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Dyslexia and music: toward a comprehensive pedagogy

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An Abstract of

Dyslexia and Music: Toward a Comprehensive Pedagogy

by

Laura Sailer

Submitted to the Graduate Faculty as partial fulfillment of the
requirements for the Master of Education Degree in Music Education

The University of Toledo
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This exploratory research probed into the topic of dyslexia and music. Subtopics included: Dyslexia and the brain, music and the brain, dyslexia and music, and pedagogical approaches to teaching music to those with dyslexia. Next, hypotheses regarding dyslexia and music were formed based on discussions of above subtopics including those about definition, effects, subtypes, and compensatory strategies. Research was conducted via survey with elementary and secondary music teachers within a large urban school district in Toledo, Ohio regarding which pedagogical approaches they feel are best to teach music to dyslexic individuals. Results indicated that teachers who responded to the survey have varying degrees of experience with dyslexic students, largely agree that dyslexia is a multi-faceted disorder that could also have subtypes, and are evenly divided in terms of which music education approach best helps dyslexic individuals be successful in music. Most of the teachers also agreed on the existence of compensatory strategies for all types of dyslexic students. Results were cross-tabulated with each other to find out which variables affected each other in a significant way.
For all teachers and the students whose lives they touch.
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Finally, to all the great teachers I have had in my life that helped me love learning and inspired me to become a teacher—thanks to you, I have at last found my true calling.
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 Imagine a student in kindergarten writing the letter “S” backwards and skipping numbers when given an oral counting exam. See her in first grade missing a field trip because she did not understand the teacher’s verbal directions to have her mother fill out the permission form, and being sent to reading lab because she lagged behind other students despite average intelligence. Now picture that same student in second grade struggling to tell time and do simple math. Fast forward to sixth grade and you will see her at the blackboard being humiliated by teacher and students alike as she struggles to write the capital cursive letter “J” but repeatedly writes a lowercase cursive “f.” Watch her as a teen and young adult as she fails the maneuverability part of her driver license exam over and over again. Envision a student with an aptitude and interest in music struggling for years on her own and then in college to read notation despite good pitch perception and tonal/rhythmic memory. Viewed separately, these events may seem to be minor errors or “growing pains.” However, if considered as part of the same phenomenon, its name is “dyslexia.”

Above describes my complex, lifelong experience with dyslexia. Although I was not formally diagnosed with or even suspected to have this disorder until adulthood, signs
of dyslexia had always been present. I was able to use compensatory strategies to counteract its influence, and achieved academic success exceeding many of my peers. However, success eluded me in one area: Music. I began to wonder if I was dyslexic, and what literature was available to help. Finding few resources, I decided to research music and dyslexia separately and attempt to “connect the dots.” It is a summary of available information on different aspects of dyslexia and music combined with possible pedagogical approaches, along with an original research component involving those most closely involved with dyslexia and music on a daily basis: Teachers.

Most research on dyslexia as well as that on dyslexia and music has been narrowly focused. As Richards et al (2002) argued, the scope of research on dyslexia must be broadened to include collaboration and interdisciplinary communication, that which enables the exhaustive examination of the pathology of dyslexia as well as the discovery of its positive ramifications. This achieves the goal common to all dyslexia research: To help those living with the disorder realize their life goals with minimal frustration.

Thus, the main objectives of the current study are: 1) Summarize available information regarding dyslexia, the brain, and music to formulate a comprehensive “snapshot” of the disorder, 2) “Connect the dots” to form testable hypotheses about the etiology, or cause, of dyslexia, dyslexia’s influence on music in general as well as specific musical goals, 3) Discover existing or formulate new pedagogical approaches to teach music to dyslexic individuals, 4) Create testable hypotheses about said pedagogical approaches, and finally, 5) Test these hypotheses using a survey for teachers within a large urban school district in Northwest Ohio.
Chapter 1

Literature Review

1.1 Dyslexia and the Brain

Most research on dyslexia points to genetic and biological causes of dyslexia originating in the brain (Bigler, 1992, Kibby et al, 2008, Meyler and Breznitz, 2005, Shaywitz et al, 2006). Researchers disagree widely about how the dyslexic brain functions, and do not even agree upon an exact definition of dyslexia.

Bigler (1992) cited Orton (1928) and Galaburda & Kemper (1979) as some of the earliest researchers into what were once simply called “reading disorders.” Orton theorized that such disorders originated in the brain, a theory supported by empirical studies in the latter part of the twentieth century. Such studies discovered structural abnormalities in the so-called “language centers” of deceased dyslexics’ brains. Despite this, the exact role and function of these structural abnormalities in causing the specific symptoms of dyslexia is not fully comprehended.

Bigler (1992) arrived at her hypothesis by comparing the brains of normally functioning children with severe brain defects to those of born dyslexics and those with “acquired dyslexia,” which is caused by injuries to language centers. Bigler discovered
that the cerebral-neurological system demonstrates more “plasticity,” the ability to adapt physically to external demands, in children born with brain defects than in individuals with mostly anatomically “normal” dyslexic brains at birth or adults who receive blows to the brain's language regions later in life. Thus, Bigler suggested that neural plasticity is either non-existent or partially suppressed in the dyslexic brain. The reason for this is unknown, although one theory Bigler mentioned is a possible autoimmune attack to fetuses in the womb. Bigler concluded that structural deficits combine with a lack of plasticity, resulting in permanent lapses in function for dyslexics.

Meyler & Brenznitz (2005) noted a possible temporal (time) processing impairment for dyslexic individuals, and speculated as to whether this deficit exists in visual as well as auditory modes of functioning in dyslexic individuals. Further, the authors pointed out that people diagnosed as dyslexic seemed to have consistent problems processing rapidly sequenced temporal information (like music), but stressed it is still controversial as to whether there are differences when processing visual, auditory, or the two stimuli simultaneously.

Meyler & Brenznitz (2005) ultimately defined dyslexia for the purposes of their study as “a neurocognitive disorder with a strong genetic basis, related in some way to the altered function of the central nervous system” (p. 94). Moreover, the authors identified two camps of etiological causes of dyslexia: 1) problems with processing language, and 2) problems with cognition. The objective of their study was to find out specifically what occurred for their subjects (dyslexic university students) when processing both linguistic as well as non-linguistic information both visually and aurally.
In addition, they wished to shed light on the categorization of dyslexia and how timing, or temporal processing, plays a role.

The results of Meyler & Brenznitz's (2005) study indicated their research is closely aligned with other findings: Dyslexics were more impaired when reacting to timed auditory stimuli than visual timed stimuli. The authors theorized this may be due to dyslexics’ lack of “automaticity,” or “a deficit that shows up for stimuli presumably familiar to most people” (p. 107). This is especially relevant with regard to music, wherein timed auditory stimuli make up a great deal of the material studied. However, the authors also found that an automatization deficit may be at the heart of dyslexics’ linguistic difficulties. Also, dyslexics' non-linguistic deficits increased when in auditory mode. In contrast, visual deficits increased when doing language-based tasks. Moreover, the amount of information, or “stimulus complexity” (p. 108), seemed to play a role. That is, the more complex the information dyslexics were required to process, the longer they took and the less accurate they were. Finally, the individual’s speed of presentation interacted with different stimuli. For instance, as linguistic tasks were presented more rapidly, deficits were notably less. The reverse was true for non-linguistic tasks.

Reiter, Tucha, & Lange (2005) studied dyslexic children in-depth. In their study, they tested 42 dyslexic and 42 non-dyslexic children using standardized tests over a wide range of executive functions, by which they meant primarily problem-solving abilities. They found dyslexic children had more difficulties with memory, inhibition, verbal fluency, as well as problem-solving specifically than the control group. Similar to other studies’ findings, the authors concurred that dyslexics usually have problems in left
temporal and parietal regions of the brain. They also found issues with pre-frontal and frontal lobes, the motor cortex, and phonological functions. In addition, in support of what Meyler and Breznitz found (2005), dyslexic children had more trouble with tasks that had a timing element or time limit (such as music). Like Koelsch et al. (2003), they also found in their review of other studies that girls’ pre-frontal impairment was usually less than that of boys.

Reid, Szczerbinski, Iskierka-Kasperek, & Hansen (2007) offered three specific theories of dyslexia’s cause: 1) Phonological deficit theory, or impaired processing of phonemes as part of speech. 2) Visual magnocellular deficit theory, wherein defects of the visual or auditory magnocellular system cause problems with processing rapid visual or auditory information, and

3) The cerebellar deficit theory, which suggests a problem with “automatization,” wherein usually primary tasks remain secondary for the brain. They tested the hypothesis (using a small sample size and different behavioral measures) that dyslexia could fit under one of these theories or all of them. All dyslexics in their study were impaired in literacy, except in the area of comprehension. This indicated that high-functioning dyslexics may compensate in this area through the use of context. Participants were also impaired on most phonological measures, but not visual or magnocellular. However, when the researchers conducted a deviance analysis (see Ramus et al 2003) on the data, they found that their sample of dyslexics had heterogeneous profiles that did not fit neatly into any of the above theories.
Kibby, Fancher, Markanen, & Hynd (2008) discussed the cerebellar deficit hypothesis after examining MRI scans of dyslexic children’s cerebella. The cerebellum is a structure at the base of the brain, sometimes called “little brain,” as it looks somewhat separated from the rest of the brain. Prior to discussing their findings, the authors presented the three most popular theories of dyslexia as phonological core deficit, double deficit, and cerebellar deficit. The first and the third theories have the same definitions as above. In contrast, the double deficit hypothesis states dyslexic children have deficits with phonemic processing in addition to retrieving phonemes from long-term memory. Phonemes are simply units of sound, like the prefix “re-.”

The authors of this article tested the cerebellar deficit theory as it is somewhat controversial. This theory is presented as a possible explanation for the aforementioned “automatization” deficit. They also mentioned that as adults, dyslexics may compensate for their reading difficulties by taking a more holistic approach, hence diminishing the role of temporal processing. Their exploratory findings using a limited sample size indicated that the right side of the cerebellum is asymmetric in non-dyslexic children, and that the opposite symmetry exists in dyslexic children. However, the authors concluded that the asymmetry of the cerebellum is only moderately correlated with rapid naming errors (of words) associated with dyslexia. They went on to say that the causes of dyslexia in individuals may be too heterogeneous to be explored under a single theory.

