medical contexts.

Acute versus chronic classification of fatigue is typically based on onset characteristics. According to Piper (1989), *acute* fatigue is often thought of as a protective physiological process that happens in healthy individuals. This type of fatigue has a "rapid onset and short duration" (Aaronson et al., 1999, p.46). In contrast, c*hronic* fatigue is usually considered an abnormal physiological process. Chronic fatigue has a gradual onset, persists over time, and has an unknown purpose (Aaronson et al., 1999).

Subjective versus objective classifications of fatigue tend to be used in clinical and research contexts. *Subjective* fatigue describes a feeling associated with a decrease in the efficiency of a person's attention, concentration, and alertness (Hornsby, 2013; Kennedy, 1988; Lieberman 2001, 2006, as cited in Lieberman, 2007), while *objective* fatigue describes a decrease in a person's performance due to prolonged or recurrent physical or cognitive demands (Kennedy, 1988; Hornsby, 2013). Objective symptoms of fatigue are performance-based and refer to reduced efficiency and productivity, whereas subjective symptoms comprise self-reported feelings of exhaustion, lack of energy, or decreased motivation to continue or complete a task (Hornsby, 2013).

In an attempt to better understand what aspects of an individual's life are impacted by fatigue, some researchers have moved away from the above classifications and define fatigue based on physical, cognitive, and social-emotional factors (Hornsby et al., 2016):

Physical fatigue refers to bodily exhaustion and a "reduced ability or desire to perform physical or mental tasks", resulting from "sustained physical exertion" or a "disease process" (Chalder et al., 1993; Hornsby et al., 2016, p.4). Researchers often consider reports of bodily symptoms to measure physical fatigue (Hornsby et al., 2016).

Cognitive fatigue refers to a "reduced ability or desire to perform cognitive tasks" as a result of prolonged periods of mental activity (Chalder et al., 1993; Hornsby et al., 2016, p.4; Van der Linden et al., 2003), resulting in a decline in cognitive abilities such as concentration or attention, planning, ignoring distractions (Boksem et al., 2005, 2006, as cited in Boksem & Tops, 2008; Van der Linden et al., 2003); memory, speed of processing, and decision-making (Ackerman, 2011, as cited in Hornsby et al., 2016, p.4).

Social-emotional fatigue refers to the "reduced ability or desire to perform physical or mental tasks; however, this reduced ability or desire is the result of emotional or psychological demands on the individual" (Hornsby et al, 2016, p. 5). Social-emotional fatigue is the result of social and emotional demands and expectations that may require sustained emotional effort, leading to feeling overwhelmed or emotionally worn out (Maslach, 1982, as cited in Barnes & Van Dyne, 2009).

In my study, I chose to consider fatigue definitions based on physical, cognitive, and social-emotional factors since the study focus pertains to understanding the fatigue experience of D/HH students in educational settings. Utilizing definitions focused on describing how fatigue impacts different aspects of an individual's life will provide more nuanced information. Given

the challenges of measuring and understanding fatigue, these definitions may be also useful for educators to aid in recognizing and managing fatigue in classroom contexts. Moreover, such classifications may help students recognize the effects of fatigue in their lives and more effectively manage fatigue throughout their school day.

Fatigue in the General Population

Fatigue has been recognized as a significant symptom associated with some health conditions (e.g., cancer, chronic fatigue syndrome (CFS), multiple sclerosis (MS), and arthritis) and people with mental health difficulties such as anxiety or depression (Nolan et al., 2013). For example, adults with MS (Amato et al., 2001) and leukemia (Hicks et al., 2003) reported that high levels of fatigue had a significant impact on their quality of life. Likewise, cancer patients report a wide range of emotional and cognitive problems related to fatigue (i.e., feelings of loneliness and irritability; loss of motivation; difficulties focusing) that negatively influence their quality of life (Curt, 2000; Flechtner & Bottomley, 2003).

In the general population fatigue may be experienced as a result of major life transitions (e.g., grief, job loss, moving; Khambatta & Jevon, 2011, as cited in Nolan et al., 2013). It may also be a consequence of prolonged or repetitive tasks in the workplace (Barker & Nussbaum, 2011). In fact, adults who experience recurrent, long-standing fatigue in the workplace are often less productive, and more likely to make errors, than those not experiencing fatigue (Ricci et al., 2007; Williamson, et al., 2011).

Fatigue in D/HH Adults

Hornsby and Kipp (2016) reported D/HH adults experience much higher levels of fatigue than the general adult population and this finding was confirmed by Alhanbali et al. (2017). Alhanbali et al. (2017) studied four groups of adults including (a) hearing aid users (n= 50); (b)

cochlear implant users (n=50); (c) single-sided deafness (n=50); (d) control group of hearing adults (n= 50). A laboratory-based listening task (sentence recognition in noise) was used to assess and compare the listening effort experienced by D/HH adults and a hearing age-matched group. Two generic standardized self-report scales, the *Fatigue Assessment Scale* (Michielsen et al., 2004) and *Effort Assessment Scale* (Alhanbali et al., 2017) were also used to measure fatigue in daily life and listening effort, respectively. The finding indicated that all groups of adults with hearing differences reported higher levels of listening effort, and fatigue while performing the task than the hearing control group. Further, in a study by Jahncke and Halin (2012) individuals with hearing differences (N = 20) and hearing individuals (N = 18) were compared within high and low noise office conditions. Memory, attention, reading comprehension performance, fatigue, and physiological stress were examined via basic cognitive tasks, fatigue self-reports, and stress indicators (cortisol and catecholamines hormone levels) respectively. Results indicated that D/HH adults were more affected by the high noise condition, exhibiting more difficulty completing memory and reading comprehension tasks than hearing adults. D/HH individuals also showed higher levels of stress hormones during the high noise situations in comparison to the low noise ones. Moreover, D/HH participants were more fatigued by high noise exposure than hearing participants due to the additional strain to understand speech in competing noise.

In general, studies have shown that D/HH adults need to exert much more effort to complete speech, language, and cognitive tasks with interfering background noise, a common occurrence in many workplaces and social environments, than hearing adults (Alhanbali et al., 2017; Hornsby, 2013; Jahncke & Halin, 2012; Rakerd et al., 1996). Examining daily life situations, Grimby and Ringdahl (2000) asked 311 D/HH and 1,256 hearing adult full-time

employees to complete the *Nottingham Health Profile* (Hunt et al., 1981) to assess health related quality of life. The D/HH workers reported lower quality of life and a higher degree of psychosocial distress in terms of 'lack of energy' and 'social isolation'. Additionally, the authors indicated that D/HH workers reported greater degrees of listening effort and fatigue than the hearing workers. Thus, the cumulative effects of fatigue can have long-term consequences for D/HH individual's quality of life.

In summary, D/HH individuals are likely to employ much higher levels of listening and cognitive effort, especially in noisy environment, resulting in higher levels of fatigue than the general adult population (Alhanbali et al., 2017; Hornsby, 2013; Hornsby & Kipp, 2016; McCoy, et al., 2005). Experiencing fatigue on a daily basis was shown to have negative long-term consequences on the quality and psychosocial aspects of D/HH individuals' lives (Grimby & Ringdahl, 2000).

Fatigue in D/HH Students

Similar to findings from studies with D/HH adults, there is growing evidence suggesting that students who are D/HH also experience more fatigue throughout their school day compared to their hearing peers (Bess & Hornsby, 2014a; Bess et al., 2016; Gustafson et al., 2013; Hicks & Tharpe, 2002; Hornsby et al., 2014; Werfel & Hendricks, 2016). High levels of fatigue have the potential to negatively impact D/HH students' performance and participation in classroom and school activities (Bess & Hornsby, 2014a; Bess et al., 2014; Hornsby et al., 2014; Lewis et al., 2015; Rohatyn-Martin & Hayward, 2016).

Results from studies of listening effort suggest sustained speech-processing demands in students with different levels of hearing can lead to mental fatigue (Hornsby, 2013). For example, Hicks and Tharpe (2002) using a dual-task paradigm to examine listening effort during completion of a word-repetition task found that students with hearing differences expended more effort to perform the task than their age-matched hearing peers.

The effort D/HH students exert to perform tasks comprising listening effort and visual effort.

Listening effort may be described as the cognitive exertion of mental energy required to engage in and comprehend spoken messages across a variety of listening environments (Hicks & Tharpe, 2002; McGarrigle et al., 2014). In schools this required D/HH students to differentiate sounds and spoken messages (e.g., teacher instruction, student discussions) that are important or relevant to the task from those that are task irrelevant and need to be ignored (e.g., PA system announcements, side-conversations or hallway noise) (Rohatyn-Martin & Hayward, 2022). Such differentiation requires deployment of cognitive resources devoted to listening effort which results in fewer cognitive resources available for the task to be completed (Hornsby, 2013; Key et al., 2017; McGarrigle et al., 2014; Moore et al., 2017).

Visual effort is described as the physical and cognitive exertion required to visually engage in or understand a spoken message (Rohatyn-Martin & Hayward, 2016, p. 24). Students who communicate via listening and spoken language rely on visual information (e.g., speechreading or lipreading, facial expressions, hand gestures) to augment comprehension of oral instructions (Rohatyn-Martin & Hayward, 2022). Similarly, students who communicate via

signed languages are highly dependent on visual information. They must continuously split their visual attention between their sign language interpreter and the speaker (teacher or classmate) (Mather & Clark, 2012). In addition, quick visual breaks (e.g., looking out the window or at a peer) without missing any of the information is not an option for D/HH students. Even a short visual break means important information is missed which could increase cognitive and physical fatigue (Rohatyn-Martin & Hayward, 2016; Rohatyn-Martin & Hayward, 2022). In summary, for many D/HH students, active attention in classroom and school environments requires higher levels of listening and visual effort, which in turn leads to fatigue.

Fatigue in individuals with different hearing levels can have serious psychosocial consequences, including decreased quality of life and well-being that differ greatly based on duration and severity (Holman et al., 2021; Hornsby et al., 2016; Kramer et al., 2006; Nachtegaal et al., 2009). D/HH students who are fatigued exhibit greater signs of stress, influencing their quality of life and well-being compared to hearing peers (Bess et al., 2016). In addition, D/HH individuals experiencing high levels of fatigue often report difficulties performing cognitive tasks. Converging evidence from multiple studies suggests that experiencing fatigue can be associated with slowed information processing (Moore et al., 2017; Bess & Hornsby, 2014b), and decreased ability to focus on task relevant components due to deployment of cognitive resources to overcome auditory and visual environmental distractions (Gustafson et al., 2018). The cognitive consequences of fatigue for D/HH students in the classroom may include difficulties concentrating on teacher instructions, difficulty filtering relevant from irrelevant noises, voices, and conversations (Gustafson et al., 2018) but particularly for activities and tasks that have high speech and/or sign processing demands over a long period of time in noisy

classrooms. Considering the high demands of processing speech and/or sign in a noisy classroom environment, it is reasonable to imagine that D/HH students expend more cognitive effort leading to increased fatigue. Researchers have hypothesized that experiencing high levels of fatigue can eventually impact D/HH students' academic performance and desire to learn at school (Bess & Hornsby, 2014b; Hornsby et al., 2014).

Despite such negative consequences, until recently relatively little attention has been paid to the relationship between hearing differences and fatigue. If indeed, fatigue is a contributing factor to reduced wellbeing, decreased cognitive performance, and subsequent learning and educational difficulties in D/HH students, it is vital to explore D/HH students' experiences of fatigue. Clearly, developing a better understanding of fatigue experiences, and the impact among D/HH students would be beneficial to the educational community. Improved understanding of fatigue would serve to help educators and clinicians to develop more effective assessment and intervention strategies for this population.

Recognizing Fatigue

As stated in the previous sections, fatigue can impact different aspects of D/HH students' lives and cause a range of physical, cognitive, and emotional symptoms interfering with their learning. So, recognizing fatigue is helpful for students, educators, and parents to effectively manage and mitigate its negative effects.

Fatigue recognition in D/HH students

D/HH students often do not notice fatigue symptoms and do not understand how fatigue may be affecting their learning (Rohatyn-Martin & Hayward, 2016) as seen in a comment by a D/HH student, *"I get really tired in English class; the interpreter has to sign a lot and I have to*

try really hard not to fall asleep. But it's just that one class so it's not a big deal" (Rohatyn-Martin, 2017, p. 127). When students do not recognize that their school performance is compromised by fatigue, they tend to internalize the cause of their fatigue as seen in comments like *"I just did not get enough sleep"* or "*I just have to work harder"* (Rohatyn-Martin & Hayward, 2016, p. 29). When students do not understand that what they are experiencing is fatigue, they are not likely to ask for help or support. Consequently, D/HH students often de-emphasis the impact of fatigue (e.g., "*it's just that one class so it's not a big deal")* or employ coping strategies (e.g., turn off device, pretending to attend) that may impact their learning and teacher perceptions of their engagement and motivation (Rohatyn-Martin & Hayward, 2016, pp. 29-30).

These findings show the need for understanding the fatigue experienced by D/HH students. It is essential for teachers to help students identify fatigue symptoms, recognize sources and conditions that cause it, and facilitate utilizing effective coping strategies to minimize it.

Fatigue recognition in educators

Many teachers seldom consider the cognitive, visual, auditory, and attention expectations D/HH students encounter daily that may result in fatigue (Rohatyn-Martin & Hayward, 2022). For example, some educators reject the use of amplification devices that facilitate learning access and reduce fatigue (Bartlett & O'Brien, 2015). This behavior is denying D/HH students' right to access to equitable education (Government of Canada, 2021; Rohatyn-Martin & Hayward, 2022). Moreover, as many teachers are unaware of the negative psychosocial, cognitive, and academic consequences of fatigue, they may misinterpret fatigue behaviours in D/HH students as inattentiveness, or disinterest in school activities (Oyler et al., 1987, as cited in Kuppler et al.,

2013; Oyler & McKay, 2008). Educators play an important role in the identification and management of fatigue for D/HH students in school contexts. Thus, there is a need to recognize fatigue signs and symptoms, fully understand its impact, and address it in educational contexts.

Fatigue recognition in parents

A study conducted by Werfel and Hendricks (2016) compared subjective ratings of fatigue for 19 students with cochlear implants and parent dyads. Subjective fatigue was examined using the *PedsQL Multidimensional Fatigue Scale* (Varni et al., 2002) as it includes both children and parent versions, allowing for direct comparisons of children and parent fatigue ratings. The results indicated that children with cochlear implants and their parents differed in fatigue ratings. Parents reported significantly less fatigue in their children than did children themselves. Parents may either under-estimate the fatigue experienced by their children or lack information into the circumstances that induce fatigue in their child's educational and social settings.

Unfortunately, there is scant evidence about awareness of fatigue in D/HH students' parents. While it has been shown that parents may be unaware or underestimate fatigue in their D/HH child (Werfel & Hendricks, 2016), Hinds et al. (1999) found that parents can have a deeper and broader understanding of fatigue when their child is struggling with a chronic health condition like cancer. Hinds et al. (1999) reported differences in the conceptualization of fatigue across 7-18-year-olds children with cancer and their parents. Data from the focus group indicated that children perceived fatigue mostly as a physical sensation (weakness) while parents' perceptions of fatigue were broader and encompassed multiple causative factors including loss of energy and cognitive symptoms. In addition, analyzing focus group data showed that while

parents considered themselves responsible for reducing their child's fatigue, children perceived that they were responsible for their fatigue. Children were likely to internalize their fatigue causes (e.g., their own inability to get adequate sleep or their participation in exercise activities). This finding is consistent for students who are D/HH with a study by Rohatyn-Martin and Hayward (2016). Regarding inadequate findings of parents' awareness of fatigue experience in their children, further research is needed.

Evaluating Fatigue

A variety of different approaches have been used to evaluate and examine fatigue in D/HH students, including subjective measures (e.g., surveys, and interviews), cognitive performance measures (e.g., attention, working memory, and processing speed), and various biological and physiological markers (e.g., salivary cortisol levels) (Hornsby et al., 2016).

