

# **Differences in Reading Comprehension Levels for Students Between Traditional Reading and Audio Recording Methods**

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## **Abstract**

As personal technology has become increasingly integrated and accessible into the daily lives of people of all ages, it has changed how all people, specifically young children, and adolescents, interact with the world around them. New technology significantly alters the landscape of education, and the current rise in personal technology has the potential to enhance the learning process. With the increase in accessibility and advertisement of audiobooks to children and adolescents without learning disorders or visual disability, there is a responsibility to determine the effect that audiobooks may have on the development of a healthy adolescent brain. Additionally, millions of students rely on alternative accommodations to even the playing field in their educational environment. There is an obligation to these students to ensure that they are receiving appropriate and effective accommodations that do not compromise the validity of standardized testing or the confidentiality of the students.

The focus on developmental learning disorders and early reading skills in past research on the topic of audiobooks leaves room to discover the impact that this technology can have on more mature readers who do not experience the difficulties associated with a learning disorder. This study aims to discover the effect of audiobooks used in place of traditional reading on healthy adolescents' reading comprehension levels.

## **Introduction and Motivation**

Personal technology has risen throughout the 21<sup>st</sup> century taking over American culture and become fully incorporated into daily life. As these technologies have become increasingly integrated and accessible, they have changed how all people, specifically young children, and adolescents, interact with the world around them. In the past, new technology has significantly altered the landscape of education and now personal technology has the potential to enhance the learning process. With the growth in accessibility and advertisement of audiobooks to children and adolescents, there is a responsibility to determine the effect that audiobooks may have on the development of a healthy adolescent brain.

Audiobooks are at the forefront of a cultural return to purely auditory entertainment outside of music. This trend has been followed by an increase in popularity of podcasts or audio entertainment files distributed over the internet which typically involves talks or interviews available in a series of episodes. While the term podcast was first used in 2004, audiobooks, or recordings of books being read aloud by a narrator, preceded podcasts with its first use in 1953. Until more recently, audiobooks were restricted to CD or tape recordings available to the public mainly through libraries and were primarily used as an accommodation for individuals with visual impairments. Research done on the digital audio consumption of teenagers in Columbia, Spain, and Mexico in 2018 found that adolescents had not yet incorporated podcasts fully into their listening routines. Researchers suggested that this distinction between podcasts and music may be tied to the higher word content of podcasts (Pedrero-Esteban et al., 2019, p. 110). Similarly, to podcasts, audiobooks are naturally word focused. The tendency for adolescents to listen to music over podcasts for recreation may highlight the struggle of grasping listener's attention and infrequent listening for comprehension.

However, with the rise of digital media, audiobooks have become easily accessible and widely used. This resurgence is indicated by the many different platforms that include audiobooks in their services such as Overdrive, Audible, Amazon, Scribd, and Google Play. These platforms and others now have focused advertisements towards teenagers and young adults that promote audiobooks as a way to incorporate reading into a busy lifestyle without needing to allocate time dedicated to reading. The possibility of performing other tasks while reading makes audiobooks an accessible way for busy individuals to consume stories. With the addition of various narrator styles and multiple narrators for audiobook recordings, audiobooks can create the story for the listener in a way that is more similar to movies and television.

Audio recordings have a robust history as an accommodation for individuals with visual impairments. This primary use case has seen audio cues integrated into many technologies as a part of the device's inclusive design. Inclusive design is defined as "the design of mainstream products and/or services that are accessible to, and useable by, as many people as reasonably possible on a global basis" (Gill, 2002, pg. 133). Auditory cues are fundamental for people with visual impairments who are interacting with a visual world. These auditory cues have been integrated into many everyday objects from cell phones to accessible crosswalks. However, often when companies are designing their products, they do not sufficiently collaborate with individuals with disabilities. This often leads to the company not being able to establish a comprehensive understanding of the challenges that they need to design their product to help mitigate. In terms of the research and development process for companies, a focus on cross-modal interaction is essential. Cross-modal interaction, in this case, is the interaction between visual, auditory, and tactile modalities. Incorporating cross-modal design into products works to engage multiple alternative senses in order to deliver information (Metatla et al., 2015, p. 35-36). Personal

technology has created the opportunity for individuals with a disability that impedes one of their senses to more fully interact with the world.

Beyond the use of audio as an accommodation in technology, it is also a less utilized accommodation in education that is rising in popularity. There are many cases where accommodations are necessary and appropriate in the classroom. These situations include when a student has a visual impairment, is blind, or has a learning or other disability. Schools are required to provide reasonable accommodations for students with obvious or documented disabilities under the Americans with Disabilities Act. While the specific needs for an individual with a disability greatly varies based on an array of factors, the term reasonable accommodation means that the action works to aid individuals to perform based on their own abilities by eliminating certain features that make the task difficult or impossible for them. These accommodations are legally required as long as these changes “do not create an undue hardship or a direct threat” (www.adata.org, 2017). In the realm of education and standardized testing, accommodations must be made in order to ensure “that the results accurately reflect the individual’s aptitude or achievement level, not the impairment” (www.adata.org, 2017). Typical presentation accommodations include listening to audio recordings, learning content through audiobooks, videos, and other digital media, having a designated reader, recorded lessons, and visual presentations of presented material (“Common Accommodations and Modifications in School”, n.d.).

Where audio recordings as accommodations stand out is in the administration of standardized testing like the SAT, a college readiness exam required for acceptance into many universities. The SAT was first introduced to college students in 1926 after psychologist Carl Birmingham adapted the Army Alpha test, an IQ test used on military recruits during World War

I (“Where Did the Test Come From?”, 2014). Following this introduction, the SAT was soon accepted by the College Board, originally a collection of 12 university presidents called the College Examination Board, which is the “organization [that] developed a standardized admissions exam” for their elite universities (“The history of the SAT”, 2019). Throughout the years the SAT has gone by several names including the original name of Scholastic Aptitude Test and the Scholastic Assessment Test that came later. Some of these changes have been prompted by criticism from individuals who claim that the SAT “integrates measures of achievement as well as [the] developed ability” and can no longer be considered an aptitude test in light of those changes (Commission on New Possibilities for the Admissions Testing Program, 1990, p. 9) From its origins as the Army Alpha IQ, test revisions to the exam have transitioned the SAT from strictly testing intelligence to the college readiness exam it is today.

The SAT is comprised of three mandatory test sections and one optional section including reading, writing and language, math, and an optional essay portion. The reading test involves reading passages from classic or contemporary works, historical documents, social science, and science-related passages. The questions that follow these passages assess the reader’s command of evidence, knowledge of words in context, analysis of history, social studies, and science. The questions that assess command of evidence require an understanding of “how authors use evidence to support their claims” and how to find relationships between two sets of information (“Inside the Test”, 2018). Words in context questions assess the ability of the student to “use context clues in a passage to figure out which meaning of a word or phrase is being used” and to “decide how an author’s word choice shapes meaning, style, and tone” (“Inside the Test”, 2018). Questions that require analysis of science, history, or social studies passages have students draw from the passages to examine, interpret, and consider the content provided (“Inside the Test”, 2018).

Due to the extensive reach and influence of the SAT as a standard for admission to colleges and universities, it is generally considered as a requirement for students planning to continue their education. The College Board provides various accommodations for students taking the SAT who have a documented disability. While 1.8 million students took the exam in the class of 2017, The College Board no longer reports on how many of these students are taking the exam using any of their accommodations (“Class of 2017 Test Results”, 2017). For all reporting since 2003 the College Board “no longer note[s] ‘Nonstandard Administration’” for students using their accommodations. However, in 2003 around 2% of students took the SAT with accommodations (Kurtzig Freedman, 2019).

Requests for accommodations must be approved by the College Board’s Services for Students with Disabilities and may take up to seven weeks to be approved. Some of their most common accommodations include extended time, computer-based exams, extra and extended breaks, and reading and seeing accommodations. Included in their presentation accommodations are large print tests, a reader who reads the entire test, signing or oral presentation of instructions, visual magnification, colored overlays, braille, an assistive technology compatible test, and an MP3 audio test format that is useful for individuals with visual impairments. Additionally, their timing and scheduling accommodations include frequent breaks, 50 or 100% extended time, and multiple day tests. Accommodations may also include changes in setting such as a private room or alternative testing site which may be beneficial to individuals with learning disabilities or who struggle with sustaining attention in busy environments (“Accommodations on College Board Exams”, 2019). While there are many different forms of accommodations, the transition from reporting accommodations means that there is no current data on how students using these accommodations are performing on the SAT. During the last year of reporting, 2003, the 2% or

32,654 students who took the SAT I under nonstandard conditions received a mean score of 474 on the Verbal test compared to the 508 mean score for standard condition test-takers, and a mean score of 481 on the Math test compared to 519 for standard conditions (“CB Seniors 2003 TOTAL GRP PRD”, 2003). The lack of data on this topic is significant because since 2003 the SAT has undergone many changes in the years since including scoring changes in 2005 and 2016 (“The history of the SAT”, 2019). While these changes were made with the intent of benefitting students, there is no way of knowing the effects of these changes on students who use accommodations.