Other research by Shaywitz, Mody, & Shaywitz (2006) supported the phonological deficit theory, as evidenced by success with interventions aimed at helping dyslexics recognize and use phonemes in reading. They described the use of technology,
such as PET (positron emission tomography) and MRI (magnetic resonance imaging), as instrumental in isolating important variables of dyslexia relating to neurology, including brain organization for reading, contrasts between dyslexics and non-dyslexics, plasticity, and the two types of reading disabilities—genetic and environmental.

The authors' findings indicated that the most important systems in the left hemisphere of the brain are: Broca’s Area (front interior region responsible for articulation and word analysis), the parietal-temporal region (a region in the midsection of the brain responsible for word analysis, and the occipital-temporal region (back region responsible for word formation). They emphasized the latter of the three has particularly important implications for dyslexia based on other research. They mentioned “automatization” of word recognition from previous articles and suggested that the formerly described left occipital-temporal, or LOT, region is responsible for this skill as well. Based on their own longitudinal study of subjects beginning in 1983 when said subjects were five years old, the authors hypothesized that there are poor readers genetically who are dyslexic and poor readers environmentally who are not.

In dispute of the phonological deficit theory, Jones, Branigan, & Kelly (2008) found in their study that in visual search and symbol tasks (non-linguistic), the dyslexic group had more errors than the control group. They presented as an explanation the magnocellular deficit hypothesis (focusing on visual rather than auditory deficits) of dyslexia, that is, visual pathways that travel in the lateral geniculate nucleus (LGN) separately to the primary cortex are disrupted and cause the reading difficulties that
characterize dyslexia. Thus, they argued that dyslexia is of visual rather than linguistic origin.

Furthermore, Jones et al (2008) found that difficulties in magnocellular processing can cause specific problems with detecting both individual and global movement of objects, as well as “unstable fixations during reading leading to inaccurate processing…” (p. 96). One specific visual pathway, called the “dorsal stream” (which is responsible to direct visual attention to points of text), works with the other, called the “ventral stream” (which uses dorsal stream feedback for more specific analysis). The authors hypothesized that dyslexia is the result of a specific left hemisphere dorsal stream deficit, and they tested this hypothesis using linguistic measures in addition to measures that exclude linguistic information but focus on the discrimination of visual-spatial relationships in an attempt to isolate a visual deficit as a possible cause of dyslexia. The authors examined three visual processing tasks and four reading tasks. The results indicated important differences in visual processing between adult dyslexics and non-dyslexics. In addition, they discovered that rapid processing and the size of information load may exacerbate problems. This points to possible issues not just with visual processing, but other cognitive processes as well.

Similar to the above research by Jones et al (2008), Sireteanu, Goebel, Goertz, & Wandert (2006) also tested the hypothesis that developmental dyslexia may be due to weak visual pathways in the brain. In relation to the magnocellular deficit theory discussed above, Sireteanu et al (2006) found that dyslexic children did not favor their left field of vision during testing, as is a common characteristic in normal visual
processing. In contrast with Jones et al (2008) however, Sireteanu et al (2006) believed the weaknesses lie in dorsal pathways on both sides of the brain, rather than just the left. Their results indicated the same lack of left-field overestimation in visual tasks, suggesting a right brain issue.

Moreover, in the tasks wherein dyslexics had to search for an item among distracters, both parallel (time independent) and serial (time needed increases with an increase in number of distracters), dyslexics consistently took more time (except on serial visual tasks) and were less accurate than non-dyslexics. Furthermore, on tested tasks requiring analysis of orientation and form, the dyslexic children were slower and less accurate than the non-dyslexic control group.

Sireteanu et al (2006) also presented the cerebellar deficit hypothesis in which automatization is inhibited. Unlike previous research discussed, they suggested that this dysfunction combined with the above visual deficits is most likely the cause of dyslexia. Finally, the authors concluded that although previous attempts to prove the magnocellular deficit theory have failed, it could not be ruled out entirely. They concluded their hypothesis was correct; however, they firmly stated that the lateral occipital cortex (back region of brain) and ventral pathways (other visual pathways opposite of dorsal, see Jones et al 2008, above) were not involved in dyslexia.

Helland (2006) suggested different degrees of dyslexic impairment and examined three groups classified as such after testing language and math abilities. The groups were classified as follows: Group One ranged from not impaired to somewhat impaired in language, Group Two was impaired in math but not language, and Group Three was
impaired in both language and math. Subsequently, Helland tried to predict which parts of the brain the students would show deficits in according to the above group classifications. He found his hypothesis to be partially validated. Although he found cognitive differences between groups, these differences were almost impossible to measure with behavioral analyses unless extremely in-depth. Thus, dyslexics may be different cognitively, yet manifest similar symptoms, making dyslexia easy to diagnose but difficult to treat. In addition, Helland found that the simpler the task (despite type of task), the less incidence of error across all groups.

Based on these findings, Helland (2006) suggested students in Group One had a specific deficit related to phonological retrieval countered by strong visual-spatial skills. The author inferred this imbalance between the two skills may lead to visual compensatory strategies, and that verbal rehearsal combined with visual graphemes (visual representations of sounds) was most likely the best treatment approach for this group. In contrast, students in Group Two displayed both impaired phonological and visual spatial skills, which may explain why they were worse at math than Group One. Treatment as described above, in conjunction with verbal rehearsal of visual-spatial concepts, was recommended for this group. Finally, Group Three displayed impaired language skills only (more severe than Group One), but demonstrated normal visual-spatial functioning. Helland advised that using visual assets to mediate language difficulties was key.

In contrast with much of the research reviewed to this point, Christenson & Griffin (2005) believed dyslexia is a “specific reading disability,” or what they termed
“SRD” (p. 24), and that professionals need to agree on this as a universal definition of dyslexia. They went on to say there is a general reading dysfunction, or RD, that is hypothetically caused by environmental factors or other dysfunctions in vision, hearing, and sensory integration that is not dyslexia. Yet, like researchers from opposite viewpoints, they found the most appropriate treatment for dyslexia is “multi-sensory written-language therapy (MLT)” (p. 26). However, they further specified a difference between dyslexia and visual processing disorders, and suggested one cause of RD is exposing children prematurely to reading before they are ready. In their conclusion, they addressed the magnocellular or visual deficit hypothesis of dyslexia. Although they did not find a causal relationship with this hypothesis and dyslexia, they admit the visual treatment approach has had some success when combined with language-based approaches.

This writer wishes to conclude this section by citing research that had a positive view of dyslexia. As we have seen, dyslexics’ brain makeup is often imbalanced. This implies that while they may be extremely weak in some areas, they may also have extreme strengths in others that help them compensate. Karolyí, Winner, Gray, & Sherman (2003) replicated their original study to further test the hypothesis that although dyslexics are poor at scrutinizing and remembering detail (a left-brain function), it should follow that they are more adept at certain holistic visual-spatial tasks. The original as well as replicated study found that dyslexics were both more accurate and faster at recognizing “impossible figures,” such as those drawn by artist M.C. Escher, as impossible. The authors concluded that dyslexic individuals may have significant strengths to draw upon.
Also, one can tentatively infer from this research that dyslexics with phonemic problems may be stronger visually than those with visual problems, and vice versa.

1.2 Music and the Brain

Numerous studies have been conducted on music and the brain, including its activation effects on the brain as well as how it processes music in reading and performance. Performing music requires “brain power” from numerous places, and even listening to music, i.e., The “Mozart Effect,” has shown positive and cross-hemispheric (both sides) activations in the brain that influence learning on a short-term basis. (Bennet & Bennet, 2008). Yet, empirical studies, wherein researchers used modern neurological technology to obtain results, suggest that other long-term effects of music on the brain are still being explored.

In a literature review by Bennet & Bennet (2008), the authors cited the lack of longitudinal studies as the reason for the subsequent lack of information about music’s long-term effects on the brain. However, during the course of their research, they uncovered a school in North Carolina wherein playing live classical music 2-3 times a week for a year significantly improved test scores. They also discovered that playing and composing music from an early age specifically enhances Broca’s and Wernicke’s areas, temporal regions both thought to be verbal learning centers of the brain. In addition, the authors found that when we imagine music (or audiate, as it is known in music education), we experience similar brain activations as in performance, with both auditory and visual cortices being stimulated. Finally, they learned that music training reinforces connectedness between areas in the brain, or “hemispheric synchronization,” i.e., the
effective combination of left and right functioning that further facilitates knowledge attainment.

Peretz & Zatorre (2005), in their study of brain damaged students’ perceptions of music and their diminished music abilities, found evidence of numerous areas of brain activation both in listening to as well as processing music. For example, they indicated that there are probably specialized areas in the brain devoted to processing scales as well as chords in tonal harmony, but they are to be determined. Furthermore, temporal auditory cortices are important in recognizing and analyzing pitches (notes), especially on the right side. Finally, they discovered that the aforementioned Broca’s area (on left) and the corresponding inferior frontal gyrus (on right) are bilaterally (both sides working together) responsible for harmonic error detection.

In addition, their research supported the theory that the brain functions of perception and performance of rhythm mirrors individuals’ usual preferences of the right hand tapping the rhythm, while the left hand keeps a steady pulse. That is, the opposite hemisphere is responsible for the opposite hand’s function, similar to other motor functions. In general, less specific rhythm activities also involve the motor cortex and the cerebellum. Moreover, they learned that the motor cortex of musicians works differently and is larger than that of non-musicians, which speaks once again to music’s effect on brain plasticity. Finally, and most relevant to the topic of dyslexia and music, Peretz & Zatorre (2005) revealed that sight-reading musical notation is distinct from reading words. To illustrate, while the left hemisphere is thought to be primarily responsible for general reading, sight reading for piano is attributed to the right occipital (back) region.
On the topic of “musical memory,” the authors stated it is perceptually based, that is, in order to remember the specific structure and components of a musical piece, one’s auditory cortex and other systems involved in perceiving music must be intact. They discussed other interesting effects of music on the brain, such as “musical chills,” or the physiological response of the body to music (Bernatzky & Panksepp, 2002). Peretz & Zatorre (2005) reported this effect has been attributed to areas of the brain typically stimulated by “biological rewards” like food and drugs.

