Anxieties Associated with Disabilities in Music Education and Performance: Recognition to Potential Solutions for Accommodation

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Abstract:

Research on disabilities and accommodations has grown significantly in recent years, in part due to the intervention of governmental agencies who have implemented new definitions and laws to protect individuals with disabilities. This research paper discusses anxieties present in three disabilities—learning disabilities, autism spectrum disorder, and visually impairment or blindness—by examining the effects of anxiety in performance and classroom situations. This paper is divided into five main sections. I begin by outlining some key terms used in the literature on disabilities (Section 1). Section 2 focuses on learning disabilities by examining the issues surrounding diagnosis and anxiety, while Section 3 discusses Autism Spectrum Disorder, the relationship between Asperger Syndrome and music, savant performers, anxieties, and accommodations for performers with Asperger Syndrome. Section 4 examines a physical disability, visual impairment and blindness, in relation to blind hearing, anxieties, and Braille scores. The last main section (Section 5), which focuses on technologies and music therapies, evaluates the benefits and drawbacks of technology, as well as music therapy. I conclude by reflecting on the current limitations and propose future steps needed to better address the needs of individuals with disabilities.

Keywords: disabilities, anxiety, test anxiety, learning disabilities, autism, blindness, music theory, music performance, technology, strategies, diagnosis, music therapy, visual impairment, Asperger Syndrome, Autism Spectrum Disorder, invisible disability, legal blindness, Music Performance Anxiety, Pervasive Developmental Disorder –Not Otherwise Specified, learning disability anxiety

INTRODUCTION

The relationship between music and disability has been explored primarily in the context of notable musicians and composers, who have struggled with disabilities. The term "disability" is problematic since it constantly evolves as the understanding of what consists of a disability changes. This ever-changing definition creates difficulties with the initial diagnosis, as well as the assessment of tools to offset the disability. As an individual who was diagnosed with a learning disability later in life, I believe the idea of increased awareness and understanding is integral to support individuals with disabilities, as is the ability to recognize potential signs in individuals who themselves are unaware of the disability. I begin by summarizing my experience of coping with an undiagnosed disability to the recognition and the tools used to accommodate the disability, followed by my main objectives, and an outline of the different sections for this research paper.

I was formally diagnosed with a learning disability at the age of twenty-four. Throughout elementary school and high school, I struggled with reading comprehension; however, since I had acquired an advanced level of reading, the problems with the comprehension were not recognized and my disability remained undiagnosed. As the material became more difficult, I adopted new strategies to cope with the disability. One such strategy involved excelling in my course work so that my examination marks would not seriously impact my final grade.

Since teachers, friends, and family members advised me that post-secondary studies would be more difficult and would bring new challenges, at first, I was not entirely discouraged when my marks dropped significantly from high school to university. However, as I continued to strive for what I considered to be acceptable marks

by investing more time and effort, my stress level began to increase when no significant change occurred in my grades. This not only occurred in lectures, but in performance as well. In my private lessons and in performances, I experienced so much stress that the instructor believed I had music performance anxiety (MPA). To cope with the problem, we discussed many strategies and tools, none leading to a long-term solution. The lessons themselves were accompanied with much anxiety, as the instructor believed I was not practicing enough. The more stressed I became because I wanted to impress him, the more I lost focus in the lessons. I would play the pitch that I would see, not realising that I was misreading the pitch due to the disability. When the stress of my lessons and performing became too overwhelming, I redirected my attention to academic courses; however, this move did not entirely relieve the stress and anxieties I experienced in my lessons.

As I progressed through my undergraduate studies, the level of stress associated with timed examinations increased, especially when these involved a higher percentage of the overall grade. I struggled to complete timed exams since the increased stress overwhelmed me, causing a physical reaction. I felt a compulsion to move; with the inability to do this I became overheated and would feel faint. Since I could no longer focus, I would rush through the exam in order to leave the room, resulting in poor exam marks, which in turn impacted negatively my final grades. It was only at the beginning of the fourth year of my undergraduate degree that a professor noticed an inconsistency between my examination marks and my understanding of the material in class discussions. She encouraged me to consult disability services. It was then that I was semi-diagnosed with exam anxiety; I was given slightly more time in exam situations and the

possibility to move around in an attempt to cope with the anxiety. I was also accommodated with a private space to write the exam so that my movements would not impact others. This solution decreased significantly the amount of stress that I experienced in timed-exam situations.

After graduating from the Bachelor's degree, I began studies at another institution, which did not accommodate exam anxiety. The learning specialist who was counselling me suggested that I undergo testing for a learning disability. After a few months of sessions with a psychologist, I was finally diagnosed with a learning disability, which caused many of my anxieties. Accommodations were put in place to help me cope more easily with the disability, resulting in the relief of many of my anxieties in exam and testing situations. My experiences raised concerns and questions regarding the difficulty in diagnosis, including: (1) what reasons lie behind the difficulties of diagnosing a learning disability; (2) why are teachers at all levels not given the tools to recognize the potential indicators for learning disabilities; (3) what, if any, disabilities other than learning have issues with diagnosis; (4) do other disabilities also have increased anxiety resulting from the disability; and (5) how can such anxieties be reduced to create a positive space for the disabled individual.

This paper will examine anxiety in relation with disabilities since the two often overlap and differentiating between the two is crucial to offer effective solutions to the disabled individual. I will begin by outlining some key terms used in the literature on disabilities (Section 1), followed by the four main sections of the research paper. Section 2 will focus on learning disabilities by examining issues surrounding diagnosis and

associated anxieties, while Section 3 will discuss Autism Spectrum Disorder, the relationship between Asperger Syndrome and music, savant performers, anxieties, and accommodations for performers with Asperger Syndrome. Section 4 will examine a physical disability, that of visual impairment and blindness, in relation to blind hearing, anxieties, and Braille scores. The last main section (Section 5), focused on technologies and music therapies, will evaluate the benefits and drawbacks of technology, as well as music therapy. I will conclude by reflecting on the current limitations and propose future steps needed to better address the needs of individuals with disabilities.

SECTION 1: Preliminary Definitions

The definitions outlined in this section cover a wide range of topics from key terminology in the literature on disabilities to anxiety. These will be used throughout the research paper.

Anxiety

Anxiety is a mental health disorder that is caused by "the body's response to danger and is adaptive in shaping responses to threatening events and promoting safety."[1] Anxiety is an individual disorder; as such, manifestations including physical symptoms, such as stomachaches, headaches, and chest pain, appear differently in every person and change depending on the circumstances of the situation.[2]

[1] Carol Rockhill, Ian Kodish, Caroline DiBattisto, Michelle Macias, Chris Varley, and Sheryl Ryan, "Anxiety Disorders in Children and Adolescents," *Current Problems in Pediatric and Adolescent Health Care* 40, no. 4 (April 2010): 67.
[2] Ibid., 75.

Asperger Syndrome (AS)

Asperger Syndrome (AS), a high functioning developmental disorder within the Autism Spectrum Disorder, is classified by severe and constant social interaction impairment, as well as the development of restrictive repetitive behaviour patterns in general interests and activities.[3]

Autism Disorder (AD)

Autism Disorder (AD), a low functioning developmental disorder within the Autism Spectrum Disorder, is distinguished by the abnormal or impaired development of social interaction and communication. This disorder is marked by many factors including the inability to recognise nonverbal communication cues, such as eye contact, facial expressions, and gestures.[4]

Autism Spectrum Disorder (ASD)

Autism Spectrum Disorder (ASD), also known as Autism Spectrum Condition (ASC), belongs to a grouping of neurologically-based developmental disabilities that are categorized within Pervasive Developmental Disorders (PDD). All disorders or syndromes in the spectrum are identified with impairments in social interaction and

[3] Ibid., 80.
[4] Michael B. First, M.D., ed. *Diagnostic And Statistical Manual Of Mental Disorders – 4th Ed. (Dsm-Iv-Tr™, 2000) - 4th Ed.* (Washington DC: American Psychiatric Association, 2000), 70.

communication to varying degrees. The spectrum includes Autism Disorder, Asperger Disorder, and Pervasive Developmental Disorder – Not Otherwise Specified.[5]

Blindness

Blindness is recognised as a level of visual impairment or by the inability to see; this disability includes the absence or severe reduction of vision.[6]

Invisible Disability

An invisible disability is not physically readily apparent; these disabilities include learning disabilities, developmental disabilities, and mental disabilities.

Learning Disabilities (LD)

Learning disabilities (LD) may be considered as an "invisible disability," depending on where the individual resides. Each governing body offers descriptions that differ slightly, as will be discussed later in relation to the ones provided by the Canadian, American, and British governments. In general terms, LD is not a "single disorder, but is a general category of special education composed of disabilities in any of seven specific areas: (1) receptive language (listening), (2) expressive language (speaking), (3) basic reading

[5] Centre for Disability Resources, "Project STAGES: Supporting Students with Autism in General Education Settings," *University of South Carolina*, last modified 9 April 2010. http://uscm.med.sc.edu/autism_project/Module 1 Lesson 3.pps.

[6] M. Cay Holbrook and Alan J. Koenig, eds., *Foundations of Education: Volume l. History and Theory Of Teaching Children And Youths With Visual Disabilities*, 2nd Ed., (New York: AFB Press, 2000), 313.

skills, (4) reading comprehension, (5) written expression, (6) mathematics calculation, and (7) mathematical reasoning."[7]

Legal Blindness:

Legal blindness is determined by the level at which an individual perceives light and varies depending on the region where the individual resides. In Canada, a person with a ratio of 20/200[8] or less in each eye, or a visual field or area of less than 20 degrees in diameter in each eye, is considered legally blind. The latter case may include individuals who have better than 20/200 vision.[9]

Music Performance Anxiety (MPA)

Music Performance Anxiety (MPA) may be considered a subgroup of general anxiety. MPA relates directly to the experience of and the anxiety associated with musical

[7] Reid G. Lyon, "Learning Disabilities," *The Future of Children* 6, no.1 (Spring 1996): 55.

[8] The ratio of 20/200 describes the distance that an individual sees without corrective lenses as compared to the distance the average person can see. For example, with a ratio of 20/10 vision an individual can see 20 feet in comparison to the average person who sees the same at 10 feet.

[9] Canadian National Institute of The Blind, "What Is Low Vision," *Canadian Ophthalmological Society*, accessed 28 May 2013, http://www.cnib.ca/en/your-eyes/eye-conditions/low-vision/Pages/default.aspx.

performance. In the context of a performance setting, MPA can manifest itself through a range of symptoms, including behavioural, cognitive, somatic, and affective.[10]

Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS)

Pervasive Development Disorder-Not Otherwise Specified (PDD-NOS), a developmental disorder within the Autism Spectrum Disorder, includes impairments in verbal or non-verbal communication and social impairments that are not as severe as Autism Disorder, but are not as high functioning as Asperger syndrome.[11]

Test Anxiety

Test anxiety can be categorised as a subgroup of anxiety. It manifests itself as feelings of worry and high emotional reactions that are directly related to an evaluation setting, including situations where the individual believes that he or she is being evaluated in some form.[12]

Visual Impairment

[10] Dianna T. Kenny, "The Role of Negative Emotions in Performance Anxiety," in *Handbook of Music and Emotion: Theory Research, Applications,* ed. Patrik Juslin and John Sloboda (New York: Oxford University Press, 2010), 433.
[11] First,, ed. *Diagnostic and Statistical Manual Of Mental Disorders* – 4th Ed., 84.
[12] Donald Wachelka and Roger C. Katz, "Reducing Test Anxiety and Improving Academic Self-Esteem in High School and College Students with Learning Disabilities," *Journal of Behavior Therapy and Experimental Psychiatry* 30, no. 3 (September 1999): 192.

Visual impairment, a general term used to describe all levels of restriction of sight, includes mild forms of sight loss to blindness; the latter consists of the complete inability to perceive light.[13]

SECTION 2: Learning Disabilities (LD)

The connection between learning disabilities (LD) and musicians in the context of the educational system has not been specifically studied since many of the accommodations for classes and exams would seem to be the same. However, there is distinctiveness in music, such as private lessons and non-traditional classes, which differs from other areas. The literature on anxiety surveyed in this paper will not relate solely to music; however, the general premises of the research may be adapted to encompass and focus on musical studies. This is due to the similar nature of performance and exam situations. Students are required to perform the knowledge they have required in a particular situation where they will be evaluated (either formally or socially). Test anxieties contribute significantly to anxieties in all students. One of the major issues surrounding anxieties and invisible disabilities is general awareness of all aspects of the

[13] World Health Organization."International Statistical Classification of Diseases and Related Health Problems 10th Revision," *World Health Organization*, 2010, http://apps.who.int/classifications/icd10/browse/2010/en#/H54.

disability as to provide support for the individual and to recognize potential indicators in individuals who have yet to be diagnosed. In this section, I will examine some of the difficulties associated with LD and anxiety to provide a better understanding of the disability as it relates to studies in general and to the specifics of music. I will begin by discussing the difficulties that arise with diagnosis for LD, followed by a summary of the anxieties common for students with LD. I will then conclude with music-based anxieties, the difficulties with the diagnosis of Music Performance Anxiety (MPA), and the differences between the two in order to differentiate MPA from LD.