Subjective measures

Much of our understanding about relationships between hearing differences and fatigue are obtained from self-reports, focus groups, interviews, and surveys or questionnaires (Backenroth & Ahlner, 2000; Hornsby, 2013; Hornsby et al., 2014; Nachtegaal et al., 2009). For example, Hornsby et al. (2014) examined the effect of having different levels of hearing on subjective ratings of fatigue utilizing the *PedsQL Multidimensional Fatigue Scale* (Varni et al., 2002) in 10 students with hearing differences and 10 age-matched hearing students. This scale includes a measure of general fatigue, sleep/rest fatigue, cognitive fatigue, and a total fatigue score (Hornsby et al., 2014). Studies have shown that the scale is easy to administer and has good internal consistency, reliability, and validity (Varni et al., 2002). Hornsby and his

colleagues found that subjective fatigue was greater in students with hearing differences compared to hearing students. Moreover, the impact of higher levels of fatigue in these students appeared across all subscales (i.e., general fatigue, sleep/rest fatigue, and cognitive fatigue).

Cognitive performance measures

Measuring cognitive performance is another assessment method for quantifying fatigue (Bess & Hornsby, 2014a). D/HH students experiencing fatigue report difficulties with cognitive performance for tasks involving attention, working memory, and processing speed (Hornsby, 2013). For example, Hornsby (2013) examined the effects of hearing aid use on subjective fatigue ratings and fatigue-related performance decrements. Participants (with bilateral mild-to-severe hearing level) completed a cognitively demanding speech-in-noise dual-task in two different conditions: a) unaided listening, and b) listening via hearing aids. Subjective ratings obtained from participants before and after completing the speech dual-task (word recall and visual reaction times tasks) revealed significant increases in fatigue and a decline in the ability to stay focused on the tasks, regardless of listening situations (i.e., with or without hearing aids). In addition to the use of subjective rating to assess fatigue, performance measures (i.e., processing speed (visual reaction times) and response speed to the visual signal) were monitored throughout the dual task. Hornsby found that participant performance slowed significantly over time when completing the tasks without hearing aids, whereas performance was stable in the aided condition. This study provides evidence that constant speech-processing demands can result in fatigue in D/HH students.

Biologic and physiologic measures

"Cortisol is a hormone secreted by the adrenal glands" in response to stress (Bess & Hornsby, 2014a, p.8). Cortisol level normally follows a daily rhythm, rising sharply early in the morning and declining gradually throughout the rest of the day. However, abnormalities in this pattern may be observed during a stressed or fatigued state (Bess & Hornsby, 2014a). Bess and Hornsby (2014a) state that measuring salivary cortisol level is a valid approach to measure fatigue because it is very sensitive to energy use, stress, and fatigue.

A study conducted by Bess et al. (2016) examined cortisol levels in 6-12-year-old students. Participants included 32 students with mild-to-moderate hearing levels (14 males; 18 females) and 28 hearing students (19 males; 9 females). Salivary cortisol samples were measured six times across two separate school days. Profiles of students with mild-to-moderate hearing levels displayed higher cortisol levels over the six measurements than hearing students' profiles. The pattern of elevated cortisol values is consistent with other studies, indicating that D/HH students likely experience continual and higher stress and fatigue levels over a school day than hearing peers.

The PedsQL Multidimensional Fatigue Scale, quality of life measure, is the most frequently used fatigue measure in student populations (Varni et al., 2002). This scale, however, was not developed for, or normed with, individuals who are D/HH; thus, there are no items specific to fatigue associated with hearing differences in educational settings. To overcome the challenges of identification and understanding of how fatigue shows itself in D/HH students a new measure, the Vanderbilt Fatigue Scale (VFS) (Hornsby et al., 2021) was designed to measure listening-related fatigue in individuals with hearing differences. VFS is designed to measure listening-related fatigue as a multidimensional condition including physical, mental,

emotional, and social domains, however, it focuses solely on auditory fatigue and doesn't consider visual effort.

Presently, the lack of reliable and valid fatigue measures to examine characteristics, intensity, coping mechanisms for all D/HH students makes it even more difficult for researchers, educators, and clinicians to accurately identify, describe, and interpret the existence and intensity of the fatigue, or suggest effective fatigue coping strategies. The subjectivity of fatigue (i.e., lack of confirmed physiologic indicators), as well as teacher and student unfamiliarity with symptomatology, contributes to a challenging process of fatigue evaluation in educational contexts.

Management of Fatigue

While evidence-based intervention strategies are not yet available for D/HH students identified with fatigue, recent studies have highlighted the benefits of assistive hearing technology (Hornsby, 2013; Gustafson et al., 2014), general classroom strategies (Bess et al., 2014; Bess & Hornsby, 2014b; Rohatyn-Martin & Hayward, 2016), and professional development for educational stakeholders (Bess et al., 2014) as intermediary steps in managing fatigue.

Assistive hearing technology

Problems relating to listening fatigue might be minimized through the use of hearing technologies such as advanced signal processing available in digital hearing aids (Hornsby, 2013). Advanced signal processing technologies include digital noise reduction and directional microphones. Digital noise reduction is the ability of digital hearing aids to recognize if signals are noise-like or speech-like and adapt accordingly (Krishnamurti & Anderson, 2008). Directional

microphones are designed to minimize the negative impacts of background noise and are more sensitive to sounds from in front of the wearer (Mondelli & Almeida, 2014). Research has shown that the use of advanced signal processing technologies might mitigate some listening fatigue-related effects by reducing the level of effort in individuals with hearing differences (Hornsby, 2013) and when sustained attention is needed in specific situations, such as classrooms (Gustafson et al., 2014).

Although evidence suggests that properly fitted hearing aids and correctly used FM systems can reduce listening effort in adults and students with mild-moderate hearing levels (Hornsby, 2013), not all students with hearing differences choose to utilize their hearing technology in school; especially older aged (middle school) students (Gustafson et al., 2013; Gustafson et al., 2015). Gustafson et al. (2015) in a pilot study, observed classrooms of 38 students with mild-to-moderate level of hearing (7-12 years old) on two different school days to record if the students were using assistive hearing technology (personal FM and/or hearing aids) in the classroom. They found that younger students (7-10 years old) were more likely to use assistive hearing technology consistently compared to older students (11-12 years old). Gustafson et al explain that reduced assistive hearing technology use in older students may be connected to students transitioning from elementary to middle school classrooms. It is more difficult for teachers to monitor assistive hearing technology use of students in middle school, and responsibility is generally transferred to the students themselves, possibly before they are ready to manage it independently (Gustafson et al., 2015). Moreover, social pressure to “fit in” with hearing peers may negatively influence how regularly D/HH students make use of hearing technologies (Gustafson et al., 2015, p.2; Rohatyn-Martin, 2017).

Students who try to utilize hearing technologies often encounter FM systems that frequently malfunction, making them feel frustrated and fearful of missing information along with educators who refuse to, or improperly, wear assistive hearing technology resulting in students experiencing headaches due to increased listening and visual effort (Rohatyn-Martin, 2017). For students who utilize assistive hearing technologies, well-functioning systems that are used consistently throughout the school day can reduce listening effort and listening fatigue. However, further research is needed to better understand the causes and implications of inconsistent use during various stages of childhood. By ensuring the use of appropriate assistive hearing technology, educators and clinicians can give students who communicate via listening and spoken language the best opportunity to access the auditory signal with the least amount of listening effort and listening fatigue experience.

General classroom strategies

It is reasonable to expect that D/HH students who are fatigued and trying to complete classroom activities requiring the use of listening/visual resources to overcome environmental distractions and sub-optimal learning conditions, particularly when classrooms are noisy will have learning challenges. Some classroom strategies that are considered beneficial include (a) preferential seating recommendations to reduce distractions and noise; (b) offering mental breaks during longer lessons; (c) slowing the pace of a lesson to provide additional time for processing; and (d) providing small group instruction (Bess et al., 2014; Bess & Hornsby, 2014b). It should be noted that other factors in the classroom such as sources of noise (e.g., windows or hallway doors) and the speaker's location (to see their face) should also be mitigated by educators where possible (Bess et al., 2014). Further research is needed to systematically investigate the potential

benefits of these strategies to provide evidence-based protocols for reducing fatigue impacts in D/HH students in the classroom.

Professional development for service providers

Bess et al. (2014) suggested some professional development programs developed for educators, specialists, and parents focused on providing information about fatigue, signs, consequences, and practical guidelines may be beneficial. Similarly, Rohatyn-Martin and Hayward (2016) recommended educators develop an awareness of the fatigue challenges for D/HH students. The authors believe that teachers need to recognize ways in which D/HH students struggle with fatigue and provide appropriate support in order to increase engagement and minimize exhaustion.

Summary

The research reviewed in this chapter focused on defining fatigue, recognizing, evaluating, and strategies to mitigate fatigue. Currently, there is limited empirical research into the fatigue experience of D/HH students, particularly in their school environments. Previous studies indicated that fatigue has received relatively little attention, outside of health conditions (e.g., cancer and multiple sclerosis) and many clinicians, audiologists, educators, and parents are not aware D/HH students experience fatigue throughout a school day and subsequently do not recognize its signs. In my study I set out to capture the nuanced voices of D/HH students in post-secondary educational settings, to understand fatigue from their perspectives and the impact of fatigue on their education. Understanding fatigue experiences more deeply through post-secondary D/HH students' perspectives may provide the basis that could assist educators, parents, specialists, and students themselves in identifying and mitigating the effects of fatigue. It also has

strong potential to contribute to the development of practices that will best support students, based on methods perceived beneficial by current students.

Chapter Three: Methodology

In this chapter, I present a review of the paradigms and philosophies that inform my study, including *ontology, axiology, epistemology,* and *methodology*. Next, I present an outline of the processes I undertook to conduct this study and provide a rationale for the method employed. Lastly, I provide a review of study trustworthiness and ethical considerations followed to ensure the credibility of the research.

Research Paradigm

In this study, I relied upon a qualitative methodology, which is suitable for comprehensive and detailed exploration of the individuals' experiences. In qualitative research, the meaning individuals attribute to a social problem is a subjective complex field that an in-depth exploration can develop and render this complexity (Creswell, 2014). When selecting a methodology, the researcher must provide a research paradigm that includes their beliefs, assumptions, and the method process to facilitate evaluation of their study (Braun & Clarke, 2006). A research paradigm is a group of assumptions that direct the way we do research and include *ontology, axiology, epistemology,* and *methodology* (Creswell & Poth, 2018). Thus, I provide this framework to best display my ontological and epistemological beliefs.

Ontology

Ontology describes the "nature of reality and its characteristics" (Creswell & Poth, 2018, p.20). In qualitative research, researchers study individuals' experiences to report multiple realities. To achieve this goal, researchers use "multiple quotes" as evidence of multiple realities of the varying perspectives of study participants (Creswell, 2007, p. 18). I believe each student who is D/HH has a different experience of fatigue. I also believe the fatigue experience of D/HH

students is culturally distinct. These students' reality of fatigue is unique. Factors that result in fatigue for D/HH students in educational settings are continuous across grades; thus, fatigue is ongoing, prolonged and accumulates over time. Hence, I included multiple quotes, as part of my Chapter 4 analysis to show how participants in this study view their experiences. Moreover, I conducted member checks to ensure my interpretations accurately captured my participants' realities and characteristics of fatigue. I explained this process in detail in the Checking the Accuracy of the Transcription and the Participant's Lens Strategy sections later in this chapter.

Axiology

Axiology refers to the values and assumptions that the researcher brings to a study and makes them known through the study process. In a qualitative study, the researcher "positions themselves" in a study which means they actively and constantly report their values and biases besides the value-laden nature of information achieved from the participants (Creswell & Poth, 2018, p.21). I recognize that there are multiple interpretations of participant experiences, and the knowledge foundation of this study may be formed by my interactions with the participants. I am also aware that my interpretation is influenced by my personal and cultural experiences. I fully explain my position in the Researcher Positionality section later in this chapter.

Epistemology

Conducting qualitative research with the epistemological assumption indicates that the researcher tries to "get as close as possible to the participants" (Creswell & Poth, 2018, p.21) to reduce the "distance" between themselves and those being studied (Guba & Lincoln, 1988, p. 94). As such, knowledge is assembled and known through subjective evidence based on participants' views (Creswell & Poth, 2018, p. 21).

As I am exploring how students who are D/HH experience fatigue in educational settings, a social constructivist epistemology is the ideal paradigm to guide my research. In this epistemology, participants generate varied and multiple "subjective meanings" of their experiences (Creswell & Poth, 2018, p.24). From this viewpoint, the researcher develops and creates a theory, rather than starting with a theory (as in post positivism), and their intent, then, is to interpret the meanings participants have about the experience (Creswell & Poth, 2018). In addition, in the social constructivist epistemology, the researcher doesn't view participants as entirely divorced from social, cultural, and educational contexts. Rather, I believe that D/HH students like any other children absorb the values of the social and cultural milieu, and their fatigue experiences are no exception. As a researcher, I ensured that my interpretations captured the unique and equally valuable perspectives of each participant.

Methodology

Methodology refers to the procedure of qualitative research. This process is described as "inductive" and "emerging" and based on the experiences of the researcher in data collection and analysis (Creswell & Poth, 2018, p.21). My study was informed by Grounded Theory as my aim was to capture the unique experiences of my participants and move beyond their description. A central idea of Grounded Theory important to my study is that generating a theory does not come "off the shelf, but rather is grounded in data from participants who have experienced the process" (Creswell & Poth, 2018, p.82). The two popular approaches to Grounded Theory are the systematic procedures (Strauss & Corbin, 1998) and the constructivist approach (Charmaz, 2000). I used the systematic procedures of Strauss and Corbin (1998) to analyze data and situate my study themes. The systematic procedures consists of four components: (a) "*causal conditions* (what factors caused the experience), (b) *consequences* (outcomes from the experience of using

the strategies), (c) *contextual and intervening conditions* (broad and particular situational factors that influence the strategies), and (d) *strategies* (actions are taken in response to the experience)" (Creswell & Poth, 2018, p.85). I chose the systematic procedures approach because, in this approach, the researcher aims to systematically generate categories and codes to explain processes or a core phenomenon (Cresswell & Poth, 2018) which aligned with the goal of my study. Additionally, the systematic procedures approach provided me a framework focused on the core category to situate emerged themes, while the unstructured approach of Charmaz (2000) does not provide such a framework (Cresswell & Poth, 2018).

Researcher Positionality

From a social constructivist perspective, researchers cannot claim to be fully objective. Data is constructed based on the researchers' interpretations, privileges, personal previous experiences, and epistemological perspectives (Krane & Baird, 2005). My passion and advocacy for the well-being of students with special needs influenced my desire to pursue graduate education in educational psychology and special education. My desire to learn about D/HH student experiences of fatigue also derives from my experiences as a psychologist and a researcher in the field of special education. While completing this research, I journaled about my beliefs and assumptions. I acknowledge my known assumptions and biases about fatigue experiences in students who are D/HH. I assume that every D/HH student will have a different experience of fatigue in educational settings. I also believe that these students will have diverse definitions of fatigue, and how fatigue has impacted their education. Furthermore, the voices of D/HH students in educational settings have been largely absent or marginalized in the research literature (Rohatyn-Martin, 2017). Thus, it is vital for me as a qualitative researcher to analyze my privilege, as it may affect participants' voices (Krane & Baird, 2005).

Due to my professional experiences and educational background as a hearing graduate student, I may be viewed as a highly privileged individual by some participants. Moreover, there is the need to acknowledge unconscious biases and how my own hearing status may be audio-centric and inflict audism on my D/HH participants. While it is true that I am not part of the D/HH community, I am an English Language Learner (ELL) student and recognize that I may have had somewhat similar experiences to students who are D/HH. As a second language learner, I have experienced fatigue when participating, listening, comprehending information, and speaking in English in educational settings and social gatherings due to extra mental effort. I have to deploy more cognitive energy to understand English sentences, particularly in noisy environments. Next, I translate the English message into my first language, then access my English vocabulary to translate my response. Such experiences allowed me to have a small window into the experiences of my study participants and may help with rapport building. However, extending my fatigue experience as an ELL student to students who are D/HH should be done carefully. Because I experienced fatigue for a limited period of time, whereas fatigue experience in D/HH students is prolonged, protracted, and ongoing. Nevertheless, to encourage my participants to share their perspectives freely and voice their concerns during the interviews, I listened attentively, refrained from making judgmental comments, and did not discuss my professional or educational experiences as a hearing person during the interviews and focus group.