Individuals with disabilities face significant challenges in many aspects due to their differences in functioning and accessibility. The National Federation of the Blind has collected statistics from various organizations that highlight the impacts that blindness has on an individual’s life. Of special interest are those that describe the educational attainment for these individuals. Of people between the ages of 21 to 64 who reported having a visual disability in 2016, 22.3% achieved less than a high school graduation, 31.6% achieved a high school diploma or equivalent General Education Development tests (GED), 30.3% achieved some college education or an Associate’s degree, and 15.7% achieved a Bachelor’s degree or higher. Within this same demographic, 27.7% were living below the poverty line and only 29.5% were employed full-time (Erickson, Lee, von Schrader, 2017). According to polls conducted by the American Printing House for the Blind in 2017, of the 63,357 students, 7.8% were braille readers, 32.3% were print readers, 10.8% were auditory readers, 32.7% were non-readers or symbolic readers, and 16.4% were pre-readers (American Printing House for the Blind, 2016).

Similarly to individuals with visual impairment, people with learning disabilities face challenges in pursuing their education. The impact of these challenges is widespread as 2.3 million students have been diagnosed with a specific learning disability or “a neurological condition that

interferes with an individual's ability to store, process, or produce information" ("New to LD", 2018). Learning disabilities have varying personalized effects but generally effects reading, writing, speaking, spelling, or reasoning abilities as well as impacting "attention, memory, coordination, social skills, and emotional maturity" ("New to LD", 2018). Each of these potential effects is in addition to the social and psychological impact that disabilities have on individuals, especially during adolescence and young adulthood.

### **Literature Review**

The ability of an adolescent to read, analyze, comprehend, and apply information that is provided to them in school is essential to their success in a traditional mainstream classroom. Reading comprehension is used as a stepping stone into further learning. Students are expected to "transition from 'learning to read' to 'reading to learn'" in order to continue onto secondary and higher education where the material is often not presented by a teacher and must be self-taught by the student through the process of reading and the associated reading comprehension (Leidig et al., 2018, p. 231). Children who experience difficulty in this transition require additional support to avoid falling behind their peers and not reaching their potential. Many factors may cause a child to miss this transition including a lack of effective reading strategies, insufficient background knowledge to apply to the text, or attention deficiencies (Leidig et al., 2018, p. 233). Unfortunately, these issues often compound upon one another and can result in a student falling behind their peers quickly if the issue is not recognized and an appropriate intervention is not implemented efficiently. A study from Germany employed the RAP strategy along with peer-tutoring and motivational strategies for students considered at risk. The RAP is a scaffolding technique for children that encourages a purposeful understanding of a passage. Students are told to "(1) 'Read a paragraph', (2) 'Ask yourself: What main idea does it contain?', and (3) 'Put the main idea into

your own words”” (Leidig et al., 2018, p. 234). After teaching this strategy to the children in a one-on-one setting, they found that this RAP intervention did result in an increase by reading comprehension skills, especially when paired with motivating factors (Leidig et al., 2018, p. 247).

Even though the cognitive processes involved in reading are complex enough on their own, it is not a holistic view of the reading process without recognizing the external factors that also come into play. Reading comprehension affects the student’s overall self-perception of academic achievement. In a study to investigate the relationship between self-perceived school performance and reading comprehension scores showed that children in elementary and middle school are keenly aware of their school performance and this awareness correlates to their reading comprehension scores (Beluce et al., 2018, p. 602). Children who achieve higher levels of reading comprehension have a better self-perception of total academic achievement (Beluce et al., 2018, p. 599). Whereas, the self-perception of a lower ability in at-risk students can lead to more complications such as the loss of motivation in academics which exasperate the issues already presented by lower reading comprehension skills. It is necessary to employ successful intervention and supportive techniques for these at-risk students to alleviate the social, emotional, and academic impacts of poor reading abilities.

Academic struggles experienced by individuals with learning disabilities may be especially frustrating because their academic achievement often does not match with their intellectual ability. This discrepancy may be partially explained by an information processing issue. Cortical auditory evoked potentials can be used to evaluate auditory information processing. These potentials can be found by recording the cortical response to auditory stimuli (Mirici et al., 2018, p. 404). According to audiology tests, children with learning disabilities may still process auditory stimuli abnormally in the absence of nonstandard results on traditional hearing tests. The stimulation of

auditory processing for these children through interventions such as music therapy has been shown to positively affect cortical auditory evoked potentials (Mirici et al., 2018, p. 407). These results imply the possibility of future music therapy interventions for individuals with learning disabilities to harness the benefits of utilizing multiple modalities of learning on the cortical level.

### ***Integration of Technology***

It has been well documented that the increasing prevalence of technology is changing the way children learn. Often technology and the digital world are feared when it comes to education and the same is true for the future of reading. Although there are educational television programs geared towards children that encourage learning and reading, there is the question of whether that encouragement translates to actual amplified interest in books and reading (Skouge, Rao, & Boisvert, 2007, p. 5). As technology becomes increasingly integrated into everyday life it is important to evaluate how we may use these new technologies to enhance learning especially since technology is being targeting for a younger and younger demographic. Given the increase in accessibility and advertisement of audiobooks to children and adolescents without learning disorders, there is a responsibility to determine the effect that audiobooks may have on the development of a healthy adolescent brain.

It has been suggested that audiobooks could have a positive impact on adolescent's literacy when employed in conjunction with other teaching methods. Unfortunately, many teachers do not have the time or resources to provide focused and individualized reading training for students who are beginning to struggle with reading. A benefit of audiobooks is that they can act as an educational tool while simultaneously acting as a form of entertainment that students will be more likely to want to engage in. For all students, including those struggling with reading, those who are reluctant to read, and those who enjoy reading, audiobooks can add an extra layer of

engagement. It has been shown that students who were instructed to listen to the book while they read along “were motivated to read ahead and focus more on the actual book” (Wolfson, 2008, p. 110). An argument associated with the increased use of audiobooks is that students will replace their reading with listening. The fundamental differences in modality between reading text and listening to audiobooks means that “audiobooks are not intended to replace the act of reading text” and it is essential to create a procedure of best practices before implementing audiobooks in the classroom (Wolfson, 2008, p. 111). Using audiobooks in education has the opportunity to not only directly benefit students academically but also to create a positive experience surrounding reading that leads to creating a lifelong reader.

While reading fluency and reading comprehension are separate aspects of the overall reading experience, a student must first achieve reading fluency in a language. Fluency involves the accuracy, speed, and fluidity of reading. Meyer (1999) defines reading fluency as “the ability to read text rapidly, smoothly, effortlessly and automatically with little attention to the mechanics of reading such as decoding” (as cited in Chang, 2011, p. 44). This fluency is essential to students as it allows them to focus less on the mechanics of reading and will therefore allow them to focus on the meaning behind what they are reading. Since the method of learning between audiobooks and physical books differs, audiobook listeners rely on another type of fluency or listening fluency. The development of listening fluency is especially difficult in individuals learning a second language. This difficulty stems from a variety of factors such as a “lack of constant exposure to spoken language delivered at normal speech rates with different accents and language use” (Chang, 2011, p. 44). This involves a lack of access to native speakers and the addition of slang and colloquial language that adds to the instability in listening to a language. Additionally, the normal rate of speech is often too fast for a language learner to be able to process the meaning of words

in addition to understanding basic linguistic elements (Chang, 2011, p. 45). As such, research has shown that this fluency along with vocabulary and dictation skills can improve when individuals read along in visual form while simultaneously listening to the same story (Chang, 2011, p. 58).

A study that followed students learning English as a second language over a 26-week period found differences in the students who received the read while listening (RWL) intervention compared to the formal instruction method. When looking at dictation skills, predictably the read while listening group saw an increase in their dictation abilities as did the control group. However, the amount of increase between the two groups was significantly different. The read while listening group saw over a 100% increase in their listening score compared to the modest increase of the control group as seen in Figure 1 (Chang, 2011, p. 52). In addition to the benefits seen in dictation abilities, the read while listening group also “gained significantly more words than the control group” seeing an increase of 566 words compared to 133 words in the control group (Chang, 2011, p. 53). An observation made by the researchers was “that students’ interest in these audiobooks also increased” (Chang, 2011, p. 58). Considering that students with reading difficulties often struggle with their motivation to read and tend to avoid academic and personal reading, this could be an important byproduct of using audiobooks. The lack of motivation that can be seen in individuals who struggle with reading comprehension has also shown to be partially counteracted when individuals listen to audiobook recordings while simultaneously reading.