2.1: Learning Disabilities and Diagnosis

Diagnosis of LD is particularly difficult since disagreements arise in relation to the definition and what indicators are used for diagnosis. In Canada, no set definition exists, making it difficult to discuss the issue across the country. Federal and provincial governments, as well as provincial ministries of education, have proposed different definitions to reflect their specific aims.[14] Since each governing body determines working definitions for LD, the various definitions proposed by these bodies can cause difficulties with diagnosis. While a psychologist conducts the diagnosis of a mental disability, there

[14] Allyson G. Harrison and Alana Holmes, "Easier Said Than Done: Operationalizing the Diagnosis of Learning Disability for Use at the Postsecondary Level in Canada," *Canadian Journal of School Psychology* 27, no. 1 (2012): 14.

are guidelines set out by each government for what is considered a disability in general terms.[15]

With the increasing global awareness on disabilities, the Canadian Federal Government has provided the following definition:

> A specific learning disability results from problems in one or more of the central nervous system processes involved in perceiving, understanding and/or using concepts through verbal (spoken or written) language or nonverbal means. It manifests itself with a deficit in one or more of the following areas: attention, reasoning, processing, memory, communication, reading, writing, spelling, calculation, coordination, social competence and emotional maturity.[16]

Within the Canadian definition of LD some ambiguity arises. As there are no strict guidelines to determine the level at which a condition is too debilitating to be considered a disability, psychologists must make this assessment without a definition set by a governing body.

The American definition is more specific with both the specific disabilities and the origin. In his article from 1996, Lyon quotes the following as it appeared in section 300.7(b)(10) of the American Code of Federal Regulations:

> A disorder in one or more basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, speak, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not apply to children who have learning problems that are primarily the result of visual, hearing, or motor disabilities, of mental retardation, of

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[15] Karla K. Stuebing, Jack M. Fletcher, Josette M. LeDoux, G. Reid Lyon, Sally E. Shaywitz, and Bennet A. Shaywitz, "Validity of IQ-Discrepancy Classifications of Reading Disabilities: A Meta-Analysis," *American Educational Research Journal* 39, no. 2 (Summer 2002): 469-473.

[16] "Definition: Learning Disability," *Industry Canada*, last modified September 28, 2008, http://www.apt.gc.ca/wat/wb14200e.asp?dId=89.

> emotional disturbance, or of environmental, cultural, or economic disadvantage.[17]

Since this was published, the regulations surrounding the disabilities have been updated twice; however the definition has remained the same creating some continuity in this definition.[18]

While these two definitions overlap in many ways, the definition provided by the United Kingdom (UK) differs significantly. The UK separates LD into two categories: Learning Disabilities[19] and Learning Difficulties. In 2001, the UK Department of Health's definition for Learning Disabilities included the presence of:

[17] Reid G. Lyon, "Learning Disabilities," 56.
[18] US Department of Education, "IDEA – Building The Legacy of IDEA 2004," *US Department of Education*, date accessed February 26, 2013, http://idea.ed.gov/explore/view/p/%2Croot%2Cstatute%2CI%2CA%2C602%2C.
[19] For the sake of clarity, I will avoid using acronyms while discussing Learning Disability in relation to the UK definition. LD will only be used for the broad sense of the term.

- A significantly reduced ability to understand new or complex information, to learn new skills (impaired intelligence), with;
- A reduced ability to cope independently (impaired social functioning);
- A disability, which started before adulthood, with a lasting effect on development.[20]

Since this definition was developed for the purposes of the Department of Health, it has a specific purpose. The UK document continues to explain that:

> [the] definition encompasses people with a broad range of disabilities. The presence of a low intelligence quotient, for example an IQ below 70, is not, of itself, a sufficient reason for deciding whether an individual should be provided with additional health and social care support. An assessment of social functioning and communication skills should also be taken into account when determining need. Many people with learning disabilities also have physical and/or sensory impairments. The definition covers adults with autism who also have learning disabilities, but not those with a higher level autistic spectrum disorder who may be of average or even above average intelligence – such as some people with Asperger's Syndrome. [21]

The Department of Health does not believe that the individuals with average or above average intelligence require additional medical assistance, which is why the definition does not include these individuals in the Learning Disability category. However, the Department of Education recognizes a different category for these individuals: Learning Difficulties. The definition consists of two parts and was defined in the Education Act of 1996:

[20] Department of Health, *Valuing people: A New Strategy for Learning Disability for the 21st Century*: March, 2001, (London, England: Parliament, 2001): 14.
[21] Ibid.

> … A person has a learning difficulty if:
> (a) he has a significantly greater difficulty in learning than the majority of persons of his age, or
> (b) he has a disability which either prevents or hinders him from making use of facilities of a kind generally provided by institutions providing post-16 education or training.
> But a person is not to be taken to have a learning difficulty solely because the language (or form of language) in which he is or will be taught is different from a language (or form of language) which has at any time been spoken in his home.
> 2. Learning difficulty is the term used in legislation while "learners with learning difficulties and/or disabilities" is a deliberately wide definition in common usage in the FE system, and includes people with mental health difficulties, autistic spectrum conditions, dyslexia, attention deficit hyperactivity disorder, behavioural emotional or social disorders, physical, sensory and cognitive impairments and other identified and non-identified difficulties in learning. All of these conditions could fall within the definition of learning difficulties for the purpose of a Learning Difficulties Assessment.[22]

While the UK definition includes two components, the definitions of learning disabilities in the US and Canada, as well as the learning difficulties in the UK, are fairly similar. However, the differences are still evident as each governing body decides what is considered a learning disability.[23]

Many similarities exist between the Canadian definition and the one provided by the American federal government, as can be seen in Figure 1; however, slight wording differences can drastically change the meaning. The American and Canadian definitions overlap for the most part, as the bold and bold italicized text indicates. Both identify LD as a deficit in the ability to read, write, spell, and perform mathematical calculations.

[22] Department for Education, "Definition of Learning Difficulties – About the Department," *Department for Education*, last modified December 20, 2012, http://www.education.gov.uk/aboutdfe/statutory/g00203393/lda/definition.

[23] For the purpose of the other sections of this paper, I will be using the Canadian federal government's definition, as it is the most inclusive and descriptive.

FIGURE 1: Definitions of LD from Canada, the United States, and the United Kingdom

<table>
<tr><th>Canada</th><th>United States</th></tr>
<tr><td>A specific learning disability results from <u>problems</u> in one more of the central nervous system processes involved in perceiving, understanding and/or using concepts through verbal (spoken or written) language or nonverbal means. It manifests itself with a deficit in one or more of the following areas: <u>attention, reasoning, processing, memory</u>, <u>communication</u>, reading, writing, spelling, calculation, coordination, <u>social competence</u> and <u>emotional</u> <u>maturity</u>[24]</td><td>A <u>disorder</u> in one or more basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, speak, read, write, spell, or to do mathematical calculations. The term includes such conditions as <u>perceptual disabilities</u>, brain injury, <u>minimal brain dysfunction</u>, <u>dyslexia</u>, and <u>developmental aphasia</u>. The term does not apply to children who have learning problems that are primarily the result of visual, hearing, or motor disabilities, of mental retardation, of emotional disturbance, or <u>of environmental, cultural, or economic disadvantage</u>.[25]</td></tr>
<tr><td colspan="2">United Kingdom</td></tr>
<tr><td>A person has a learning difficulty if:
(a) he has a significantly greater <u>difficulty</u> in learning than the majority of persons of his age, or
(b) he has a disability which either prevents or hinders him from making use of facilities of a kind generally provided by institutions providing post-16 education or training.
But a person is not to be taken to have a learning difficulty solely because <u>the language (or form of language) in which he is or will be taught is different from a language (or form of language) which has at any time been spoken in his home</u>.</td><td>Learning difficulty is the term used in legislation while ‘learners with learning difficulties and/or disabilities’ is a deliberately wide definition in common usage in the FE system, and includes people with mental health difficulties, autistic spectrum conditions, <u>dyslexia</u>, <u>attention deficit hyperactivity disorder</u>, <u>behavioural</u> <u>emotional</u> <u>or social disorders</u>, <u>physical</u>, <u>sensory and cognitive impairments</u> and other identified and non-identified difficulties in learning. All of these conditions could fall within the definition of learning difficulties for the purpose of a Learning Difficulties Assessment.[26]</td></tr>
<tr><td colspan="2">The Bold text indicates the same terminology between the Canadian and the United States definitions
The Bold italics text indicates similar terminology between the Canadian and the United States definition
The <u>underlined</u> text is the same terminology between the Canadian and the United Kingdom or the US and the UK
The <u>Underlined italics</u> text is similar terminology between Canada and the United Kingdom or United States and UK</td></tr>
</table>

[24] *Industry Canada*, “Definition: Learning Disability,” http://www.apt.gc.ca/wat/wb14200e.asp?dId=89.
[25] US Department of Education, “IDEA – Building The Legacy of IDEA 2004,” http://idea.ed.gov/explore/view/p/%2Croot%2Cstatute%2CI%2CA%2C602%2C .
[26] Department of Education, “Definition of Learning Difficulties – About the Department,” http://www.education.gov.uk/aboutdfe/statutory/g00203393/lda/definition.

The Canadian definition is slightly broader, including coordination, social competence, and emotional maturity, as possible criteria for the consideration of someone with LD.[27] However, the American definition includes specific conditions and sources of the disability.

Both of these are more specific than the general UK terminology. The UK definition provides the manifestations of LD, including dyslexia and attention deficit hyperactivity disorder; it does not, however, account for deficits in abilities, such as reading and writing. This is the reason for the drastic differences between the American and Canadian in contrast to the United Kingdom. Comparing all three definitions, there are only a few commonalities, as indicated by the underlined and underlined italics. The only term that is common to all three definitions is the problem, difficulty, or disorder used to describe the issues presented by the disability. Each governing body proposes specific criteria when deciding what wording to include or disregard. As a result, similar definitions can be interpreted differently.

The ambiguity in the specific definitions, as well as the lack of consistency within different regions, creates difficulties with the diagnosis of a disability. This is particularly relevant in relation to invisible disabilities, since there is no concrete way of measuring the level of the disability. If the intelligence of an undiagnosed individual is high enough to compensate for the deficits, it can be difficult to recognize the indicators for the disability. Agreeing on a universally accepted definition is challenging with respect to invisible disabilities, but is necessary in order to provide appropriate support for all individuals with disabilities.

[27] Industry Canada, "Definition: Learning Disability," http://www.apt.gc.ca/wat/wb14200e.asp?dId=89.

2.2: Anxiety and LD

Similar to LD, anxiety is equally as difficult to define. Although not all individuals with LD experience incapacitating levels of anxiety, it is common. The combination of anxiety and the disability can create some difficulties with diagnosis since the disability can be masked by anxiety if this anxiety is more prominent. The individuality of the disability creates difficulties in determining the extent of the disability, as well as how and when anxieties come into play. However, generalizations and categories may serve as useful tools to better aid the individual cope with the effects of LD and anxiety. Recently, scholars have identified that individuals, students and non-students, with LD experience an increase in emotional difficulties in comparison to their non-LD peers.[28] This type of emotional difficulty is often directly related to anxiety. The studies examining LD and anxiety, which included some participants chosen because of their LD, show that many different levels of anxiety exist in individuals with LD compared to those without. These subjects experienced both LD and anxiety, while the individuals without LD may or may not have experienced anxieties. What is common throughout the studies is that individuals with LD experience a higher level of anxiety than those without.[29] Anxiety, however, is very common and there are varying theories discussing its origin and the way it exhibits itself in different individuals. Nelson and Harwood examine three theories to discuss this topic: primary disorder theory, cerebral dysfunction theory, and secondary reaction theory (see Figure 2).

[28] Alexander M. Wilson, Catherine Deri Armstrong, Adele Furrie, and Elizabeth Walcot, "The Mental Health of Canadians With Self-Reported Learning Disabilities," *Journal of Learning Disabilities* 42, no. 1 (January/February 2009): 25.
[29] Jason M. Nelson and Hannah Harwood, "Learning Disabilities and Anxiety: A Meta-Analysis," *Journal of Learning Disabilities* 44, no. 1 (January/February 2011): 3.

FIGURE 2: The Direction of Cause in Learning Disability Anxiety (LDA) Theories

Name of Theory	LD	Direction of Cause	Anxiety
Primary Disorder Theory	LD	←	Anxiety
Cerebral Dysfunction Theory	LD	← →	Anxiety
Secondary Reaction Theory	LD	→	Anxiety

Primary disorder theory proposes that high levels of anxiety cause learning disabilities. The individual experiences anxiety due to the knowledge of the importance of academic achievement and the fear of potential failure; this may result in a more pronounced disability or an "avoidance of academic work."[30] Cerebral dysfunction theory is the middle ground between the three theories. The researchers propose, "LD and anxiety have a common brain-based etiology and, therefore, frequently co-occur."[31] In this case, it is not that either is the cause or the result, but rather that the two simultaneously occur, causing elevated levels of both; they stem from the same biological factor, either "genetic/constitutional or based on brain dysfunction."[32] Finally, the authors argue that for the third theory, secondary reaction theory, the learning disability creates the anxiety. A reading disability serves as a good example for this latter theory.