Procedure

Selection criteria and participant recruitment

The present study is situated within a larger SSHRC-funded study aiming to develop a survey to identify fatigue in students who are D/HH and find strategies to moderate fatigue in K-

12 educational contexts. Therefore, the sample size and selection criteria were chosen to achieve purposive sampling, necessary to accomplish the study goals. Utilizing purposive sampling helped the detailed interpretation of the data (Palys, 2008). Purposive sampling focuses on specific characteristics of a population of interest to best enable me to answer my research questions.

Inclusion criteria for my study included students who: 1) communicated in spoken English, in ASL, and dual-language users (spoken English and ASL); 2) attended the University of Alberta or MacEwan University; 3) were between the ages of 18 to 25. There were no exclusion criteria based on gender, the year of study, or degree program. Choosing students who communicated in spoken English, in ASL, or who were dual-language users allowed me to capture nuanced experiences based on cultural and communication modes. Further, D/HH students who attend post-secondary institutions have not only succeeded in highly competitive academic environments but have also overcome adverse experiences. Their participation in this study provided insight into what fatigue is like for them and the coping strategies that have enabled them to succeed. An information letter was emailed to prospective participants (see Appendix A). This letter detailed the nature of the study and consent procedures. Electronically filled and signed consent forms were obtained from all participants (see Appendix B).

Participants' characteristics

Participants comprised three post-secondary-students who identified as D/HH: one student, Catherine, communicated spoken English, one student, Lynne, communicated in ASL, and one student, Lyss, was a dual language user (spoken English and ASL). All three participants were Caucasian females ranging in age from 20-30 and undergraduate students at MacEwan University. The hearing levels ranged from moderate (Catherine), moderate-to-severe (Lyss), to

profound (Lynne). Catherine and Lyss attended mainstream K-12 schools and Lynne attended K-12 in a school for the Deaf. Please note, the names used are pseudonyms chosen by each participant.

Participant focus group and interviews

Participants took part in a virtual focus group and two individual interview sessions via a secure platform (Google Meet), lasting approximately two hours each. In my study, each interview began with an overview of the research process, a review of the consent form, and two pre-interview activities. The pre-interview activities aimed to provide effective prompts to establish rapport with participants and facilitate participants' recall and reflections regarding past education and social experiences connected to fatigue (Ellis et al., 2011). I asked participants to complete a demographic form (including choosing their own pseudonym and their preferred pronouns) before the interview (see Appendix C). The virtual interviews in Google Meet began with the participant's presentation and discussion of the completed pre-interview activities followed by the interview questions.

An ASL interpreter attended the focus group session with Lynne who identified as Deaf. The interpreter's role was to: (a) translate oral questions into ASL, and (b) translated Lynne's ASL responses into English. Additionally, a member of the larger SSHRC research study team who is Deaf and communicated via ASL participated in the interview session to assist with the participant's comfortability, clarify misunderstandings, and ensure that I was able to make appropriate notes related to Lynne's responses.

Focus group questions. Flexibility in open-ended questions in focus groups and interview sessions allows the interviewer to enter novel areas, cover a wide array of information, and build rapport (Smith & Shinebourne, 2012). In my study, the focus group/interviews

consisted of 15 open-ended questions across three categories of fatigue (Cognitive, Social-emotional, Physical). Prompts and follow-up questions were used if necessary to help facilitate in-depth discussion (see Appendix D). Participants were made aware that they had the right to refuse to answer questions.

Recording and Transcription. All interviews were audio and video recorded for the creation of transcripts. Audio recordings ensured that all verbal information was collected and facilitated accurate transcription. Video recordings documented ASL, nonverbal communication and gestures. Each interview was transcribed verbatim. I transcribed audio recordings for speech sessions (with Catherine and Lyss). The ASL researcher from the larger SSHRC research study team transcribed the signing session (with Lynne). Participants had the right to request that the audio or video recording be turned off at any time. The focus group recordings were downloaded locally to my computer and all electronic files, recordings, and other documents were stored on a password-protected computer.

Checking the accuracy of the transcription

In this process the ASL researcher and participants verified the accuracy of transcripts. For the signing participant, when there were discrepancies between my transcript (interpreter's translation) and the ASL researcher's transcript, I asked ASL researcher to review video recording and verify responses and accuracy of interpreter translation. Then, participants were contacted and provided a copy of their interview transcripts using the pseudonyms created by the participants to check the accuracy. Of the three participants, two clarified an ambiguity in their interviews. I edited the transcript according to the participants' comments to ensure it accurately reflected their points. Additionally, I followed Rohatyn-Martin (2017) for instances where I inserted or altered words in direct quotations to edit grammatical errors, square brackets [ ] were

placed around these changes. Participants were also told that they were able to withdraw their data up to three months after the final interview was completed and four weeks after receiving their transcript for review via email. No participants withdrew their data from the study.

Data analysis

According to Creswell and Poth (2018) during data analysis, the researcher follows a path of data organization for analysis; data reduction into themes and subthemes by the coding process; and data representation in figures, tables, or a discussion to develop detailed knowledge of the topic under study. Thematic analysis is a basic, commonly used qualitative research analysis method and can be used for many different forms of qualitative research (Braun & Clarke, 2006). In my study, I utilized a thematic analysis to confirm that extracted ideas were from the participants' experiences and not impacted by my own biases and perspectives. The identified themes in my study were at the latent or interpretative level which Braun and Clarke (2006) describe as analyzing beyond the explicit or semantic meaning of the text and examining the underlying assumptions and ideas that were represented within the text. With slight modifications, my analysis followed the seven phases suggested by Braun and Clarke (2006, p. 87).

Phase 1: Transcription and engagement with the data. The first step involved immersing myself in the data by transcribing it, watching and rewatching recorded focus group and interview sessions, and re-reading transcripts. It helped me ensure that the participants were the focus of the analysis and increased my familiarity with each transcript to absorb the data (Braun & Clarke, 2006).

Phase 2: Commenting on the data and capturing meaning. The second step involved adding comments on the data directly (i.e., transcripts) and creating text divisions to capture the meaning, concept, or idea a participant was conveying (Braun & Clarke, 2006), rather than

dividing text based on sentences or paragraphs. These comments helped me develop an understanding of what meanings and ideas participants were trying to convey.

Phase 3: Creating the initial codebook. Next, I created a codebook and began to code the data set. The process of generating codes included segmenting my data into categories of content that were similar semantically. The results were initial codes that appeared interesting to the researcher and related to the study questions (Braun & Clarke, 2006). Codes can both be pre-established, derived from the extant literature, or derived independently from the data (Hill et al., 2005). I created the codes from the focus group and interviews data, as it forced me to consider each participant without preconceived notions; thus, avoiding any potential bias (Hill et al., 2005). Additionally, any data that captured some important concepts regarding the research questions were identified and coded. During this process, I added new codes whenever I came across new meanings, concepts, and ideas that did not fit into any existing initial code category. The same process was completed for each transcript.

Phase 4: Identifying core ideas/ themes. After creating and refining codes, sorting codes into potential themes is recommended (Braun & Clarke, 2006). In this phase, the researcher starts interpreting the data and forming arguments related to the research questions (Braun & Clarke, 2006). In addition, Braun and Clarke (2006) created a visual representation to sort and categorize the relevant codes into thematic groups and build relationships among them. During this step, I sorted and clustered codes based on similarities or connections into thematic groups and subgroups. Afterward, I designed a preliminary thematic map which helped me think about and identify relationships amongst themes (See Appendix E).

Phase 5: Reviewing core ideas/ themes. The next step of the analysis involves reviewing the themes in order to establish meaningful coherence, and clear distinctions between

themes (Braun & Clarke, 2006). During this phase, I reviewed the codes that were categorized within each theme to ensure coherence and identified sub-themes within themes. Similar themes were merged and renamed. Also, newer themes were developed upon review, and the thematic map was updated. Reviewing the codes also helped me confirm that each theme was distinct and responsive to the research questions.

At this stage Braun and Clarke (2006) suggest that researchers review their thematic map to ensure it accurately reflects the meanings in the entire data set. Thus, I compared, revised, and modified all of the original transcript codes and themes, using participants' own words as a verification, to ensure that the updated thematic map accurately reflected the source data set.

Phase 6: Defining themes. Braun and Clarke (2006) state that after the creation of the improved thematic map, researchers must clearly define each theme and translate the findings of the codes into a vivid "story that each theme tells" (p. 92). In this phase, I clearly defined each theme and sub-theme to clarify their meanings along with aspects that made them necessary and distinct.

Phase 7: Coherent presentation of themes. The last phase of the analysis includes incorporating the developed thematic findings into a research study write-up. This write-up must include enough evidence of each theme to present the findings and make an argument in response to the research questions (Braun & Clarke, 2006). The application of this phase is evident in the following Results and Discussion chapters.

Trustworthiness of the Study

To determine whether qualitative research findings are valid, Creswell and Poth (2018) suggest adopting three validation strategies: a) researcher's lens, b) participant's lens, c) readers' or reviewer's lens, each of which is described below:

Researcher's lens strategy: clarifying researcher bias or engaging in reflexivity

The researcher's lens strategy that I utilized was clarifying researcher bias and engaging in reflexivity. In this validation strategy, the researcher reveals their past experiences, personal biases, prejudices, and orientations by providing an opportunity to narrate and convey to readers how the researcher's background and perspectives shape their own interpretation of the findings. This process enables readers to understand the researcher's position throughout the study (Hammersley & Atkinson, 1995; Merriam & Tisdell, 2015, as cited in Creswell & Poth, 2018). As stated in the Phase 2 data analysis process, my notes and comments during the focus group and interview sessions, and throughout the research process, helped me acknowledge and separate my views, assumptions, and experiences from the data itself (see Researcher Positionality).

Participant's lens strategy: prolonged engagement and member checking

Validation strategies that are formed from the lens of participants allow them to have an important role in confirming the credibility of findings (Creswell & Poth, 2018). I followed two strategies to ensure that I understood the participants' responses and interpreted them accurately. I used prolonged engagement with the data (i.e., repeated listening and watching of recordings and reviewing transcriptions) and member checking following data analysis and interpretation. After analyzing the data, I emailed participants their transcript and a summary of the findings. Participants were invited to review their transcription accuracy and if they chose to do so, clarify, change, or delete any statements they had made. I also asked them to verify the credibility of my interpretations (i.e., emerged themes and sub-themes). I considered their responses to ensure that I accurately interpreted and presented the participants' points of view.

Reader's or reviewer's lens strategy: having a peer review and debriefing

This strategy allows the researcher to search for an external check by "someone familiar with the research and phenomenon explored" (Creswell & Miller, 2000, p. 129). My supervisory committee and I had regular peer debriefing sessions throughout the data analysis process. I took meeting notes and adjusted analyses, or interpretations based on these discussions. In addition, as mentioned previously in "Checking the accuracy of the transcription" section, discrepancies between the interpreter' and the ASL researcher' transcript were discussed, and consensus agreed. I had regular meetings with the ASL researcher, and my supervisor to continually discuss discrepancies and to make sure the themes and sub-themes best reflected participants' views.

Ethical Considerations

This study received ethics approval from the University of Alberta's Research Ethics Board (REB 1) Pro00098505. A key consideration was to ensure participant confidentiality. Throughout the study, information participants shared remained strictly confidential, and their anonymity was assured using pseudonyms in place of their real names and by removing any personally identifying information (e.g., school name, workplace, city, teacher name) from the transcripts. Participants were given information about confidentiality in the study Information Letter (See Appendix A). Audio and video recordings were downloaded locally to my computer and all electronic files, recordings, and other documents were password-protected.

It was also important to ensure that participation in the study was voluntary and did not create duress. There were no known risks to participants being involved with the study. I closely observed the participants' verbal and non-verbal language for signs of distress and was ready to end the interview if needed. None of the participants reported feeling uncomfortable or emotional distress during or after the focus group sessions. Nevertheless, appropriate

connections to counselors were provided to participants in case their descriptions of fatigue lead them to feelings of emotional duress. To ensure participation remained voluntary, information on the voluntary nature of the study was provided before, during, and after the focus group interviews (see Appendix A and B). Additionally, it was made clear to participants that the interview could be stopped at any time without repercussions, nor did they have to answer questions they did not wish to.

Chapter 4: Findings

The objective of my study was to gain a deeper understanding of D/HH students' experiences of fatigue in educational settings. In this chapter, I present the findings of my study including detailed descriptions of the themes and subthemes that emerged. Utilizing the four components of the systematic procedure of Strauss and Corbin (1998), I identified four major themes across participant responses. Each component of the systematic procedures connected to my themes in the following way:

a. *Causal conditions* is connected to the "*fatigue contributors"* theme in which participants described the causal conditions and situational determinants that may affect their fatigue experience, including environment (i.e., background noise, seating location, and lighting), educational task characteristics (i.e., mental multitasking, inaccessible materials, and group assignments), and assistive hearing devices (i.e., denying the necessity, equipment quality issues, and social pressure).

b. *Consequences* is connected to the "*fatigue consequences"* theme in which D/HH students explained how experiencing fatigue impacts their learning, relationships with others, and leisure time after school.

c. *Contextual and intervening conditions* is related to the "*fatigue manifestations"* theme in which participants focused on fatigue symptoms in physical, cognitive, and social-emotional aspects and awareness of them in fatigue-inducing conditions.

d. *Strategies* is connected to the "*coping with fatigue"* theme in which participants described behaviors, actions, and strategies that helped them to reduce or limit the negative consequences of fatigue, including actions or strategies that impacted learning and socialization.

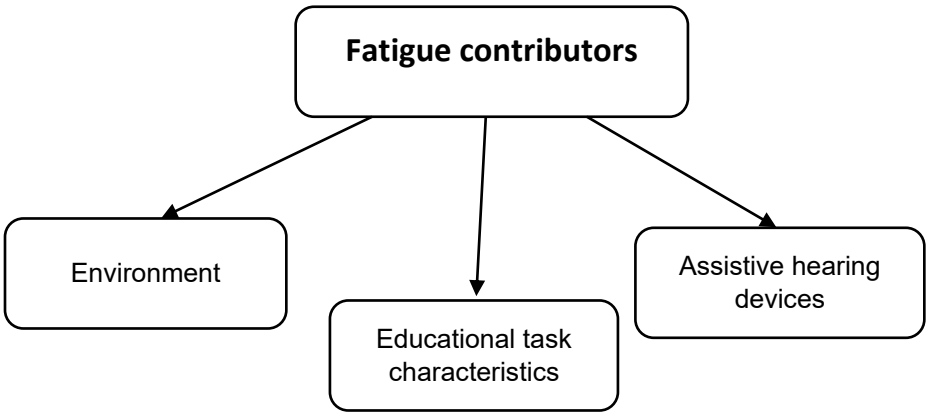
In the following sections, I discuss each theme in detail by providing quotes, examples, and my interpretation of D/HH students' fatigue experiences.

Theme 1. Fatigue Contributors

Participants spoke directly about situations causing fatigue in their everyday lives, particularly in educational settings. As shown in Figure 1, the conditions and situations that students most commonly reported as contributing to fatigue were attributed to the environment, educational tasks, and assistive hearing devices.

Figure 1

Visual representation of theme 1: fatigue contributors



Environment

Students described challenging elements in their educational and social environments which required more effort on their part to watch, listen, and understand. When such effort was sustained over extended periods, such as a school day without enough breaks or a lengthy and noisy social gathering, fatigue was commonly reported.

Background noise. All three participants reported that environments with excessive background noise were a significant contributing factor. Participants reported that trying to focus and understand a teacher while side conversations by peers were occurring was especially

exhausting. Catherine mentioned that if people start talking behind her in class, she has to exert greater effort in focusing on the lecturer. Another participant, Lyss, stated that *"It is mentally exhausting to force myself to ignore the small noises.*" She reported that noises such as pen tapping, chairs being scraped on the floor, other students shuffling papers, coughing, sneezing, and whispering interfere with her ability to focus on and attend to the learning task.

Seating location. Another aspect in educational environments that participants described as fatigue contributors was seating location. Lynne expressed frustration with being "*stuck in the back somewhere*" because she would "*zone out*", saying, "*there's no way I could hear what is going on. I can't focus if I'm behind somebody.*" Similarly, Catherine said, "*it is difficult to stay focused because I have Deaf eyes, noticing anything that moves*." Similar to background noise, the increased effort needed to listen and watch at a distance or ignore classmate movement increased fatigue.