*Table 1 The Mean Scores of Two Forms of Listening Test at Times 1&2*

**Table 1. The Mean Scores of Two Forms of Listening Test at Times 1 & 2**

| Group                    |           | Time 1 |           | Time 2 |           |
|--------------------------|-----------|--------|-----------|--------|-----------|
|                          |           | MC     | Dictation | MC     | Dictation |
| RWL ( <i>n</i> = 7)      | <i>M</i>  | 26.14  | 12.14     | 32.71  | 24.86     |
|                          | <i>SD</i> | 3.48   | 3.53      | 3.50   | 5.11      |
| Control ( <i>n</i> = 12) | <i>M</i>  | 26.50  | 9.33      | 29.25  | 16.42     |
|                          | <i>SD</i> | 3.26   | 4.68      | 4.39   | 5.81      |

*Note:* the maximum score = 40

*Table 1.* Descriptive statistics for the two subgroups at Time 1 (pre-test) and Time 2 (post-test). Reprinted from “The Effect of Reading While Listening to Audiobooks: Listening Fluency and Vocabulary Gain” by Chang, A., 2011. *Asian Anthropology*, 10, p. 52

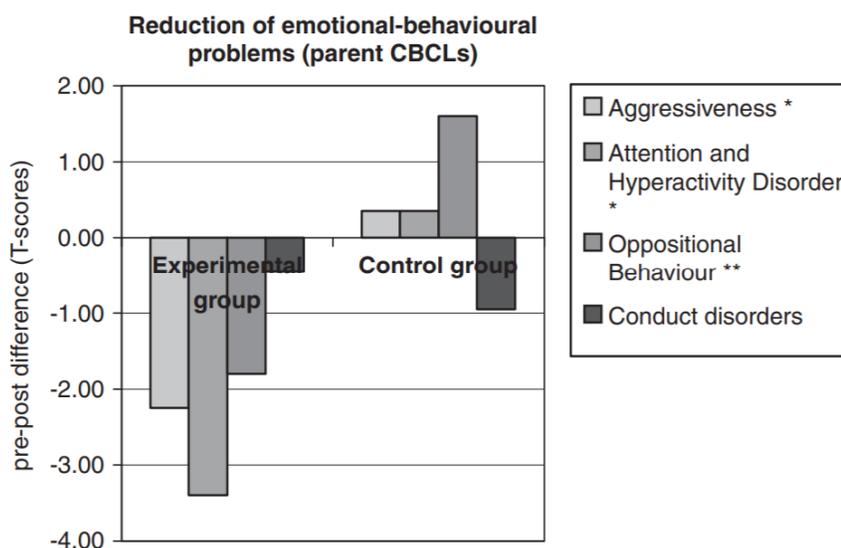
While audiobook recordings have not been shown to impact reading fluency, the greater excitement and interest in reading that is often gained through the combination of these methods can be considered a benefit for students using audiobooks. Children who lack access to fluent readers, if they are learning a new language or their home language differs from their in-school teaching language, typically have a lower self-esteem or confidence. In this case, the audiobooks are a great benefit which mitigates their lower confidence. (Boeglin-Quintana & Donovan, 2013, p. 55). Along with this benefit for children without access to fluent readers, audiobooks, as well as other forms of digital reading materials, like electronic books, may also have other features such as animations, sound effects, and general feedback that can help bridge the gap for children learning to comprehend the written word (Oakley & Jay, 2008, p. 246). Additionally, this collaborative approach of audiobook recordings and reading can be used to increase reading

stamina in children who may otherwise not be able to spend long times reading (Larson, 2015, p. 176). This increase in stamina can help all children, particularly those individuals who may struggle with their attention span including those who are diagnosed with attention deficit hyperactivity disorder (ADHD) or are dealing with any side effects from medications.

Given the long history of audiobook's being used as an accommodation for individuals who have difficulty reading lends to the natural association of audiobooks being used for people who have learning disorders. For children with a developmental language disorder, there are difficulties in all areas of language comprehension as well as in both the spoken and written modalities of a language. (Gough Kenyon et al., 2018, p. 2517). One example of a developmental learning disorder is dyslexia. Dyslexia is a term used to describe "a pattern of learning difficulties characterized by problems with accurate or fluent word recognition, poor decoding, and poor spelling abilities" for individuals who fall into specific criteria for being diagnosed with a Specific Learning Disorder described as a neurodevelopmental disorder according to the Diagnostic and Statistic Manual of Mental Disorders, 5<sup>th</sup> edition (DSM-V, APA, 2013).

Beyond the difficulties for a traditional student, individuals who have a specific learning disorder and are experiencing impairment with reading experience difficulties in the academic aspect of their schooling. As well these students experience negative social effects in relation to other adolescents and their teachers. Students with dyslexia more frequently report low self-esteem, anxiety, and depression associated with the additional academic pressure. The culmination of these psychosocial effects on adolescents can have a major impact on their overall development and personalities. A study on adolescents ages 11 to 16 years old who were previously diagnosed with a specific reading disability looked at the results of assigning these participants audiobooks had on their academic and emotional well-being (Milani et al., 2010, p. 89). The use of audiobooks

as an academic accommodation for these adolescents did not show any significant impact over the control group in terms of academic achievement in history, geography, or science. There was a beneficial effect on reading accuracy in the group that listened to audiobooks that likely resulted from the practice that following along to the audiobook allowed (Milani et al., 2010, p. 94). However, the results did show a “reduction of emotional–behavioral problems of the externalizing type (aggressive behavior, attention deficit with hyperactivity, oppositional behavior and conduct disorders)” according to the self-report questionnaire from their parents (Milani et al., 2010, p. 92). The researchers suggested that the reduction of those externalizing behaviors may have been reduced as a result of a feeling of increased independence which reduced the adolescent’s frustrations (Milani et al., 2010, p. 93).



*Figure 1. Reduction of emotional-behavioral problems. Reprinted from “The effects of audiobooks on the psychosocial adjustment of pre-adolescents and adolescents with dyslexia.” by Milani, A., Lorusso, M. L., & Molteni, M., 2010, Dyslexia (10769242), 16(1), p. 93*

### ***Visually Impaired Students***

Students with low vision or blindness face a different set of challenges in the classroom from those with a learning disability. These challenges stem from the reduction or elimination of visual learning mediums as an option. A learning medium is a tool used in education that is utilized in combination to aid in the student's education (Grbović, Stanimirov, & Jablan, 2013, p. 770). Traditional classrooms rely on a combination of visual and auditory learning mediums to help students in the learning process. While reading levels are frequently used as a measure of determining a student's educational level, "children with visual impairment often do not reach the reading speed of children without impairments" (Grbović, Stanimirov, & Jablan, 2013, 783). This deficiency extends to those students who are audio readers, braille readers, or those who use multiple reading methods combined. These students often struggle with reading speed and comprehension levels. Adding to this challenge is the fact that visual impairments and learning disabilities often coexist which may compound the issues of lower "reading fluency, vocabulary, and concept development" seen in individuals with either disorder (Jones & Hensley-Maloney, 2015, p. 226). Students experiencing both visual impairment and learning disabilities will require intentional support in both educational accommodations and social skill areas to increase their independence and avoid learned helplessness.

In research performed in China on the impact of silent or oral reading modes and braille reading patterns, students with visual impairments were assessed on their reading speed and comprehension. Previous research has shown that braille readers read at a much slower rate than their sighted peers but the impact of reading braille on reading comprehension has not been consistently determined (Chen et al., 2019, p. 2). The inconsistency of the research on braille reading's impact on comprehension is likely due to many factors including the student's training levels, "age at the onset of blindness, educational history, tactile sensitivity, mechanisms of

cognitive processing and perceptual characteristics" (Chen et al., 2019, p. 2). Not much is known about the impact that the age of onset of blindness has on braille reading comprehension skills. Some studies suggest that individuals who were congenitally blind or became blind at a very young age benefit from sensory compensation and better tactile identification skills over their counterparts who became blind later referred to as adventitiously blind individuals. In contrast, other studies suggest that individuals who once had sight are "able to stimulate their visual schema and gain a more comprehensive understanding" of what they are reading (Chen et al., 2019, p. 3).

Children usually progress from oral reading or reading aloud, to silent reading as they learn to read. Typically, visual readers are able to comprehend text efficiently through silent reading however, some research suggests that reading aloud still allows for higher levels of comprehension "especially in low ability or younger readers" (Chen et al., 2019, p. 2). The results of the study in China showed that while there was no significant difference between congenitally blind or adventitiously blind participants, those who read aloud while reading showed slower reading speeds and higher levels of reading comprehension similar to visual readers. Additionally, even participants in the silent reading groups often mumbled to themselves while reading. This suggests that auditory feedback provided by reading aloud allows for further processing (Chen et al., 2019, p. 6).

### ***Standardized Testing***

Recorded audio is one of the primary accommodation options for standardized tests like the SAT and ACT for individuals with a disability. The SAT and ACT are viewed as essential tests for high school students applying to universities. Many universities in the United States require the score for at least one of these two tests for admission to the school. Recorded audio and screen reading are the most common accommodation options for blind or visually impaired individuals

taking the test. Additionally, accommodations like additional time, recorded audio, and screen reading are seen as ways to level the playing field for every individual with a physical disability or learning disability. However, recorded audio accommodations fundamentally change the structure of a standardized test. It is essential to determine that individuals receiving accommodation are receiving beneficial accommodations that allow them to perform in a way that is accurate to their abilities on the test subject.