> [E]levated anxiety during reading interferes with the phonological loop, causing the need for articulatory rehearsal, which taxes working memory capacity … reading involves holding information in working memory from one sentence to the next, poor reading comprehension may result when working memory is disrupted by anxiety.[33]

The common link between the three theories is that the anxiety levels are detrimental to the individual's capability to learn.

It is plausible that all of the elements outlined in the three theories exist in different individuals since every learning disability is unique to the individual. However, for the purposes

[30] Ibid., 3-4.
[31] Ibid., 3.
[32] Otfriend Spreen, "The Relationship Between Learning Disability, Emotional Disorders, and Neuropsychology; Some Results and Observations," *Journal of Clinical and Experimental Neuropsychology* 11, no. 1 (1989): 121-122.
[33] Nelson and Harwood "Learning Disabilities and Anxiety," 4.

of this paper, I will focus on primarily the secondary reaction theory since it correlates most readily with LD and test anxiety. The ambiguity resulting from the many factors that surround LD cause additional problems with diagnosis. With the origin of anxiety and subsequently LD unknown, diagnosis and treatment of both becomes complex. The treatment is based on trial and error as to provide coping strategies to aid primarily the anxiety or the learning disability. It is important to be aware of the issues surrounding the problematic diagnosis of anxieties in relation to disabilities to put the proper coping strategies into place. The ultimate goal of the diagnosis is to reduce the level of anxiety and enhance performance.

2.3: Anxieties and the LD Student

Anxieties play a significant role not only in music performance, but also in the context of exams and tests; this is a commonality across all subjects. Music training shares many aspects with other fields of study in relation to students who experience LD-associated difficulties in exams, tests, and classrooms learning, but it differs with the activity of performance. As previously mentioned, individuals with LD "may experience even higher levels of anxiety" than the non-LD student.[34] Studies have concluded "approximately 70% of students with LD experience higher anxious symptomatology than do non-LD students."[35] Anxiety in general is a debilitating factor for students with LD. In a study conducted by Thaler, Kazemi, and Wood, successes in youth are predicted by "emotional stability and lower stress."[36] When academic

[34] Nicholas S. Thaler, Ellie Kazemi, and Jeffrey J. Wood, "Measuring Anxiety in Youth with Learning Disabilities: Reliability and Validity of the Multidimensional Anxiety Scale for Children (MASC)," *Child Psychiatry Human Development* 41, no. 5 (October 2010): 502.
[35] Nelson and Harwood, "Learning Disabilities and Anxiety," 9.
[36] Thaler, Kazemi, and Wood, "Measuring Anxiety in Youth with Learning Disabilities," 502.

success is hindered because of LD, the levels of stress and anxiety increase, which in turn further impedes academic success.

These anxieties can have negative effects not only in the classroom, but socially as well. Studies have concluded that individuals with LD can have "difficulties making and maintaining friendships with same-age peers."[37] At a school-age level, teacher and parent approval have a higher impact on depression and anxiety in individuals with LD.[38] Individuals with LD also have higher percentages of depression and anxiety later in life.[39] These anxieties have not only been linked to social anxieties, stemming from lower academic achievement in testing situations, but also from a lower self-esteem in classroom settings as well.[40]

2.3.1:Test anxiety

Test anxieties contribute significantly to anxieties in all students. However, similarly to general anxiety, students with LD are also at higher risk of experiencing test anxiety than their non-LD peers.[41] While some test anxiety has positive effects on non-LD students,[42] often those who suffer from severe test anxiety do not fulfill their potential under strenuous circumstances.[43] Since more students with LD experienced nervousness, stress, frustration, helplessness, or

[37] Ibid., 502.
[38] Wilson et al., "The Mental Health of Canadians With Self-Reported Learning Disabilities," 25.
[39] Ibid.
[40] Thaler, Kazemi, and Wood, "Measuring Anxiety in Youth with Learning Disabilities," 502-503.
[41] Jolyn D. Whitaker Sena, Patricia A. Lowe, and Steven W. Lee, "Significant Predictors of Test Anxiety Among Students With And Without Learning Disabilities," *Journal Of Learning Disabilities* 40, No. 4 (July/August 2007): 362-363.
[42] Sena, Lowe, and Lee, "Significant Predictors of Test Anxiety Among Students With and Without Learning Disabilities," 361.
[43] Dawson R. Hancock, "Effects of Test Anxiety and Evaluative Threat on Students' Achievement and Motivation," *The Journal of Educational Research* 94, no. 5 (May/June 2001): 288.

uncertainty, along with feelings of worry due to the amount of limited time which result in rushing to finish quickly,[44] these students are less likely to experience positive testing situations, making them more anxious in future tests due to past failures.[45] All of these factors can result in test scores that are significantly lower than those of students without LD.

Testing in these circumstances does not test the knowledge or preparation of the individual, as the negative results stem from the anxieties of the test or examination. As the anxieties and worrying increase in these individuals, "more effort and spare processing capacity are devoted to the solution of the anxiety problem associated with the test taking process, at the expense of solving the test problems."[46] As such, the individual's anxiety score is directly related to the achievement in reading and mathematics test scores.[47] Evaluation in the form of testing is considerable in the context of academics. Since the levels of anxiety during the evaluation are higher in LD students, the assessments of students with LD are often lower than those without.

Under these circumstances, learning difficulties increase in students with learning disabilities, as their grades do not reflect their knowledge. In order for the evaluation of students to be accurate, recognising the increased anxieties and putting accommodations in place to reduce the anxieties are required. Many music classrooms can accommodate LD students during testing situations; however, problems arise with specialised skills, such as music dictation. The testing of these skills can create problems as the instructor plays the exercises to the entire classroom. Without either recording the exercises or having additional time to accommodate the

[44] Tali Heiman and Karen Precel, "Students With Learning Disabilities In Higher Education: Academic Strategies Profile," *Journal of Learning Disabilities* 36, no. 3 (May/June 2003): 251-254.
[45] Sena, Lowe, and Lee, "Significant Predictors of Test Anxiety Among Students With and Without Learning Disabilities," 371.
[46] Ibid.
[47] Ibid., 363.

LD student, the time needed to process the material because of the disability creates additional anxieties for the student.

2.3.2: Classroom Anxiety

Another type of anxiety common among students with LD is classroom anxiety. Unlike exam anxiety, classroom anxiety is more difficult to assess in a study than test anxiety because of the problems that arise in duplicating an accurate classroom setting. However, classroom anxiety overlaps in many ways in terms of effects with test anxiety. Students with LD "may feel embarrassed when called upon to read out loud, answer questions in class, express their needs, or participate in other academic activities. These students may worry excessively about their performances or successes while also experience [*sic*] a lack of control over their academic and social outcomes."[48]

The anxiety, similar to that of testing situations and explained as secondary reaction theory, occurs when the processing of information is blocked by the body's reaction to decrease the levels of anxiety, causing the absorption of information to be greatly reduced. Information is continually delivered and must be processed, which results in sensory overload. The combination of this with the aforementioned body's response to anxiety creates difficulties in the classroom for individuals with LD by reducing their ability to filter and retain key points. This relates directly to test anxiety since the individual's inability to absorb pertinent information in the classroom increases the anxiety associated with an impending test. In turn this aggravates the situation by heightening the overall anxiety in classroom situations. In both classroom and testing situations, "those who struggle to master academic skills may develop an anxiety reaction

[48] Thaler, Kazemi, and Wood, "Measuring Anxiety in Youth with Learning Disabilities," 502-503.

in anticipation of possible academic failure."[49] This can also occur in private lessons. The instructor may have to present the information a number of times for the student to absorb it completely. The anxieties that are created in these types of one-on-one settings differ from those presented in typical classrooms. If the student has anxieties with this particular type of situation, the anxieties previously mentioned will prevail and will reduce the amount of information that can be processed. This can be frustrating for both the instructor and student.

2.4: Music Performance Anxiety (MPA) and Learning Disabilities Anxiety (LDA)

Many music students experience some level of anxiety in relation to performance in concert and in the classroom in the form of music performance anxiety (MPA) and/or learning disabilities anxiety (LDA). MPA is associated with atelphobia, the fear of imperfection, neuroticism, and other social phobias.[50] It stems from "sensitivity to both internal types of arousal and critical judgement by others."[51] Osborne and Kenny conclude that MPA is a combination of three systems: physiological arousal, behavioural responses, and fearful cognitions; while these may be considered on their own, they are interconnected.[52] Although MPA is directly related to the specific anxieties of musical performance, LDA encompasses all of the anxieties that are created by LD. This includes testing and exam anxieties, as well as classroom anxieties.

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[49] Sena, Lowe, and Lee, "Significant Predictors of Test Anxiety Among Students With and Without Learning Disabilities," 3.
[50] Elizabeth Valentine, "The Fear of Performance, " in *Musical Performance: A Guide To Understanding,* ed. John Rink (Cambridge: Cambridge University Press, 2002), 172.
[51] Ibid.
[52] Margaret S. Osborne and Dianna T. Kenny, "The Role of Sensitizing Experiences in Music Performance Anxiety in Adolescent Musicians," *Psychology of Music* 36, no. 4 (2008): 447.

Since the two types of anxieties can be present while performing, the symptoms of LDA could be mistaken for MPA. MPA can cause anxiety among individuals who do not suffer from LD, often accruing similar symptoms, as the body's reaction to anxiety is similar. The anxieties that occur in performance can compare to the anxieties in classrooms and exams. In a classroom setting, an individual can experience anxieties from being called upon with the expectation of knowledge. Although there is not necessarily an evaluation attached to a performance, anxieties can arise with the expectation of a good performance. The symptoms can be divided into physiological, behavioural, and mental. The physiological symptoms include "increased heart rate, palpitations, shortness of breath, hyperventilation, dry mouth, sweating, nausea, diarrhoea and dizziness."[53] Behavioural symptoms refer to those of "shaking, trembling, stiffness, and dead-pan expression, or of impairment of the performance itself."[54] Finally, the mental symptoms pertain directly to the "loss of self-esteem" and the "fear of public performance," and primarily the negative thoughts that coincide.[55] Significant overlaps occur between the physical symptoms for MPA and LDA. Individuals with LDA suffer from "physiological arousal, which was originally termed 'emotionality' … [and] produces physical symptoms such as sweaty palms, increased heart rate, or shallow and rapid breathing when an individual prepares for and takes a test."[56] However, it is not just the physiological arousal that physically creates symptoms. Individuals with LD also "have physiological, cognitive, and behavioural responses that stimulate negative feelings about an evaluation."[57] One significant difference between test anxiety with LD students and performance with MPA students is the timing of the anxieties. One

[53] Valentine, "The Fear of Performance, " 168.
[54] Ibid., 168-169.
[55] Ibid., 169.
[56] Sena, Lowe, and Lee, "Significant Predictors of Test Anxiety Among Students With and Without Learning Disabilities," 361.
[57] Ibid., 360.

of the strategies to cope with MPA involves the displacement of the anxiety. In studies, more experienced performers confirmed that they had more anxiety prior to a performance, while the less experienced performers had anxieties during the actual performance.[58] Students with LDA experience the anxieties during the evaluation period, rather than prior or post evaluation, resulting in lower concentration and cognitive impairment.[59]

LDA and MPA differ primarily through the origin of the anxiety. LDA originates from a learning disability, as it directly pertains to recalling memorized musical material; if the student is reading music, LDA affects the ability to comprehend the music and to identify the notes on the page, as well as the ability to internalize the notes, similar to written examinations. If the anxiety originates from the MPA, then the strategies used to reduce the anxiety must be different than those used to cope with LDA. Researchers believe that "students with LD are hypothesized to have basic psychological and/or neuropsychological deficits that impede their ability to perform well in basic academic areas. While many of the solutions for MPA, such as the Alexander technique or Biofeedback, might take away performance-related anxieties, they will not do the same for LDA."[60] However, some of the cognitive techniques used to treat MPA, such as psychological relaxation techniques, including relaxing self-instructed word repetition or deep breathing, do help offset the negative thoughts associated with the LDA.[61] Other techniques also need to be considered in order to address the many factors that lead to LDA and to reduce the anxieties. Just as with test anxiety, students with LD experience more anxieties in relation to

[58] Valentine, "The Fear of Performance," 177.
[59] Nelson and Harwood, "Learning Disabilities and Anxiety," 4.
[60] Valentine, "The Fear of Performance," 177.
[61] Philip Cohn, "Why Does My Stomach Hurt? How Individuals with Learning Disabilities Can Use Cognitive Strategies to Reduce Anxiety and Stress at The College Level," *Journal of Learning Disabilities* 31, no. 5 (September/October 1998): 514-515.

performance-based activities because of their disability. Once the anxiety is managed, the performer should be able to perform to his or her maximum potential.

It is crucial for students and teachers to understand the difference between MPA and LDA to find effective solutions. Since the two anxieties can have similar symptoms, it can be difficult to differentiate between the two, and often a diagnosis of MPA becomes the default. Strategies to cope with MPA do not necessarily help the individual with LDA. Awareness is important not only for educators who are in contact with young children, but at all levels since suitable coping strategies must be explored to offset anxieties.

2.5: Concluding remarks

LD can be difficult to diagnose, as there is no tangible measurement for diagnosis and the symptoms of the disability vary significantly between individuals. This difficulty can be even greater in musicians with undiagnosed disabilities, as the anxieties produced are similar to those of MPA. It is essential for educators at all levels to recognise the potential signs not only for the LD, but LDA and MPA as well. Instructors must be able to discuss anxieties with students in order to offer solutions for these anxieties.