Further research supported the above view that multiple brain structures are involved in musical processing. More specifically, Mauk & Buonomano (2004) revealed several aspects about the nature of the brain and temporal (or time processing), which are vital in music. Temporal processing is two-fold: The brain must both decode or process the temporal information, but also code the information, or make sense of it on an ongoing basis. The authors reported that temporal processing is most relevant in the auditory domain, which makes this topic even more relevant to dyslexia and music.

As for specific brain structures, Mauk & Buonomano (2004) reported that the cerebellum seems responsible for the overall timing of the brain. Further, other areas of the brain are responsible for temporal processing, depending on the kind of task and what mode it is in (visual or auditory). They found that neural circuits located everywhere in the brain are involved with temporal processing, and that mechanisms responsible for timing can be improved with practice. This gives great hope to dyslexic music students struggling with rhythmic difficulties.
Of particular interest with regard to dyslexia and music is the process of reading notation, which has undoubtedly caused much frustration in dyslexic music students. In their study of the physiological processes involved in score reading, Gunter, Schmidt, & Besson (2003) used ERP’s, or event-related brain potential, testing to obtain results. They discovered that language and music are similar syntactically and elicit similar brain responses on the ERP, while other studies they cited indicated the opposite. Also, they found through error detection exercises with musicians that sight reading abilities are most likely located in the right occipital lobe (back region). However, they pointed out that this cannot be generalized to other areas of music or even literary reading. They concluded by stating that violation (error) detection in written music involves similar brain responses to that of listening to music, yet they pointed out that the overall process of listening to music is not the same as reading music.

What occurs during audiation, as aforementioned, is still somewhat of a mystery. Brodsky, Kessler, Ginsborg, Henik, & Rubinstein (2008) analyzed the movements of the throat via throat-audio and larynx electromyography of skilled musicians during sight reading of both familiar and newly composed pieces, both with and without distracters, in three ways: 1) Silently, with different notation in front of them, 2) with rhythmic distracters, 3) and while the participant was singing a different song. As they expected, accuracy decreased with distracters. Also, they tested the laryngeal processes taking place during silent reading and mathematics and found sub vocal processes in these as well as in music, although those in music were significantly different. In addition, they tested audiation processes in percussionists and learned that they are the best auditors overall
of both rhythm and pitch. Despite this, they concluded that regardless of instrument, there is a strong audiological and/or motor link that occurs during audiation in all musicians.

Meister, Krings, Foltys, Boroojerdi, Müller, & Topper (2004) found similar results in their study of 12 piano students and their brain activation patterns when playing the right hand part of a Bartok piece. They discovered that professional pianists show less activation in motor areas than non-musicians (presumably because they are used to it). However, the remainder of their findings concurred with those of Brodsky (2008) discussed above. Specifically, they tested brain processes for both imagery, or audiation, as well as brain processes during actual playing. Areas showing activation during playing included: Cerebellum unilaterally (both sides), left primary sensorimotor area, part of the pre-frontal cortex, and visual areas. Audiation activated the same areas with the exception of the left primary sensorimotor area and right cerebellum.

Stewart, Henson, Kampe, Walsh, Turner, & Frith (2003) examined both reading musical notation and structural brain changes in their study of non-musicians. They hoped to uncover what parts of the brain showed functional change following 15 weeks of basic musical training.

They found the most striking change occurred in the superior parietal cortex inside the dorsal visual processing stream. One recalls this is the structure responsible for determining “what” one sees, while the ventral stream decides on specifics based on the information feed from the dorsal stream. Thus, they hypothesized that music, especially reading notation, has a definite visual-spatial element.
The above research by Stewart et al (2003) was conducted mostly with adults. Koelsch, Grossmann, Gunter, Hahne, Schröger, & Friederici (2003) found differences both in the way children and adults process music, and on the basis of gender. They used the ERP’s (event related electric brain potentials) in five-to-nine-year-olds as they listened to music in major and minor tonalities. Results indicated children exhibited distinct brain responses depending on whether the appropriate harmony was used in examples. This suggested that children as early as the age of five have already learned to process music correctly.

In terms of gender differences, they learned that boys were more likely to use the left hemisphere of the brain to process music, whereas girls did it more bilaterally (both sides). Further results showed that children processed music more like language than adults. Both have particular implications for child and adult musicians with dyslexia.

1.3 Dyslexia and Music

Unfortunately, research about dyslexia and music is scarce. Reviews of articles this writer has been able to uncover are presented here, along with a few interesting qualitative articles. While the latter may not provide empirical evidence of any one theory regarding dyslexia and music, they do provide the outsider with a valuable perspective regarding the specific challenges dyslexics studying music face.

M.T. (1996) suggested dyslexics may be gifted musically but still have issues reading notation, which he reported involves visual-spatial decoding combined with translating said decoding into motor activities. This article explored the musical experiences of two individuals with dyslexia: Paul, a trumpet player in his twenties, and
Jacob, an 11-year-old boy just starting in music instruction. Paul found it hard to play his instrument with written music, but impossible without. He stated: “When it comes to a new piece it is like starting from the beginning again. Also I get confused when I am playing fast (p. 69).”

In comparison, Jacob seemed to love music and was very frustrated by his inability to read music notation. He exclaimed,

It’s so annoying to see everyone else playing fluently and poor old confused me sitting there with my keyboard…every time I look at a manuscript paper it’s just like reading some alien language…it’s like trying to find a picture in one of those magic eye things (p. 70).

Jacob’s mother, who is also Paul’s teacher, reported some success with Jacob through the use of “Peggy Hubicki’s plastic staff and symbols” (Hubicki, M. 1994 as referenced in M.T. 1996, p. 70).

Overy’s (2000) research challenged the position that dyslexics’ music troubles are primarily issues with notation. She suggested instead that dyslexia may also affect other pertinent musical skills such as auditory and visual perception, short-term memory, and motor skills.

Overy took the stance that dyslexics’ language and musical problems are primarily rhythmic, and that rhythmic musical activities could possibly address both difficulties. In her research, she found dyslexic children’s rhythmic skills severely lacking, as well as skills in identifying the number of notes in sequences and differences
in timbre. However, following rhythmic training, the children’s rhythmic, as well as phonetic and spelling, skills improved.

As a follow-up to this study (see Overy, 2000) Overy, Nicolson, Fawcett, & Clarke (2003) looked into Overy’s former hypothesis by examining the musical difficulties encountered by dyslexics. The authors used a new music aptitude test for dyslexic children that they adapted from a combination of available tests (Seashore 1960, Bentley 1966, Gordon 1965, Wing, 1968). Available tests were discarded due to their complexity and long periods of concentration required of children in favor of a new test created by the authors and tested out in the previously cited study by Overy (2000). The test was modified for the 2003 study, following administration of dyslexia early screening test (DEST) and comparisons of musical timing scores of six children with “strong risk” of reading difficulties and 16 children without. Based on the significance of increased timing difficulties of children with strong risk of reading difficulties, ($p < 0.001$), the newly created musical aptitude test (MAT) was administered. This test included items on rhythm skills, meter skills, tempo discrimination, rapid skills, pitch skills, and other measures. There was no reported reliability for the DEST or MAT. The results of the MAT indicated the dyslexic group scored lower on timing skills but higher on pitch skills. Further, 33% of the children with dyslexia had deficits associated with rapid temporal processing. The authors cited this as evidence of a “subtype” of dyslexia, which needs further investigation. Moreover, in testing other skills like spelling as a control measure, the authors found a correlation between skilled rhythm tapping and spelling ability. Overy et al (2003) concluded by suggesting multi-sensory music training
for dyslexics that focuses on rhythm skills along with “rapid skills,” or fast musical reading and processing, that may improve linguistic and musical skills simultaneously.

The above findings are corroborated by Tiffin-Richards, Hasselhorn, Richards, Banaschewski, & Rothenberger (2004). They tested the timing performance of children with dyslexia through measuring success at finger tapping tasks while controlling for comorbidity of ADHD (attention deficit hyperactivity disorder). They discovered the groups with dyslexia only or dyslexia combined with ADHD performed well at tapping rhythms for the most part when compared with ADHD only and control groups. However, dyslexics performed worse across the board when rhythms were more complex. The authors concluded that dyslexics’ temporal processing impairments have more to do with “reproducing time” than timing discrimination tasks. Thus, those with dyslexia may fall behind in complex timing tasks also requiring motor activity like music.

Auditory skills needed for processing both language and music were discussed in a review by Kraus & Banai (2007). They reported that an individual’s musical training will affect his or her auditory processing. In fact, they discovered that musicians respond more strongly to the sound of their instrument than others, and have stronger responses than non-musicians to even simple tones. Further, they found the musician’s brain response to pitch follows pitch frequencies more closely than responses of non-musicians. In addition, they stated that the auditory processing system is flexible and can change in response to environment. This effect is heightened by an individual’s intent. In other words, musical training results in changes to the auditory cortices, which in turn facilitates perceptual learning.
Kraus & Banai (2007) continued by discussing the particular difficulties of children with an auditory processing disorder in which they experience trouble picking out speech in noisy environments. While this is not specifically dyslexia, 30% of dyslexic children have abnormal neurological responses to sound. The authors deduced this has to do with the “fidelity” of the brain response to sounds being delayed that in turn affects auditory processing. To illustrate, the authors postulated that speech sounds asymmetric to some dyslexics. One wonders if the relative symmetry of the left posterior region of dyslexic brains in comparison to normal brains plays a role (Bigler, 1992). Kraus & Banai (2007) concluded that cognitive and learning deficits are directly correlated with auditory processing deficits. They suggested practice as a remedial measure for this that has met with some success.