Research done through the College Board in 2005 on the SAT Reasoning test looked at what the impact of giving extended time on the SAT was in regards to scores. The SAT reasoning test involved traditional mathematics and reading questions that are now considered part of the SAT test after the name change in 2005. In the study, it was found that extended time was beneficial for medium and high ability students but provided no advantage for low ability students (Mandinach et al., 2005, p. 1). This finding helps dispel the idea that getting extended time on a test is beneficial to all students and will allow lower ability students to achieve disproportionately high results. However, this study also found that students with disabilities “did not perform as well on average as students without disabilities, regardless of the test-timing condition” (Mandinach et al., 2005, p. 16). While this result may be influenced by the inclusion of students with learning disabilities and ADHD, it brings up further questions of the effectiveness of the accommodations in helping individuals with disabilities.

### ***Reading Comprehension***

An adolescent reading comprehension level is tightly tied to their executive functioning. Beyond fluency and vocabulary, executive functioning has also been shown to predict reading outcomes. Executive functions include inhibition, or the ability to suppress responses when necessary, shifting, or the ability to switch attention between tasks, and working memory, or the

ability to revise and monitor representations in working memory (Georgiou & Das, 2018, p. 244). A model of the relationship between reading comprehension and the executive functions can be seen in Figure 2. The link between executive functions and reading comprehension brings the issue of reading comprehension abilities beyond the immediate classroom functioning and into a future predictor of success. These executive functions are essential for all individuals to develop since they are tied to self-regulation and management. These skills are not only predictors of academic achievement but also maintaining a healthy and productive lifestyle in general. As such, it is essential to improve these executive functioning skills through practice as an evaluation of comprehension.

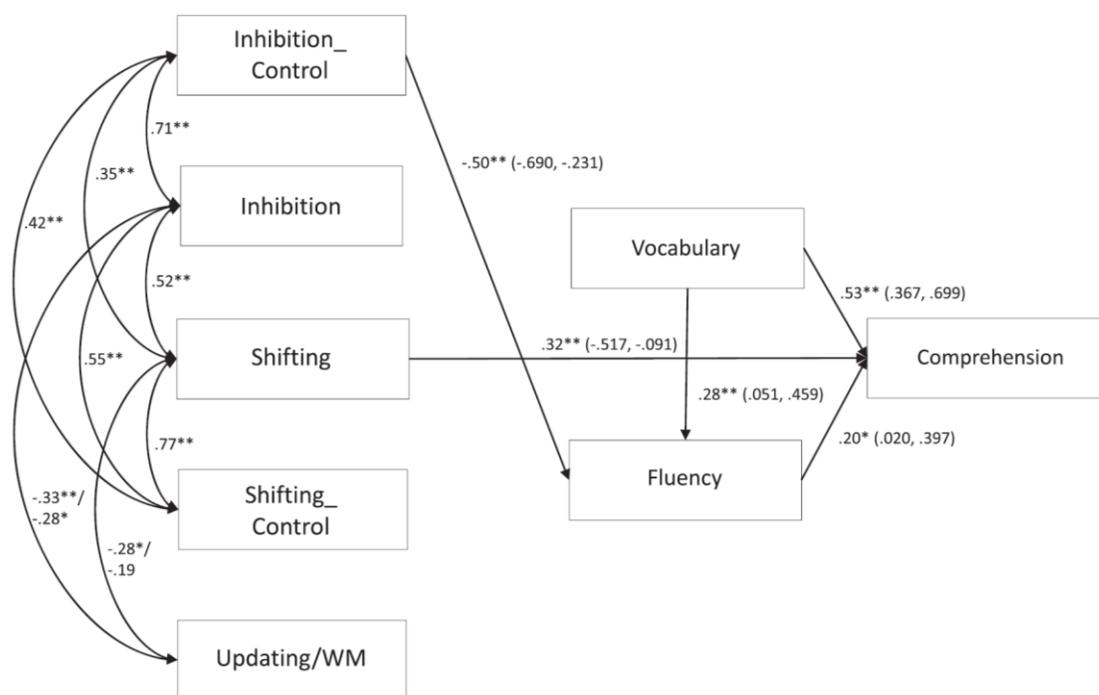


Figure 2. Reduced model of path analysis examining what executive functioning components predict reading comprehension. Reprinted from “Direct and indirect effects of executive function on reading comprehension in young adults.” by Georgiou, G. K., & Das, J. P., 2018, *Journal of Research in Reading*, 41 (2), 251.

Citing a deficiency in reading comprehension levels for children in the US, a group of researchers looked at students in Title 1 schools to investigate the relationship between a student's vocabulary knowledge and their reading comprehension. It is understood that decoding is a strong predictor for reading comprehension. Knowledge of vocabulary terms becomes "increasingly important to reading comprehension in the late elementary years" (Quinn et al., 2020, p. 609). This project focused on vocabulary size based on the idea that reading comprehension has two fundamental aspects, "word reading and linguistic comprehension" with the vocabulary being a learning skill that is essential to the reading comprehension process (Quinn et al., 2020, p. 609). This claim was made based on several hypotheses about the relationship between reading comprehension and vocabulary knowledge. Notably, Anderson and Freebody described the fundamental nature of vocabulary knowledge with their instrumental hypothesis. In addition to the fundamental nature of vocabulary knowledge aiding in reading comprehension, Anderson and Freebody emphasized that prior knowledge and experience with topics can directly enable a child to draw inferences required for comprehending passages. The third hypothesis about reading comprehension is the reciprocal hypothesis. This reciprocal hypothesis notes that the relationship between reading comprehension and vocabulary also works the opposite way, with successful reading comprehension increasing vocabulary knowledge through the ability of an individual to draw inferences about unknown words in the process of their reading.

Understanding this complex relationship between vocabulary knowledge and reading comprehension highlights the added difficulties that children in a low-income community's face in terms of literacy. Knowing that children from low-income families enter "preschool knowing fewer words and are more likely to have a learning disability", these researchers, therefore "sought to examine the co-development of vocabulary knowledge and reading comprehension" in students

from at-risk schools in Florida (Quinn et al., 2020, p. 611). To do this, children with both a diagnosed learning disorder and those without a diagnosed learning disorder were assessed using the Peabody Picture Vocabulary Test and the Stanford Achievement Test for Reading Comprehension each year from kindergarten to fourth grade to assess their development of vocabulary knowledge and reading comprehension. Their results showed support for the reciprocal hypothesis but only for students without a learning disability. Additionally, this study did not see a developmental lag but rather a developmental deficit for students with an identified learning disorder. Students with a learning disorder "did not catch up with their typically developing peers in reading comprehension by Grade 4" (Quinn et al., 2020, p. 621). While students with a learning disorder and a lower ability in reading comprehension saw a larger increase in their ability than students with a learning disorder who started at an average reading comprehension score, on average they still did not reach the reading comprehension levels of their counterparts without a learning disorder within the scope of the project. The lack of support for a beneficial relationship between vocabulary knowledge and reading comprehension, programs for students with learning disorders may be more effective when focused on the decoding piece of reading (Quinn et al., 2020, p. 623).

Researchers at Adiyaman University in Turkey looked at the effects of the TWA metacognitive strategy, or "Think Before Reading, Think While Reading, and Think After Reading", for students with learning disabilities. The purposeful addition of metacognitive strategies is important for learning disabled students as research has shown that these students either do not develop these strategies on their own or do not use effective strategies (Firat, 2019, p. 25). Metacognition in reading comprehension calls for active participation in the form of "developing [an] understanding of an author's purpose, adjusting reading speed, taking notes,

interpreting the meaning in the context, asking questions, making inferences, paraphrasing, and re-reading sections" in a way that allows the reading process to continue effectively (Firat, 2019, p. 24). The SRSD technique, or self-regulation strategy development, involves six different steps that work to teach students skills that will allow them independence. This process progresses from the teacher developing prerequisite skills with the student, discussing strategies together, then the teacher becomes a model for the student. The students are then expected to learn the strategies through practice, guidance, and support until students can independently practice and implement these strategies on their own (Firat, 2019, p. 27).

The three parts of the TWA strategy were utilized in the research done at Adiyaman University to study the effectiveness of these strategies for students with learning disabilities as well as how these strategies were maintained for students after three and six weeks. The results of this study showed that the participants each had an increase in their reading comprehension skills. These results were determined by their performance on texts developed by Karasu, Girgin & Uzner to look at the ability of the students to generalize the strategies that they were taught through expository texts (Firat, 2019, p. 31). This study had some significant limitations in its generalizability. Specifically, there were only three participants and these three participants were only followed as far as six weeks after the implementation of the strategies. Even with these limitations, all three students showed improvement in reading comprehension. Although they all improved, they did not all reach the same level of reading comprehension skill. These results suggest that the TWA strategy may be beneficial for students with learning disorders however, future research would need to be done to determine if these results can be generalized to a larger population. As well future research would need to evaluate if this strategy is successful over a longer period and/or the benefits of this strategy for younger students.