With younger students, the teacher will know the student more personally since classrooms are generally smaller. Difficulties arise later as the time spent with the instructor is more limited in larger classes. This presents issues for undiagnosed individuals now struggling as the material becomes increasingly difficult. While there may not be many students who are diagnosed at more advanced levels of learning, either in high school or in university, students with LD rarely understand the issues on their own and need help in identifying the problems

related to LD. The instructor must be willing to direct them to the appropriate specialist for a proper diagnosis.

Diagnosis is not the only reason for instructors to understand LD and the anxieties associated with them. If instructors possess an understanding of the manifestations and potential occurrences of the disability, they may set up their classrooms to allow the student with LD to become less anxious, allowing the information to be properly assimilated. In testing situations, as well as classroom situations, when the anxieties become significant the body focuses primarily on coping with the anxiety and less on retaining information. If these anxieties can be managed, the student will be more capable of understanding the material and participating, leading to an improvement in class performance, as well as in overall mental health.

While there is extensive research on the anxieties produced from testing situations in students with LD, little exist for musicians with LD. This is an important area of research that needs to be addressed, as there are many instances of LDA that may differ from test anxiety. Understanding a disability in all manifestations will result in new tools for the student, who needs more appropriate and specific accommodations to cope with LDA, as well as resources to improve his or her self-esteem in classroom, testing, and performance situations.

SECTION 3: Autism Spectrum Disorder (ASD)

Autism Spectrum Disorder (ASD), similar to a learning disability, is an invisible disability. New anxieties, which interfere with music performance, arise in relation to this disability. This section will examine the anxieties and potential negative implications a musician with ASD could encounter; it will also provide an understanding of the disability with the goal of offering insights into the anxieties to optimize the performance potential. I will begin with a

discussion of the research conducted on Asperger Syndrome (AS) and ASD, followed by the relationship between ASD and performance, notable performers with ASD, and the potential anxieties related to the disability.

3.1: Autism Disorder (AD) and Autism Spectrum Disorder (ASD)

Leo Kanner, while a psychiatrist at Johns Hopkins University, identified autism in 1943, and associated the disability with low IQ and either non-speaking children or those with weak communication skills. This classification was applied extensively throughout the 1980s. He noted the existence of "extreme lack of responsiveness to other people, impairment in verbal and nonverbal communication, insistence on maintaining sameness in the environment, excessive attachment to small objects, certain isolated areas of ability such as excellent rote memory or spatial perception, avoidance of eye contact, and a normal physical appearance."[62] Hans Asperger further contributed to the research on Autism Disorder (AD) by identifying Asperger syndrome as a subset within the AD in 1944.[63]

This new classification highlighted the complexity of the disorder and changed the understanding of autism from a single disorder to a spectrum. At the beginning of the millennium, new research brought increasing awareness and media coverage to the disability. This research also broadened the medical community's awareness and understanding of the

[62] Alice-Ann Darrow and Tammy Armstrong, "Research on Music and Autism Implications for Music Educators," *Applications of Research in Music Education* 18, no 1 (January 1999):15.
[63] Centre for Disability Resources, "Project STAGES: Supporting Students with Autism in General Education Settings," *University of South Carolina,* last modified 9 April 2010, http://uscm.med.sc.edu/autism_project/ .

disorder, which, in turn, resulted in more diagnoses of individuals. In 1970, one in 2,500 people were diagnosed with Autism, compared to 2000, where the number of cases rose to one in 200.[64]

Autism Spectrum Disorder (ASD) is categorized as a Pervasive Developmental Disorder (PDD). There are three disorders categorized as PDD: Childhood Disintegrative Disorder, Rhett's Disorder, and ASD.[65] For this paper, I will be focusing on ASD as the connection to music is more prevalent in such individuals. Within ASD, three subcategories have been identified, as shown in Figure 3: Autism Disorder (AD), Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS), and Asperger syndrome (AS). The criteria and definition for AD has remained similar to the ones originally proposed by Kanner in 1943. However, researchers now consider AD as the lowest functioning form of ASD.

AS is the highest functioning form of ASD and does not include the same language or cognitive development difficulties that are typical with AD. Individuals with AS share key characteristics, such as impairment of use of nonverbal behaviours including eye contact and social gestures, difficulty in social situations, strict need for routine, a strong interest in one or more specific areas that is abnormal in focus or intensity, and an infatuation with objects or parts of objects; these individuals also struggle with not understanding social cues.[66] PDD-NOS, as the name suggests, fills the gap between AD and AS. Often individuals with PDD-NOS share

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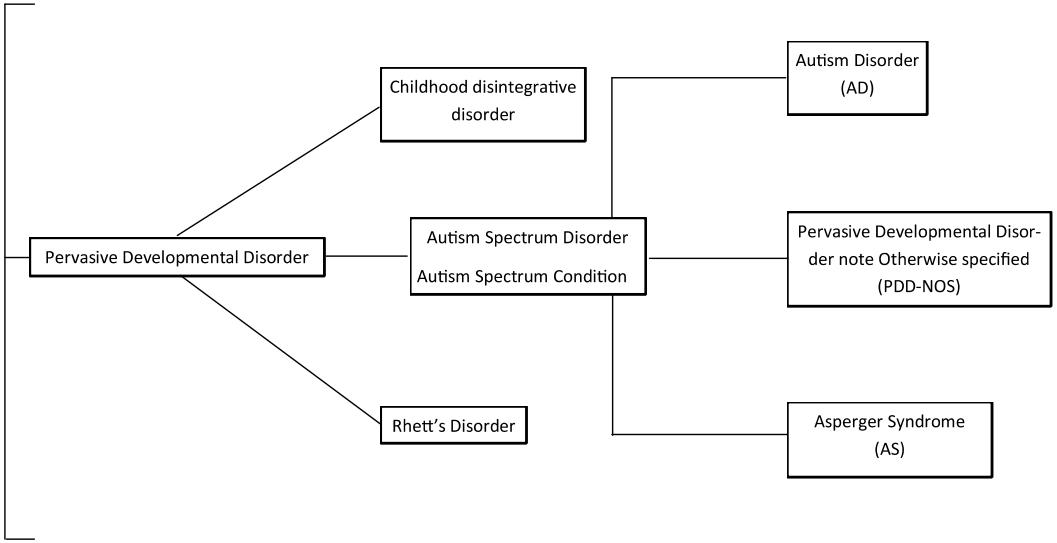
[64] Simon Baron-Cohen, *The Essential Difference: The Truth About The Male and Female Brain*, (New York: Basic Books, 2003), 136.

[65] For additional information on Rhett's Disorder and Pervasive Developmental Disorder, consult First, ed. *Diagnostic and Statistical Manual Of Mental Disorders – 4th Ed.*

[66] Centre for Disability Resources, "Project STAGES: Supporting Students with Autism in General Education Settings," *University of South Carolina*, last modified 9 April 2010, http://uscm.med.sc.edu/autism_project/Module 1 Lesson 3.pps. For further information on the syndrome, including many of the smaller specific traits, consult the National Institute of Neurological Disorders and Stroke, "Asperger Syndrome Fact Sheet," *National Institute of health*, last modified 21 August 2013, http://www.ninds.nih.gov/disorders/asperger/detail_asperger.htm.

FIGURE 3: Pervasive Developmental Disorders and the Autism Spectrum Disorder



similarities with those with AD, but do not meet all of the criteria for either AD or AS.[67] There have been examples of individuals with ASD demonstrating exceptional abilities that are connected to savant skills. This rare aspect of ASD is the connection of extreme ability in direct contrast to the disability.[68] While it has been extensively researched, the understanding of savant skill, the connection with ASD, and the rarity of the skills are still unknown.[69] These various skills include mathematics, music, visual art, engineering, science, as well as others. Since individuals with and without savant skill who exhibit musical abilities at a high level of performance often fall into the AS category, this category will be the primary focus for this section's discussion.

3.2: Asperger Syndrome (AS) and Performance

The relationship between ASD and musical ability creates unique circumstances for performers with ASD. Musical ability does not solely stem from savant abilities; individuals with ASD hear, understand, and perceive music differently than the general population. Although not all ASD children have strong musical abilities, many show attentiveness to music from a young age.[70] Prior to the awareness of AS, Kanner reported that six out of the eleven individuals studied had "music-related behaviours that are

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[67] Centre for Disability Resources, "Project STAGES: Supporting Students with Autism in General Education Settings," *University of South Carolina,* last modified 9 April 2010, http://uscm.med.sc.edu/autism_project/Module 1 Lesson 4.pps.

[68] Allan Snyder, "Explaining And Inducing Savant Skills: Privileged Access To Lower Level, Less-Processed Information," in *Autism and Talent,* ed. Happé Francesca and Uta Frith (New York: Oxford University Press, 2010), 75.

[69] Francesca Happé and Uta Frith, "Introduction: The Beautiful Otherness of the Autistic Mind" in *Autism and Talent*, ed. Happé Francesca and Uta Frith (New York: Oxford University Press, 2010), xii.

[70] Darrow and Armstrong, "Research on Music and Autism Implications for Music Educators," 16.

extraordinary given their developmental levels."[71] Even those without savant gifts either displayed a musical ability, or gravitated naturally to music; remarkably, AS individuals without musical training often had a considerable understanding of pitch connections and form. These individuals also showed an understanding of emotions through the music with facial expressions and body language, and achieved greater success interpreting and identifying emotions through music.[72]

While individuals with ASD often have a connection to music, it is the individuals with AS who often make great performers. This is due to the numerous characteristics attributed to AS that coincide with performers. While not all characteristics are observed in every case of AS, common ones can include a severe intensity, attention to specific details, and savant musical ability including absolute pitch, as well as increased musical memory and performance. Furthermore, AS individuals who do not possess savant gifts also exhibit exceptional musical ability.[73]

Without savant gifts, individuals with AS often also have a preoccupation with music. This is a common diagnostic indicator of individuals with AS and is identified as a severe intensity. This occurs in the form of routine, as well as attention to a particular subject or activity typically to the exclusion of all others.[74] Researchers have speculated

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[71] Pamela Heaton, "Assessing Musical Skills in Autistic Children Who Are Not Savants," in *Autism and Talent*, ed. Happé Francesca and Uta Frith (New York: Oxford University Press, 2010), 152.
[72] Jinah Kim, Tony Wigram, and Christian Gold, "Emotional, Motivational And Interpersonal Responsiveness Of Children With Autism In Improvisational Music Therapy," *Autism* 13, no. 4 (2009): 390-391.
[73] Francesca Happé and Pedro Vital, "What Aspects of Autism Predispose to Talent," in *Autism and Talent*, ed. Happé Francesca and Uta Frith (New York: Oxford University Press, 2010), 33.
[74] First, ed. *Diagnostic and Statistical Manual Of Mental Disorders – 4th Ed. (Dsm-Iv-Tr™, 2000) - 4th Ed.*, 70.

that this results from differences in the development of the brain. These developmental issues have created a hyper-systemizing brain, which allows for a higher portion of material to be understood when analysed. The increase in cognitive ability is significantly higher than those who are "neurotypical, or individuals with typical brain development."[75] As a result, individuals with AS create more connections with the information provided. Every piece of information given is linked to many other factors and this contributes to the intensity of a specific question, task, or object. While this is not specific to musical connections, it can have a great impact. For musicians, this increased associative understanding can provide new ways of relating material and of highlighting these connections in performance interpretations that other performers may not specifically understand or perceive, resulting in a unique and stimulating performance.

The intensity to an object relates closely to the attention to detail; however, intensity and attention to detail differ in origin and brain functionality. Intensity is linked to hyper-systemizing, while increased attention to detail is caused by a sensory hyper-sensitivity, which can lead to superior pitch recognition and processing.[76] This unique perception of music is noted in auditory, analytical, and performance situations. It can create an alternate understanding of the pitch that can result in a performance that differs in pitch hierarchy in comparison to the understanding of pitch in performers without AS.

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[75] Simon Baron-Cohen, Emma Ashwin, Chris Ashwin, Teresa Tavassoli, and Bhismadev Chakrabarti, "Talent in Autism: Hyper-Systemizing, Hyper-Attention to Detail and Sensory Hyper-Sensitivity," in *Autism and Talent*, ed. Happé Francesca and Uta Frith (New York: Oxford University Press, 2010), 45.
[76] Ibid., 47.

In some cases, individuals with AS exhibit characteristics of savant abilities in one particular area. The ability of some of these individuals to detect patterns correlates with higher levels of performance ability since they typically make increased connections in the music not necessarily specific to the pitches on the page. Many individuals also possess additional abilities, such as absolute pitch, the ability to instantly reproduce music after an initial hearing, or extraordinary abilities to retain information.

Not all individuals with AS have savant gifts; individuals who typically possess these additional cognitive abilities detect patterns, structure, and form at a higher level than those without savant gifts.[77] However, musical ability is common in many individuals without savant gifts, as the ability to detect patterns and to question the structure of a musical form is prevalent in AS individuals.[78] This is also connected to the innate capabilities of pitch and musical memory above formal training.[79] This unique ability, way of listening, and hearing music, in combination with the ability to analyse structural elements and identify patterns that are exclusive to the way that the mental processes work in the AS brain, create a distinctive performer. The combination of all or a few of these factors allow the performer with AS to present a new performance style that is generated from a unique cognitive ability.