Auditory processing in speech as well as music is examined by Besson, Schon, Moreno, Santos, & Magne (2007). The researchers used behavioral measures as well as previously discussed ERP’s to obtain results. They tested adults (musicians and non-musicians) and children (dyslexic and non-dyslexic). They postulated music processing is similar to language processing in the brain. For example, voices in speech often have a pitch matching their corresponding emotion. Thus, they hypothesized that musical training increases the ability to discriminate among pitches, which in turn improves overall language processing.

Using the method of exposing musicians and non-musicians to the same song with both strong and weak pitch changes, they suggested musicians would be more adept at recognizing weak pitch changes. They proved this hypothesis correct. Moreover, they
found language has a different brain location for musicians. That is, language is stronger bilaterally for musicians. The authors found similar results in children studied, and concluded that having a musical ear improves perception of pitch changes in music and speech alike.

Finally, when testing ten “phonologic” dyslexic children, Besson et al (2007) found a higher rate of error in speech pitch discrimination than controls. Following this, the dyslexic children were trained for eight weeks using phonological and audio-visual training, while the control group was involved in painting classes. Once re-tested, the dyslexic children improved in speech pitch discrimination. The authors suggested future implications may involve musical training as a treatment to improve literacy for dyslexics.

1.4 Dyslexia, Music, and Pedagogy

This review of literature has focused on neurological structures and processes involved in both dyslexia and music, as well as how dyslexic individuals react to, interact with, and learn music. As the goal of this present study is to suggest a comprehensive pedagogy in teaching dyslexics, an examination of the theories and techniques, both inside and outside the realm of existing music education methods, is warranted.

As a general introduction to this topic, Richards, Witton, Moore, Reddy, Rippon, & Talcott (2002) presented a fascinating article about the “dyslexia ecosystem.” They reported this “ecosystem” encompasses researchers, educators, and the families and individuals living with dyslexia. The implication is that the ecosystem is the community
of these people that are too dependent upon the elements contained within it, much like a rainforest, and that the individuals in the ecosystem must venture out of their comfort zone of expertise in order to truly help dyslexic individuals.

The authors pointed out several problems with the ecosystem as it was, and expanded ideas for improvement. For example, they questioned the medical model of dyslexia presented previously, which often treats symptoms of the disorder rather than addressing underlying causes. In the authors’ view, dyslexia is too complex a disorder to be explained by one theory or model, and they pointed out that successful assessment and educational modes of treatment deviate substantially from the medical model.

Furthermore, Richards et al (2002) found current research on dyslexia too focused on determining causes rather than creating effective interventions. In fact, the lack of interdisciplinary communication and collaborative research combined with the narrow focus of existing research further separates the purpose of dyslexia research from its purported objective of helping those with dyslexia. They suggested more collaboration and “breadth” rather than “depth” of research, along with more research exploring possible positive ramifications of a dyslexia diagnosis, both of which could garner more government support for dyslexia. Finally, they stressed the importance of educators both expecting and being equipped to handle dyslexia in their classrooms.

In relation to this, Wadlington & (2003) investigated educator beliefs regarding dyslexia using a survey. This instrument was developed based on their literature review, with an initial 75 items covering dyslexia’s definition and origin, characteristics, treatment, school environment, and impact. It was narrowed down to 32 items to make it
more concise via combining similar items, and by changing or deleting items that were confusing or deemed not as important as others. It was then pilot-tested for content and face validity (.73 Cronbach’s Coefficient Alpha), then narrowed down to a final item number of 30 based on comments of pilot subjects. Response options were in Likert format and coded one through four. The authors found that, with the exception of elementary classroom teachers, most educators had misconceptions about dyslexia that may affect quality of instruction. The authors concluded this may be due to elementary teachers dealing more with students just learning to read. In addition, they mentioned (as numerous examples in this research have alluded to) that even among neuroscientists, there is not a definite consensus about definition, cause, etiology, or treatment of dyslexia. Obviously, further research and dissemination of said research (to special education teachers especially) is needed.

Treatment approaches to dyslexia are as varied as dyslexia itself. Tønnessen (1999) discussed three different approaches to treating dyslexia from the field of psychology: Cognitive (focusing on rules governing thinking processes) behaviorist (focusing on behavior and environmental stimuli causing it) and connectionism (the combination of awareness, or cognition, and automaticity, or acting without knowing). The author discovered that cognitive psychology offers few benefits to dyslexics as knowing grammatical/and or spelling rules does not necessarily guarantee success for those with dyslexia, while constant practice and repetition of both familiar and unfamiliar words (connection and alternation between awareness and automaticity) is more helpful.
Even in those with “normal” brain structures, effective music instruction is often highly individualized. A factor as seemingly minor as choice of instrument used in aural training may play a huge role in pitch discrimination (Loh, 2007). One may ask: Where does one begin in music instruction with dyslexic students?

First, one must distinguish between adapted music instruction versus music therapy. Music therapy is the use of music to achieve other objectives, cognitive or behavioral, whereas music instruction teaches specific music skills. According to Ockelford, Welch, & Zimmerman (2003), special education students in the UK experience very little music education due to this confusion. What special education schools call “music education” is closer to music therapy and is being provided by individuals neither trained in music pedagogy nor music therapy.

Now that this distinction is made, one can shift focus to specific adaptations for dyslexic students that enable them to acquire musical skills. Vance (2004) reported that 20% of the general population may be dyslexic in some way. She went on to say that traits of dyslexia may lead dyslexics toward music. That is, dyslexics who are impaired visually or aurally may rely on kinesthetic skills needed to play an instrument. Impaired understanding of the written word may result in the advanced development of aural skills, which results in hearing/matching pitches well.

Vance (2004) concluded that teachers are important bridges between dyslexic students and musical material. She encouraged teachers to obtain a copy of dyslexic students’ Individual Education Plan (IEP), a special plan for students with disabilities, which will provide valuable input on how these particular students learn. However, she
revealed that signs of dyslexia are commonly mis-diagnosed or undiagnosed, meaning students can make it through school without a diagnosis and subsequent IEP. In fact, music teachers have the unique opportunity to observe hallmarks of dyslexia in undiagnosed students due to the nature of music activities and instruction. Therefore, as the author pointed out, music teachers may be instrumental in attaining a diagnosis for these students.

Vance (2004) continued by naming some specific musical problems of dyslexia: Auditory processing deficits, sequencing problems (including motor), right/left confusion, time/direction confusion, and an inability to understand or follow directions. She wrapped up her article by exploring tips in Sheila Oglethorpe’s piano book for dyslexics (Oglethorpe, S., as referenced in Vance, 2004, pp. 29-30). First, a multi-sensory approach was advocated, including kinesthetic activities and the Kodály method. Second, enlarged music, highlighters, and adhesive-backed notepaper in bright colors can be useful for dyslexics with visual deficits. For dyslexics with directional problems, one can encourage them to follow the line of music with their finger while singing or listening. For dyslexics with short-term memory deficits, skills to acquire can be broken down into smaller chunks until learned completely, with only one new idea or task presented at a time. It is important to find the right instrument for these students, acknowledge positive musical traits, and change activities if the student is frustrated. As this is not always possible in group settings, individual dyslexic students may be allowed to take a break.

In relation to the above, McCord & Fitzgerald (2006) compiled research specifically describing dyslexics’ difficulties playing instruments and options for
circumventing them. They described a teacher with a dyslexic student, who, after several unsuccessful attempts to help her read notation, highlighted each space in the musical staff (where notes are placed either on lines or spaces in relation to where they sound) with a different color, which eventually helped her read fluently. Discerning where notes are on the staff, in addition to reading fast, are typical problems of dyslexic students. The authors went on to say that music educators can gain valuable input by consulting with special education teachers to discuss skills needed for particular instruments. Sitser (1998) described the similar experience of a dyslexic pianist who lined up notes, re-wrote them, and colored their heads in with colors that had the same letters as the note names. This method reportedly improved her reading skills for piano.

Moreover, as in the previous article, McCord & Fitzgerald (2006) described some of dyslexics’ common difficulties and how they correlate with musical skills. In addition to advocating a multi-modal approach, they made other useful suggestions. For instance, dyslexics with visual-spatial problems may find it difficult to read fingering charts for woodwind instruments, as well as reading/writing right to left. The authors suggested that a magnetic board with musical concept manipulatives may help. Also, dyslexics with short-term memory problems may not be able to remember key signatures (markings in the beginning of the piece that may affect notes later in the piece), whereas those with long-term memory problems may not remember or be able to memorize woodwind fingerings mentioned above. Because of this, woodwinds may not be the best instrument choice for the dyslexic with both visual-spatial and long-term memory problems. Brass instruments may be a better choice for these individuals because there are not as many
fingerings to remember; however, they are not for dyslexics with aural learning issues due to their difficulty with hearing overtones (other parts of a note that make it sound richer or better in tune). Finally, percussion (drums and other rhythmic instruments) may be less frustrating for all dyslexics, except those with significant rhythm delay issues, because students will be able to make a sound right away. However, mallet instruments (like the xylophone) are more difficult for visually impaired learners as there is too much “back and forth.”

McCord & Fitzgerald (2006) closed the article by telling the story of Mike Covert, a music teacher who used a clever method with a violin student with syndrome. Although not dyslexic, she exhibited similar impairments with reading notation. He created a giant “staff” on the floor with paper plate “notes” with which they could kinesthetically and aurally practice phrases of music through singing and “walking” them together.

Music educators may wonder, aside from the above reviewed methods, what value the current music education approaches of Kodály, Orff, and Dalcroze have to offer dyslexic music students. What follows is a short synopsis of these theories; then, this writer will select some of these theories’ components that would be helpful in dyslexic music instruction based upon research previously presented.

Zoltán Kodály, according to DeVries (2001), was a Hungarian music education guru, felt that music is for everyone, and learning music must start with the voice no later than first grade. Further, music used for teaching literacy and other facets should be of high quality and in the native language of the children one is instructing. DeVries
expanded on Kodály’s approach to fit the needs of a changing world. He advocated that music will be more fun for children if process-oriented (as real life musicianship is) rather than product oriented. Secondly, Kodály’s Hungarian folk songs are used too commonly in international classrooms, when he only meant for them to serve as examples of songs children are familiar with. It is important to take away from this that music used in the classroom must be socially and culturally relevant to the particular group of students.