Reading comprehension may be viewed in a neuropsychological perspective that takes into consideration the interplay of motivation, attention, and working memory. While much research has been done that developed knowledge about the basic skills and foundational elements of reading skills, the persistence of reading difficulties in children who receive current interventions shows that these interventions fall short in correcting the higher-order reading skills that advanced reading comprehension relies on (Wasserman, 2012, p. 42). A neuropsychological perspective on reading difficulties may be able to provide a more holistic understanding of these core issues. The process of obtaining the basic and advanced skills required for reading happens together as opposed to solely learning basic skills and then advancing towards comprehension. However, the impact of the individual skills changes as a child's reading becomes more advanced, with whole-word decoding being more beneficial for younger children and then becoming less highly correlated with reading comprehension as the child progresses in their schooling (Wasserman, 2012, p. 43).

Essential to achieving comprehension is the creation of mental representations of a text. In successful reading comprehension, these mental representations are described as coherent when "meaningful connections are established between discrete units of new information (text) and the reader's prior knowledge (an existing network of related information)" (Wasserman, 2012, p. 43). These coherent connections rely on executive support strategies like working memory and attention that readers must employ in order to create and maintain their mental representations of the text. Attention, an ability to utilize an individual's cognitive resources on a specific task, and motivation are often limited in individuals who experience reading difficulties (Wasserman, 2012, p. 44). Influential models of attentional deregulation cite the impact of dopamine and noradrenaline on the executive control circuit. Likewise, working memory requires sustained activity in the

prefrontal cortex which relies on the functioning of these same dopaminergic pathways (Wasserman, 2012, p. 47). These models of attentional deficiencies lend to the unified learning model which "defines motivation as an executive process that directs effort and attention to a particular task" and requires working memory to enable connections between old and new information (Wasserman, 2012, p. 48). Overall, this neuropsychological perspective on reading comprehension classifies reading difficulties as an issue-based in executive functioning with an inability to effectively allocate "attentional and working memory resources" (Wasserman, 2012, p. 48).

### **Theories and Interventions**

Researchers at the Institute of Mental Health in Singapore studied the effect of an Auditory-Visual Interactive Decoding (AVID) reading program for children receiving psychoeducational services. Children who have reading difficulties often experience frustrations that impact not only their academic experience but their social and emotional experiences. For children with learning disorders and reading difficulties, orthographical interventions that focus on teaching children to examine words in terms of the common visual patterns are used. These orthographical interventions are used to counteract processing "letters either as individual units or as garbled or transposed combinations" that is frequently seen in poor readers (Joo Lian Kheng et al., 2009, p. 72). This difficulty is also seen in children with ADHD who have working memory deficits. These deficits can be seen in the ability to recall sentences at a significantly lower rate than their control counterparts with other psychiatric diagnoses. The AVID method seeks to train children who do not naturally read words in the most efficient manner by using patterns to adopt those techniques in order to improve their reading fluency and comprehension. When students have poor reading fluency, struggle to read the individual words, they are not able to make efforts to understand the

meaning behind what they are reading. Using multiple tests including the Test of Word Reading Efficiency, the Wechsler Individual Achievement Test (2nd edition), informal AVID tests, and the Fry 1000 Lists High Frequency Sight Words, this study found that children who received 30 to 42 hours of AVID intervention showed maintained improvement in their ability to decode words between 5 to 10.5 months (Joo Lian Kheng et al., 2009, p.83). This improvement in the recognition of sight words by using pattern focused teaching as opposed to specific word training shows promise for more effective orthographic interventions.

The theory of reading disabilities being a result of improper temporal processing in multiple domains as opposed to the result of a disorder in a specific sensory domain was examined in research from Solan for the Journal of Optometric Vision Development. This theory questions the long-held belief that developmental dyslexia is a language processing disorder. Instead, it claims that individuals with reading disabilities have difficulties with the integration of auditory and visual input (Solan, 2004, p. 16). Visual attention requires directed activation and vigilance to create sustained attention to the appropriate visual stimuli. This study utilized 12, 1-hour weekly sessions of temporal vision-processing therapy that works to teach participants visual cognitive strategies like "attention and sensitivity to moving targets and low spatial frequencies" (Solan, 2004, p. 18). Compared to the control group that did not receive the therapy and saw no significant change in reading comprehension, these participants who were 6th graders considered to be moderately disabled readers saw their "learning rate in reading improved from 58% to 220%" in 5 months (Solan, 2004, p. 17). This study suggests that creating an intervention that considers multiple modalities of processing into consideration will provide a more effective treatment of a reading disability.

While learning institutions are often familiar and prepared to accommodate individuals with impairments that are obvious or visible, individuals with less visible impairments are chronically underserved. Learning difficulties that involve "problems in speaking and listening, in reading, in writing, difficulties in learning mathematics, in organizations skills, problems with social skills and motor skills" fall into the category of those less visible disorders (Angelka & Goran, 2018, p. 32). An individual is considered to have an intellectual disability when there is a "delayed and longer duration of individual phases of development" that can impact their overall functioning (Angelka & Goran, 2018, p. 32). However, many individuals without an intellectual disability still face specific learning disorders like dyslexia, dysgraphia, and dyscalculia which "allows the typical psychosocial development" but still experience difficulties in their education (Angelka & Goran, 2018, p. 32). Whether learning difficulties result from a socioeconomic cause, biological, or a combination of different factors, the impact on the educational process makes it necessary to create individualized approaches to mitigate these issues. Researchers Angelka and Goran looked at the level of abilities in individuals with intellectual disabilities and special learning problems. They found that both the group of individuals with both intellectual disabilities and special learning problems, as well as, the control group without intellectual disability scored the highest on subtests that evaluated their visual association. Both of these groups also scored the lowest for the subtest that evaluated their auditory memory. From an intervention standpoint, Angelka and Goran suggested utilizing visual association more frequently as it is the most well-developed ability but also encouraged a focus on stimulating auditory memory for all students (Angelka & Goran, 2018).

Defining a reading disability comes with a set of challenges posed by the fact that there is a variability of diagnosis over time and it does not necessarily correlate with a child's IQ scores. A

suggested measure in defining a reading disability is to look at the discrepancy between listening and reading comprehension as opposed to the discrepancy between IQ scores and achievement (Badian, 1999, p. 139). This alternative version of defining a reading disability would allow for discrimination to be made of whether the deficiency is in understanding or in word decoding. The connection would, therefore, need to be made between listening comprehension and reading comprehension. Determining a classification system for reading disabilities is made more complicated through the fact that there is often a lack of stability in the current classification systems for an individual over time. In this study, the stability of the classification of individuals as having a reading disability was generally low with 25% of the children classified as reading disabled in 1<sup>st</sup> grade remaining in that classification by the time they reached 2<sup>nd</sup> grade (Badian, 1999, p. 145). However, this lack of stability is in line with traditional methods of classification and highlights the need for a clearer understanding of how to best classify individuals with reading disabilities. It has been shown that the correlation between listening comprehension and reading comprehension is larger as the individual gets older. This effect may be due to the heavy reliance on decoding. The reliance on decoding is high while children are still learning to read and then decrease as a student becomes a more proficient reader. This difference suggests that using listening comprehension in place of reading comprehension for individuals who require accommodations may become more reliable measure as the student gets older (Badian, 1999, p. 146).

In research from the University of Padova the impact of higher-order processing skill training programs on reading comprehension was studied with a special focus on the modality of the training program. The intervention consisted of two training programs, a listening program, a reading program, and an active control group, delivered to children in the fourth and fifth grades

over 22, 1-hour sessions held twice a week. These programs focused on training metacognition, working memory, and integrating information. Each of the three skills that were focused on in the training programs was a part of the situational model of reading in which the reader creates "a meaning-based representation of the text" (Carretti et al., 2014, p. 195). These higher-order skills become increasingly essential to the ability to comprehend a text over basic decoding skills in adolescence. Unlike in previous research, the training programs in Padova sought to analyze the impact of these different skills working in conjunction with each other when employed in a class context (Carretti et al., 2014, p. 195-196). The participants in this study were tested with pre and post-test assessments looking at the effects on metacognition for text sensitivity, strategy use, and self-monitoring, as well as working memory, and integration skills (Carretti et al., 2014, p. 198-199).

Both training programs showed a benefit over the active control group with an increase in overall scores and outperforming the active control group at the post-test stage (Carretti et al., 2014, p. 205). Interestingly, only the reading training program saw an improvement in working memory which was tested using a different modality, a listening comprehension task (Carretti et al., 2014, p. 206). While the increased benefit in the reading group may be associated with improved decoding skills that are associated with reading practice, even children who do not struggle with decoding skills saw an advantage in the reading program over the listening group (Carretti et al., 2014, p. 207). Additionally, the effect could be exaggerated by the fact that the listening task was a change in the testing modality for the reading comprehension training group whereas it used the same modality as the rest of the session for the listening comprehension training group. This difference leads to the possibility of fatigue impacting this result (Carretti et al., 2014, p. 206). However, coupled with the sample size of 185 students among the three groups, there was

also a considerable dropout rate in the study with 14 children in the reading group, 10 in the listening, and 2 in the active control group (Carretti et al., 2014, p. 204). Future research would need to be done to determine the possibility of the reading comprehension training program positively impacting reading and listening comprehension modalities. The transfer of benefits between modalities and sustained benefits over 8 months with the reading comprehension training but not the listening comprehension training are of particular interest for future research (Carretti et al., 2014, p. 206).