3.3: Savant Performers

While individuals with savant skills are rare, the abilities of these individuals are extraordinary. One such individual who possesses these skills is Derek Paravicini. The

[77] Ibid., 55-61.
[78] Heaton, "Assessing Musical Skills in Autistic Children Who Are Not Savants," 153.
[79] Ibid., 157.

pianist does not only have AS, but is also blind, both due to complications with his premature birth. Remarkably, Paravicini has the ability to listen to, understand, and play a piece after a single hearing. The way that this is achieved is through the systemizing of the form and overall concept of the piece rather than the memorization of the music as it is played. This ability stems from the capacity to connect specific material that the ASD brain can absorb, absolute pitch sensory hyper-sensitivity, and understanding form in a way that differs from someone musically trained.

Dr. Adam Ockelford has been using Paravicini's musical ability to help the pianist cope with his disability, as well as his emotional impairments; expression in the music is used as a means to create an "emotional encoding" to connect with everyday emotions.[80] With most emotions, Paravicini can re-create the desired effect with some proficiency; however, he struggles with the "angry" emotion. He performs "angry" to the same extent as he does the "happy" emotion, and adds additional grunts to insinuate there is something else, but is unable to accurately phrase it.[81] Paravicini does not only play the piano for enjoyment, but also, with guidance from Ockelford, uses it as a learning tool to grasp emotions. He makes connections between emotions that cause him difficulties and the emotions that he can systematically understand through music.

Some individuals with ASD, such as Parvicini and Glenn Gould, have benefitted greatly from music performance. Gould was never formally diagnosed with ASD as there was no formal diagnosis until 1992, ten years after his death. However, there are some compelling arguments from which we may draw this conclusion. Dr. Timothy Maloney

[80] Kapil Gururangan, "Savant Syndrome: Growth of Empathy and Creativity," *Berkeley Scientific Journal* 15, no. 1 (Fall, 2012): 5.
[81] Ibid., 5.

successfully presents the similarities and the characteristics that coincide with AS in Gould's behaviours, including impairment of reciprocal social interactions, non-verbal communication problems, unchanging routines and rituals, fixations and obsessive interests, speech and language idiosyncrasies, abnormal reactions to sensory stimuli, motor abnormalities, mental imagining and feats of memory, savant gifts, as well as late onset and chronic health problems.[82] Gould exhibited many of these traits, which combined to create musical interpretations that are characteristically autistic. The persistent use of staccato and the preference for "local coherence" serve as examples of the way in which Gould performed his autism.[83] These are unique characteristics that marked his performance and created unparalleled performances.

Gould's suspected disability created anxieties that eventually pushed him toward the recording studio and away from live performance. His anxieties did not relate directly to performance, but, rather, arose from the social interactions post-performance. The anxieties worsened to the point where he required prescription medication, including tranquilizers, to cope with the anxiety of social interaction in a performance setting. Even with these medications, he was still often criticized for not interacting with the audience post-performance.[84] Without knowing the reason behind his struggles, finding a solution was difficult, if not impossible. The social anxieties experienced by Gould led to his retirement from public performance and the beginning of his recording career. The lack of understanding of autism at the time, as well as proper accommodations, created the

[82] S. Timothy Maloney, "Glenn Gould, Autistic Savant," in *Sounding Off: Theorizing Disability in Music*, ed. Neil Lerner and Joseph N. Straus (New York: Routledge Taylor & Francis Group, 2006), 126.
[83] Ibid., 138.
[84] Ibid.,128-129.

inability for Gould to manage his social anxieties and continue with his performance career.

3.4: Asperger Syndrome Anxieties

As with any disability, performing with autism is accompanied by issues that the general population does not necessarily face; such challenges need to be overcome to ensure the comfort of the performer. Due to the nature of the disability, mannerisms associated with autism frequently result in the perception of a "freak show" and some audience members will be attracted to the "otherness" that the performer displays instead of the music. Because of this sense of "otherness" while playing, some disabled performers prefer to hide their disability by "passing." "Passing" is a term used in disability studies to describe disabled bodies trying to "pass" for able-bodied individuals. Often, with cases such as autism, the performer's attempt to "pass" creates an uncomfortable situation, making it more difficult to play. Similar to the loss of concentration that arises from increased anxiety, which detracts from the task at hand, the individual who focuses on concealing his or her disability to the audience, experiences the same type of detraction during the performance.

If a performer does not know about his or her disability, such as Gould, passing is not an option, and many of the identifying features appear as rituals or antics. The rituals that Gould displayed are now understood as part of the ASD. Gould hated the social conventions that were required of him; his low placement of the piano bench, as well as humming and playing, are just a few of the mannerisms that were very controversial with audience members. Some went for the "freak-show" aspect of the performance, while

others were mortified by the mannerisms. In 1956, the Detroit Times summarised his performance as "Gould great, antics upsetting."[85] The perception of otherness, in this case, is strong since ASD was not yet defined and the mannerisms would have been unprecedented. However, more recently, as ASD becomes more prevalent, many audience members are still interested in witnessing abnormalities in the performance or what the performer has had to overcome, rather than the music. This can cause additional anxieties, as the performer can be aware of the motivation behind the audience's presence. In the case of Gould, the many anxieties that were created by the audience, critics, and post-performance gatherings forced him to retire from performing live and to begin his studio career. With more understanding and acceptance, otherness will not be the primary appeal of the performance, allowing the unique and amazing music that individuals with ASD create to be sought out rather than a display of abnormality. This will alleviate the anxieties resulting from an audience's reception to a different performance, as well as reduce the need to "pass," freeing up the brain to focus on the task at hand, which is creating an enhanced performance.

3.5: Accommodations for Asperger Syndrome Performers

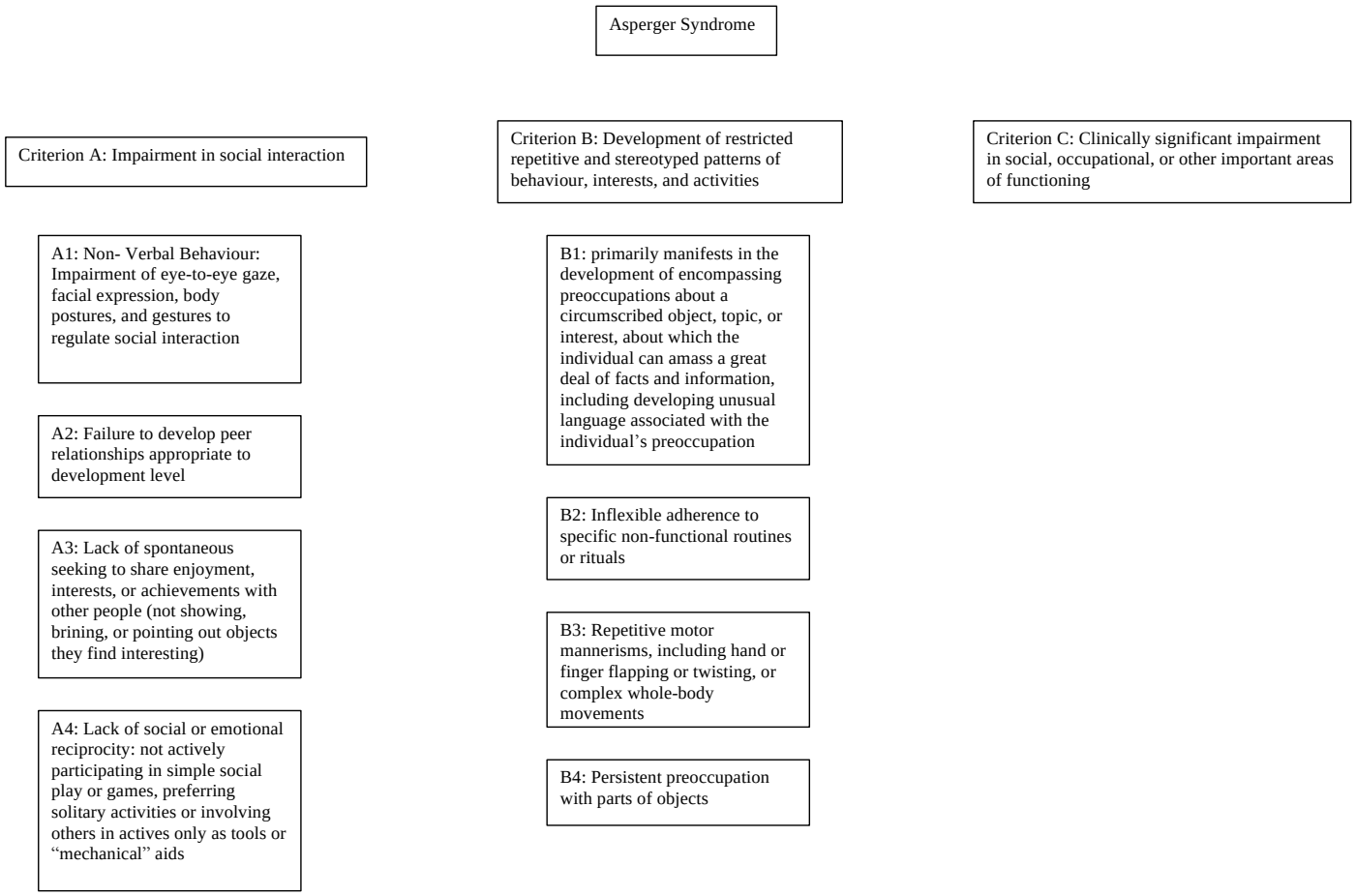
As with all disabilities, especially invisible disabilities, the needs of every individual performer with AS will be different, depending on the anxieties and accommodations that he or she requires. In most cases, individuals with AS are diagnosed early in childhood; however, similar to other invisible disabilities, AS occasionally remains undiagnosed until later in life. If the individual does not exhibit

[85] Ibid., 121.

typical behaviours associated with AS or has a milder form of the disability, the notable signifying characteristics can be misdiagnosed or completely missed. This is due to the lack of tangibility of the characteristics and the complexity of the disability. The behaviours often associated with AS can be grouped into three main categories: (1) the impairment of social interaction, (2) the development of restricted, repetitive patterns, or behaviour, as well as slight impairment of verbal communicative skills, and (3) the impairment in the use of multiple nonverbal behaviours.[86] A summary of each of the behaviours is shown in Figure 4. Not all behaviours are present in every individual and each manifestation can differ. However, this figure depicts the diagnostic criterion as described in the fourth edition of *Diagnostic and Statistical Manual of Mental Disorders*. For ease of diagnosis, AS is divided into the three disorder-specific categories listed above. There are three areas of diagnostically specific characteristics diagnosis in the DSM-IV-TR, depicted in the figure. For a positive diagnosis, the individual must present at least six characteristics, with two or more from the first section, criterion A, and at least one in criterion for each B and C. While not all symptoms are manifested in every individual, these are the typical indicators and behavioural tendencies of individuals with AS. All of these symptoms can create anxieties if accommodations are not accessible. The most detrimental symptom for AS individuals is the necessity for a routine or development of restricted, repetitive patterns or behaviours, as it can negatively impact both performer and performance. The need for rituals prior to a concert or support for special requirements may not be possible in all venues. However, accommodating these repetitive patterns may be vital for lowering anxieties, creating a better performance.

[86] Ibid., 70-73.

FIGURE 4: Criterion for Diagnosis of Asperger Syndrome



Another potential area of anxiety is the interaction with the general public or audiences. However, accommodations can be made, such as playing a video of an interview with the performer after the concert, rather than the performer interacting with the audience, or advising the audience members that the performer will not be available to meet with them after the concert. It is important to strive for a balance between accommodations for the performer and allowing the otherness to be part of the performance. Without this balance the performer may not be able to play, as the anxieties of the ASD can be overwhelming. An understanding of the performer and his or her needs is imperative for the success of the performer and the performance itself.

3.6: Concluding Remarks

Performers with ASD create amazing performances; however, performing with this type of disability can increase the level of anxieties. While ASD is an invisible disability, as there are not many physical traits and the distinguishing features of the disability occur in the brain, audiences can notice many of the rituals or physical behaviours symptomatic of the disability. These identifiers can create instances of "otherness" marking the disabled, or ASD performer, from other "normal" performers. This can be recognized not only from the particulars of the rituals or needs, but also from accommodations required for the comfort of the performer. Currently, most disabled performers are recognised for their disability, rather than the performance itself. Accommodations further highlight the differences between the two types of performers. Until a full understanding and equalization of performers is achieved, a balance must be maintained in relation to the level of accommodations provided. If the performer is

accommodated too extensively, the audience could focus on the "freak show" aspect of the performance over the actual musical performance. This can create more anxieties for the performer, reversing the affects of the accommodations. However, if an appropriate balance is achieved, the otherness can be eliminated from the audience's perspective and the performer will potentially be able to perform without debilitating anxieties. With the amazing gifts that can accompany the disability, the performer should be recognised as a performer, not as a disabled performer.