Classroom lighting. Poorly lit classrooms also increased fatigue for the D/HH students. It was especially effortful for participants to watch, listen, and understand after hours of watching an ASL interpreter or attempting to speech read (lipread) and determine the meaning of a teacher's facial expressions in poor classroom lighting. As stated by Catherine *"if there's dim light or that flickery kind of fluorescent light, or if it's too bright, then I am possibly missing what they're saying."* Lynne also highlighted an example of how difficult it was to watch her interpreter in the dark classroom, stating "*once my teacher turned the lights off and turned on a video. I was in the dark, so I couldn't even see the interpreter, while we were watching a video.*"

Online learning. When schools transitioned from in-person to online learning due to the COVID-19 pandemic, participants' opinions varied about the change in the learning environment as a fatigue contributor. Lynne explained having multiple screens to manage simultaneously; that

is, reading materials on one device, following an interpreter on another, and watching the teacher on a third screen, was exhausting. She stated that "*it is not easy for me, and it causes me visual fatigue."* She also referred to some challenging factors in the learning environment at home (e.g., poor lighting and background noise) compared to a typical classroom, explaining how distracting and fatigue-inducing these elements are: *"I have to study and work in the basement which has poor lighting and there is still noise and distractions at home like my dog, kids, and my boyfriend watching TV*." Catherine also experienced visual fatigue with fully online learning, stating "*Doing a lot more computer screen reading, actually fatigues me more [because of] eye strain.*" She added that she gets distracted more easily in online learning environments due to the pop-ups on browsers. Meanwhile, Lyss found the online environment less tiring. She explained that the quieter environment and access to high-quality equipment (i.e., microphone and headphones) meant she could easily hear everyone and unlike in-person learning, she did not miss any information, "*online school is at your own pace,*" and "*it is awesome that you can stop it whenever you want and then do it in your own space."* A disadvantage of online learning noted by all participants was reduced opportunities for socializing. "*[In] online asynchronous classes, your chance for interaction will be less, there are less enjoyable visual stimuli in the environment, you are always in the same place, and it is boring*" (Lynne).

Educational task characteristics

D/HH students identified multiple school-related factors including: (a) mental multitasking, (b) inaccessible materials, and (c) group assignments, as fatigue contributors.

Mental multitasking. Participants described having to focus on multiple sources of information to complete different tasks simultaneously as fatigue-inducing. For example, Catherine said, "*Trying hard to make sure I'm hearing everything that's being said and adjusting*

my attention [between speakers], or some sort of other devices that's offering information, whether it be a TV program or whatever, is extremely exhausting". Lyss agreed, stating that she has a hard time simultaneously watching the interpreter, looking at the board, and paying attention to teachers' body language.

Inaccessible materials. All three participants identified how inaccessible materials are a major contributor to fatigue. Course content with unfamiliar vocabulary and terminology was identified by all the participants as fatiguing due to the increased need for fingerspelling of undesignated signs, "*I have to pay more attention to areas that are new to me. I have a hard time understanding specific words in some contexts in which I have to use more fingerspelling such as math, science, and chemistry*" (Lynne). Catherine added videos with no or automated captioning as another example of inaccessible material. She specifically referred to auto-generated captions as a distraction, not meeting students' needs or accessibility requirements because of inaccuracy: *"videos with no captions or auto-generated captions on videos are usually very inaccurate and distracting*". Further, Lynne pointed out her own responsibility for taking notes in some classes, explaining when the educator does not provide notes beforehand, keeping up with class learning pace is extremely exhausting for her, "*when note-taking responsibility is [put] upon students' shoulders, I'd be focusing so much on taking the notes and simultaneously trying to hear what the teacher said that I'd fall behind in the comprehension aspect*" (Lynne). She added that she has difficulty finding volunteers to give her notes and when she does, she sometimes has trouble understanding the notes, which increases her stress level, leading to fatigue.

In addition to accessibility, Lynne referred to equity and inclusivity, stating that "*I feel fatigued when materials are not accessible for everyone, and the teacher is not willing to do that.*

A teacher once said to me when I asked them to turn on the lights so I could see the interpreter while we were watching a video, 'there are thirty other students in this class'." A dimly lit classroom required more effort from Lynne to watch, listen, and understand the video and interpreter simultaneously. She explained how the teacher's comment made her feel like she did not belong in the class because supporting her needs meant other students' learning was negatively impacted which was not fair to them.

Group assignments. Participants agreed that trying to follow multiple speakers in overlapping conversations in group discussions/activities also contributed to their fatigue. For example, "*I cannot 100% engage in a dialogue or class discussion because I was too focused on the teacher's words through the interpreter's hands. I find when I have to focus more in a group discussion, that's when I get drained*" (Lynne). In this regard, participants mentioned that their fatigue was a consequence of frustration, anxiety, and stress experienced during such group discussions or conversations as shown by Catherine's comment: "*you have this heaviness, irritableness, and feeling like you're forced to miss out, whether it's being in these group things and you mishear or miss the little jokes, you can't hear what people's suggestions are sometimes, or ideas, depending on if we're all in the same classroom still in separate groups."*

Assistive hearing devices

Two of the participants described how not using their hearing devices increased their fatigue. The reasons they did not always wear hearing devices included: (1) *denying the necessity,* (2) *equipment quality issues*, and (3) *social pressure*.

Denying the necessity. Trying to avoid, suppress, or ignore the necessity of hearing aids was one reason students indicated why they did not wear hearing devices. For example, Lyss

stated "*In elementary and junior high school, I refused to use any communication support*" adding *"I did not realize that I needed it*." Catherine agreed, "*When I was in grade five, it took me a long time to accept that I needed it."* She discovered that *"not wearing proper amplification and then trying to take everything in and trying to learn at my best when I couldn't, made me fatigued."*

Equipment quality issues. Catherine and Lyss felt that when used, their hearing device sometimes increased their fatigue, citing clarity issues (e.g., added static, sound distortion) and physical discomfort. Lyss stated, "*I refused to wear hearing aids because of distorted sounds, and I remember coming home from school every day and just being completely exhausted.*" Catherine added: "*Over fifteen years ago, I had one of those little black FM box systems on my desk, so obviously the acoustics, the sound quality, wasn't that great… and then trying to take everything in and trying to learn at my best when I couldn't, made me fatigued.*"

Social pressure. Lyss and Catherine both described being embarrassed and insecure about themselves in high school because of their hearing devices. They explained how these feelings led them to not wanting to use their hearing devices. Lyss described a situation when she was at high school "*I had one kid in my class tell me that hearing aids are only for old people.*" Additionally, "*I felt embarrassed when I had to point out things related to my hearing devices such as if the FM system was wrong or the battery died, or something got turned off.*" She continued, "*I did not wear them, or I used to bear the issues and say nothing as I felt embarrassed, and I believe that caused me more fatigue as I was struggling with hearing.*" Overall, using assistive hearing technology plays an important role in fatigue. Not realizing the necessity of hearing devices or avoiding using them due to equipment quality issues or social pressure, resulting in higher levels of fatigue.

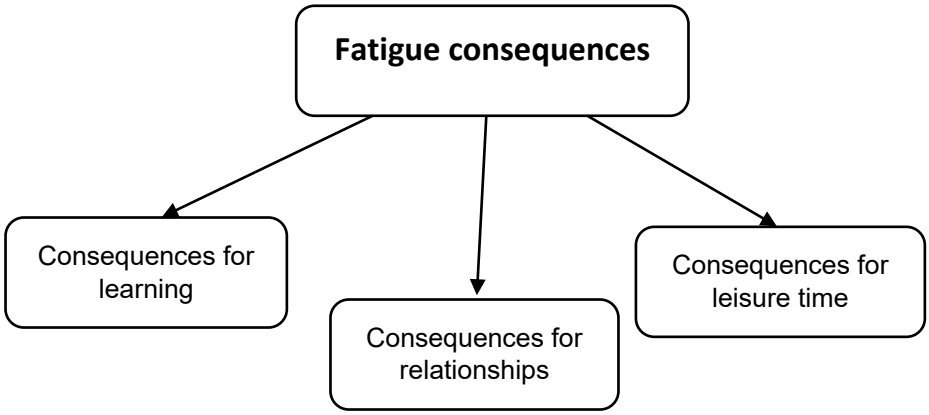
In summary, comments from participants point out conditions and situations in educational settings that contribute to fatigue, including environment, characteristics of educational tasks, and utilizing assistive hearing devices. The implication of these findings will be discussed in Chapter 5. Educators and students need to be able to identify and consider conditions that contribute to fatigue. When fatigue contributors are not understood or mitigated the negative consequences accumulate. The consequences of fatigue on learning and relationships are described in Theme 2.

Theme 2. Fatigue Consequences

The focus group findings revealed three aspects of a D/HH student's life that were adversely affected by fatigue: learning, relationship with others, and leisure time (see Figure 2).

Figure 2

Visual representation of theme 2: fatigue consequences



Consequences for learning

Participant responses revealed that the adverse effects of fatigue on learning are various and pervasive. A common experience across participants related to reduced processing ability which in turn affected comprehension. "*If you are fatigued it's harder to process what teachers*

are saying because your brain doesn't have the capacity to take all the information in" (Catherine). Other cognitive consequences included difficulty concentrating, forgetfulness, and uncharacteristic errors. Lynne stated, "*I feel like I procrastinate a lot if I can't be in the right frame of mind to be able to concentrate on my work due to fatigue."* Sharing a work experience, Lyss added *"I was filling out forms for a patient and because of all of the competing noise I accidentally wrote down a number wrong. I have to review and read my notes, otherwise, I make more mistakes and forget things when I am fatigued."*

Participants also described the impact fatigue had on their grades and academic achievement at school. As explained by Lyss "*I just didn't have that mental energy to finish reading after class or do that much more work on that paper"* and Catherine added, *"maybe fatigue affects the level of comprehension too, which causes lower grades."*

Consequences for relationships

Participants reported that being fatigued has negatively impacted their personal relationships and emotional well-being outside of school. A commonly reported consequence involved the limiting of social networks and social events in order to manage fatigue; *"I really lack the mental energy to invest in friendship, family relationships, and social situations."* (Catherine) and "*After school, you don't just have the same level of excitement and energy to see your friends and hang out*" (Lyss).

All participants indicated that even the effort required to consider the logistics of attending and participating in social events after school was fatigue-inducing: "*Is the place a new one or have I been there before? How many people am I actually gonna know? Is it someplace I'm familiar with? What are the acoustics gonna be like? What's the table gonna be like? Where am I gonna be sitting?"* (Catherine). However, participants also expressed concern that they

gave the unintended impression of being *"rude, lazy or selfish"* rather than fatigued. "*Friends may think they have been cut out, while I am just tired, they cannot understand, and they think I don't care about our friendship*" (Catherine).

Emotions experienced as a result of fatigue related to maintaining relationships and participating socially varied from frustration, irritability, feeling nervous, anxious, or worn out, and being less motivated to complete schoolwork. Participants perceived that these emotions resulted from the limitations imposed on everyday life by their fatigue and resulted in ongoing relationship challenges "*My relationships with my family and friends were affected as I was irritable, super moody, angry, and upset with them most of the time"* (Lyss). Thus, participants believed that the accumulation of school-related fatigue adversely affects their relationships with others.

Consequences for leisure time

Participants identified that their interest in after-school activities and hobbies was also affected by fatigue. Lyss cited "*feeling emotional exhaustion stops me from having something scheduled like going to the gym after school*," and that she has learned to "*budget*" her energy and "*save*" it for homework. Catherine expressed concern with having no hobbies and interests in her adult life, explaining that "*when people ask me what my interests and hobbies are, it's kind of hard to come up with a list of things. I never felt like I had a thing [hobby], I was always just worried, am I gonna be able to hear the coach? Am I gonna be able to hear others? So, there were just too many worries. It was just not worth my time and energy."* She also stopped learning piano because she "*was too tired to focus on it and felt guilty so ended up quitting.*"

All participants indicated that throughout their lives their overall enjoyment of life has been significantly affected by fatigue. Having to budget limited resources and energy prevented

the D/HH students from engaging in or continuing "fun" leisure activities that eventually affected their enjoyment in life. Catherine said that being constantly mentally occupied in ensuring that important things get done in the day (e.g., schoolwork, her job, and household tasks), meant she had no energy left for herself, *"I feel my own fun personal things have gotten shoved under the rug.*"

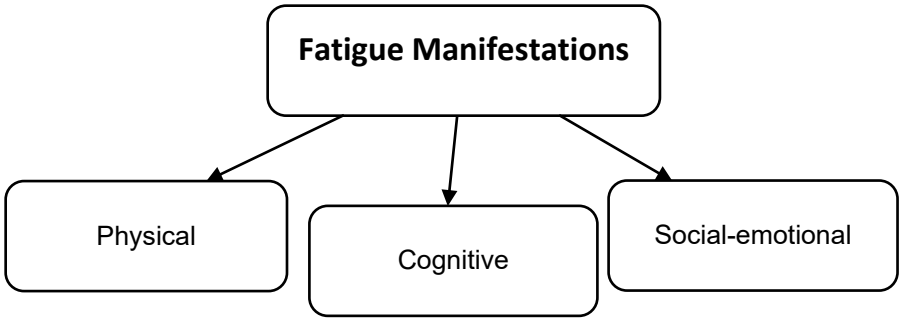
In summary, participants' comments confirm that fatigue has had significant negative consequences across many aspects of their life in, and after school. The connection between these findings and previous studies, along with possible implications will be discussed in Chapter 5. To reduce these negative effects, educators and students need to be aware of fatigue symptoms which is the focus of Theme 3.

Theme 3. Fatigue Manifestations

When asked about how fatigue manifests, participants described behaviours and feelings that included chronic exhaustion, low energy levels, loss of focus, and becoming irritable. In an attempt to have a more nuanced understanding of how fatigue impacts D/HH students' lives researchers have classified fatigue based on physical, cognitive, and social-emotional factors. Likewise, I grouped the manifestations described by participants within the same categories (see Figure 3).

Figure 3

Visual representation of theme 3: fatigue manifestation



Physical

I classified responses connected to bodily manifestations as physical. Participants described physical fatigue as feelings of chronic physical exhaustion and feeling generally physically weak; along with low energy levels; headaches; blurred vision; strained, itchy, and sensitive eyes; excessive yawning; and slowed reflexes and responses. Participants reported that challenging listening circumstances could be physically exhausting. Catherine stated "*Some specific situation at the school would cause me more physical fatigue. [For example,] when we were learning a lot of new things. I tried taking physics at one point and I realized it was going to be too much comprehension that was needed and so I just didn't bother with that, I dropped that class so that I wouldn't have to deal with the physical demands.*"

Cognitive

Participants' comments connected to the intellectual purposes of the schooling were classified as cognitive because it requires cognitive effort to achieve these purposes. Participants often described cognitive fatigue as a feeling of mental exhaustion. Some examples reported by participants include difficulties staying focused, processing, and comprehending information (in reading tasks at school), understanding words (due to sound distortion and/or clarity), and following instructions.

Lyss indicated that "*procrastination*" was a sign of cognitive fatigue for her: "*Sometimes I procrastinate a lot, and if I can't be in the right frame of mind to be able to concentrate on my schoolwork, [then] I feel like I'm not putting as much effort in. That is the time I realize that I am fatigued.*" She also referred to "*zoning out*" as another sign of fatigue for her "*I realize I am [cognitively] fatigued when I'm staring at the computer without actively thinking, my eyes don't*

focus and I'm repeatedly telling myself: come on, you need to focus, what is happening? You need to focus, but I just can't."

Moreover, experiencing difficulties in concentration, understanding information, and following instructions or other classmates' ideas may result in uncharacteristic errors and cause D/HH students to miss even more information. Lynne stated that *"I think the extra mental effort that I have to put into my learning leads to mistakes or errors or forgetfulness."* These kinds of experiences happened repeatedly throughout the day and were described as cognitively or mentally exhausting by participants.