Researchers from the University of Georgia "investigated the auditory and visual working memory functioning in college students with attention-deficit/hyperactivity disorder" and learning disorders (Liebel & Nelson, 2017, p. 980). Despite the difficulties that students with ADHD experience in academics and the increasing rate at which these students are entering universities, this older population is underrepresented in the plethora of research in reading. The neurocognitive deficits "in attention, executive functioning, learning, and working memory" seen in children with ADHD are likely to remain into adulthood even for those students who progress to postsecondary education however the lack of research on this population limits our understanding of how these differences may impact college students specifically (Liebel & Nelson, 2017, p. 981). The research that has been done with children shows that "visual WM (VWM) was weaker than auditory WM (AWM)" with a much weaker performance with visual memory (Liebel & Nelson, 2017, p. 981). However, the research done with students in postsecondary education did not show these same results. Instead, a group of college students with ADHD without a learning disorder diagnosis showed no difference between AWM and VWM (Liebel & Nelson, 2017, p. 987). The result of this study suggests that neither auditory or visual working memory has a significant impact on basic reading fluency abilities in this population (Liebel & Nelson, 2017, p. 988).

A common conception in the field of education is the idea that matching learning styles to instruction style will benefit students and create a more efficient learning environment. Frequently learning styles are defined through Dunn and Dunn's Learning Styles Inventory which focuses on different modalities such as visual, auditory, tactile, and kinesthetic processing (Rogowsky et al., 2015, p. 64). Despite the pervasive nature of the theory of learning styles, there is a lack of empirical evidence on the topic. Rogowsky et al. studied learning styles to determine the relationship between learning style preferences and learning aptitudes (Rowgowsky et al., 2015, p. 65). Participants in this study took the Building Excellence Online Survey Styles Assessment Inventory in order to be divided into groups based on their preferred learning style as primarily auditory or visual word learning styles. They then were evaluated on the Listening Aptitude Test and the Reading Aptitude Test and were randomly assigned to either read an e-book or listen to an audiobook recording and answer comprehension questions on the passages they read. This study found that preferred learning style was "not found to significantly predict differences in learning aptitude" and instead, the participants who were classified as having a preference for "visual word learning style outperformed those classified as having a preferred auditory learning style on both the listening and reading comprehension aptitude tests" (Rowgowsky et al., 2015, p. 76). These results lend themselves to further questions about the different learning modalities. While participants in the reading group were allowed to read at their own pace, they were not allowed to re-read or skip text and participants in the audiobook group were not allowed to replay or fast-forward the recording (Rowgowsky et al., 2015, p. 68). This aspect of the study may have led to results that are less applicable to the traditional classroom where an individual utilizing either learning style would be allowed to replay or re-read the material which may reduce some burden on their memory. Additionally, the history of these participants was not documented. Traditional

classrooms employ visual learning styles during comprehension exams. This prior experience with the visual learning style may account for the benefit of a visual learning method for both individuals with this preference and those with auditory learning style preference.

Overall, more people are beginning to integrate audiobooks into their everyday lives. From the available research on audiobooks, reading comprehension, and learning disabilities it is clear that audiobooks or other audio interventions can have a positive impact on academic achievements and personal enjoyment for individuals learning to read or learning a new language. However, there is a lack of research on how audiobooks may impact the reading experience of mature readers and impact reading comprehension and the learning process for typically developing children. The proposed study will look at the immediate impact of a transition to integrated audio recordings such as those provided as an accommodation in standardized testing in typically developing students.

## **Methodology**

### ***Hypotheses***

The purpose of this study is to increase understanding of the experience of listening to audio recordings and to see how this experience compares to the traditional reading experience. To do this, we will be examining the relationship between these reading methods and an individual's reading comprehension scores on a standardized test, the SAT. The hypothesis for this primary outcome is that listening to SAT level passages will result in lower reading comprehension scores than traditional reading. The null hypothesis is that listening to SAT level passages will have no effect on reading comprehension scores. To analyze the data for this hypothesis the data between the traditional reading and audio recording methods will be analyzed using an independent samples t-test.

A secondary outcome of this study is to examine any gender effect between males and females in both the traditional reading and audio recording groups. The hypothesis for this outcome is that there will be a significant difference in reading comprehension scores in the audio recording group when compared to the traditional reading group. The null hypothesis is that there will be no difference between males and female's reading comprehension scores in the audio recording or traditional reading groups. The statistical analysis that will be utilized for this outcome is an ANOVA test. Another secondary outcome from this study is to look at the differences in reading comprehension scores between the methods for participants who indicate their native language to be other than English. The hypothesis for this outcome is that participants who indicate English as their native language will have higher reading comprehension scores for traditional reading and audio recording methods when compared to participants who indicate any other language as their native language. The null hypothesis is that participants who indicate English as their native language will have no difference in scores on traditional reading and audio recording methods

when compared to participants who indicate any other language as their native language. A third secondary outcome from this study is the examination of differences between participants who indicate themselves as first-generation college students and those who do not. The hypothesis for this outcome is that participants who indicate that they are a first-generation college student will have lower reading comprehension scores for traditional reading and audio recording methods when compared to participants who indicate that they are not first-generation college students. The null hypothesis is that participants who indicate that they are first-generation college students will have no difference in scores on traditional reading and audio recording methods when compared to participants who indicate that they are not a first-generation college student. A final secondary outcome will be to look at the connection between familiarity and positive feelings towards audiobooks and reading comprehension scores. The hypothesis for this outcome is that participants who indicate slightly or strongly positive feelings towards audiobooks will have higher reading comprehension scores in the audio recording group when compared to participants who indicate neutral, slightly, or strongly negative feelings towards audiobooks. The null hypothesis is that feelings towards audiobooks will not affect reading comprehension scores in the audio recording group. The statistical test that will evaluate these outcomes is an ANOVA test.

### ***Participants***

This study will utilize a convenience sample of undergraduate students from Houston Baptist University. These undergraduate students will be recruited via a recruitment email sent out from their professor through Blackboard. Students will be asked to voluntarily participate in this research. The recruitment email will introduce the study and will include the link to the survey through SurveyMonkey. Eligible participants will be undergraduate students who are 18 to 21 years old. Participant's data will be excluded from the sample if they indicate that they "cannot do at all" to the demographic questions "do you have difficulty seeing , even if wearing glasses" or

“do you have difficulty hearing, even if using a hearing aid”. This population has been selected to aid in the generalizability of results to target the main SAT and other standardized testing populations. A sample size of 200 participants will be required for this study. Since the study will be conducted online, there will be no face to face contact with the researcher with any participants. Participants will be asked to complete an informed consent prior to beginning the survey.

### ***Procedures***

Individuals who choose to begin the survey will be asked to complete an informed consent that highlights their voluntary participation in a research study about reading comprehension. In the informed consent, individuals will be made aware of their right to withdraw consent at any time or skip any questions. After completing the informed consent, participants will be randomly assigned to receive one of three versions of a survey. The survey is comprised of two reading passages from the College Board’s practice SAT reading test and a section of 14 demographic questions. The survey will include an excerpt from Charlotte Brontë’s “The Professor”, and Lydia Minatoya’s “The Strangeness of Beauty”. These passages will be presented to the participant in the form of either traditional text for them to read, as an audio recording of the passage, or both modalities will be presented. Participants who are randomly assigned to the audio recording group will receive the standard instructions presented with the SAT accompanied by a link to a YouTube video with the audio recording. Participants who are assigned to the traditional reading group will receive the text of the passage along with the standard instructions presented with the SAT. Participants who are assigned to the combination group will receive the text of the passage, a link to a YouTube video with the audio recording, with the standard instructions presented with the SAT. There will be no time requirement and participants may go back and reread or relisten to the passage as frequently as they deem necessary. All participants will then complete a section of 14

demographic questions. In this section, participants will also be asked to report their attitude towards traditional reading and audiobook reading methods.

### ***Variables***

The independent variable for this experiment will be the method of reading. The methods utilized will be traditional visual reading, listening to an audio recording of the passage, or visual reading while listening to an audio recording of the passage. The dependent variable for this experiment will be the difference in reading comprehension level. Reading comprehension levels will be determined through the use of SAT reading comprehension test questions. The SAT reading comprehension test will be used to evaluate the reading comprehension levels in traditional reading and audio recording methods.

### ***Confounds***

This study could be impacted by several confounds. Attrition may occur due to the level of engagement required from the survey. The participant's history with audiobooks and traditional reading including both positive and negative experiences could influence the participant motivation in the study. Participant's attitude towards reading and technology can influence their experience performing the procedure. Additionally, genre preferences and familiarity with the passages and the authors can impact the participant experience. Test anxiety may impact the participant's ability to perform on the reading comprehension tests. Previous educational experience and educational background will influence an individual's reading comprehension scores.