SECTION 4: Visual Impairment and Blindness

Visual impairment, unlike the previously discussed invisible disabilities of the mind, is easier to diagnose for two primary reasons. First, visual impairment has been studied and documented for more than a century, and thus researchers have a greater understanding of the disability. Second, the tangibility, as well as measurable nature of the disability, makes it easier to diagnose than invisible disabilities. The International Statistical Classification of Diseases and Related Health Problems classifies visual impairment into seven categories, each with corresponding ratios determining the distance an individual sees in relation to normal eyesight. For example, an individual with a ratio of 20/70 would be able to see at 20 feet what the average person would be able to see at 70 feet.[87]

As previously stated, visual impairment is grouped into seven categories. The first category, 0-mild or no visual impairment, includes individuals whose vision is 20/70 or

[87] Canadian National Institute of The Blind, "What Is Low Vision," *Canadian Ophthalmological Society*, accessed 28 May 2013, http://www.cnib.ca/en/your-eyes/eye-conditions/low-vision/Pages/default.aspx.

better. The second category, 1-mild visual impairment, identifies individuals with the ability to see worse than 20/70 but better than 20/200, while the third category, 2-severe visual impairment, groups individuals with ratios between 20/200 and 20/400. Categories 3-5, all considered blindness, range from the mildest form (category 3 with ratios between 20/400 and 20/1200) to category 4 (with 20/1200) and category 5 (the most severe classification of blindness with the inability to perceive light).[88]

While ten million individuals in the United States are visually impaired, only 1.3%, or 130,000 people have no light perception.[89] The following section will discuss the potential anxieties that are associated with individuals with visual impairments. I will begin with an examination of the anxieties in both performance and classroom settings, followed by an examination of one notable performer with visual impairment and the unique hearing ability possessed by individuals with visual impairment.

4.1 Blind Hearing

While most blind individuals have an increased auditory perception, including hearing sensitivity and a higher processing speed of speech, for individuals who were born blind, understanding and perceiving music can be drastically different from sighted musicians due to reading Braille notation. Most sighted musicians perceive sound as aural information, which is transcribed as visual representations in the form of a musical score. This is particularly true when learning new music or analysing a musical work. For

[88] World Health Organization, *International Statistical Classification of Diseases and Related Health Problems* 10th ed. Geneva: World Health Organization, 2011.
[89] Elaine Bass Jenks, "Explaining Disability: Parents' Stories of Raising Children with Visual Impairments in a Sighted World," *Journal of Contemporary Ethnography* 34, no. 2 (April 2005):146.

individuals who have learned music exclusively through Braille notation or aural stimuli, the comprehension of musical notation will differ significantly from sighted musicians. Due to the nature of Braille scores, the representation of musical works is far more tactile than visual in nature. This does not relate only to the identification of pitches, but also to the understanding of pitch. Sighted musicians refer to pitches as being high and low based on the orientation of pitches on a staff. For Braille readers, the sense of high and low is lost since the cells used to represent pitches are constructed using an alternating series of raised dots.[90] Moreover, the blind student will read sonorities horizontally, rather than as vertical constructions, due to the limitations of Braille notation.

A current debate that has arisen in the visually impaired community centers around the use and value of Braille for reading musical scores, as opposed to new technologies which are now available to accommodate visually impaired individuals. As technology advances, some believe that the use of Braille is becoming less efficient and an out-dated resource.[91] (These new technologies will be discussed in Section 5.) However, even without the knowledge of Braille scores, the understanding of pitch is tactile in nature for blind musicians. Auditory understanding of pitches is based primarily on the "physical knowledge of an instrument," which directly relates to the understanding of the unique sounds of each instrument, including tone, as opposed to the visual cues provided by the instrument. [92] Blind musicians interpret music differently and conceive

[90] Joseph N. Straus, *Extraordinary Measures: Disability in Music* (New York: Oxford University Press, 2011), 171-173.
[91] Rachel Aviv, "Listening to Braille," *Sunday New York Times Magazine*, January 3, 2010: 42-45.
[92] Straus, *Extraordinary Measures,* 173.

pitch in a way that is dissimilar to other musicians, which can cause difficulties when discussing music in a performance and classroom setting.[93]

4.2: Visual Impairment Anxieties

Visually impaired musicians can experience anxieties in different contexts, including performance and classroom settings. Both of these settings can cause uncomfortable situations, directly resulting in lower comfort levels, and can limit learning potential. Accommodations can be put into place in classroom settings to balance the need for visual materials; however, the following accommodations may be put into place to reduce anxieties and enhance learning for blind or visually impaired individuals, who approach music differently from their sighted peers: (1) increasing the one-on-one time, (2) increasing the time available for assignments and tests, (3) allotting more time to convert text to Braille, and (4) providing access to tutors and note takers. Individuals who are visually impaired are concerned with the ability to preserve their independence and their anxieties rise when they must rely on others to do tasks for them. The increased anxiety may also result from less independence in and out of the classroom, including requiring more tools for visual material and increased time to learn material, as well as the lack of independence in performance situations. Maintaining the autonomy of the student is important to remember when reflecting on accommodations

[93] Different conceptions of pitch can be found in oral traditions. The Aka tribe in Africa do not perceive pitches as high and low, but rather as multidimensional. Lower pitches are understood as "bigger" and higher pitches as "smaller." For more information, consult Frederic Voisin and Simha Arom, "Theory and Technology in African Music," in *Garland Encyclopedia of World Music*, Volume 1: Africa, edited by Ruth M. Stone, 254-270 (New York: Routledge, 1997), 257.

for the individual; it is also important to consider alternate methods of teaching to accommodate the visually impaired student.

4.2.1: General Classroom Anxieties

While classroom settings may result in increased anxieties through the decrease or loss of independence, other situations where anxieties may arise in the classroom need to be considered. These anxieties can originate from the misinterpretation of information or a limitation of the understanding of pitch from a visual perspective. Although most individuals will have accommodations for typical classrooms, such as audio textbooks and exam accommodations, there are specific classes that would provide additional anxieties for visually impaired musicians, such as sight singing and ear training. There is a connection between visual impairments and absolute pitch (AP), and the individual nature of AP creates significant anxieties in the context of these aural skills classes, as will be discussed below. Moreover, there are other classes such as music theory that use significant visual aids to convey concepts.

While there is a significant relationship between (AP) and blindness, there are still anxieties that affect these students in the aural skills classrooms. Depending on the available technologies, as well as the training that was provided prior to post-secondary education, a particular setting will significantly impact the comfort of an individual in these circumstances. [94] Not every individual with AP is able to solely rely on pitch

[94] The available technologies will be discussed in the next section.

accuracy to understand all of the pitches given for dictation.[95] The individual needs will change depending on the severity of the disability, as well as the individual and one-on-one training that was previously provided.

Many of the anxieties that surround visual disabilities depend on the individual's prior experiences and specific needs. In addition to understanding traditional notation and being able to discuss the material with sighted musicians, the visually impaired student must also be able to read Braille in order to read music. For an individual who was sighted while learning music, the ease of learning Braille will decrease significantly, which will result in increased anxiety levels.[96] Alternatively, for individuals who have been blind since birth, understanding the visual and graphic representations of a print score can also create difficulties and anxieties when discussing music with their peers.[97]

4.2.2: Braille Scores

A Braille score can be an excellent tool for individuals with visual impairments. The opportunity to have a tactile representation of the score that an individual is able to read independently provides the means for the musician to learn and read music on his or her own terms. However, there are significant difficulties that also arise with the use of

[95] Jon Kochavi, "Do You Hear That? Autism, Blindness, and Teaching Music Theory," *Music Theory Online* 15, nos. 3 and 4 (August 2009) http://www.mtosmt.org/issues/mto.09.15.3/mto.09.15.3.kochavi.html.
[96] Janna Saslaw, "'Teaching Blind': Methods for Teaching Music Theory to Visually Impaired Students," *Music Theory Online* 15, nos. 3 and 4 (August 2009) http://www.mtosmt.org/issues/mto.09.15.3/mto.09.15.3.saslaw.html.
[97] Joël Dazé, email correspondence with author, 13 June 2013. Dazé is a blind piano teacher currently working in Ottawa. He started to lose his eyesight in his Bachelor's degree while studying at the University of Ottawa. He continued his education completing his Master's degree at the same institution. In addition to teaching private music lessons, he also is a liaison with Student Access Services for blind and disabled musicians studying at the University of Ottawa.

this tool. Due to significant differences between Braille and printed scores, learning the other type of score can be challenging. Braille scores transcribe information in a serial manner with multiple cells. Each cell represents a different piece of information, including pitch height, staff, note duration, articulation, and dynamics.[98] Symbols, such as fermatas and other graphic representations in printed scores, are not represented in Braille scores. For an individual who lost his or her sight before reading printed music or who was born blind, these graphic representations can cause a disassociation with the terms used by other musicians, unless someone has shown the individual a tactile representation of the symbols not included in the Braille scores.[99] This absence of information can cause a blind individual to have difficulty discussing works of music with other musicians, and experience anxieties in relation to other missing features on the page.

Another anxiety that can arise through Braille scores is the availability of the scores for a classroom setting. While there is a large selection of Braille scores in the CNIB library, retrieving required scores takes time and these are not as readably available as printed versions. The student needs time to locate and obtain the scores before class so that he or she can learn the work(s) ahead of class. Sight reading is very difficult since notation consists primarily of a horizontal layout, forcing the musician to read one staff at

[98] For additional information on Braille scores, as well as the challenges that can arise from the differences between printed and Braille scores and teaching strategies, consult David Pacun "Reflections on and Some Recommendations for Visually Impaired Students," *Music Theory Online* 15, nos. 3 and 4 (August 2009) http://www.mtosmt.org/issues/mto.09.15.3/mto.09.15.3.pacun.html; Shersten Johnson, "Notational Systems and Conceptualizing Music: A Case Study of Print and Braille Notation, " *Music Theory Online* 15, nos. 3 and 4 (August 2009) http://www.mtosmt.org/issues/mto.09.15.3/mto.09.15.3.johnson.html.

[99] Dazé, email correspondence with author.

a time. This is time consuming for works with more than one instrument. While it is possible for an individual to learn and understand the piece discussed in class without the score, access to the score and recording makes it far easier to grasp the elements discussed in class.[100]

Recognising the difficulties in obtaining scores, as well as the time required to learn the piece through Braille notation, is essential for instructors and tutors in order to accommodate appropriately and to reduce the anxieties of visually impaired and blind students. While there are alternatives to Braille scores, which will be discussed in Section 5, there are additional time requirements for these as well. In all cases, visually impaired and blind students benefit greatly from having early access to scores in preparation for class; this preparation allows them to participate more actively in the class discussion and to alleviate anxieties.

Classes that include repertoire with graphic notation, commonly found in contemporary music, can also create anxieties for the student who uses Braille scores. The CNIB holds a large number of classical scores in the library; however, due to the contrapuntal and cellular nature of Braille, graphic notation cannot be replicated since there are no current equivalent symbols in Braille. Like fermatas and other standard musical notation, the blind student can experience the same type of disassociation between the Braille score and the missing graphic notation. Without access to this specialised notation, the student cannot actively participate in the class discussion and may experience higher levels of anxiety.

[100] Ibid.

4.2.3: Music Theory Classroom Anxieties

Music theory instructors utilize different visual tools to teach concepts more effectively to students. First-year music theory instructors introduce students to the fundamentals of music notation, as well as four-part writing and analysis, to prepare them for courses in analysis, counterpoint, and post-tonal theory. As this is not a language-based course and many of the concepts are derived from the musical score, a blind or visually impaired student could experience more difficulties in understanding or grasping the concepts that the instructor presents. While Braille scores are available for students with visual impairments, there can be an additional challenge in learning the material in a music theory setting due to the number of musical examples used in the classroom and the differences between the Braille and print versions.[101]

Many of the examples included in music theory classrooms consist of four-part chorale-style writing, which convert to keyboard style in Braille notation. For each cell, the upper voice is notated as a letter name followed by the interval that would be played simultaneously. For keyboardists, learning to play the piece using this method works well since the intervals are easy to figure out.[102] However, in a music theory classroom, it can be challenging to understand the voice leading of the inner voices of a chorale for a non-keyboard player or for a beginner musician using Braille notation. Moreover, since the layout of the chords is different, the way that the information can be processed is different as well.

[101] Johnson, "Notational Systems and Conceptualizing Music;" Pacun, "Reflections on and Some Recommendations for Visually Impaired Students."
[102] Ibid.

In the case of determining chord type by the pitches in the excerpt, the blind or visually impaired student must first identify the pitches before determining the chord. Since the layout of the two versions (traditional and Braille) differ, conventional methods of teaching may not align well with Braille scores. An alternative teaching method may need to be implemented for students using Braille notation or additional private sessions may be required. If students sing the inner voice in the context of the class to hear the inner voices—a task that many first-year music students struggle to do—a visually impaired or blind student would not participate readily due to the layout of the score.[103] As previously stated, autonomy is an important part of every student's learning process. The inability to participate and the need for someone to play the inner voices of a chorale can reduce the ability of blind students to be self-sufficient and result in increased anxieties.