All participants felt that classroom teams and parents were not always fully aware of cognitive fatigue and the necessity of mental breaks. Catherine stated that *"although teachers and parents like to know, they cannot actually know, and they do not know about this mental effort and fatigue, they do not believe students, they think it is fake to get [out] of school."* Participants felt that there was greater awareness about fatigue among professors at university than amongst the teachers they had in their K-12 years. Lyss explained that a reason for this may be related to the level of ability and willingness to advocate for their needs as post-secondary students that they did not possess as high school students. She also added that instructors demonstrated a higher level of trust in post-secondary students than teachers of K-12 students. She mentioned that "*When I was in junior-high teachers [thought]I was faking [that] I'm tired at school to get [out]of it.*"

Awareness of the necessity of breaks was another issue discussed. Participants perceived that interpreters noticed the need for breaks more than other classroom team members. Lynne explained how such awareness on the part of her interpreter was helpful throughout her school day: *"Sometimes I needed to get visual breaks by not watching the interpreter, teacher, or slides.*

If I hadn't been offered [a break], sometimes the interpreter would slow down their signs and then help me to catch up later to support me having that break."

Social-emotional

Comments made about social-emotional purposes of their education, that is, socializing at or after school (e.g., conversations they have with peers and teachers at school, and parents at home), were classified as social-emotional. Fatigue had adverse effects on all participants' general motivation, life-enjoyment, and interactions with others. Participants described social-emotional fatigue as feeling drained or worn out, getting irritable, impatient, or short-tempered in their interactions with others. Struggling to watch, listen, and understand others at school or after school in social gatherings was associated with feeling frustrated, irritable, anxious, sad, and angry- all of which appeared to increase vulnerability to fatigue.

Participants reported frustration or irritability when they were not able to understand class conversations and they felt left out of group discussions. Lyss referred to the lack of understanding and empathy from others in social situations stating, "*No one else really fully understands you and doesn't understand why you're so tired and irritable most of the time."* She continued how sometimes just the smallest things (e.g., missing a little joke in a group) can be overwhelming, "*I don't want to deal with small issues sometimes because I've already dealt with so much."*

Participants described a lack of motivation or desire to hang out with friends or attend family dinners, following an exhausting day at school. They explained being exhausted interfered with their desire to socialize: "*I felt frustrated because of the lack of parties, socializing, clubs where you make new friends. I don't have 'university experience' at the university because I feel fatigued most of the time due to exams and courses.*" (Lynne).

Participants also described a lack of motivation to engage fully in social interactions due to fatigue. For example, Catherine stated that "*When I feel like I have to repeatedly remind others to take turns in speaking, and they do not pay attention to what I say, I come to the point when I say "whatever". I only show up without motivation."* However, she also mentioned how people around her affect her mood stating that "*if people are positive, willing, nice, understanding and interacting with smiles, I will be motivated again to join the conversation.*" Thus, participants suggest that having social support is helpful in reducing the impact of fatigue, and aids in motivation to participate in interactions that are auditorily and visually challenging.

To summarize, participants perceived that fatigue manifested as physical, cognitive, and social-emotional symptoms. When fatigue contributors in educational and social circumstances are not addressed leads to D/HH students limiting or avoiding social interactions at or after school. Moreover, participants perceived that classroom teams and parents were not always fully aware of fatigue symptoms. D/HH students are more motivated to engage in interactions even when fatigued if others in their educational and social networks are aware of fatigue manifestations. However, a lack of understanding and empathy from others, or misinterpreting and mislabeling D/HH students' fatigue-related behaviors leave these students overwhelmed, less motivated, and feeling unsupported. D/HH students cope with and minimize the consequences of fatigue differently, which is the focus of Theme 4.

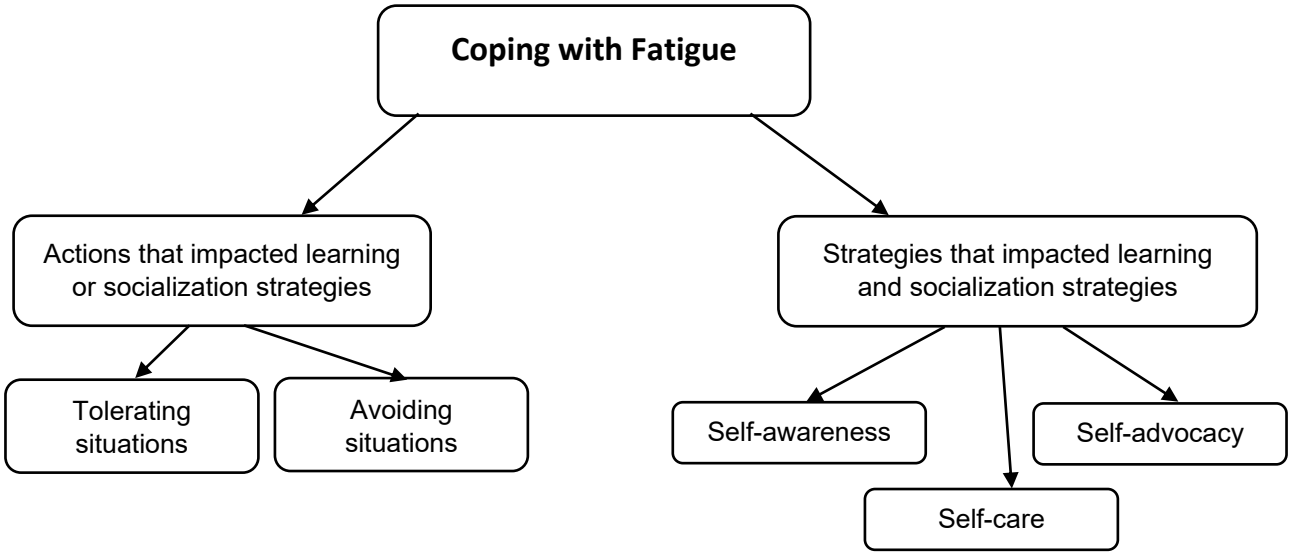
Theme 4. Coping with Fatigue

The coping behaviors, actions, and strategies employed by participants to limit the impact of fatigue in educational and social settings were grouped into two categories: (a) actions that impacted learning and socialization (e.g., tolerating or avoiding a challenging situation); and (b)

strategies that impacted learning and socialization (e.g., self-awareness, self-care, and self-advocacy) (see Figure 4).

Figure 4

Visual representation of theme 4: coping with fatigue



Actions that impacted learning or socialization

Participants described coping behaviors and actions that impacted learning and socializing, including tolerating a difficult situation and avoiding challenging situations.

Tolerating situations. Participants described situations that were exhausting but which they chose to tolerate. For example, Lyss stated, "*I'm getting used to it."* referring to feeling shy and incompetent in her ability to advocate, adding *"I used to just bear it and say nothing as I felt embarrassed, and I believe that caused me more fatigue."* Similarly, Lynn mentioned *"Sometimes it's just not worth it. All that extra work just for what? So, I've kind of picked my battles, I have to figure out what's most important to me."* These comments indicate that participants tend to tolerate some situations as a fatigue-reducing coping mechanism.

Avoiding situations. All participants described times their fatigue was so severe that they were not even able to tolerate the challenging situation. For example, Lyss explained, "*I give up and remove myself from the situation."* Lynne also explained how avoidance can happen unconsciously by *"zoning out"* and *"day-dreaming"* (i.e., no longer maintaining attention on the task) in class. Similarly, Catherine explained she physically avoids situations, particularly noisy environments (e.g., group conversations or assignments) in response to the level of effort needed to remain engaged. These comments indicated that sometimes students choose to avoid situations as a self-care strategy to reduce the cumulative consequences of fatigue.

Strategies that impacted learning and socialization

Participants identified several coping strategies that supported learning and socialization, including self-awareness, self-care, and self-advocacy.

Self-awareness. One of the coping strategies described by participants was an awareness of the challenges arising from their hearing difference. Recognizing the necessity of hearing aids and wearing it/them regularly, resulted in improvement of conversational ability and decreased fatigue as shown in Lyss' comment: "*Since I started wearing hearing aids regularly, I have realized that oh! wow! I really do need it. When I accepted the fact that I had hearing loss, it was helpful.*" Moreover, Catherine mentioned how she has tried to improve D/HH teenagers' awareness, stating "*I tell teenagers about my experience, how I didn't want to wear it [referring to her hearing aid] when I was younger, and now that I do it's so different.*" She continued that improved awareness has led to improved well-being as well as greater participation in social activities along with reduced effort and fatigue.

Recognizing fatigue and informing teachers, family, and friends about its impacts have led to improved relationships as shown in Catherine's comment: *"having that awareness and*

ability to say: Hey, sorry, that was my bad that we couldn't meet. It doesn't mean that I don't care about our friendship. I am just tired." Thus, awareness of factors that contribute to or ameliorate fatigue may be more beneficial for well-being in the long run. Trying to avoid situations, or ignoring the fact that fatigue is real only increased fatigue and left D/HH students overwhelmed and feeling unsupported.

In addition, helping students become aware of and understand the causes of fatigue reduced the likelihood of them internalizing causes of fatigue and getting stuck in a vicious cycle, in which they perceived fatigue as their fault (e.g., "*I am lazy*", "*I am a bother in class*", *"I stayed up too late."*). Such negative internal attribution may increase fatigue and decrease well-being. Catherine succinctly speaks to this issue: *"I used to have a feeling that I'm a nuisance, I'm a bother. So, the more I could do for myself and the less I could bring that forward then the easier it would be for everybody. I knew nothing about fatigue."* Hence, not expressing distress, frustration, or concerns caused as a result of fatigue can isolate D/HH students in times of need.

Finally, all participants, whether they communicated via spoken English or ASL, explained how they planned ahead of time to minimize fatigue. Examples provided by the participants included: evaluating and adjusting to social situational demands; identifying if using hearing aids was necessary; and choosing seating location to improve audibility and lip-reading. Bringing a supportive person to social events was also discussed as a strategy to ameliorate fatigue at social gatherings "*Sometimes I bring a friend or my boyfriend because obviously, they understand [my fatigue] better than anyone else. He is a good resource that I have to help me out in that situation*" (Lyss). Although such preparation required more effort in advance of a

social gathering for the participants, it made such events more enjoyable and less fatigue-inducing.

Self-care. All participants stressed the importance of daily self-care strategies to reduce fatigue. Informing others about fatigue to get support resulted in more effective management of effort and energy as shown in Lynne's comment: "*Being aware of my limits, recognizing when I am tired and learning how to manage my energy are very helpful coping behaviors."* In general, strategies that the participants used to recover, and recharge included relaxation activities, mental breaks, and naps.

Relaxation. Participants described different ways of relaxing to reduce fatigue including: meditating in a quiet, dark place; reading poetry and song lyrics; listening to music; and, taking a long bubble bath as shown in Catherine's and Lynne's comments: "*after a tiring day, I can finally have a nice long bubble bath and unwind"*(Catherine), "*I love poetry and lyrics, If I'm overwhelmed, stressed, or tired, I will often think about those things and distract myself from what's going on in that current moment*" (Lynne)**.** Participants all agreed that these strategies helped them recover from fatigue.

Mental breaks. Participants consciously structured their day to include mental breaks when they found themselves draining from listening/watching in class or at a social event. They agreed that taking short mental breaks to relax gives their mind a rest from the rigors of listening, watching, understanding, and participating. Examples of breaks described by participants include finding a quiet place to rest and recover (e.g., library); doing things that don't involve the mind such as doodling on paper or leaving the class, and going to the locker room or bathroom. Catherine mentioned that she had been offered a special room in junior high school that she could use to take breaks whenever she felt fatigued. She stated "*I usually went there to take a*

break from listening. I used the room for reading in silence, drinking tea or coloring." She found that having a designated place that she could go during a school day helped to reduce fatigue. Participants who used hearing aids felt that they needed a break from their devices (i.e., turning off or removing their hearing devices) in educational and non-educational settings (e.g., shopping malls) because the overwhelming amount of amplified background noise in noisy locations sometimes increased fatigue.

Naps. Two participants felt that taking naps during the day usually helps them overcome fatigue. In contrast, Lynne reported that naps made her "*feel confused*" and "*mentally foggy*", so she doesn't take them. Moreover, Lyss explained even though naps were helpful, talking about naps is not a comfortable effortless experience. She stated that *"I usually feel embarrassed and not comfortable telling people that I need these naps because I feel like they're judging me. They say I am young, and I shouldn't need [to nap] that much.*" Thus, normalizing self-care coping strategies is an important component in D/HH students using them.

Self-advocacy. Throughout the focus group interviews participants described self-advocacy as challenging but when they did advocate for their needs more positive relationships with teachers, friends, and family members were established. Advocacy strategies described by participants as enhancing communication and relationships and minimizing fatigue included:

(a) informing teachers and educational assistants (EAs) about their different levels of hearing and establishing more positive relationships. Lyss stated that "*I always let the instructor know that I am hard of hearing, and I think it is very helpful for me and the instructor.*" Catherine added "*I think that's why I had some success with my professors because I explain these things [referring to fatigue experience] to them and I try to let them know. So, when these things inevitably come up in the middle of the semester, they were*

more supportive." Regarding improving communication and trust with teachers, Lyss added *"when you have a good relationship with the teacher, it is also way easier to reach out to them after the class. Sometimes after class I would approach the teacher and share how things were bothersome, asking whether there could be some changes or not."*

(b) building supportive relationships with friends and family members. Lynne said, "*Having a comfortable and smaller support group to be able to help and support you through big gatherings, events, or at the class like my husband or my friends is helpful."* She added that *"talking to other deaf people who have similar experiences helps me express my emotions and cope with fatigue."*

(c) asking communication partners (e.g., other classmates, EAs, or the teacher) to speak louder, more clearly, and to face the D/HH student while speaking. For example, Catherine said "*Sometimes being confident enough to say: 'Hey, can you just look at me when you speak?' Especially, if we are in a bigger group, like around the table, is very helpful.*"

(d) raising concerns with the teacher or principal about seating location or disruptive background noise (e.g., a fan not working properly).

(e) stopping the teacher and asking for clarification or repetition of instructions. For example, Catherine said, "*Now as an adult, for sure I would raise my hand and ask it to be repeated.*"

(f) asking for mental breaks. Lyss reported how over time she has become more confident asking for mental breaks, *"I do know often what I need and I'm more willing to share that part [feeling fatigued], whereas before I was trying to hide it. Now I can easily say 'I'm tired, I need to leave the class'."* Lynne agreed, stating *"I also was too shy of a kid, and I didn't want to admit that I needed a lot of help. However, that is not the case now."*

Participants reported their ability to advocate for themselves improved as they got older, a finding important for educational teams to understand.

In summary, findings suggest that fatigue is a significant problem for D/HH students in educational and social settings. Participants in my study described fatigue arising from three conditions and situations: (a) environmental factors; (b) characteristics of educational tasks; and (c) utilizing assistive hearing devices. When these fatigue contributors are not recognized or addressed there are negative consequences across many aspects of D/HH students' lives, including learning abilities, relationships with others, and leisure activities.

To minimize these negative effects, fatigue needs to be recognized early. It was clear from participants' comments that fatigue manifests itself physically, cognitively, and social-emotionally. D/HH students in this study perceived that there is a lack of awareness among classroom team members and students themselves about fatigue manifestations, which may lead to more adverse consequences. Improving awareness of fatigue symptoms for D/HH students and others in their educational and social networks will help in fatigue management. Finally, D/HH students described coping actions or strategies that impacted learning and socialization. These findings will be discussed in Chapter 5, along with the implications for each identified theme.

Chapter 5: Discussion and Conclusion

I begin this chapter with a summary of the themes and sub-themes that emerged from my study, and a discussion of the findings in relation to my research questions and relevant literature. For each theme, I discuss implications for researchers, teachers, parents, and students who are D/HH. Finally, I describe limitations and suggestions for further research directions on fatigue in D/HH students.

D/HH Students' Perspectives of Fatigue

The purpose of my study was to explore post-secondary D/HH students' perspectives of fatigue experienced in educational settings. Although empirical evidence is limited, data from previous studies suggest that many D/HH students experience significant fatigue (Bess & Hornsby, 2014a; Bess et al., 2016; Gustafson et al., 2013; Hicks & Tharpe, 2002; Hornsby et al., 2014; Werfel & Hendricks, 2016) that has the potential to jeopardize their school performance (Bess & Hornsby, 2014a; Bess et al., 2014; Hornsby et al., 2014; Lewis et al., 2015; Rohatyn-Martin & Hayward, 2016). I intended to develop an in-depth understanding of the individual experiences of three students who identified as D/HH (with hearing levels ranging from moderate, moderate-to-severe, to profound), and to explore themes and sub-themes that arose from the interview and focus group sessions. My study addresses two research questions:

(a) What are post-secondary D/HH students' experiences of fatigue in educational settings?