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## **Appendix**

### **Informed Consent**

#### **TITLE OF STUDY**

Differences in Reading Comprehension Between Traditional Reading and Audiobooks

#### **PURPOSE OF STUDY**

You are invited to take part in a research study conducted by Kathleen DiBacco, a graduate student at Houston Baptist University.

The purpose of this study is to understand the differences in how people understand a story when they read it and when they listen to it. If we are able to recognize the differences between these reading methods then we can have a better awareness on how technology will impact learning in the future.

Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate or to stop participating at any time without penalty. You are not guaranteed any personal benefits from participating in this study. If you don't understand something in this form it is your right to ask the researcher for clarification or more information. If at any time you have questions about your participation, do not hesitate to contact the researcher(s) named above.

#### **STUDY PROCEDURES**

The study will be conducted online through SurveyMonkey. During the study you will first be provided with a short list of instructions for the following story passages that you will answer questions about. You will read or listen to two passages and then answer 10 multiple choice questions about each passage. After completing the questions you will click next and fill out some questions about yourself. This study should take about 30 minutes to complete.

#### **BENEFITS AND RISKS**

There are minimal risks associated with this research. It is possible that the information provided in this study might be seen by unauthorized personnel, however no identifiable information will be collected from you during this study. You may refuse to answer any question at any time. You may also withdraw from or stop any procedure at any time.

There may be no direct benefit to you for your participation in this study. However we hope that the information obtained from this study may help increase the understanding that we have about the impact that audiobooks have on learning.

## **CONFIDENTIALITY**

Your responses to this survey will be anonymous. Please do not write any identifying information on your survey.

## **CONTACT INFORMATION**

If you have questions, concerns, or complaints at any time about this study, or you experience adverse effects as the result of participating in this study, you may contact the investigator, Kathleen DiBacco at [dibaccok@hbu.edu](mailto:dibaccok@hbu.edu). If you have questions regarding your rights as a research participant, or if problems arise which you do not feel you can discuss with the investigator, please contact the Faculty Supervisor, Dr. Joseph Pelletier at [Jpelletier@hbu.edu](mailto:Jpelletier@hbu.edu) or 281-649-3051 or you may contact the Institutional Review Board.

## **VOLUNTARY PARTICIPATION**

Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign this consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason without any negative effects.

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## **CONSENT**

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

By checking “I Agree” below, you acknowledge that you have read this information and have had the study purposes, procedures, risks and benefits explained to your satisfaction.

## Reading Comprehension Measures

Questions 1-10 are based on the following passage.

This passage is from Lydia Minatoya, *The Strangeness of Beauty*. ©1999 by Lydia Minatoya. The setting is Japan in 1920. Chie and her daughter Naomi are members of the House of Fuji, a noble family.

1 Akira came directly, breaking all tradition. Was  
2 that it? Had he followed form—had he asked his  
3 mother to speak to his father to approach a  
4 go-between—would Chie have been more receptive?

5 He came on a winter's eve. He pounded on the  
6 door while a cold rain beat on the shuttered veranda,  
7 so at first Chie thought him only the wind. The maid  
8 knew better. Chie heard her soft scuttling footsteps,  
9 the creak of the door. Then the maid brought a  
10 calling card to the drawing room, for Chie.

11 Chie was reluctant to go to her guest; perhaps she  
12 was feeling too cozy. She and Naomi were reading at  
13 a low table set atop a charcoal brazier. A thick quilt  
14 spread over the sides of the table so their legs were  
15 tucked inside with the heat.

16 “Who is it at this hour, in this weather?” Chie  
17 questioned as she picked the name card off the  
18 maid's lacquer tray.

19 “Shinoda, Akira. Kobe Dental College,” she read.

20 Naomi recognized the name. Chie heard a soft  
21 intake of air.

22 “I think you should go,” said Naomi.

23 Akira was waiting in the entry. He was in his early  
24 twenties, slim and serious, wearing the black  
25 military-style uniform of a student. As he  
26 bowed—his hands hanging straight down, a  
27 black cap in one, a yellow oil-paper umbrella in the  
28 other—Chie glanced beyond him. In the glistening

29 surface of the courtyard's rain-drenched paving  
30 stones, she saw his reflection like a dark double.

31 "Madame," said Akira, "forgive my disruption,  
32 but I come with a matter of urgency."

33 His voice was soft, refined. He straightened and  
34 stole a deferential peek at her face.

35 In the dim light his eyes shone with sincerity.  
36 Chie felt herself starting to like him.

37 "Come inside, get out of this nasty night. Surely  
38 your business can wait for a moment or two."

39 "I don't want to trouble you. Normally I would  
40 approach you more properly but I've received word  
41 of a position. I've an opportunity to go to America, as  
42 dentist for Seattle's Japanese community."

43 "Congratulations," Chie said with amusement.  
44 "That is an opportunity, I'm sure. But how am I  
45 involved?"

46 Even noting Naomi's breathless reaction to the  
47 name card, Chie had no idea. Akira's message,  
48 delivered like a formal speech, filled her with  
49 maternal amusement. You know how children speak  
50 so earnestly, so hurriedly, so endearingly about  
51 things that have no importance in an adult's mind?  
52 That's how she viewed him, as a child.

53 It was how she viewed Naomi. Even though  
54 Naomi was eighteen and training endlessly in the arts  
55 needed to make a good marriage, Chie had made no  
56 effort to find her a husband.

57 Akira blushed.

58 “Depending on your response, I may stay in  
59 Japan. I’ve come to ask for Naomi’s hand.”

60 Suddenly Chie felt the dampness of the night.

61 “Does Naomi know anything of your...  
62 ambitions?”

63 “We have an understanding. Please don’t judge  
64 my candidacy by the unseemliness of this proposal. I  
65 ask directly because the use of a go-between takes  
66 much time. Either method comes down to the same  
67 thing: a matter of parental approval. If you give your  
68 consent, I become Naomi’s yoshi.\* We’ll live in the  
69 House of Fuji. Without your consent, I must go to  
70 America, to secure a new home for my bride.”

71 Eager to make his point, he’d been looking her full  
72 in the face. Abruptly, his voice turned gentle. “I see  
73 I’ve startled you. My humble apologies. I’ll take no  
74 more of your evening. My address is on my card. If  
75 you don’t wish to contact me, I’ll reapproach you in  
76 two weeks’ time. Until then, good night.”

77 He bowed and left. Taking her ease, with effortless  
78 grace, like a cat making off with a fish.

79 “Mother?” Chie heard Naomi’s low voice and  
80 turned from the door. “He has asked you?”

81 The sight of Naomi’s clear eyes, her dark brows  
82 gave Chie strength. Maybe his hopes were  
83 preposterous.

84 “Where did you meet such a fellow? Imagine! He

85 thinks he can marry the Fuji heir and take her to  
86 America all in the snap of his fingers!”

87 Chie waited for Naomi’s ripe laughter.

88 Naomi was silent. She stood a full half minute  
89 looking straight into Chie’s eyes. Finally, she spoke.

90 “I met him at my literary meeting.”

91 Naomi turned to go back into the house, then  
92 stopped.

93 “Mother.”

94 “Yes?”

95 “I mean to have him.”

96 \* a man who marries a woman of higher status and takes her family’s name

1) Which choice best describes what happens in the passage?

A) One character argues with another character who intrudes on her home.

B) One character receives a surprising request from another character.

C) One character reminisces about choices she has made over the years.

D) One character criticizes another character for pursuing an unexpected course of action.

2) Which choice best describes the developmental pattern of the passage?

- A) A careful analysis of a traditional practice
- B) A detailed depiction of a meaningful encounter
- C) A definitive response to a series of questions
- D) A cheerful recounting of an amusing anecdote

3) As used in line 1 and line 65, “directly” most nearly means

- A) frankly.
- B) confidently.
- C) without mediation.
- D) with precision.

4) Which reaction does Akira most fear from Chie?

- A) She will consider his proposal inappropriate.
- B) She will mistake his earnestness for immaturity.
- C) She will consider his unscheduled visit an imposition.
- D) She will underestimate the sincerity of his emotions.

5) Which choice provides the best evidence for the answer to the previous question?

- A) Line 33 (“His voice... refined”)
- B) Lines 49-51 (“You... mind”)
- C) Lines 63-64 (“Please... proposal”)
- D) Lines 71-72 (“Eager... face”)

- 6) In the passage, Akira addresses Chie with
- A) affection but not genuine love.
  - B) objectivity but not complete impartiality.
  - C) amusement but not mocking disparagement.
  - D) respect but not utter deference.
- 7) The main purpose of the first paragraph is to
- A) describe a culture.
  - B) criticize a tradition.
  - C) question a suggestion.
  - D) analyze a reaction.
- 8) As used in line 2, “form” most nearly means
- A) appearance.
  - B) custom.
  - C) structure.
  - D) nature.
- 9) Why does Akira say his meeting with Chie is “a matter of urgency” (line 32)?
- A) He fears that his own parents will disapprove of Naomi.
  - B) He worries that Naomi will reject him and marry someone else.
  - C) He has been offered an attractive job in another country.
  - D) He knows that Chie is unaware of his feelings for Naomi.