Moreover, Scott (2008) stated that inductive reasoning methods should be central to any approach using Kodály. That is, the intense focus of some music educators on technical skills may come at the cost of teaching students to be sensitive performers. He recommended structuring the classroom so that both students and teachers create knowledge through inquiry and discussion. Although some direct instruction is necessary for the teacher to ascertain whether students have attained certain skills, no classroom should be all direct, or deductive, instruction. Teachers should continue to provide models and see how students both encounter and solve musical questions and/or problems.

Based on the above, the Kodály approach may be best suited to dyslexics with visual spatial difficulties, as it is geared towards the development of aural abilities using the voice. Furthermore, the approach suggested by Scott makes it possible for teachers to meet their students halfway despite differing skill levels and make music available to all.

Next, Carl Orff, as noted by Goodkin (2001) was a German musician who wanted to achieve the ancient Greek goal of a combination of music, dance, and language. The
Orff approach is similar to that of Kodály and Dalcroze, in that Orff felt music is vital to the education of children, is for all to participate in and enjoy, should be heard before being seen on the page, and should involve movement and the active creation of itself. The Orff approach differs from these two with the idea of improvisation at its core. The teacher must carefully structure improvisatory exercises to allow children freedom in creating their own musical forms and activities. In addition, creative imagination should be exercised fully to include not only musical activities, but also visual and dramatic play.

Orff is usually referred to as an “approach,” rather than a “method,” because Orff wanted teachers to create their own curricula rather than adhere closely to a prescribed set of rules. Goodkin (2001) identified two stages inherent in Orff that children should experience and incorporate in this order continuously: Romance, theory, romance. Thus, the artistic rather than technical side of music is emphasized. In summary, the Orff approach requires the teacher to relate music to everyday life, let children discover their own knowledge with guidance; then, knowledge must be cemented through similarly guided improvisation.

The only problem one sees with the Orff approach and dyslexia is the common use of specially created pitched percussion instruments in tandem with it. Dyslexic students with visual impairments can find such instruments, for example, the xylophone, difficult to play due to a great amount of eye movement and coordination required. In this case, however, students can be afforded the opportunity to participate either by changing to simpler, non-pitched percussion instruments, simplifying their parts on the barred
percussion instruments, or by removing unused bars. Yet, like Kodály, the Orff approach has something for all kinds of dyslexic students: Those having problems with motor and aural skills can practice with the instruments in a fun and creative setting designed by them, using their strong visual skills to master the instruments. In contrast, those with visual difficulties can still participate (with modifications), using their strong aural skills to guide them while gaining familiarity with song forms minus the frustration of reading music.

A final approach, that of Swiss musician Emile Jacques-Dalcroze, offers a movement-based foundation for educating dyslexic music students. This approach includes solfège (or specific words for sung pitches that remain constant regardless of key), “eurhythmics” (a term coined by Dalcroze for expressive movement), and improvisation. Dalcroze believed the development of the ear, muscle response, and creative expression should all be incorporated together as the base of musicianship. In other words, emphasis is on developing better communication between eye, ear, mind, and body. Moreover, children should develop a storehouse of aural and kinesthetic rhythmic patterns and be able to recognize them in repertoire.

Zachopoulou, Vassiliki, Chatzopoulou, & Ellinoudis (2003) sought to find out if a music and movement program based on Dalcroze and Orff would improve the rhythmic ability of children aged four to six. Dalcroze found that the source of rhythm in music lies in the human body; and, children can organize rhythms themselves through bodily movements. The study involved 72 children equally divided by gender and group status (experimental or control) who participated in music activities two times weekly, while
the control group did free play activities. Their interest in this hypothesis stemmed from an argument in the literature that maturation is more of a factor in improvement of these abilities than practice of Orff and Dalcroze techniques. Their findings indicated that music training using the above techniques improved many facets of the groups’ rhythmic abilities, suggesting that training is more relevant than maturation.

In review of Dalcroze’s technique in relation to students with dyslexia, one finds the practice of eurhythmics may be beneficial in most dyslexics due to motor deficits. However, this may also be challenging if performed too fast, therefore, “slow and steady wins the race.” An added benefit will exist for visual dyslexics, in that they will capitalize on their auditory skills while reinforcing such skills with their bodies, which will help their musicianship later as well as aiding in memorizing music when reading becomes difficult. Finally, aural dyslexics may find their ear will be vastly improved by having something concrete (as in body movement) to attach to sounds, and even if they miss something, the conceptual knowledge dyslexics possess will most likely help them “fill in the blanks.”

In addition to musical benefits associated with the above methods, as research has shown, learning music can also improve auditory and rhythmic skills some dyslexics lack for speech and phonological processing. In addition, having dyslexics do a variety of musical exercises informs treatment specialists and researchers more about the type and severity of their conditions than reading or intelligence tests alone.
Chapter 2

Hypotheses

In regard to the causes of dyslexia, tentative assumptions are:

1) Dyslexia is a dysfunction in one or more structures of the brain, including, but not limited to: left temporal-parietal region, visual pathways, the motor and auditory cortices, occipital lobe, and cerebellum. Both size of cerebellum and symmetrical shape in the dyslexic brain (compared to the normal brain with an asymmetry on the left hemisphere) may play a role. Moreover, dyslexia is a multi-faceted disorder which may not only affect language and music processing visually, but also language and music processing aurally. In addition, motor skills may also be affected by dyslexia, causing issues with coordination and gait. Finally, a combination of any or all of the above issues could also exist for certain dyslexics.

2) Sub-types of this disorder must be considered due to the numerous and varying theories of the definition and causes of dyslexia. The following sub-types based on the literature are suggested: a) aural dyslexia, wherein individuals struggle with auditory and
phonological processing in reading and auditory processing in music, but may have strong visual compensatory skills, b) visual dyslexia, wherein individuals have issues with spatial discrimination, detailed visual processing, and visual fixation (all involved in reading music), but usually strong aural skills, c) motor-specific dyslexia, wherein individuals perform average on the above tasks but experience significant impairment in coordination and gross/fine motor tasks (like playing an instrument or rhythmic movement), and d) non-specified or combined dyslexia, which may involve any number of combinations of the above sub-types.

3) The best pedagogical approaches this writer has discovered in this research for each sub-type are as follows: a) For those with aural dyslexia, over-familiarization with aural components of music, such as tonal and rhythmic patterns, as advocated by Kodály, Orff, and Dalcroze is a must (as this same approach is used in language to help this type of dyslexics read). Furthermore, the kinesthetic-based approach of Dalcroze will aid these students to connect sounds they may be in danger of misinterpreting with a solid physical movement that will also aid their short- and long-term memories, with which most dyslexics experience problems. Kodály also has something to add to the kinesthetic approach with his advocacy of forming hand signs while singing solfége (referred to as Curwen hand signs, named so for their inventor). Finally, the barred pitched percussion instruments of Orff offer these students an opportunity to use their visual skills to “see” the sounds they are hearing without actually compounding the issue with music notation.

Therefore, it is predicted that Kodály and Dalcroze will be selected by teachers
equally as chosen methods for aural dyslexics, with Orff chosen as a close second. It is important to note that, when notation is introduced, there is a danger of aural dyslexics becoming dependent on it due to strong visual skills combined with memory problems. Over all, practicing music has positive implications for aural dyslexics, as research has shown that this results in an improvement of not only music skills, but also language skills as a whole.

b) Most visual dyslexics will soar with the approaches of Kodály, Orff, and Dalcroze in early stages of music learning, which will allow them to use their strong aural skills to familiarize themselves with music while creating. One drawback of Orff is noted as the use of barred instruments that require somewhat complex eye movements, but Orff instrument parts can be easily simplified or different instruments used. For this reason, it is expected that teachers will select Dalcroze and Kodály in equal amounts, and Orff somewhat less. On a final note, it is when visual dyslexics begin to read notation that care must be taken to make proper adaptations, in the form of visual aids. Suggestions noted here include: Highlighting spaces of the staff or coloring note heads with different colors corresponding to letter name of the note, using adhesive-backed colored notepaper for the same purpose, encouraging students to first follow a line of music with their finger while singing or listening before attempting to play on their instrument, and using motor manipulatives that allow their hands or feet to do what their eyes cannot. These methods are not necessarily unique to any one music education approach, which will be vital for music teachers to keep in mind when working with visual dyslexics at the music reading stage.
c) Motor-specific dyslexics may have trouble with the movement-based approach of Dalcroze. However, practice with rhythms that their ears or eyes can attach to prior to trying movement may be beneficial, as research has shown that, like pitch rehearsal, the rehearsal of rhythm; regardless of dyslexia, improves this skill over time. However, piano may be an almost impossible instrument for these students to master due to the complex coordination and motor demands required. Thus, the approaches of Kodály and Orff are each expected to be chosen by the teachers surveyed in equal amounts (teachers are permitted to choose more than one approach), with Dalcroze chosen considerably less.

d) Non-specific dyslexics will likely encounter the most difficulties of all in acquiring musical skills. It is only through continued work on the part of both student and educator that a tailored approach can be devised. While this may not be possible for all students in all settings, one finds the myriad approaches examined here have “something for everyone,” including “normal” learners. It is especially important with non-specific dyslexics to thoroughly assess (perhaps through trial and error) which specific instrument they will be most able to play, due to the relative “wild card” nature of their dyslexia. As mentioned previously, music educators may have a unique insight into the struggles of dyslexics, and may even be instrumental in attaining diagnoses for suspected but unconfirmed dyslexics. It is thus hypothesized that Orff, Kodály, and Dalcroze will be chosen in equal amounts for these dyslexics, or “other” will be chosen as a majority, implying that a varied approach is needed. Further, it is hypothesized that teachers will agree that all types of dyslexics have compensatory strategies (sometimes in opposition to that with which they struggle) that help them to function.
Chapter 3

Study Design

3.1 Objectives

The main objectives of this research are to: 1) Summarize available information regarding dyslexia, the brain, and music to formulate a comprehensive “snapshot” of the disorder. 2) “Connect the dots” to form testable hypotheses about the etiology of dyslexia, dyslexia’s influence on music in general as well as specific musical goals, 3) Review existing and formulate new combined pedagogical approaches to teach music to dyslexic individuals, 4) Create testable hypotheses about said pedagogical approaches, and finally, 5) Survey music teachers about their experiences with dyslexic students and discover if they agree with current research reported as well as hypotheses formed.
3.2 Procedures and Information

A survey for music teachers within a large urban school district in Northwest, Ohio, was designed (see Appendix A). A survey was chosen as the primary research tool due to financial and timing constraints. In addition, this survey was completed online “blind,” via Survey Monkey.