The level of anxiety that arises depends in large part on the individual student's background preparation. If a student has had prior private instruction, he or she will have acquired a foundation for the understanding of musical concepts, as well as learning strategies to approach new material. Alternatively, if there is no prior knowledge of concepts such as four-part chorale style, which is often used in first-year music theory classrooms, a student will struggle more to grasp these concepts in a larger classroom-learning environment. Moreover, if a student has a form of AP, he or she may find it easier to understand the material by primarily listening to it. For example, he or she could hear the voice leading of an inner voice in a four-part chorale. However, there are many forms of AP and not all will allow the student to easily identify the inner voices. Given

[103] Ibid.

the differences between traditional and Braille scores, tutoring or other forms of one-on-one sessions may be necessary to ensure that the blind student receives adequate resources to learn the material and to decrease his or her anxieties in a classroom setting.

4.3: Performance Anxieties

As previously stated, the loss of autonomy causes many anxieties for blind and visually impaired performers. This can result from something as simple as the need to be walked on stage. Before a musician is able to perform, he or she must be aware of his or her surroundings, as well as be able to navigate getting on and off the stage in a dress rehearsal, in order to be self-sufficient and comfortable for the performance. By having access to the room or stage before a performance, a visually impaired or blind student can identify potential obstacles and avoid embarrassment, which will decrease the level of anxiety associated with the unknown. Even with this accommodation, anxiety may arise as a result of a new surrounding and impact the performance. Similar to the negative effects of the anxieties associated with LD and Autism, visually impaired musicians must be aware of their surroundings so that they can focus on the performance rather than coping with anxieties.[104]

Other anxieties arise from the way the music is learned. When the performer is visually impaired, lighting can be a significant obstacle. If the performer requires a large amount of contrast to be able to see the music, the lighting needs to be adequate to create the contrast with the music. In most cases, the lighting requirements can be discussed prior to the performance and be adequately adapted for the specific needs of the

[104] Dazé, email correspondence with author.

performer. However, in instances where the visually impaired musician is not the only performer on stage, or is a member of a group, this can be difficult to manage since the lighting can be detrimental to other musicians' performances. Nevertheless, adequate lighting can provide the means to read music for a visually impaired musician.[105]

In addition to the need for adequate lighting, the learning process for a visually impaired student and the availability of a score for large ensembles can be sources of anxiety. While there are many Braille scores available in the context of listening to a work or analysing it, fewer exist for performance purposes; visually impaired or blind musicians who perform in an orchestra or large ensemble must find Braille scores, as well as plan the time that it will take to learn their part with or without the Braille score.[106] If the Braille score is not readily available for a particular work, they must ask themselves if there will be enough time to obtain, transcribe, or record their instrumental part and learn it prior to rehearsals and performances.

4.4: Blind Performer

Nobuyuki Tsujii has recently become world renowned for his amazing accomplishments as a concert pianist. After his joint Gold Medal win at the 2009 Van Cliburn International Competition, he has performed as a soloist and a concerto soloist worldwide with prestigious orchestras, such as the BBC Philharmonic, the NHK Symphony, the Yomiuri Nippon Symphony, the Tokyo Symphony, the Japan

[105] Ibid.
[106] Ibid.

Philharmonic, and the Orchestra Ensemble Kanazawa, in venues like the BBC Proms/Royal Albert Hall and Carnegie Hall.[107]

Tsujii has been blind since birth, which provides a unique perspective on the music; it has also forced him to find creative ways to negotiate some of the visual cues on which many sighted musicians rely. While performing with an orchestra, instead of receiving visual cues, Tsujii listens for the conductor's breathing. This allows him the means to assess where the rhythm is located, providing cues. As with many blind musicians, Tsujii faces the obstacle of learning the music in an efficient manner; since the pianist found Braille scores not only to be slow to use, but often difficult to locate, he has opted for an alternate form of learning.[108] His teacher records each hand of the work and Tsujii assimilates the work by ear. By finding strategies to cope with his blindness, Tsujii overcame the difficulties associated with a visual disability and has now become a world-leading concert pianist.

4.5: Concluding Remarks

With the disabilities discussed in the previous sections, understanding the nature of the disability was important to both the diagnosis as well as the accommodations. With visual disabilities, it is more important to focus on accommodations for the individual student since diagnosis is tangible and far easier to

[107] IMG Artists, "Nobuyuki Tsujii Biography," *IMG Artists*, last modified August 2013, http://imgartists.com/create/pdf/nobuyuki_tsujii_-_joint_gold_medalist_of_the_thirteenth_van_cliburn_interna.

[108] Aviv, "Listening to Braille, " 42-45; Ivan Hewett, "Nobuyuki Tsujii: 'The Piano is an Extension of My Own Body,'" *The Telegraph*, July 16, 2013.

assess. The individual may require additional private tutoring (either with the instructor or with an external tutor), access to materials before and in class, and extra time to access materials in Braille or to complete assignments. While not every individual will have the same needs, there are some general anxieties that are common among students with visual impairment or blindness. The time required to undertake research for papers increases significantly since the student must take additional steps to research and write a paper. The visually impaired student must first convert the information to a format that he or she is able to read, either in Braille or to an electronic PDF so that the computer can read the information to the student. Finding the appropriate balance between managing anxieties and the ability to learn independently is crucial for students who are visually impaired in order to be autonomous. Students who have visual impairments conceive music differently from other musicians. These alternate ways of approaching music contribute to enriched performances, as well as new approaches to music analysis. Accommodating visually impaired and blind students allows these individuals to actively participate in classroom and performance settings, which in turn enriches the learning experience of their sighted peers.

SECTION 5: Technological Tools and Therapies

Increasing interest in research on disabilities, as well as resources and therapies to facilitate the development and ease of diagnosed individuals, has resulted from the implementation of numerous laws and a formal recognition of disabilities. With the growing interest in accommodations for disabilities, new accessible technologies and therapies that focus on reducing anxieties have been developed to help disabled

individuals in a learning environment. This section will begin by discussing important technological tools and different therapies, followed by recommendations for new resources. The first section will examine current technologies for blind individuals, which provide comfort and independence for these individuals, as well as the benefits and drawbacks surrounding the technology. The second section will discuss advancements in music therapy to support individuals with ASD.

5.1: Technology

As technologies advance, new developments emerge to improve the lives of all disabled individuals. Many of the anxieties resulting from the disabilities are alleviated by the introduction of these technologies. While technological tools are critical to accommodate disabilities like visual impairment, these tools can also be a valuable resource for other disabilities. Many operating systems come pre-equipped to aid visually impaired individuals utilize computers. These operating systems can be potentially beneficial for sighted persons with reading disabilities. Mac computers, released by Apple Inc., include internal settings that read aloud the menu items over which the cursor hovers. Other computer programs compatible with the Windows platform, such as Window-Eyes[109] and Job Access With Speech (JAWS),[110] give visually impaired and blind individuals access to utilize computers by reading aloud the information that other users would be able to see. This technology adapts well to the classroom environment by

[109] GW Micro, "GW Micro – Window-Eyes," *GW Micro, Inc.*, accessed 15 July 2013, http://www.gwmicro.com/Window-Eyes/.
[110] Freedom Scientific, "JAWS Screen Reading Software Headquarters – by Freedom Scientific," *Freedom Scientific, Inc.*, accessed 15 July 2013, http://www.freedomscientific.com/jaws-hq.asp.

providing the user with the means to communicate musical ideas in relation to learning music for performance, creating and completing assignments for courses, and analysing scores, as well as composing, while maintaining the musician's independence. Although much of the software has been recently upgraded and developed, problems such as compatibility and cost surround the technology.

5.2: Accessibility Software

Different software programs have become an integral part of accessibility for musicians with disabilities since this type of software has the ability to bridge the gap between musicians who read Braille and those who do not. Many different software programs are accessible, which aid musicians in both a professional and educational capacity. For music production, Cakewalk can be used both by blind musicians and sighted musicians; this program allows all users to create high-quality recordings. Since it is compatible with JAWS, it has become a valuable resource for individuals who are blind, as it provides an interface where music can be created in collaboration with sighted and blind musicians.[111]

Current technology is also able to assist with the independence of visually impaired students working in an environment with sighted musicians. It can assist the student with learning new music and composing music, as well as completing music theory assignments. Dancing Dots, a company dedicated to accessibility, designs music programs specifically for blind and low-vision performers. This company has created

[111] Dancing Dots, "Cakewalk SONAR: Multi-Track Audio Production/High-End Sound Recordings," *Dancing Dots*, accessed 15 July 2013, http://www.dancingdots.com/prodesc/cw-ad.htm.

many products, including Goodfeel Braille Music Translator and Cakewalk SONAR, with the goal of accommodating these musicians.[112]

Goodfeel Braille Music Translator, as its name suggests, transcribes scores from Finale, Sibelius, and other notation software using MusicXML file formats to Braille. Goodfeel is compatible with JAWS and offers accessibility for users who are visually impaired. This increases the disabled student's independence to convert files to Braille by eliminating the need for another individual to manually transcribe the music to Braille. Goodfeel is also compatible with a portable Braille reader, which electronically transmits the score to the reader so that it can be read without printing the Braille version.

Lime Aloud, a music notation software also created by Dancing Dots, includes different versions. In its simplest form, it is specially designed to work with JAWS for individuals who are visually impaired, allowing the individual to write and play back music. The program has the capability to create scores, or to play and edit previously inputted scores. This software allows visually impaired individuals to manoeuvre through the score using standard curser keys, while the playback feature plays each chord. Lime Aloud is unique in that, while the note is playing, the program also connects to JAWS to provide notation cues such as accents, lyrics, and ties. This feature gives disabled musicians the means to process the score much more quickly than reading Braille since the software provides sounds almost simultaneously rather than as individual cells of raised dots.[113]

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[112] Saslaw, "'Teaching Blind'."
[113] Dancing Dots, "Lime Aloud from Dancing Dots," *Dancing Dots*, accessed 15 July 2013, http://www.dancingdots.com/prodesc/limealoud.htm.

Lime Aloud software also includes the scanning software SharpEye Music Reader. This software scans printed music and imports it into Lime to then be edited and utilized by Lime Aloud. Unfortunately, sometimes the score created from this technology contains minor inaccuracies and a sighted musician needs to compare the scores to eliminate errors prior to learning or editing the score in Lime Aloud.[114] The combination of Lime Aloud and SharpeEye is a valuable tool for individuals who are composing music, and can be utilized in classrooms where arranging music or completing assignments with notation is required.

Sibelius Speaking, another innovation of Dancing Dots, was one of the first solutions created by Dancing Dots to aid visually impaired and blind students with accessible music notation software; it is compatible with JAWS software. A platform for JAWS reads the screen to the user while playing the notes and chords using the cursor keys that are embedded in the original software. This creates a file format that is used in many professional and learning contexts, maximizing the compatibility.[115] Unfortunately, Sibelius Speaking was not developed further for versions of Sibelius post Sibelius 3.[116] Instead, Dancing Dots focused on the refinement of Lime Aloud to create a more intuitive and tactile software for the visually impaired user.[117]

Recently Sibelius has developed the scanning software PhotoScore Ultimate. This program has the capability of taking print or handwritten scores and converting them with relative accuracy to Sibelius files. While this technology is not accessible itself, it greatly

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[114] Ibid.
[115] Saslaw, "'Teaching Blind'."
[116] Dancing Dots, "Sibelius Speaking," *Dancing Dots*, accessed 15 July 2013, http://www.dancingdots.com/prodesc/SibSpeaking.htm.
[117] Ibid.

benefits individuals who are visually impaired by creating files that can be used for learning or be adapted as a tool for music analysis.[118]

5.3: Applications of the Tools

Professional musicians and students can utilize all of the software discussed above. For a composer, the use of the technology leads potentially to collaborations with sighted musicians, Braille-reading blind musicians, and non-Braille reading blind musicians. If a file has been formatted electronically, the composer can send this file to others who can either print the music or use programs, such as Lime Aloud and Goodfeel, to playback or modify the file. Alternatively, if the score is printed, it can be scanned using SharpeEye and converted to a Lime file so that a student or musician can learn the score by hearing it, or it can be converted to Braille notation using Goodfeel. These tools facilitate access to the score in a timely and cost-effective way since the musician does not have to send the score to be converted to Braille by a professional transcriber.[119]

For a student, these technologies can be useful for completing music theory and other assignments. A sighted individual can scan the musical examples into the computer using either SharpeEye or PhotoScore, making them accessible to the student. Examples generated through notation software can be converted directly to a Lime compatible file, allowing the student to complete the assignment without the assistance of a sighted transcriber. These tools can be utilized for both composition-based assignments involving four-part harmony and the analysis of musical excerpts.

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[118] Avid Technologies, "PhotoScore Ultimate," *Avid Technologies*, accessed 15 July 2013. http://www.sibelius.com/products/photoscore/ultimate.html.
[119] Dazé, email correspondence with author.

Using these tools does require proficiency with the programs from the student to the professor; it may also require alternate teaching strategies. However, with adequate classroom preparation, the blind individual will be given the necessary tools to function in a learning environment with his or her sighted peers, alleviating associated anxieties.[120]

5.4: Drawbacks with the Technology

While many of the technologies like Lime and Sibelius offer great tools to assist in the creation of music, many other programs in place in post-secondary institutions are not accessible. Software programs for electronic composition, such as Cubase, and notation software, such as Finale, are widely used in educational and professional environments, but are incompatible with screen readers like JAWS and Window-Eyes. In a professional setting, visually impaired musicians can convert files to a program that is accessible. Unfortunately, in an academic setting where the individual is learning the available software as part of a course, this is not always an option. In this instance the individual would not be able to participate in that particular class and alternatives would have to be put into place to learn the software that is accessible. This could be in the form of an independent research project, where the student is taught a software program privately. If these accommodations are not available to the student, he or she would be unable to learn the tools to write electronic music as part of his or her undergraduate studies.