(b) How has fatigue impacted D/HH students' education?

These questions focused on two fundamental areas: post-secondary D/HH students' experiences of fatigue in educational settings, and the consequences of fatigue on the students' education. The information derived from the focus group and interview sessions and the extant literature helped to gain a nuanced understanding of the participants' experiences. Utilizing the systematic procedures of Strauss and Corbin (1998) when analyzing the data, my study themes were situated within the four broad components of that framework: (a) *causal conditions*, (b) *consequences*, (c) *contextual and intervening conditions*, and (d) *strategies*. Table 1 provides an overview of the themes and sub-themes I categorized as they relate to the components of systematic procedures.

Table 1

Overview of the systematic procedures' components, themes, and sub-themes

Systematic Procedures Components	**Themes**	**Sub-themes**
Causal conditions	1. Fatigue contributors	Environment Educational task characteristics Assistive hearing devices
Consequences	2. Fatigue consequences	Consequences for learning Consequences for relationships Consequences for leisure time
Contextual and intervening conditions	3. Fatigue manifestations	Physical Cognitive Social-emotional
Strategies	4. Coping with fatigue	Actions that impacted learning or socialization Strategies that impacted learning and socialization

The focus group and interviews provided me with valuable, rich, and thoughtful information regarding the fatigue experience among the three D/HH post-secondary students. I will discuss each theme in connection to the relevant literature followed by implications for researchers, teachers, parents, and students who are D/HH.

Theme 1. Fatigue Contributors

When asked about situations that contributed to fatigue in the classroom, participants reported encountering a variety of challenging situations in daily life at school, resulting in higher levels of fatigue. Fatigue contributors identified by study participants included environmental factors (i.e., background noise, lighting, and seating location), educational task characteristics (i.e., mental multitasking, inaccessible materials, and group assignments), and assistive hearing device utilization (i.e., denying their necessity, equipment quality issues, and social pressure). In fact, the increased auditory, visual, and cognitive effort (in the form of attention and concentration) needed to ignore irrelevant or distracting stimuli in these situations appeared to be the primary source of fatigue across participants. These findings are consistent with those reported in previous studies (e.g., Holman et al., 2019; Hornsby, 2013; Key et al., 2017; Mather & Clark, 2012; McGarrigle et al., 2014; Moore et al., 2017; Rohatyn-Martin & Hayward, 2022; Shinn-Cunningham & Best, 2008).

Some environmental factors that contribute to higher levels of fatigue have been described in previous studies. For example, Connolly et al. (2015) reported that students recognized poor school acoustics reliably in which more effort was required of them and disrupted their learning. Decreased speech recognition performance because of the degraded acoustic classroom environment (Hick & Tharpe, 2002), and the need to continuously monitor the classroom environment, required sustained cognitive effort from D/HH students, leading these students to experience higher levels of fatigue (Davis et al., 2021). Likewise, participants in my study reported that environments with excessive background noise were a significant contributing factor to their fatigue. In addition, my study participants pointed out specific examples of classroom background noise that may seem minor, but even these minor noises

interfered with the students' ability to focus on and participate in the learning tasks, such as pen tapping, chairs being scraped on the floor, other students shuffling papers, and whispering. Participants also emphasized other environmental factors contributing to their fatigue such as inappropriate seating location and poor classroom lighting affecting their ability to hear or see. These factors have also been highlighted by Canadian Association of Deaf (CAD) (2015) as important factors that need to be addressed in classrooms to support D/HH student success.

In addition to environmental factors, features of academic tasks in educational settings contributed to fatigue. Davis and his colleagues (2021) reported educational characteristics such as multi-speaker conversations and group conversations in the class as fatigue contributors for D/HH students due to the increased auditory and/or visual effort and deployment of cognitive resources toward overcoming task-irrelevant stimuli. Similarly, participants in my study found group conversations/discussions contributed to their fatigue. Moreover, the findings of my study highlighted other academic task characteristics. Mental multitasking and inaccessible materials were both major contributors to their fatigue. The sustained effort needed to watch, listen and understand unfamiliar vocabulary (via speech and/or sign), content without visual or written notes, and videos with no captions were examples described by participants as requiring more effort and left little energy for investing in learning or developing social relationships.

The issue of equity and fairness was highlighted by one participant, Lynne, describing a teacher refusing to provide more light in the class while watching a video to support her ability to see her interpreter. The teacher believed providing more light in the classroom for Lynne would negatively affect other students' learning; thus, changing the environment to support one student's learning was not "fair" to the majority of students' learning. Studies on fairness suggest most adults define fairness as "everyone gets the same thing" (Edyburn, 2006, p.23). However,

according to Edyburn (2006) fairness doesn't mean equal, instead, it is defined as equitable, that is, "everyone gets what they need" to succeed (p.23). If a teacher does not provide enough light in the classroom for a D/HH student to see the interpreter, that student's learning will be impeded.

To further students' success in learning, it is essential educators provide a safe, inclusive learning environment that considers all the students' needs and offer equitable learning opportunities. Kunc (2000) points out that teachers are often unaware that minor adjustments in the classroom environment can eliminate learning barriers, resulting in successfully integrating students with disabilities. Developing an awareness of "how the environment around the student is [disabled]" (Kunc, 2000, p.5) benefits not only the student with a disability but often many other students as well. Returning to Lynnes's comment, her teacher could provide equitable learning experiences for all students, including Lynne. The educator could have turned off the lighting in the classroom to accommodate the students she was concerned about and provided a stand-up lamp at the back (or a corner) of the room so Lynne could sit there, watching the video with enough light to see her interpreter. Alternatively, Lynne's teacher could have provided the video with accurate captions which would eliminate the need for Lynne's interpreter while watching the video.

Another factor contributing to fatigue reported by the study participants was the use of hearing devices. The impact of hearing device usage on fatigue in the extant literature is mixed. Some studies suggest that hearing devices reduce listening effort and hence fatigue for D/HH students who use devices (Bisgaard & Ruf, 2017; Davis et al., 2021; Dawes et al., 2014; Gustafson et al., 2014; Holman et al., 2019; Hornsby, 2013), while others reported that assistive hearing technology usage may actually increase listening effort and consequently fatigue (Davis

et al., 2021; Hughes et al., 2018). For example, Hughes and colleagues (2018) indicated that study participants who used hearing aids reported feeling overwhelmed by the need to sustain a high level of listening effort and tended to turn down or "switch off" their hearing devices to take a listening break to reduce fatigue.

Similar to previous research, the findings of my study were mixed. Participants highlighted the necessity of hearing devices in mitigating fatigue; however, they also reported using their hearing devices at times increased their fatigue, citing clarity issues (e.g., added static, sound distortion) and physical discomfort. Consequently, participants felt fatigued and the need for a break from their devices (i.e., turning off or removing their hearing devices), especially in noisy locations. To date, the evidence regarding the impact of wearing hearing devices on fatigue in D/HH students is in its early phases. Fatigue itself is a complex construct, and hearing devices factors (e.g., device type, use time, settings) contributing to fatigue in D/HH students have yet to be fully examined.

It is important to recognize that managing fatigue for D/HH students is an equity issue. If fatigue contributors such as school/classroom environments, materials and tasks, and hearing technology equipment have not been set up to support D/HH students' success, stress and fatigue will accumulate, resulting in negative consequences that I will discuss in more detail in Themes 2 and 3.

Implications for fatigue contributors

Findings from my study have implications for researchers, teachers, principals, and D/HH students themselves. Some D/HH students may not clearly understand specific contributors to their fatigue in the classroom, recognize the sources of exhaustion (Rohatyn-Martin & Hayward, 2016), and tolerate less than ideal learning environments rather than express their needs and

concerns. It is essential for teaching teams, school administrators, and students themselves to be aware of potential fatigue contributors in educational settings. The CAD (2015) describes several factors in classroom environments that need to be considered including lighting, designs, and colors of wallpaper/wall paint all of which may create visual/auditory noise and consequent eye/ear strain and fatigue. Likewise, my study's findings confirmed that fatigue can be reduced when environmental considerations such as minimizing distracting background noise and limiting any disruptive noises in the class, considering preferential seating of a student, and communicating in areas with good lighting are addressed.

Moreover, the CAD (2015) also provides suggestions to make information accessible for D/HH students. These recommendations include (a) providing information in visual language (e.g., signing, global symbols, pictographs, or printed basic written language); (b) keeping lectures/ presentations as short as possible with scheduled breaks; (c) providing opportunities to shift visual attention from the interpreter; (d) decreasing length of lessons that involve extensive spoken language. Likewise, Rohatyn-Martin and Hayward (2016) suggested educators offer frequent breaks, merge auditory information with visual and kinesthetic learning opportunities, and reduce speaker overlap in group discussions to encourage D/HH students' participation in class and minimize fatigue. Findings from my study indicated that fatigue will also be more manageable if school materials are examined for accessibility (i.e., accurate captioning on videos or transcripts when in online meetings, verbal instructions with written booklet and visuals), and minor lesson adjustments (i.e., reduce the duration of lessons, offer mental and physical breaks, slow the pace of a lesson to allow for additional processing time, and provide material notes or the schedule of a day ahead of time).

Hearing device issues caused some student participants to turn down or remove them which has implications for audiologists and hearing aid specialists. These specialists need to be aware of and consider fatigue as a factor resulting from sound quality and discomfort issues and troubleshoot with the student and their educational team to improve D/HH students' willingness to utilize their hearing technology in educational settings.

As early as 2002 the available evidence identified fatigue contributors for D/HH students. Over the last decade, researchers have reported adverse effects of these contributors on D/HH students' learning and socializing and have offered suggestions to address these adverse effects. However, participants in my study continue to describe the same issues in their classrooms revealing a fundamental gap between research and practice in this area. This gap suggests that the way researchers have been trying to inform educational stakeholders has not resulted in significant changes. New mechanisms are needed to bridge the research-practice gap, improve collaboration between researchers and educators, and accelerate the speed of change.

Studies investigating D/HH students' perceptions are an important place to start in bridging this gap. Very rarely has research in this area reflected the perceptions of D/HH students themselves, and voices of these students have been largely absent or marginalized (Rohatyn-Martin, 2017). Studies like Rohatyn-Martin (2017), Rohatyn-Martin and Hayward (2016), and my study might be a route to amplify the voices of D/HH students themselves which may increase to engage in advocacy. Returning to the example provided by Lynne of the teacher stating that "*there are thirty other students in this class*", D/HH students are not likely to advocate on their own behalf if they receive such comments from their teachers. Such comments may cause them to feel that their needs impede other classmates' learning, or the environment is

not safe to advocate for these needs. Consequently, students will feel excluded. I will discuss the issue of self-advocacy in more detail in Themes 3 and 4.

Applying the Universal Design for Learning (UDL) framework is another way to bridge the research-practice gap. An important issue identified as a fatigue contributor was equity of support. To address equity issues, the UDL framework has been adopted across many school districts over the last decade. This framework is designed to address "potential barriers to learning in a curriculum or classroom" by adjusting the curriculum and environment to meet learners' variability and diversity (Lowery et al., 2017; Rose et al., 2005, p. 508). UDL is implemented through planning before students come to the classroom or when the teacher becomes aware of their particular needs (Hayward et al., 2020). The fatigue contributors described by my study participants are learning barriers that could be addressed by implementing the UDL framework. By proactively anticipating fatigue contributors for D/HH students (i.e., environmental factors, materials and tasks, device issues), educators can build in supports that help students meet their needs and provide opportunities for them to thrive in the classroom.

In summary, identifying potential fatigue contributors will help educators to address them, and provide an equitable and supportive educational environment for D/HH students. Collaboration with researchers, interpreters, educational assistants, and parents, through implementing UDL (i.e., adjusting the classroom environment and modifying instruction and materials based on D/HH students' needs) to mitigate fatigue may reduce the research-practice gap, and would be beneficial in keeping all the students engaged, including D/HH students.

Theme 2. Fatigue Consequences

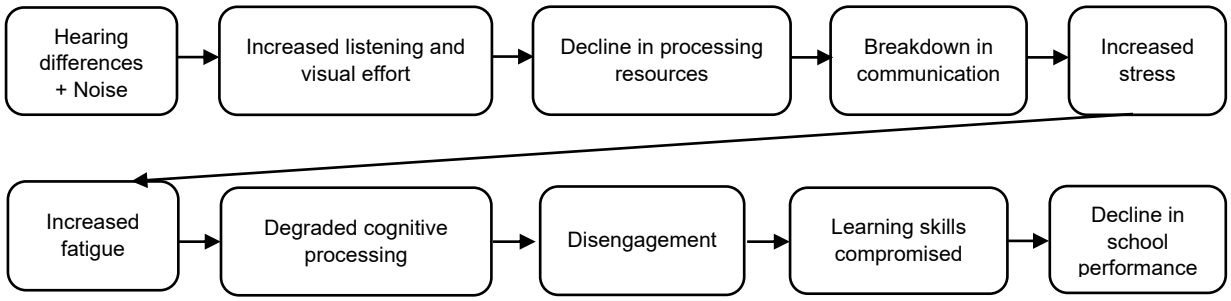
The negative consequences of fatigue described by my study participants affected learning opportunities, relationships with others (teachers, parents, friends, and classmates), and

enjoyment of leisure time. All participants confirmed that experiencing fatigue negatively impacted their learning opportunities. They reported difficulties in comprehending class materials and maintaining focus on tasks at school. This finding is consistent with previous research suggesting that a fatigued state can reduce central nervous system activity, causing slowed information processing (Moore et al., 2017; Bess & Hornsby, 2014b), and decreased attention (Gustafson et al., 2018). Reduced cognitive performance due to fatigue can also affect academic achievement as participants in my study attested. They believed that fatigue negatively influenced their learning, which led to lower grades.

Connections between fatigue and academic performance are elucidated in Bess and Hornsby's (2014b) conceptual model of fatigue. I have adapted their model with permission to include visual effort (see Figure 5). The adapted conceptual model of fatigue delineates the factors that accumulate to result in a decline in academic performance. Being exposed to fatigue contributors (i.e., suboptimal visually and/or auditorily noisy classroom environment with inaccessible materials and instructions), D/HH students need to expend more listening and visual effort in order to watch, listen, and understand oral and/or sign language. Increased listening and visual effort lead to a decrease in the processing capacity that is available for other tasks which, in turn, causes a breakdown in communication (Bess & Hornsby, 2014b). Consequently, D/HH students have to invest more cognitive resources to recognize, process, and understand speech and/or sign compared to their hearing peers (Dwyer et al., 2019; Hicks & Tharpe, 2002; Howard, et al., 2010) which causes accumulated stress and subsequent fatigue (Hornsby et al., 2014). The combination of effort, stress, a decline in cognitive processing resources, and/or disengagement, resulting in fatigue negatively affects essential learning skills and ultimately a decline in academic performance for D/HH students (Bess & Hornsby, 2014b).

Figure 5

Bess and Hornsby's adapted conceptual model linking hearing differences to fatigue and school performance.



Note: Adapted and modified with permission from "The complexities of fatigue in children with hearing loss," by Bess and Hornsby, 2014b, *Perspectives on Hearing and Hearing Disorders in Childhood.* 24(2), p. 26.

In addition to fatigue consequences on learning and academic achievement, participants in my study described disengagement or avoidance of certain social settings as ways in which they attempted to manage fatigue, but which affected their personal relationships and emotional well-being. Disengagement can create a multitude of side-effects that negatively affect after-school leisure activities. In this regard, my study findings replicate and extend the psychosocial consequences of fatigue reported in previous studies (Bess et al., 2016; Davis et al., 2021; Holman et al., 2021; Hornsby & Kipp, 2016; Hughes et al., 2018; Kocalevent et al., 2011; Kramer et al., 2006; Nachtegaal et al., 2009). For example, Hughes and colleagues (2018) indicated adults with a severe-profound level of hearing reported that despite having a high degree of motivation and effort to engage and communicate in social settings, they were often unsuccessful, resulting in a revision of their social goals and eventually negative effects on their quality of life and well-being (Hughes et al., 2018).

The findings of my study indicated that the accumulation of school-related fatigue led to avoiding or limiting after-school activities, hobbies, and social events (mostly because of fatigue contributors in these situations) which in turn adversely affected D/HH students' emotional and social well-being. Returning to a comment by Catherine, *"I feel my own fun personal things have gotten shoved under the rug,*" reveals that having to budget resources and energy leads D/HH students to limit their social network and leisure activities which eventually affects their overall enjoyment in life outside of school.