10) Which choice provides the best evidence for the answer to the previous question?

- A) Line 39 (“I don’t... you”)
- B) Lines 39-42 (“Normally... community”)
- C) Lines 58-59 (“Depending... Japan”)
- D) Lines 72-73 (“I see... you”)

Questions 1-10 are based on the following passage. This passage is from Charlotte Brontë, *The Professor*, originally published in 1857.

1 No man likes to acknowledge that he has made a  
2 mistake in the choice of his profession, and every  
3 man, worthy of the name, will row long against wind  
4 and tide before he allows himself to cry out, “I am  
5 baffled!” and submits to be floated passively back to  
6 land. From the first week of my residence in X—  
7 felt my occupation irksome. The thing itself—the  
8 work of copying and translating business-letters—  
9 was a dry and tedious task enough, but had that been  
10 all, I should long have borne with the nuisance; I am  
11 not of an impatient nature, and influenced by the  
12 double desire of getting my living and justifying to  
13 myself and others the resolution I had taken to  
14 become a tradesman, I should have endured in  
15 silence the rust and cramp of my best faculties; I  
16 should not have whispered, even inwardly, that I  
17 longed for liberty; I should have pent in every sigh by  
18 which my heart might have ventured to intimate its  
19 distress under the closeness, smoke, monotony, and  
20 joyless tumult of Bigben Close, and its panting desire  
21 for freer and fresher scenes; I should have set up the  
22 image of Duty, the fetish of Perseverance, in my  
23 small bedroom at Mrs. King’s lodgings, and they two  
24 should have been my household gods, from which  
25 my darling, my cherished-in-secret, Imagination, the  
26 tender and the mighty, should never, either by  
27 softness or strength, have severed me. But this was  
28 not all; the antipathy which had sprung up between

29 myself and my employer striking deeper root and  
30 spreading denser shade daily, excluded me from  
31 every glimpse of the sunshine of life; and I began to  
32 feel like a plant growing in humid darkness out of the  
33 slimy walls of a well.

34         Antipathy is the only word which can express the  
35 feeling Edward Crimsworth had for me—a feeling, in  
36 a great measure, involuntary, and which was liable to  
37 be excited by every, the most trifling movement,  
38 look, or word of mine. My southern accent annoyed  
39 him; the degree of education evinced in my language  
40 irritated him; my punctuality, industry, and  
41 accuracy, fixed his dislike, and gave it the high  
42 flavour and poignant relish of envy; he feared that I  
43 too should one day make a successful tradesman.  
44 Had I been in anything inferior to him, he would not  
45 have hated me so thoroughly, but I knew all that he  
46 knew, and, what was worse, he suspected that I kept  
47 the padlock of silence on mental wealth in which he  
48 was no sharer. If he could have once placed me in a  
49 ridiculous or mortifying position, he would have  
50 forgiven me much, but I was guarded by three  
51 faculties—Caution, Tact, Observation; and prowling  
52 and prying as was Edward's malignity, it could never  
53 baffle the lynx-eyes of these, my natural sentinels.  
54 Day by day did his malice watch my tact, hoping it  
55 would sleep, and prepared to steal snake-like on its  
56 slumber; but tact, if it be genuine, never sleeps.

57           I had received my first quarter's wages, and was  
58 returning to my lodgings, possessed heart and soul  
59 with the pleasant feeling that the master who had  
60 paid me grudged every penny of that hard-earned  
61 pittance—(I had long ceased to regard  
62 Mr. Crimsworth as my brother—he was a hard,  
63 grinding master; he wished to be an inexorable  
64 tyrant: that was all). Thoughts, not varied but strong,  
65 occupied my mind; two voices spoke within me;  
66 again and again they uttered the same monotonous  
67 phrases. One said: "William, your life is intolerable."  
68 The other: "What can you do to alter it?" I walked  
69 fast, for it was a cold, frosty night in January; as I  
70 approached my lodgings, I turned from a general  
71 view of my affairs to the particular speculation as to  
72 whether my fire would be out; looking towards the  
73 window of my sitting-room, I saw no cheering red  
74 gleam.

- 1) Which choice best summarizes the passage?
- A) A character describes his dislike for his new job and considers the reasons why.
  - B) Two characters employed in the same office become increasingly competitive.
  - C) A young man regrets privately a choice that he defends publicly.
  - D) A new employee experiences optimism, then frustration, and finally despair.
- 2) The main purpose of the opening sentence of the passage is to
- A) establish the narrator's perspective on a controversy.
  - B) provide context useful in understanding the narrator's emotional state.
  - C) offer a symbolic representation of Edward Crimsworth's plight.
  - D) contrast the narrator's good intentions with his malicious conduct.

- 3) During the course of the first paragraph, the narrator's focus shifts from
- A) recollection of past confidence to acknowledgment of present self-doubt.
  - B) reflection on his expectations of life as a tradesman to his desire for another job.
  - C) generalization about job dissatisfaction to the specifics of his own situation.
  - D) evaluation of factors making him unhappy to identification of alternatives.
- 4) The references to "shade" and "darkness" at the end of the first paragraph mainly have which effect?
- A) They evoke the narrator's sense of dismay.
  - B) They reflect the narrator's sinister thoughts.
  - C) They capture the narrator's fear of confinement.
  - D) They reveal the narrator's longing for rest.
- 5) The passage indicates that Edward Crimsworth's behavior was mainly caused by his
- A) impatience with the narrator's high spirits.
  - B) scorn of the narrator's humble background.
  - C) indignation at the narrator's rash actions.
  - D) jealousy of the narrator's apparent superiority

6) The passage indicates that when the narrator began working for Edward Crimsworth, he viewed

Crimsworth as a

- A) harmless rival.
- B) sympathetic ally.
- C) perceptive judge.
- D) demanding mentor.

7) Which choice provides the best evidence for the answer to the previous question?

- A) Lines 28-31 (“the antipathy... life”)
- B) Lines 38-40 (“My southern... irritated him”)
- C) Lines 54-56 (“Day... slumber”)
- D) Lines 61-62 (“I had... brother”)

8) At the end of the second paragraph, the comparisons of abstract qualities to a lynx and a snake mainly have the effect of

- A) contrasting two hypothetical courses of action.
- B) conveying the ferocity of a resolution.
- C) suggesting the likelihood of an altercation.
- D) illustrating the nature of an adversarial relationship.

9) The passage indicates that, after a long day of work, the narrator sometimes found his living quarters to be

- A) treacherous.
- B) dreary.
- C) predictable.
- D) intolerable.

10) Which choice provides the best evidence for the answer to the previous question?

- A) Lines 17-21 (“I should... scenes”)
- B) Lines 21-23 (“I should... lodgings”)
- C) Lines 64-67 (“Thoughts... phrases”)
- D) Lines 68-74 (“I walked... gleam”)

#### Demographic Questions

Please specify your ethnicity/race. (Check all that apply)

- A. Caucasian
- B. African-American
- C. Latino or Hispanic
- D. Asian
- E. Native American
- F. Native Hawaiian or Pacific Islander
- H. Other/Unknown
- I. Prefer not to say

What is your age?

Short Answer Space

What is your gender?

- A. Female
- B. Male
- C. Other

What is your annual household income?

- A. Less than \$20,000
- B. \$20,000 to \$34,999
- C. \$35,000 to \$49,999
- D. \$50,000 to \$74,999
- E. \$75,000 to \$99,999
- F. Over \$100,000

What is your classification?

- A. Freshman
- B. Sophomore
- C. Junior
- D. Senior

What is your current GPA?

Short Answer space

Which languages are you capable of speaking fluently? (Check all that apply)

- A. English
- B. Spanish
- C. Portuguese
- D. French
- E. Mandarin
- F. Arabic
- G. Other
- H. Prefer not to say

What do you consider your native language?

- A. English
- B. Spanish
- C. Portuguese
- D. French
- E. Mandarin
- F. Arabic
- G. Other
- H. Prefer not to say

Do you consider yourself a first-generation college student?

- A. Yes
- B. No

Do you have difficulty seeing, even if wearing glasses?

- A. No - no difficulty
- B. Yes – some difficulty
- C. Yes – a lot of difficulty
- D. Cannot do at all

Do you have difficulty hearing, even if using a hearing aid?

- A. No- no difficulty
- A. Yes – some difficulty
- B. Yes – a lot of difficulty
- C. Cannot do at all

How frequently do you listen to audiobooks for pleasure?

- A. Never
- B. A few times a year
- C. A few times a month
- D. A few times a week
- E. Nearly every day

How frequently do you read traditional text-based books for pleasure?

- A. Never
- B. A few times a year
- C. A few times a month
- D. A few times a week
- E. Nearly every day

How would you describe your feelings towards audiobooks?

- A. Strongly positive
- B. Slightly positive
- C. Neutral
- D. Slightly Negative
- E. Strongly negative

How would you describe your feelings towards traditional text-based books?

- A. Strongly positive
- B. Slightly positive
- C. Neutral
- D. Slightly Negative
- E. Strongly Negative