This poses three problems; the first is the accessibility of education. If a visually impaired or blind student is particularly interested in music technology or composition,

[120] Saslaw, "'Teaching Blind'."

his or her disability prevents him or her from obtaining the same level of education as a sighted musician. Secondly, if an independent research project is an option, the professor would have to be proficient in the accessible program prior to teaching the student in order to properly instruct the new software. Thirdly, the licensing cost of the software would be substantial to accommodate one individual. While some software companies are increasingly aware of the need for accessibility in their products and are integrating compatibility with screen-reading software or imbedded features, others are unable due to the layout of the software.

In addition to the three drawbacks discussed above, the cost associated with purchasing hardware and software can be problematic for both the student and the institution. Many programs must be purchased in order to be able to perform, create, write, and complete classroom assignments with relative independence. Software, such as JAWS and Window-Eyes, can easily be used in other courses and would be a necessary tool for any visually impaired or blind individual. However, the cost of these programs, as well as programs specifically geared at music, can be very costly. In order for the programs to work effectively, JAWS must be updated regularly. Therefore, a new version of the software must be purchased frequently to be compatible with any new technology. The price for programs such as the ones discussed above can range anywhere from $200 to $1600.[121] In order to use programs such as Goodfeel, accessories such as a Braille Embosser at an approximate cost of $6000 or an electronic Braillenote, which transcribes the computer screen to Braille and costs approximately $4000, must be available.[122]

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[121] Dancing Dots, "Dancing Dots Music and Accessibility Products and Services," *Dancing Dots*, accessed 15 July 2013, http://www.dancingdots.com.
[122] Dazé, email correspondence with author.

These hardware devices are in addition to the expenses associated with the replacement of the computer itself and other hardware and software upgrades.

Although technology has recently made significant advancements to accommodate composers and music students with disabilities to alleviate disability-related anxieties, the cost of owning this technology is often out of reach for individuals with disabilities. The same problem exists with technology to assist the performer.

5.5: Performance Related Technology

Most of the technological advances are focused on assisting blind musicians in learning, writing, or analysing music. However, there are also technologies that have a practical application during the performance. Recent developments in technology have facilitated the inclusion of blind musicians into orchestras. DIAMI, an ambient intelligent-based architecture for blind musicians, provides the musician with real time communications and instructions from the conductor by transmitting what a sighted musician would see in baton movements. The system is comprised of three separate parts connected through a " WiiMote system." This system transmits wireless transmissions through an infrared LED located at the tip of the baton to a computer, which sends the movements of the baton to the musician through vibrations in a bracelet worn by the musician.[123] This system allows the blind musician to independently be aware of the movements of the baton and provides the musician with immediate information, strengthening the connection between the conductor and the musician. This can alleviate

[123] Javier Bajo, Miguel A. Sánchez, Vidal Alonso, Roberto Berjón, Juan A. Fraile, and Juan M. Corchado, "A Distributed Architecture for Facilitating The Integration of Blind Musicians in Symphonic Orchestras," *Expert Systems with Applications* 37, no. 12 (December 2010): 8508-8515.

anxieties of performing in large groups, creating a more productive performance environment for the performer, resulting in a better performance.

5.6: Music Therapy

While technology is a helpful aid for the application of music, therapies are often used in order to create situations where the individual is able to successfully integrate him or herself into society. There is a strong connection between music and ASD, including the way in which music is heard, understood, and perceived. Although some, but not all, ASD children have strong musical ability, many children with ASD show attentiveness to music from an early age.[124] Before the distinction between the AD and ASD was recognised, Kanner reported six of the eleven individuals studied had "music-related behaviours that are extraordinary given their developmental levels."[125] While not every child has an extraordinary musical talent, most of the children reacted to music better and with more success than general emotions.[126]

One of the common forms of treatment for individuals with ASD is music therapy. This therapy can be beneficial for all ranges of ASD, from limited functioning to high functioning, by applying a wide a range of techniques that are aimed at the specific individual's needs. Often music is used to help develop communication skills.[127] For individuals with speech issues, music therapy focuses on "important linguistic

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[124] Darrow and Armstrong, "Research on Music and Autism Implications for Music Educators," 16.
[125] Heaton, "Assessing Musical Skills in Autistic Children Who Are Not Savants," 152.
[126] Kim, Wigram, and Gold, "Emotional, Motivational and Interpersonal Responsiveness of Children With Autism in Improvisational Music Therapy," 390-391.
[127] Hayoung A. Lim and Ellary Draper, "The Effects of Music Therapy Incorporated with Applied Behavior Analysis Verbal Behavior Approach for Children with Autism Spectrum Disorders," *Journal of Music Therapy* 48, no. 4 (Winter 2011): 533-534.

information embedded in music stimuli which [are] organized by principles of pattern perception" to help with the development of speech production.[128] However, this treatment is also commonly used for socio-emotional development, disrupt patterns of isolation, and social withdrawal.[129] This provides lifetime tools to the individual since many adults with AS suffer from depression, a direct result of not feeling "accepted" in their work environment or with a partner.[130]

Music therapy, which can be introduced at any age, attempts to help the individual with forming age-related peer relationships, understanding social cues, learning how to "read" people, and increasing self-esteem. One of the techniques used to achieve these goals involves the creation of music or having a conversation through music.[131] At a younger age, research has shown that it is beneficial to integrate students with AS or ASD in a typical music classroom. In these situations, the student has less off-task responses and focuses more easily on the task, resulting in a positive experience.[132] The creation of music in a classroom setting is a less stressful situation than a regular classroom for students with all forms of autism; this is particularly true in relation to interacting and socializing with peers of the same age group since music is a "strong

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[128] Ibid., 533.
[129] Music Therapy Association of British Columbia, "Autism Spectrum Disorders: Music Therapy and Autism," *MTABC*, accessed 10 November 2012, http://www.mtabc.com/page.php?53.
[130] Baron-Cohen, *The Essential Difference, The Truth About The Male and Female Brain*, 145.
[131] Ashleigh Hillier, Gena Grecher, Nataliva Poto, and Margaret Dougherty, "Positive Outcomes Following Participation in a Music Intervention for Adolescents and Young Adults on The Autism Spectrum," *Psychology of Music* 40, no. 2 (March 2012): 202.
[132] Darrow and Armstrong, "Research on Music and Autism Implications for Music Educators,"16.

motivator for appropriate social behaviours."[133] Music therapy not only decreases the sensory overload stimulation responses, but can also create a learning environment for appropriate social behaviours.

Musical performance has also proven to be a valuable approach for autistic individuals. Performance has been shown to enhance an emotional response, something with which ASD individuals struggle, and eye responsiveness in these individuals.[134] Since every case is different, the outcomes and appropriate forms of therapy vary from person to person. However, for those who do enjoy performing, this therapy is both enjoyable and beneficial.

Not only do autistic individuals relate strongly to music, but individuals with AS also often make great performers since many of the characteristics that are attributed to AS overlap with those of performers. These characteristics, which include a severe intensity, attention to specific details, and savant musical ability or an enhanced musical ability in individuals without savant gifts, are not present in all individuals with AS, but most AS and other autistic individuals respond well to music. Music therapy draws on these characteristics to teach autistic individuals communication skills, social interactions, and general emotions, ameliorating their interaction with others and their quality of life.

[133] Ibid., 18.
[134] Hillier, et. al., "Positive Outcomes Following Participation in a Music Intervention for Adolescents and Young Adults on The Autism Spectrum," 202.

5.7: Concluding Remarks

Music therapies and the development of tools have improved the success of individuals with disabilities. However, more needs to be done to support these individuals and to alleviate their anxieties in different environments. Less expensive academic versions of accessible software programs would provide a good starting point, but other solutions should be explored. The development of new technology and the increasing number of applications have made the potential for accessible resources for all disabled performers infinite; this technology has opened the door for solutions that were unimaginable in the past. I would like to make two recommendations—one for individuals with LD and one for blind or visually impaired individuals—as a way to continue the discussion on improving accessibility in a learning environment.

Individuals with LD have access to many computer programs to help them with reading assignments, textbooks, and papers. Unfortunately, few resources currently exist for musicians with LD. With today's technology, it would be possible to develop a music program with colours. Using colours to highlight a staff or pitches could provide the means for some disabled musicians to read more easily the correct pitches. This would alleviate some of the anxieties that arise for individuals who perceive moving pitches, or have difficulties recognising pitches, in stressful learning or performing situations, increasing confidence.

For visually impaired or blind individuals, as well as instructors of visually impaired or blind students, one of the most detrimental aspects of the learning process is the extensive amount of time required to obtain Braille scores. With current technological advances, a database could be compiled with a Braille version of the score, as well as a

recording and MusicXML, Sibelius, and Finale files that can be converted to Lime Aloud; this would be similar to the numerous databases for public-domain printed scores. Users would also be able to upload files that they had converted or to which they had access, creating an accessible file-sharing source for music. This would not only help students and professional musicians with learning scores, but would also benefit instructors in compiling music theory, history, and aural skills examples for visually impaired and blind students. Creating a database that is accessible to all individuals would be a vital source for visually impaired and blind musicians so that they could share their works and collaborate with other musicians; moreover, this database would promote an equitable educational experience for all.

CONCLUSION

Individuals who suffer from anxiety often struggle with classroom and performance activities. In order for a student or performer to maximize his or her potential, there must be a strategy in place to cope with such anxieties. For individuals with disabilities, finding ways to alleviate the anxieties is especially important as they often stem from the disability. Adopting solutions to lower anxiety levels, whether LDA or MPA, provides an environment where the disabled individual can maximize learning, as well as performance. As many governments around the world take a greater interest in the rights of disabled individuals, the attention to the specific needs and accommodations for disabled individuals has surged. While this has increased the awareness of disabilities, disabled individuals still face many challenges. Awareness is required to understand any disability. This awareness is not limited to the disability, but also to the many challenges

that disabled individuals face. Disabled individuals need be accommodated so that they may participate and contribute in classroom and performance spaces at the same level as their peers.

Anxieties often pose challenges by interfering with either the absorption of information or the delivery of the performance. Research on anxieties associated with LD has shown that these anxieties can have detrimental effects in the individual's ability to understand material and to perform on tests. This is in large part due to the amount of focus required to cope with the anxiety instead of the class material. The disabilities explored in this paper, whether invisible (LD or ASD) or visible (visual impairment or blindness), are interrelated with anxieties in performing and learning situations. In order for an individual to perform, whether it is a musical performance, an exam, or in the context of a classroom setting, the anxieties must be alleviated so that the individual can perform at his or her full potential.

There are, however, some instances where accommodating an individual can also be detrimental. If the performance highlights the disability and/or accommodations for the performer, the audience may not be focused on the actual performance, but on the eccentric behaviour or accommodations for the performer. This could result in increased anxieties for the performer, who is self-conscious about his or her disability. With a better understanding and awareness of disabilities, audiences are able to listen to the performance itself, rather than focusing on the disability, decreasing the anxieties for the performer. This awareness and understanding can provide additional support for the performer to create a better performance for the audience.

More research should be conducted on the effects of anxiety, the benefits of music performance, and other points of intersection between disabilities and performance with the goal of increasing awareness on disability and performance. LD has been extensively researched in relation to other fields, such as mathematics, literature and language studies, and science, but not music. Research in ASD is more extensive in relation to music, since all areas of the spectrum have a strong connection to music. However, there are still topics that could be further researched, such as the anxieties related to performance and the impact of "passing" in a musical performance. Blindness or visual impairment is the most documented disability examined in this paper. Extensive research exists due to recent technological advances and to the recognition that individuals with this disability need alternate forms to process visual information. However, additional research on accommodations is still required so that more tools can become available for these disabled individuals.

Accommodations can make a significant difference to a student with disabilities. While the educational system has improved at providing accommodations for disabled individuals, there are still some areas that could be ameliorated. First, all educators should be aware of the main symptoms or indicators of potential invisible disabilities, as well as having information on how to recommend a professional diagnosis. It is also important that educators be aware of the specific needs of the individuals with diagnosed disabilities so that these individuals can be properly accommodated. In a university setting, many of the accommodations are offered by a separate department specializing in disabilities and access services. However, professors can provide accommodations, such as electronic versions of class notes and presentations prior to classes, and adaptive

teaching, where necessary, to create a learning environment in which the student can excel.

Musicians with disabilities offer dynamic and unique perspectives in both performance and classroom settings. These individuals and their experiences are important to the development of music in both research and performance. Reducing anxieties and enhancing the ability of individuals to perform and/or learn provides a space to show these alternative interpretations. As technology advances, the number of possible accommodations and tools for individuals with disabilities expands. The potential for a database with accessible scores and recordings for visually impaired or blind students is not far away, since technology is already in place to provide such a tool. These technologies also give rise to new and more efficient ways of communicating and sharing information. All of these resources will provide the means for disabled individuals to maximize their potential and will offer these individuals equal opportunities in learning, performing, and creative spaces.

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