Implications for fatigue consequences

As shown by my study participants' comments, the consequences of fatigue can be significant when fatigue contributors are not adequately addressed. Fatigue impacted several aspects of a D/HH student's life, including their learning abilities, social life, and leisure time. Given the extra listening and visual effort involved in the learning process in mainstream classrooms for D/HH students due to environmental distractions and fatigue contributors, it is not surprising that the cognitive processing resources of these students are adversely affected, as shown in Figure 5. The adapted conceptual model of fatigue provides educators and students with a tool to use in identifying fatigue contributors (i.e., excessive noise in the environment) and fatigue consequences (i.e., declined processing resources, communication breakdowns, lower class engagement, and reduced academic performance). By using the adapted model educational stakeholders can begin to identify contributors and consequences in their educational environments. Educators need to be aware that for many D/HH students, over-taxing resources accumulate and have long-standing negative consequences.

Enhanced awareness of fatigue contributors and knowledge about multiple and pervasive consequences of fatigue in and after school can interrupt such accumulation. Returning to

Catherine's comment about having no energy left for her social life and leisure activities after school shows that students often prioritize schoolwork. Thus, it is important to support these students by scheduled mental and physical breaks and utilize the lessons adjustments described in the Theme 1 implications section. Providing these types of supports will demonstrate for D/HH students ways to take care of themselves, manage fatigue, and prioritize their needs and interests. I will discuss this issue of self-care in more detail in Themes 3 and 4. Moreover, awareness about fatigue consequences will hopefully help D/HH students take the adverse effects of fatigue seriously. Thus, teachers and parents can identify potential fatigue contributors, recognize fatigue consequences in their D/HH students and children sooner, and actively address their school-related and home-related needs.

Theme 3. Fatigue Manifestations

The focus of this theme was on fatigue signs and symptoms and differentiating three aspects of fatigue experienced by D/HH students (i.e., cognitive, social-emotional, and physical). Participants indicated that actively trying to watch, listen, and understand in the variety of challenging educational settings contributed to experiencing cognitive, social-emotional, and physical fatigue. The finding that fatigue can manifest itself in diverse aspects of participants' lives is consistent with the findings in the broader fatigue literature. While there is not a universally accepted definition, most researchers describe fatigue as a multidimensional construct (e.g., Bess & Hornsby, 2014a; Holman et al., 2019; Hornsby et. al., 2016) with common identifiable aspects (i.e., cognitive, social-emotional, and physical).

Participants in my study perceived that the majority of their teachers, interpreters, and classroom teams lacked knowledge about fatigue manifestations, and how to recognize them. For example, participants described times when they felt teachers did not realize that they were

fatigued. When teachers do not offer any mental or physical breaks, participants tend to take breaks in ways that are not helpful to their learning (e.g., by turning off or removing their hearing aids, zoning out, closing their eyes, putting their head on their desk). These behaviours led educators to misinterpret and label fatigue consequences as laziness, distraction, inattentiveness, disinterest, or "behaviour" issues (Rohatyn-Martin & Hayward, 2016). This finding shows the necessity of understanding fatigue manifestations in D/HH students by educators since fatigue can compromise D/HH students' educational and social opportunities. When teachers do not have enough awareness about the high levels of fatigue that D/HH students experience, nor recognize fatigue manifestations, they cannot take steps toward managing fatigue.

Participants' comments also confirmed that developing awareness about fatigue manifestations is important for students themselves. Students often struggle to recognize fatigue symptoms and as a result tend to internalize the causes of their fatigue (Rohatyn-Martin & Hayward, 2016; Rohatyn-Martin, 2017). If D/HH students more fully understand their fatigue contributors (i.e., environment, educational tasks, and assistive hearing devices), consequences (i.e., learning, relationship with others, and leisure time effects), manifestations (i.e., physical, cognitive, and social-emotional), they may be better able to speak about it, advocate for themselves, and get appropriate support from their teachers. This finding echo results from previous research by Rohatyn-Martin and Hayward (2016), who explain that students need language that enables them to describe their fatigue experiences.

In summary, improving awareness of fatigue manifestations encourages students to speak about it and prevents them from internalizing causes. Such enhanced awareness also helps educators and class teams accurately identify fatigue symptoms and prevent them from misinterpreting or mislabeling fatigue manifestations.

Implications for fatigue manifestations

It is essential for educators, researchers, professionals, and students to know that fatigue can manifest itself in many different ways. Improving current knowledge is necessary with respect to the lack of awareness about fatigue experiences in D/HH students and misinterpretation of its manifestations by educators (Oyler & McKay, 2008). Indeed, fatigue prevention is more achievable if educators recognize its symptoms at earlier stages. Current knowledge can be improved by educating teachers about signs and symptoms associated with fatigue, and guidelines for identifying its severity.

Improving awareness of fatigue symptoms will help educators, clinicians, and researchers to describe different "fatigue profiles" (e.g., cognitive, social-emotional, and physical). Such a classification system is useful in helping educators and clinicians notice signs more comprehensively.

Enhanced awareness about fatigue manifestations may help teachers be more watchful, alert, and vigilant about the presence of signs, and not misinterpret or mislabel these signs (Rohatyn-Martin & Hayward, 2016). For example, if a student puts their head on desk it could be because of having a headache, a sign of physical fatigue; or if a student appears to be daydreaming, zoning out, or having difficulty staying focused, these could be signs of cognitive fatigue; and if a student is irritable, impatient, or short-tempered, they could be social-emotionally fatigued.

Rohatyn-Martin and Hayward (2022) suggest normalizing fatigue in the classroom and making it a classroom problem (rather than a D/HH student's problem) by sharing information about it and asking all students to collaboratively detect its symptoms. Sharing this information will help students develop a language to speak about their experiences of fatigue. Also,

encouraging students to think about different conditions that contribute to their fatigue (e.g., in the classroom and school environment, and characteristics of their educational tasks) will show D/HH students' ways to prioritize their needs and take care of themselves. It will also create a safe environment for D/HH students to voice their concerns and advocate for their learning rights.

Theme 4. Coping with Fatigue

The findings in my study showed that study participants utilized coping mechanisms to manage fatigue in their daily life and these coping mechanisms varied significantly. The two main categories of fatigue coping mechanisms included: (a) actions that impacted learning and socialization (e.g., tolerating or avoiding a challenging situation); and (b) strategies that impacted learning and socialization (e.g., self-awareness, self-care, and self-advocacy).

Previous studies outlined some fatigue coping strategies that enriched learning and socialization opportunities. For example, Holman et al. (2019) reported planning ahead as common coping strategies utilized for work and social situations by D/HH adults. Planning ahead included decisions about the location of seating, getting more information about the people who will be part of the social settings, and getting prepared for the listening tasks and responsibilities ahead of time (Holman et al., 2019). Similarly, participants in my study reported examples of planning in advance to ameliorate fatigue in educational settings and at social gatherings, such as evaluating and adjusting to social situational demands, identifying if using hearing aids was necessary, and choosing seating locations to improve audibility and lip-reading.

In addition to planning, using hearing devices, taking naps, and listening breaks were highlighted by Davis et al., (2021) examining the fatigue experiences of D/HH adults (hearing

aid users and cochlear implant users). These authors also reported self-advocacy strategies as "proactive engagement", meaning the D/HH adults actively engaged in the situation and advocated for themselves instead of avoiding situations (p. 6). Asking for a listening break, informing a communication partner about their different levels of hearing, asking a communication partner to socialize in a less noisy environment, and to speak clearly were examples described by Davis et al. (2019) as proactive engagement strategies with which the findings of my study are consistent. Findings of my study show that self-awareness strategies (e.g., realizing the necessity of hearing aids and wearing it/them regularly, recognizing fatigue symptoms and informing others), self-care strategies (e.g., meditating and taking mental breaks), and self-advocacy strategies (e.g., informing teachers and EAs about their different levels of hearing, establishing more positive and supportive relationships, raising their concerns about fatigue contributors in the environment, and asking for clarification or repetition of instructions) are effective coping mechanisms that reduce fatigue.

With respect to offering mental/listening breaks as effective coping strategies particularly in educational settings, the findings of my study align with those reported by Johnston and Doyle (2011) indicating that as a result of high levels of fatigue, many students who self-identified as having "invisible disabilities", including D/HH students, required formally scheduled mental breaks during lectures. The authors also indicated that students requested changes to the lecture delivery pace to mitigate the fatigue experience. However, only one of the participants in my study reported that they were offered a special room or area to take breaks and rest throughout the school day.

To compensate for the absence of breaks, participants in my study stated a variety of coping actions used when facing high levels of fatigue in the class (e.g., removing hearing aids,

turning amplification devices off, taking visual breaks by doodling on a paper, and stopping engaging and zoning out completely during the lesson). Previous research has highlighted some similar actions to cope with fatigue, but which result in disrupted learning or socialization. For example, physical and/or emotional withdrawal and avoidance have been reported by D/HH adults as fatigue coping actions (Holman et al., 2019). These coping behaviors are similar to the findings of Rohatyn-Martin and Hayward (2016) for D/HH high school students. These authors indicated that the D/HH participants had limited coping strategies, and mostly used “survival mechanisms", meaning coping actions that while reducing fatigue may inadvertently impact learning opportunities and teachers’ perceptions of the students' engagement (Rohatyn-Martin & Hayward, 2016, p. 27).

In summary, these findings echo the importance of the need for effective fatigue coping mechanisms. The findings of my study show that D/HH students have both actions and strategies to cope with fatigue. If D/HH students are not provided with a supportive environment that addresses their fatigue contributors, they are likely to compensate for this absence by coping actions that may adversely impact their learning and socialization, resulting in an intensification of their fatigue consequences. Moreover, lack of awareness about fatigue manifestations (i.e., physical, cognitive, and social-emotional symptoms) will likely result in the internalization of the fatigue causes by students and misinterpreting and mislabeling the fatigue symptoms by educators. For this reason, educators and clinical practitioners should take fatigue into account when teaching in educational settings and developing interventions in clinical settings for D/HH students. Researchers should also continue to investigate the efficiency of these fatigue coping strategies and interventional plans, reporting the most effective ones for D/HH students.

Implications for coping with fatigue

The lack of sufficient awareness about coping strategies significantly affects the robustness of our knowledge on effective interventions; therefore, enhanced awareness about effective and ineffective fatigue coping mechanisms from D/HH students themselves will lead to a better framing of intervention programs.

Moreover, enhanced awareness of fatigue manifestations may advance research aimed at identifying specific targets for future intervention programs. Intervention programs focused on physical, cognitive, and social-emotional aspects can be implemented at schools by educators to specifically target those fatigue symptoms in students, which should result in minimizing fatigue consequences.

It would also be beneficial to initiate education programs designed for parents informing them how to support their children at home. By involving parents, educators can develop a support system of informed individuals who can help with, and advocate for, D/HH students concerning fatigue. This will be a critical step for developing better interventions to mitigate fatigue in D/HH students.

Similar to Rohatyn-Martin and Hayward's (2022) suggestion, it would be helpful for educators, class teams, and students to normalize diversity, and prepare for students with diverse needs before students enter their class. As discussed in the implication sections of the previous themes, educators need to consider all potential fatigue contributors as learning barriers and eliminate or minimize them to prevent fatigue consequences. Moreover, describing the different manifestations of fatigue would help students develop the language needed to talk about fatigue, reducing the likelihood of misinterpreting or mislabeling these symptoms. Finally, improving

awareness about effective solutions, strategies, and actions to cope with fatigue will help minimize the adverse effects of fatigue.

It is necessary to highlight the importance of shared responsibility in terms of self-advocacy strategies. D/HH students are not atomistic entities who are divorced entirely from their social, cultural, and educational contexts. They often have to shoulder the entire responsibility of advocacy while they are embedded in ableist educational and societal systems that are often unsafe environments for them to advocate. Many D/HH students struggle with advocacy. The resources needed to advocate may not be available when students are already overwhelmed by fatigue. Further, self-advocating can also be fatigue-inducing, stressful, and anxiety-provoking itself, particularly when there have been negative experiences with attempts to self-advocate (e.g., Lynne's comment from a teacher stating that "*there are thirty other students in this class*").

Hence, normalizing fatigue in the classroom and making it a classroom problem (rather than a D/HH student's problem) will establish the co-responsibility for advocacy. One approach that educators can take is collaboratively designing a classroom program that focuses on identifying fatigue contributors (see Theme 1 implications section) and developing solutions to address them (Rohatyn-Martin & Hayward, 2022). Educators need to be aware that coping strategies can be highly individual, and there is no single solution that will work for all D/HH students. Also, resources and solutions will be helpful for many other students in the classroom (Rohatyn-Martin & Hayward, 2022). Taking a whole class approach may help D/HH students feel that they are supported, that their concerns and needs are as important as others, and the environment is safe enough to advocate for these needs, so they will be more likely to advocate on their own behalf.

Limitations

As pointed out by Rohatyn-Martin (2017), very few studies have valued the actual voices of D/HH students themselves, my study adds to the literature that highlights these students' voices expanding the knowledge base on these students' experiences of fatigue. There are limitations related to (a) the recruitment process; (b) methodology; (c) the analysis process.

Recruitment process

I interviewed one gender (female) from the Caucasian racial classification, and from a particular geographical region (Alberta, Canada) which reduced my ability to consider the impact of factors such as gender, race, socioeconomic status, and culture. These factors may influence fatigue contributors and experiences.

All participants in my study were post-secondary students completing undergraduate degrees. The inclusion of other levels of post-secondary education such as master's and Ph.D. students might have resulted in different experiences and levels of fatigue than those reported by undergraduate students. Likewise, participants with different levels of hearing such as mild or mild-to-moderate might also have experienced different effects of fatigue.

In addition, through purposeful sampling, my study participants comprised three D/HH students, including one student who communicated in spoken English, one communicated in ASL, and one was a dual language user (spoken English and ASL). Moving forward it might be interesting to replicate the study recruiting participants from these groups separately (e.g., only ASL users). Thus, for a more diverse sample, future research could employ nationwide samples, including participants from varying genders, ages, and different levels of hearing.

Study participants were recruited voluntarily. This might have led to a bias towards participants who are either very outgoing and self-confident, have higher motivation, have

experienced fatigue before and were willing to share their experiences, or who have lifestyles that allow them to take part in the research.

Methodology

My study methodology is qualitative which relies highly on self-reported data. Collecting self-reported information has limitations. The responses provided by participants were authentic; however, it is important to acknowledge that study participants' experiences may include intentional or unintentional biases, including exaggeration of fatigue experiences, selecting a particular memory or information, and trying to provide socially acceptable answers. It should also be noted that during focus group and interview sessions, it is possible that the initial classification of interview and focus group questions and probe questions that asked about various types of fatigue experiences may have impacted participants' responses.

Analysis process

During data analysis, I identified the majority of the initial codes, themes, and sub-themes, after which my supervisory committee began assessing the texts with those codes, themes, and sub-themes in mind to add, adapt or change. Braun and Clarke (2006) recommend researchers independently develop initial codes, themes, and sub-themes and then compare them which may have resulted in differences in initial codes and themes. To overcome this issue, I assessed the trustworthiness of my study (researcher's lens, participant's lens, reviewer's lens; Creswell & Poth, 2018) to validate my codes, themes, and sub-themes.

Recommendations for Future Research

Regarding the themes and implications in this study, several topics can be investigated. More research is needed to further specify a comprehensive model of fatigue in educational settings from multiple perspectives such as educators, parents, psychologists, and speech-

pathologists. For example, there are mixed findings for parents' awareness of fatigue experience in their children. Some studies have reported that parents are unaware of or underestimate their child's experience of fatigue (Werfel & Hendricks, 2016), while other studies indicate that parents do understand fatigue experience in their children (Hinds et al., 1999). Thus, future research is needed in this area. In addition, we need to know more about the fatigue construct in students with varying types and degrees of hearing. We also need information related to the prevalence of fatigue, its contributors, consequences, manifestations, and coping strategies in each of those student groups with different modes of communication separately (e.g., D/HH students who use LSL, ASL users).