The instrument itself was loosely based on the survey created by Wadlington & Wadlington (2003) in their study about the attitudes of educators toward dyslexia. It differs in that it is not as broad in scope and focuses solely on dyslexia and music with the exception of the first two questions. Its purpose was to test specific hypotheses created for the current study about dyslexia and music gleaned from the literature review, and how teacher variables interacted with these hypotheses, including: definition of dyslexia, what dyslexia affects, years of teaching experience, years in the specific large urban school district and grade levels taught, how many confirmed and suspected dyslexic students each teacher has had, the existence of proposed subtypes (aural, visual, motor-specific, and combined), which music education approaches of “the big three” (Orff, Kodály, and Dalcroze) worked best respectively for each subtype identified in each teacher’s experience, and the existence of compensatory strategies for each type (usually opposite of the kind of dyslexia they have, as supported by the literature review) except for combined, as the combined type of dyslexia is assumed to have differing degrees of compensatory strategies. Due to studies in the literature review stressing that dyslexia tends to be mis-diagnosed or undiagnosed, it was necessary to include “suspected dyslexic students” as a survey item to more adequately measure teacher experiences.
Most questions were structured with specific responses required, with the exception of question three, “How long have you been a practicing teacher?” and question four, “How long have you taught in [large urban district]? Please specify grade level(s).” Question one was dichotomous and asked if dyslexia is “primarily a reading disorder that does not affect reading and other areas” or “a multi-faceted disorder that can affect reading and other areas,” which were the two main definitions found in the literature. Question two was similar to question one but asked more specifically “what dyslexia affects,” whether it is “reading and language only,” or “all aspects of life, including motor skills,” a dichotomy also discovered in the literature review. The next item, question five, asked how many confirmed dyslexic students the teachers had directly instructed over the course of his or her career in [large urban district] only. A Likert-type scale was used with options starting at zero and increasing by three for each option given, ending with “over 20” and “don’t know” options. Question six was exactly like question five but asked instead about the experience of the teacher with suspected dyslexic students. Question seven gave short descriptions of the subtypes of dyslexia supported by the literature review and asked the teachers in which of the categories (aural, visual, motor, or combination) the students with which they had experience belonged. The teachers were also given the option to skip this question if they did not agree on the existence of dyslexia subtypes. The final items were dichotomous, and asked whether each dyslexia subtype possessed compensatory strategies (yes or no)—here, the type of compensatory strategies was less important than the verification of their existence.
Variables contained within the survey were tested for significance using Pearson’s chi square and SSPP software. In addition, the way in which variables measured influenced each other was examined through cross-tabulation, Pearson’s chi square, and SSPP software. Years of teaching, experience with confirmed dyslexic students and suspected dyslexic students, type of dyslexic students, and type of music methods that work for each subtype, were examined. Also, the type of dyslexic students encountered and the existence of compensatory strategies for each subtype were examined. In addition, the number of confirmed and suspected dyslexic students with which teachers had experience, type of dyslexic students encountered, as well as music methods that may work for each subtype of dyslexia, were examined. It is expected that each variable examined will have a statistically significant effect on the variable with which it has been cross-tabulated.

3.3 Population

The survey was e-mailed to all music teachers (N=79) within the large urban school district. Follow-up included e-mails and phone calls from both principal and student investigator. Results were generalizable to this specific population only, which was chosen because the district is the largest school district in Northwest Ohio.
Chapter 4

Results

4.1 Results

This study was designed to measure teacher experiences with students who have dyslexia as well as perceptions of dyslexia that may have been formed by such experiences. In this study, the survey response rate was 35%. Teaching experience ranged from seven to 46 years and represented categories of 0-10 (n = 6), 11-20 (n = 9), and over 21 (n = 13) years of experience.

For question one, “Is dyslexia primarily a reading disorder that does not affect other areas, or a multi-faceted disorder that can affect reading and other areas?” A significantly greater proportion of respondents (92.9%) agreed that dyslexia is multi-faceted ($\chi^2 = 20.57, p < .0002$). For question two, “Does dyslexia affect reading and language only, all aspects of life, including motor skills, or none of these?” a significantly greater proportion (92.9%) of respondents agreed that dyslexia affects all aspects of life ($\chi^2 = 11.571, p < .001$).
Years of teaching (question three) was cross-tabulated with whether respondents felt dyslexia was primarily a reading disorder or a multi-faceted disorder (question one). While the majority of all teachers, regardless of experience, indicated that dyslexia was a multi-faceted disorder, this finding was not significant statistically. Raw data are listed in table 4.1.

4.1 Years of Teaching and Definition of Dyslexia

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Years of teaching (question three) was also cross-tabulated with what dyslexia affects (question two). These results were not found to be statistically significant. Cross tabulations are listed in table 4.2.
4.2 Years of Teaching and What Dyslexia Affects

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<thead>
<tr>
<th>All aspects of life, including motor skills</th>
<th>Reading and Language Only</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Years of Teaching</strong></td>
<td><strong>Responses</strong></td>
</tr>
<tr>
<td>0-10</td>
<td>3</td>
</tr>
<tr>
<td>11-20</td>
<td>2</td>
</tr>
<tr>
<td>20+</td>
<td>0</td>
</tr>
</tbody>
</table>

Due to small sample size due to low response rate, question four, regarding time spent teaching and grade levels taught in the large urban school district, were not included in analysis. Moreover, time spent in a particular school system (question five) seemed less relevant than time spent teaching overall, and follow-up questions regarding experience with dyslexic students qualified that the students had to be from the large urban school district studied.

For question six, “Roughly how many dyslexic (confirmed) students have you directly instructed over the course of your career (large urban district only)?,” a significantly greater proportion (53.6%) of respondents did not know how many confirmed dyslexic students they had taught ($\chi^2 = 17.14$, $p < 0.001$). Question six was cross-tabulated with years of teaching (question three). These results were not found to be statistically significant. Cross tabulations are listed in table 4.3.
4.3 Years of Teaching and Number of Confirmed Dyslexic Students

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Number of Confirmed Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Don’t Know”</td>
</tr>
<tr>
<td>0-10</td>
<td>2</td>
</tr>
<tr>
<td>11-20</td>
<td>7</td>
</tr>
<tr>
<td>20+</td>
<td>6</td>
</tr>
</tbody>
</table>

This question was also cross-tabulated with question one. These results were not found to be statistically significant. Cross tabulations are listed in table 4.4. Question six was cross-tabulated with what dyslexia affects (question 2). These results were not found to be statistically significant. Cross tabulations are listed in table 4.5.

4.4 Number of Confirmed Dyslexic Students and Definition of Dyslexia

<table>
<thead>
<tr>
<th>Number of Confirmed Dyslexic Students</th>
<th>Reading Disorder Only</th>
<th>Multi-faceted</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>1-4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5-8</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t Know</td>
<td>1</td>
<td>14</td>
</tr>
</tbody>
</table>
4.5 Number of Confirmed Dyslexic Students and What Dyslexia Affects

<table>
<thead>
<tr>
<th>Number of Confirmed Dyslexic Students</th>
<th>Reading/Language Only</th>
<th>All Aspects of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>5-8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>20+</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

For question seven, “Roughly how many dyslexic (suspected) students have you directly instructed over the course of your career (large urban district only)?” a significantly greater proportion (60.7%) of respondents did not know how many suspected dyslexic students they had taught ($\chi^2 = 19.14, p < .001$). Question seven was cross-tabulated with years of teaching (question three). These results were not found to be statistically significant. Cross tabulations are listed in table 4.6.

4.6 Years of Teaching and Number of Suspected Dyslexic Students

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Number of Suspected Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Don’t Know” 0 1-4 5-8 Over 20</td>
</tr>
<tr>
<td>0-10</td>
<td>3 0 1 2 0</td>
</tr>
<tr>
<td>11-20</td>
<td>7 0 1 1 0</td>
</tr>
<tr>
<td>20+</td>
<td>7 1 1 2 2</td>
</tr>
</tbody>
</table>
A statistically significant proportion of respondents (75%) felt dyslexia was a combination of aural, visual, and motor difficulties \( \chi^2 = 23.21, p < .001 \). These results were cross-tabulated with years of teaching (question three), but were not found to be statistically significant (see table 4.7).

### 4.7 Years of Teaching and Type of Dyslexic Students Encountered

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Types of Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aural</td>
</tr>
<tr>
<td>0-10</td>
<td>0</td>
</tr>
<tr>
<td>11-20</td>
<td>0</td>
</tr>
<tr>
<td>20+</td>
<td>0</td>
</tr>
</tbody>
</table>

For question nine, “If you agree there are subtypes of dyslexia, which of the following music methods do you feel works best for aural dyslexics as described in question seven (you may choose more than one)?” (57.7%) felt that Orff was the best approach, with Dalcroze and Kodály as close seconds (50% each). These results were not statistically significant.

Question 10 was similar to question nine but asked instead about visual dyslexics. (55.6%) of respondents felt that Kodály was the best approach, with Dalcroze (48.1%) and Orff (51.9%) chosen in almost equal amounts. However, these results were not statistically significant.
Question 11 asked about approaches for motor-specific dyslexics. A greater number (57.7%) of respondents chose Orff. Kodály (50%) and Dalcroze (42.3%) were chosen with almost the same frequency. Neither result was statistically significant.

Question 12 asked about approaches for combined dyslexics. A significantly greater number of respondents (74.1%) chose Orff ($\chi^2 = 18.11, p < .003$).

Years of teaching (question three) was cross-tabulated with all questions regarding dyslexia subtypes and music methods (questions nine-12). Results were not found to be statistically significant in the case of aural dyslexia, visual dyslexia, or motor-specific dyslexia (See tables 4.8 through 4.11).

4.8 Years of Teaching and Music Methods that Work for Aural Dyslexia

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Kodály</th>
<th>Orff</th>
<th>Dalcroze</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>11-20</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>20+</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

4.9 Years of Teaching and Music Methods that Work for Combined Dyslexia

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Kodály</th>
<th>Orff</th>
<th>Dalcroze</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>11-20</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>20+</td>
<td>7</td>
<td>11</td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>
4.10 Years of Teaching and Music Methods that Work for Visual Dyslexia

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Kodály</th>
<th>Orff</th>
<th>Dalcroze</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>11-20</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>20+</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

4.11 Years of Teaching and Music Methods that Work for Motor-Specific Dyslexia

<table>
<thead>
<tr>
<th>Years of Teaching</th>
<th>Kodály</th>
<th>Orff</th>
<th>Dalcroze</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>11-20</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>20+</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>

A significantly greater proportion of respondents (79.2%) felt that visual dyslexics possess strong aural skills, motor skills, or both ($\chi^2 = 8.16, p < .004$). A similar finding was true regarding motor-specific dyslexics, wherein a significant number (70.8%) of respondents found that this kind of dyslexics possess compensatory strategies ($\chi^2 = 4.16, p < .04$). In comparison to aural dyslexics, 62.5% of respondents felt that aural dyslexics have these compensatory strategies; but, this was not statistically significant. The existence of compensatory strategies for each type of dyslexia was cross-tabulated by type of dyslexic students (aural, visual, or motor-specific) encountered by the teachers. These results were not found to be statistically significant regarding visual dyslexia, aural dyslexia, or motor-specific dyslexia (See tables 4.12 through 4.15).
### 4.12 Existence of Compensatory Strategies for Visual Dyslexics by Type of Dyslexic Students Encountered**

<table>
<thead>
<tr>
<th>Compensatory Strategies?</th>
<th>Type of Dyslexic Students Encountered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aural</td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
</tbody>
</table>

**Four respondents skipped this question

### 4.13 Existence of Compensatory Strategies for Aural Dyslexics by Type of Dyslexic Students Encountered**

<table>
<thead>
<tr>
<th>Compensatory Strategies?</th>
<th>Type of Dyslexic Students Encountered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aural</td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
</tbody>
</table>

**Four respondents skipped this question

### 4.14 Existence of Compensatory Strategies for Motor-Specific Dyslexics by Type of Dyslexic Students Encountered**

<table>
<thead>
<tr>
<th>Compensatory Strategies?</th>
<th>Type of Dyslexic Students Encountered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aural</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
</tr>
</tbody>
</table>

**Four respondents skipped this question

The number of confirmed dyslexic students with which teachers had experience (question six) was cross-tabulated with the type of dyslexic students encountered (question eight). Results were not found to be statistically significant (See table 4.15).
4.15 Number of Confirmed Dyslexic Students by Type of Dyslexic Students Encountered**

<table>
<thead>
<tr>
<th>Type of Dyslexic Students</th>
<th>Number of Confirmed Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 1-4 5-8 Over 20 “Don’t Know”</td>
</tr>
<tr>
<td>Aural</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>Visual</td>
<td>3 1 2 2</td>
</tr>
<tr>
<td>Motor-Specific</td>
<td>0 0 0 1</td>
</tr>
<tr>
<td>Combination</td>
<td>1 5 2 1 12</td>
</tr>
</tbody>
</table>

**Two respondents skipped this question

The number of suspected dyslexic students with which teachers had experience (question seven) was cross-tabulated with the type of dyslexic students encountered (question eight). Results were not found to be statistically significant (See table 4.16).
4.16 Number of Suspected Dyslexic Students by Type of Dyslexic Students Encountered**

<table>
<thead>
<tr>
<th>Type of Dyslexic Students</th>
<th>Number of Suspected Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Aural</td>
<td>0</td>
</tr>
<tr>
<td>Visual</td>
<td>0</td>
</tr>
<tr>
<td>Motor-Specific</td>
<td>0</td>
</tr>
<tr>
<td>Combination</td>
<td>0</td>
</tr>
</tbody>
</table>

**Two respondents skipped this question

The number of confirmed dyslexic students with which teachers had experience (question six) was cross-tabulated by music methods that work for aural dyslexics, visual dyslexics, motor-specific dyslexics, and combined dyslexics (questions nine-12). Results were not found to be statistically significant for aural dyslexics, visual dyslexics, motor-specific dyslexics, or combined dyslexics (See tables 4.17 through 4.20).
### 4.17 Number of Confirmed Dyslexic Students by Music Methods That Work for Aural Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Confirmed Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalcroze</td>
<td>0</td>
</tr>
<tr>
<td>Orff</td>
<td>1</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>
4.18 Number of Confirmed Dyslexic Students by Music Methods That Work for Visual Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Confirmed Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalcroze</td>
<td>0</td>
</tr>
<tr>
<td>Orff</td>
<td>1</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>
4.19 Number of Confirmed Dyslexic Students by Music Methods That Work for Motor-Specific Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Confirmed Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalcroze</td>
<td></td>
</tr>
<tr>
<td>Orff</td>
<td>0</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

4.20 Number of Confirmed and Dyslexic Students by Music Methods That Work for Combined Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Confirmed Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalcroze</td>
<td>0</td>
</tr>
<tr>
<td>Orff</td>
<td>1</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>
The number of suspected dyslexic students with which teachers had experience (question seven) was cross-tabulated by music methods that work for aural dyslexics, visual dyslexics, motor-specific dyslexics, and combined dyslexics (questions nine-12). Results were not found to be statistically significant for aural dyslexics, visual dyslexics, motor-specific dyslexics, or combined dyslexics (See tables 4.21 through 4.24).

4.21 Number of Suspected Dyslexic Students by Music Methods That Work for Aural Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Suspected Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalroze</td>
<td>0</td>
</tr>
<tr>
<td>Orff</td>
<td>0</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>
4.22 Number of Suspected Dyslexic Students by Music Methods That Work for Visual Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Suspected Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalcroze</td>
<td>0</td>
</tr>
<tr>
<td>Orff</td>
<td>0</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>
4.23 Number of Suspected Dyslexic Students by Music Methods that Work for Motor-Specific Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Suspected Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalcroze</td>
<td>0</td>
</tr>
<tr>
<td>Orff</td>
<td>0</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

4.24 Number of Suspected Dyslexic Students by Music Methods that Work for Combined Dyslexics

<table>
<thead>
<tr>
<th>Music Methods</th>
<th>Number of Suspected Dyslexic Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dalcroze</td>
<td>0</td>
</tr>
<tr>
<td>Orff</td>
<td>0</td>
</tr>
<tr>
<td>Kodály</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>
4.2 Discussion

The extremely small sample size, as well as the low response rate to the survey, is of great importance when discussing the results of this study. These results are generalizable only to the large urban district studied in Northwest, Ohio. However, if one tentatively assumes that all large urban public school districts operate in a similar manner, the results retain some of their value.

Some of the hypotheses presented were validated. A significantly higher proportion of respondents felt that dyslexia is a multi-faceted disorder (as much of the literature supports), rather than simply a reading disorder (as some of the literature supports). In addition, significantly more teachers agreed that dyslexia affects more in the lives of those diagnosed than simply reading. Furthermore, a significant percentage of teachers surveyed agreed that subtypes of dyslexia in fact exist, with the non-specific, or combined type of dyslexia, believed to be most common. A caution regarding these results involves the significantly high number of teachers who didn’t know how many dyslexic students (either confirmed or suspected) they had taught. It is questionable if teachers who cannot recognize dyslexia in their classroom have an adequate picture of its etiology. However, it is possible these teachers could have researched dyslexia on their own at some point during their career; thus, this should be added as a question should the study be replicated.

Results regarding the hypothesis about the best approach (Dalcroze, Kodály, and Orff) chosen for aural dyslexics was neither supported nor discredited. Results regarding the hypothesis that the best approach chosen for visual dyslexics would be Dalcroze and
Kodály in equal amounts, and Orff somewhat less, neither supported nor discredited the hypothesis. This was also true regarding the best approach for motor-specific dyslexics. Results were significant for the hypothesis regarding the best approach for non-specific, or combined, dyslexics. This hypothesis of equal amounts was not supported, with Orff as the preferred approach. Reasons for this may be that dyslexia as a multi-faceted disorder is still controversial, and Orff may be seen by this population as the “go to” approach if these students are encountered. This may also be due to the Orff Chapter in Northwest Ohio being both well-respected and attended.

Results regarding the hypothesis that teachers surveyed would agree that all dyslexics possess some compensatory strategies showed this hypothesis was partially correct. In the case of visual dyslexics and motor-specific dyslexics, results were “yes,” to a significant degree. However, in the case of aural dyslexics, results were “yes,” but were not found to be significant. One reason for this may be that more is known about dyslexia as a visual processing disorder, specifically with regard to differentiated instruction techniques for these individuals. Also, physical issues involving gait or coordination may have more obvious and tangible solutions to both dyslexic students and teachers than aural processing problems.

With regard to cross-tabulations, years of teaching was not found to be significantly related to either the definition of dyslexia, or what dyslexia affects. This is puzzling, considering that teachers, in addition to day-to-day interaction with all types of learners, also must usually be involved in continuing education to renew their licenses. However, one reason for this may be a lack of training specifically with special needs children. Years of teaching was also not significantly related to experience with either
confirmed or suspected dyslexic students. Thus, it would appear that gaining experience with and/or recognizing dyslexic students in the classroom is an issue that occurs randomly and independently of years of experience. The above reasoning applies similarly to years of teaching and the type of dyslexic students encountered, as these were also not found to be significantly related. Teaching experience was also not significantly related to which music methods worked best for any of the dyslexia subtypes. Overall, these results indicate music teachers may feel that it is not their responsibility to recognize dyslexic students, or are not equipped to teach dyslexic students, and that the difficulties dyslexic students experience stop at the door to the music classroom. Moreover, these assumptions may occur at all stages of the teaching experience. In support of this, a greater proportion of respondents did not know how many confirmed or suspected dyslexic students they had taught. These are all issues in need of further investigation.