Moreover, a fatigue survey designed especially for D/HH students in educational settings is a crucial and fundamental step in the improvement of assessment and intervention programs. Most available fatigue measures have not included the voice of D/HH students themselves. Thus, developing and validating a measure of fatigue relevant to the experiences of students who are D/HH needs further exploration. Additional research also is needed to further investigate the adequacy and accuracy of a fatigue survey. It is also important to consider that evidence-based fatigue coping strategies need to be developed, implemented, and evaluated for effectiveness in collaboration with D/HH students.

Another valuable area of research is the research-practice gap in this field. As discussed in Theme 1 implications, there is a fundamental gap between research and practice in the area of addressing fatigue contributors in educational settings, suggesting the need for innovation. New mechanisms and/or implementing the UDL framework are necessary to bring actual changes in educational stakeholders' actions to bridge this gap.

In summary, it is essential to focus the research in the field of fatigue in D/HH students to (a) amplify these students' voices; (b) collaboratively consider other perspectives (e.g., educators, parents, professionals); (c) develop fatigue surveys particularly for D/HH students in educational settings; (d) develop and evaluate coping strategies and intervention programs to mitigate fatigue; (e) bridge the research-practice gap by collaborative research efforts and implementing a UDL framework. All these steps can be addressed only if the importance of fatigue as a potential risk factor for adverse outcomes in D/HH students' lives is recognized.

Conclusions

The purpose of my study was to increase the awareness of fatigue in D/HH students among educators and students themselves by answering two questions: (a) what are post-secondary D/HH students' experiences of fatigue in educational settings? (b) how has fatigue impacted these students' education? Utilizing Strauss and Corbin's (1998) systematic procedures approach, my study developed themes and sub-themes from focus group interview responses to better understand fatigue experiences of D/HH students in educational and social settings.

The findings indicate that fatigue is a significant issue for post-secondary D/HH students in social and educational settings, arising from three conditions and situations: (a) environmental factors; (b) characteristics of educational tasks; and (c) utilizing assistive hearing devices. Over the last decade studies have identified some of these fatigue contributors, however, the finding of my study shows D/HH students continue to struggle with these fatigue contributors in their classrooms, revealing a research-practice gap. Implementing a UDL framework as an innovation to address learning and social barriers that contribute to fatigue may be a way to improve collaboration between researchers and educators, and as a commitment to valuing diversity, equity, and inclusion for all students, bridging the research-practice gap.

As described by study participants, not recognizing and addressing fatigue contributors results in adverse consequences across many aspects of D/HH students' lives, including learning outcomes, relationships with others, and leisure activities. Experiencing high levels of fatigue after school and having to budget limited resources and energy for schoolwork prevented D/HH students from having enjoyable social lives and leisure activities. Findings from my study indicate that fatigue consequences in K-12 settings have far-reaching effects, impacting students' adult life. Awareness about fatigue consequences will help educators, and D/HH students themselves seriously consider these adverse effects.

It was apparent from participants' comments that fatigue manifests itself physically, cognitively, and social-emotionally. Improved awareness about fatigue symptoms may help educators be more watchful about the presence of fatigue and reduce misinterpretation or mislabeling of these manifestations. By implementing a UDL framework, teachers can normalize fatigue and its symptoms, helping students develop a language to speak about their experiences. Encouraging D/HH students to talk about fatigue contributors, and manifestations will provide a safe environment to prioritize their needs, voice their concerns, and advocate for their learning rights.

To mitigate fatigue, participants in my study reported varied coping actions and strategies, ranging from tolerating or avoiding situations that have adverse educational and social consequences, to strategies that enriched learning and socialization opportunities. It is important to educate students and teachers on the use of effective fatigue coping strategies and resources which will be helpful for many students.

In summary, fatigue is a significant problem for D/HH students. Not addressing fatigue contributors leads to adverse consequences in D/HH students' lives. To reduce these adverse

consequences, fatigue manifestations should be identified early, and effective fatigue coping strategies should be recommended and taught. To achieve these goals, it is imperative to enhance awareness among educators, parents, and D/HH students themselves.

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Appendix A: Information Letter

Title of the study: Deaf and Hard of Hearing Students' experience of fatigue

Principal Investigator:
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Department of Educational Psychology Phone: (587) 974-3793
University of Alberta, Edmonton, AB

Supervisor:
Denyse Hayward, Professor Email: dhayward@ualberta.ca
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University of Alberta, Edmonton, AB

Invitation to Participate: You are invited to participate in this research study about fatigue experience because you are a deaf/hard of hearing student with post-secondary education experience.

Purpose of the Research: Fatigue has been acknowledged as one explanatory factor for lower academic outcomes for deaf and hard of hearing (D/HH) students. The impact of fatigue is often poorly understood by both students and educators. Some research shows that many students often struggle to recognize fatigue symptoms and frequently internalize its cause. Teachers frequently misconstrue fatigue coping behaviors as a lack of motivation and laziness and do not recognize the importance and critical need for educational support to identify and mitigate fatigue symptoms.
My overarching goal is to understand, identify and describe fatigue symptoms experienced by post-secondary students who are deaf or hard of hearing. This information will be shared with teachers, specialists, and parents in K-12 educational contexts.
You will help me answer these two questions:

1. What are post-secondary D/HH students' experiences of fatigue in educational settings?
2. How has fatigue impacted post-secondary D/HH students' education?

Participation
What I am asking from you as a participant:

- Participate in virtual interviews via Google Meet with the researcher.
- An ASL interpreter will be provided for participants.
- I am asking for about 3 hours of your time.
- There will be one interview session including pre-interview activities (30 mins) related to your experiences of fatigue in your schooling.
- There will be a follow-up interview (30-45 mins) to discuss the transcripts of your interviews for accuracy, researcher interpretations, and additions/edits you may wish to make.
- The sessions will be audio and video recorded to create accurate transcripts of the interviews.

Benefits: There are no direct benefits to you by participating in this research, but it will allow me to gain a deeper and broader understanding of post-secondary students who are D/HH in terms of their perceptions, experiences, and strategies related to mitigating fatigue. I plan to share knowledge gained

from participants with teachers, parents, specialists, and students in K-12 educational contexts to better meet their needs in the future.

Risks: There are no known or anticipated risks to you by participating in this research; however, if at any point you feel you need to speak to a counselor about any negative feelings you experience from the study, one will be provided for you.

Confidentiality/Anonymity: The information that you will share will remain strictly confidential and will be used solely for the purposes of this research. The only people who will have access to the research data are me, and my master's supervisor, Dr. Denyse Hayward. With your permission, your responses may be used verbatim in presentations and publications, but you will not be identified. Anonymity is guaranteed since your name will be protected using a different name and by removing any personally identifying information (e.g., university name, school name, workplace, city, teacher name) from the transcript. When this research is completed, all recordings and transcripts will be kept for five years. The recordings will then be destroyed according to the University of Alberta secure data deletion guidelines.

Data Storage: Audio and video recordings will be downloaded to a computer and all electronic files, recordings, and other documents will be stored on a password-protected computer or in a locked filing cabinet at the University of Alberta for a period of *5* years.

Voluntary Participation: You are under no obligation to participate and if you choose to participate, you may refuse to answer questions that you do not want to answer. You have the right to request that the audio or video recording be turned off at any time. You may withdraw your interview up to 3 months after the final interview is completed.

Information about the Study Results: The research findings will be available to you upon request.

Contact Information: If you have any questions or require more information about the study itself, you may contact the researcher (Shiva Zarezadeh Kheibari) at the phone number or email mentioned herein.

The research is being undertaken as part of the Shiva Zarezadeh kheibari's graduate studies.

The plan for this study has been reviewed by a Research Ethics Board at the University of Alberta. If you have any questions regarding your rights as a research participant or how the research is being conducted, you may contact the Research Ethics Office at 780-492-2615. Please keep this form for your records.

Appendix B: Consent Form

Study Title: Deaf and Hard of Hearing Students' experience of fatigue

Principal Investigator: Shiva Zarezadeh kheibari, Email: szarezad@ualberta.ca, Phone: (587) 974-3793, Department of Educational Psychology, University of Alberta
Research/Study Supervisor: Denyse Hayward, Professor, Email: dhayward@ualberta.ca, Phone: (780) 248-2019, Department of Educational Psychology, University of Alberta

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Please check your information letter and align your yes/no checkboxes with what you are asking of participants

Have you read the attached Information Letter?	Yes ☐ No ☐
Do you understand the benefits and risks involved in taking part in this study?	Yes ☐ No ☐
Do you understand that you can ask questions and discuss this study with the researchers at any time?	Yes ☐ No ☐
Do you understand that you can withdraw your interview up to 3 months after the final interview is completed?	Yes ☐ No ☐
Do you understand that your records will be kept confidential?	Yes ☐ No ☐
Do you understand who will have access to the information collected from you?	Yes ☐ No ☐
Do you understand that audio and video taping is part of this research project and that these recordings will be used for data analysis?	Yes ☐ No ☐
Do you give permission for your responses to be included anonymously in presentations and publications?	Yes ☐ No ☐

I agree to participate in this study: Yes ☐ No ☐

Signature of Participant	Name (Printed)	Date

Appendix C: Demographic Survey

1) Age

☐17-19 ☐20-22 ☐ 23-24 ☐ 25+

2) Current year

☐1 ☐2 ☐3 ☐4+ ☐Recently Graduated

3) Identified gender

☐Male ☐Female ☐Other (specify)……

4) Ethnicity

☐Caucasian (white) ☐Black ☐East Indian ☐Asian ☐Other

5) Hearing level

☐Mild ☐Moderate ☐Severe ☐Profound

6) How do you primarily communicate?

☐ASL only ☐Spoken English only ☐Signed English (SEE)

☐Total Communication (specify)…….. ☐Other (specify)……

7) Do you use amplification devices? If so, do you use (circle all that apply):

☐Yes ☐No

☐Hearing aids ☐ Cochlear Implant (specify which ear)

☐BAHA ☐FM System ☐Other (specify)……

8) Did you attend a school for the Deaf or mainstream school for your K-12 education?

☐School for the Deaf ☐Mainstream School ☐Both (specify grades)

Appendix D: Interview Protocol

Time of Interview:
Date:
Place:
Interviewer:
Interviewee:

Pre-interview Activities

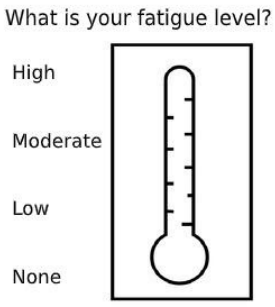
In order to prepare you for our interview, I would like you to complete the three activities below. We will begin our interview by having you talk about these.

A. Make a list of 10 important words that come to mind for you when you think about school.

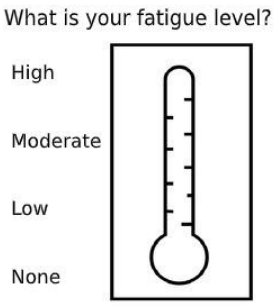
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

B. Think about a typical school day. Use the fatigue/tiredness thermometer below to identify how fatigued/tired you are at these times.

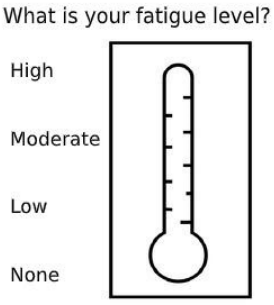
1) Beginning of your school day



2) Middle of your school day



3) Right after school?



Interview Questions

Cognitive I'm going to ask you some questions about the mental effort (thinking, concentrating, planning, attending, problem-solving) it took for you to listen, watch, and understand throughout your school experiences.
1. Can you tell me about situations at school that make it more difficult to listen, watch or understand? [Follow up] What do you do in those situations? [Probe] Do you give up; do you try harder? [Follow up] Do you feel that your schoolwork is affected by these situations? [Follow up] How?
2. Think about that/a time when it took a lot of effort to concentrate. Can you tell me about it? [Follow up] What difficulties did it cause for you? [Probe] Did it cause you to make mistakes, miss details, or forget things?
3. How do you know you are mentally tired?
4. Do you feel like it takes you more mental effort (planning, thinking) to watch, listen and understand than it does for your peers? [Follow up] Can you tell me specifically when it happens? [Follow up] Why do you think so? [Follow up] What do you do when you feel this way? [Follow up] Do you think other people (teachers/ classmates/ parents) are aware that it takes you more mental effort? [Follow up] What do they do? Is it enough? What do you do?
5. Can you tell me about a situation at school when you knew/felt that you really needed to take a mental break (a break from thinking, concentrating)? [Follow up] Do you think your teachers knew that you needed a mental break? [Probe] Are you offered mental breaks in your day? [Follow up] If you are not offered breaks, what do you do when you feel you need a break from thinking or concentrating? [Probe] Do you remove or turn off your hearing device or try not to watch the interpreter to take a break from listening or watching? [Follow up] If so (you are offered breaks) what do your mental breaks look like? [Probe] Do teachers give mental breaks only to you or to the whole class? [Follow up] How do you feel about that?
6. What situations in the classroom(s) and/or school environment might interfere with the effort it takes to give your full attention? [Probe] Do things like noise, light, location of seating in the different classroom make it take more effort to pay attention?
7. When you think about the mental effort that you used in class when you were younger, was it harder then? [Follow up] Has anything changed between then and now? [Probe] Are there any strategies that you use now that you wish you knew about then?

Physical

I'm going to ask you some questions about the physical effort (body responses, eye and hand muscles, energy use/exertion), it took for you to listen, watch, and understand throughout your school experiences.

1. How does the physical effort that it takes for you to watch, listen and understand affect you?
[Follow up] Do the physical efforts result in headaches, feeling drained/weak, eyes burning, anxiety, muscle weakness, constant yawning after a taxing class/ day at school?
[Follow up] How do you know you are physically tired?
[Follow up] Can you tell me about some situations in school that required intense physical effort?
[Follow up] What do you do in those situations?
[Follow up] Are there particular situations that are harder than others?
[Probe] In particular classes, time of day?
[Follow up] Does your energy change during the transitions between classes?
[Probe] Do you find yourself taking time to walk around the school or dragging your feet more?

2. Have you noticed any differences in the physical effort it takes for you to participate in the in-person classes vs online classes?
[Follow up] How do you know that it is different?

3. How does the physical effort that it takes for you to watch, listen and understand during the school day affect your energy after school?
[Follow up] Is your participation in extracurricular activities like completing homework, doing sports, meeting friends, etc. affected?
[Probe] Do you have the energy to take part in your hobbies/ household activities?

4. Can you tell me about a time when you felt you needed a nap /to take a rest after school because it took you a lot of effort to listen, watch and understand during the day?
[Follow up] Do you feel like you need to nap or rest after school more than others do?
[Probe] Why do you feel you need a nap/rest?
[Follow up] Can you think of anything that could change your school day so that you don't need to take a nap after school?
[Follow up] Do you think your teachers could do anything to support you when feeling this way?
[Follow up] Do you think your parents could do anything to support you when feeling this way?

Social-emotional

I'm going to ask you some questions about the social-emotional (motivation, enjoyment, and interactions with others) effort it took for you to listen, watch, and understand throughout your school experiences.

1. Think about sometimes when it took a lot of emotional effort to watch, listen and understand throughout the school day. Can you tell me about a time when
a) you felt frustration or irritability? Tell me about that.
b) you were stressed out (feel nervous/anxious)? Tell me about that.
c) you felt less motivated or had no desire to do your schoolwork? Tell me about that.
d) you felt worn out/ or just gave up? Tell me about that.
e) your confidence/ self-esteem was affected? Tell me about that.

f) you felt embarrassed/ insecure or secure about yourself? Tell me about that. [Follow up] How do you know you are emotionally exhausted? [Follow up] What are the triggers? [Follow up] What strategies do you use to overcome these feelings?
2. Do your emotional responses interfere with your relationships with other people (teachers, EAs, TAs, classmates, interpreters, friends)? [Follow up] Can you give me an example?
3. Does being emotionally exhausted interfere with your socializing with others? [Probe] Have you limited or avoided social events? [Follow up] Why did you feel you needed to avoid the event? [Follow up] If not, what strategies have you used so you can be successful when in social settings?
4. What do you do after school? [Follow up] Are there any activities that you like to do after school? [Follow up] Does the emotional effort you use during the school day affect a) your participation in these activities? Tell me about that. b) your interest and enjoyment in the activities? Tell me about that. c) your relationships with your family and friends after school? Tell me about that. d) your enjoyment of life? Tell me about that.

Appendix E: Preliminary thematic map