The next set of cross-tabulations involved whether experience with confirmed or suspected dyslexic students was significantly related to the type of dyslexic students encountered (aural, visual, motor-specific, and combined), as well as which music methods worked best for aural, visual, motor-specific and combined dyslexics. The results showed that experience with both confirmed as well as suspected dyslexic students was not significantly related to the type of dyslexic students encountered. In the case of experience with confirmed dyslexic students and which music methods worked best for different types, results showed this was not statistically significant. Also, experience with suspected dyslexic students and which music methods worked best for different types was not statistically significant. Finally, the questions regarding
compensatory strategies were not significantly related to questions regarding dyslexic students encountered by respondents. Therefore, it seems that further investigation is needed regarding experience with dyslexic students and its impact on opinions and methods of music teachers.
Chapter 5

Summary, Implications, and Conclusion

5.1 Summary

A survey was sent to teachers in a large urban school district in Northwest Ohio. Respondents’ teaching experience ranged from seven to 46 years. Due to low response rate (35%), caution is necessary when generalizing the results of this present study to other populations.

Hypotheses were formed regarding the definition and effects of dyslexia, subtypes of dyslexia, music education approaches, and compensatory strategies of dyslexic students. Significant results include: Opinions of a high percentage of teachers that dyslexia is a multi-faceted disorder that affects all aspects of life, and opinions of a high percentage of teachers that dyslexia was a combination of aural, visual, and motor difficulties. Orff was a significantly popular choice of music teachers to educate combined dyslexics, and the belief existed among a high percentage of teachers that compensatory strategies for visual and motor-specific dyslexics exist. Due to the fact that
a significantly high percentage of teachers also did not know how many confirmed or suspected dyslexic students they had taught, the rest of the results may be suspect, unless teachers had independently researched dyslexia to come to these conclusions.

5.2 Implications for Music Education

Dyslexia appears, indeed, to be a disorder that is multi-faceted, which affects many areas of life, and has few hard and fast answers as to best practice. It seems that the low response rate to this survey could be attributed to the idea that because music teachers do not teach reading, they have nothing to contribute to the diagnosis and treatment of dyslexia. However, it is a disservice to students, both academically as well as musically, to continue to think of dyslexia as primarily a reading disorder that only affects reading and language, especially when music teachers, due to the varied nature of tasks students are required to do in the music classroom, are quite possibly on the “front lines” of discovering and assisting different kinds of dyslexic students through the use of differentiated instruction. Moreover, it has been shown that learning and performing music contributes to cross-hemispherical activations, (the effective combination of left and right functioning that further facilitates knowledge attainment) for individuals without dyslexia (Bennet & Bennet, 2008). In addition, practicing music (especially practicing rhythmic patterns) has been found to help dyslexic students with improving phonetics and spelling (Overy 2000; Overy et al 2003). Overall, music teachers are simply teachers with “music” in front of their name. Success for all students, both academically and musically, needs to be top priority.
The effects of music on dyslexia are clear, but what of the effects of dyslexia on music? This is yet another reason that music teachers must be aware of dyslexic students in their classrooms and how to best assist them. Dyslexic students may have true ability and/or compensatory strategies hidden behind difficulties caused by their disorder; and, music teachers should strive to bring out the best in all their students, dyslexic students not excluded. A few main points in this regard that are important for music teachers to remember include: Dyslexic students may not be readily recognizable to music teachers, or even diagnosed. The ways in which their musical skills will be affected, as well as how music teachers could best help them learn, both musically and academically, are challenges that must be unfolded and dealt with day by day. The good news is that, although further evidence is needed, teachers in this study currently practicing overwhelmingly advocate a multi-disciplinary approach to teaching dyslexics music, involving methodologies (Dalcroze, Kodály, and Orff) that have been hailed as best practice for years. Considering that the face of dyslexia is changing, a multi-disciplinary approach should also be advocated for teaching dyslexics not only music, but all academic subjects as well.
5.3 Conclusion

Dyslexia, the brain, music, and pedagogical music approaches have been examined to provide a background for discovering music educators’ experiences and opinions about dyslexia. Several hypotheses have been presented and tested, including those regarding definition, effects, dyslexia subtypes, music education approaches, and compensatory strategies for dyslexics. It is hoped these hypothesis will be tested at a later time with a larger sample size, using school districts in a variety of settings (urban, suburban, and rural) from different parts of the country, at which point, assuming favorable results, the implications can be applied broadly across music education, as well as other disciplines.
References


Appendix A

Dyslexia and Music Survey

What follows is a survey about music teacher experiences and perception of students with dyslexia.

Instructions: For each question below, please circle the answer you most agree with, or that which most accurately reflects your experiences (in large urban district only*)

1) Do you feel dyslexia is:
   a) Primarily a reading disorder that does not affect other areas.
   b) A multi-faceted disorder that can affect reading and other areas.

2) Does dyslexia affect:
   a) Reading and language only
   b) All aspects of life, including motor skills
   c) None of these

3.) How long have you been a practicing teacher? _________
4.) How long have you taught in [large urban district]?

Please Specify Grade Level(s)

5.) Roughly how many dyslexic (confirmed) students have you directly instructed over the course of your career (large urban district only)?

a.) 0
b.) 1-4
c.) 5-8
d.) 9-12
e.) 13-16
f.) 17-20
h.) over 20
i.) don’t know

6.) Roughly how many dyslexic (suspected) students have you directly instructed over the course of your career (large urban district only)?

a.) 0
b.) 1-4
c.) 5-8
d.) 9-12
e.) 13-16
f.) 17-20
h.) over 20
7.) In the literature, there are subtypes of dyslexia suggested. If you agree there are subtypes of dyslexia, which of these most accurately reflects the experience of *most* of the students you have taught?

a.) I do not agree (please go to question 12)

b.) Aural—difficulties hearing pitches and understanding speech, and the distortion of sounds heard in the absence of a specific hearing disorder

c.) Visual—difficulties processing visual information due to involuntary movement or fixations of the students’ eyes in the absence of a specific visual disorder

d.) Motor—difficulties with balance and coordination that impede learning (such as learning to play an instrument). May also be unusually clumsy or have an unusual gait in the absence of any physical malady

e.) A combination of the preceding three descriptions

Please read the following descriptions of the “big three” music education approaches before continuing:

**Orff:** Carl Orff was a German musician who wanted to achieve the ancient Greek goal of a combination of music, dance, and language. Orff felt music is vital to the education of children, is for all to participate in and enjoy, should be heard before being seen on the page, and should involve movement and the active creation of itself. The teacher must carefully structure improvisatory exercises to allow children freedom in creating their own musical forms and activities. In addition, creative imagination should be exercised fully to include not only musical activities, but also visual and dramatic play. Central to Orff practice in classrooms today are barred instruments, including xylophones, metallophones, and glockenspiels. The reason for this is that children can easily play notes correctly because they are carved on the bars, the bars are larger for lower sounds and smaller for higher sounds, and the spatial relationships are logical, both musically and otherwise. Finally, children can begin to visually link what they see with what they hear in their improvisatory discoveries.
**Kodály:** Hungarian-born Zoltán Kodály felt that music is for everyone, and learning music must start with the voice no later than 1st grade. Further, music used for teaching literacy and other facets should be of high quality and in the native language and culture of the children one is instructing. Music literacy is an intense focus of the Kodály approach. Solfège syllables (or specific words for sung pitches that remain constant regardless of key) are taught aurally and through the use of Curwen hand signs both by teacher and students. Rhythm is taught kinesthetically via clapping, patting, and percussion instruments, and also through the use of syllables for different rhythmic durations (example: ta for quarter note, ti-ti for two eighth notes). Rhythms may also be presented with iconic symbols before actual notation.

**Dalcroze:** the approach of Swiss musician Emile Jacques-Dalcroze offers a movement based foundation for educating music students. This approach includes solfège (or specific words for sung pitches that remain constant regardless of key), “eurhythmics” (a term coined by Dalcroze for expressive movement), and improvisation. Dalcroze believed the development of the ear, muscle response, and creative expression should all be incorporated together as the base of musicianship. In other words, emphasis is on developing better communication between eye, ear, mind, and body. Moreover, children should develop a storehouse of aural and kinesthetic rhythmic patterns and be able to recognize them in repertoire.

8. If you agree there are subtypes of dyslexia, which of the following music methods works best for aural dyslexics as described above (you may choose more than one)?

   a.) Dalcroze  
   b.) Orff  
   c.) Kodály  
   d.) other

9. If you agree there are subtypes of dyslexia, which of the following music methods work best for visual dyslexics as described in question 7 (you may choose more than one)?

   a.) Dalcroze
b.) Orff  
c.) Kodaly  
d.) other

10.) If you agree there are subtypes of dyslexia, which of the following music methods works best for *motor-specific* dyslexics as described in question 7 (you may choose more than one)?

   a.) Dalcroze  
   b.) Orff  
   c.) Kodaly  
   d.) other

11.) If you agree there are subtypes of dyslexia, do you find compensatory strategies exist in dyslexic students, wherein:

   a.) *visual dyslexics* possess strong aural skills, motor skills, or both?  
      Y    N

   b.) *aural dyslexics* possess strong visual skills, motor skills, or both?  
      Y    N

   c.) *motor-specific dyslexics* possess strong visual skills, aural skills, or both?  
      Y    N

12.) Would you like a copy of the completed research?  

      Y    N
If so, please provide your email address and one will be sent to you:

__________________________________________________

THANK YOU SO MUCH FOR YOUR PARTICIPATION!

*Please note name of the large urban district has been altered from how it appeared on the original survey to protect confidentiality of participants and district.