

The CRISIS Study: COVID-19 and Reading Impairments: Survey Investigating Socializing

by

Samira Zabian

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Science

in

Rehabilitation Science

Faculty of Rehabilitation Medicine
University of Alberta

© Samira Zabian, 2022

Abstract

An invisible disability, such as a reading impairment, can negatively influence one's reading, writing, and spelling abilities. However, reading impairments also impact social and emotional wellbeing. Social interaction can act as a buffer against social and emotional stressors to enhance wellbeing. In the present study, we wanted to gain insight into the impact of a global emergency (the COVID-19 pandemic) on socializing in adults with and without reading impairments. Participants ($N = 53$; Mean Age = 26) completed an online survey which collected information on socio-demographics, health history, reading history, perceptions of the pandemic, anxiety, depression, and social and emotional measures. Standardized questionnaires of anxiety (Generalized Anxiety Disorder 7 (GAD-7)) and depression (e.g., Patient Health Questionnaire 9 (PHQ-9)) were used. Social measures included queries about social participation habits and social relationships. Emotional factors were measured using five subtests from the National Institute of Health (NIH) Toolbox Emotion Battery, including general life satisfaction, perceived stress, emotional support, instrumental support, and loneliness questionnaires. Results showed that social participation decreased over the pandemic for individuals with dyslexia and the general population, but to a greater extent for individuals with dyslexia ($p = .026$, $p = .002$, respectively). Adults with dyslexia reported lower instrumental support during the pandemic, in comparison to adults without dyslexia ($p = .007$). Adults with dyslexia reported greater depression scores ($p = .041$) and lower life satisfaction scores ($p = .030$), compared to adults without dyslexia, *only* before the pandemic. In general, adults who increased their social participation during the pandemic also reported higher life satisfaction scores on both parts A and B of the questionnaire ($r_s = .319$, $p = .026$; $r_s = .304$, $p = .040$, respectively), as well as higher emotional ($r_s = .501$, $p < .001$) and instrumental support scores ($r_s = .466$, $p < .001$). Importantly,

loneliness was negatively correlated with social participation before the pandemic ($r_s = -.358, p = .011$), but not during the pandemic. In accordance with the International Classification of Functioning, Disability and Health's (ICF) dimension of participation, these findings underscore the protective and differential impacts of social participation for individuals with and without disabilities and the impacts of a global crisis on social participation particularly for individuals without disabilities. The differential impact of social participation for varying groups on aspects of mental health and other emotional factors during a pandemic are further discussed as well as the potential clinical implications.

Preface

This thesis is an original work by Samira Zabian. This project received research ethics approval from the University of Alberta Research Ethics Board 2, Project Name “The CRISIS Study: COVID-19 and Reading Impairments: Survey Investigating Socializing, No. 00108315, May 2021. Research in this thesis was completed in collaboration with a co-investigator, Dr. Cassidy Fleming, and with a research assistant, Amberley Ostevik, at the University of Alberta. The study concept was achieved with the support of my supervisor, Dr. Jacqueline Cummine and the study method was developed in collaboration with Dr. Cassidy Fleming. The survey used in this research project was created after consulting the literature; relevant literature was cited where necessary. No part of this thesis has been previously published.

Acknowledgements

I would like to thank the following individuals for their continuous support throughout the process of this research project:

My supervisor, Dr. Jacqueline Cummine for believing in my research abilities as an undergraduate student and for her continuous support throughout the research process.

Amberley Ostevik, for supporting the data analysis process and for continuous editing of the survey.

Dr. Cassidy Fleming, for support with concept creation, the study design, and ongoing editing.

The Faculty of Graduate Studies and Research and the donors of the Canada 150 Alumni Award in Rehabilitation for their financial support throughout my education.

Finally, my husband Mohammad AlIssa for his continuous support of my education, especially during a pandemic!

Acknowledgements for Research Tools

We thank Prof. Helen WARD, Dr. Christina ATCHISON and the research team in the Patient Experience Research Centre (PERC) of Imperial College London, School of Public Health for permission to use their survey instrument. Imperial College London, in turn, thanks Prof. Kin On KWOK, Ms. Wan In WEI, Prof. Samuel Yeung Shan WONG and the research team in the Division of Infectious Diseases of JC School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong Special Administrative Region, China for permission to use their survey instrument and translating it into English

(https://wwwnc.cdc.gov/eid/article/26/7/20-0500_article).

Table of Contents

| | |
|---|------------------|
| <i>Abstract</i> | <i>ii</i> |
| <i>Preface</i> | <i>iv</i> |
| <i>Acknowledgements</i> | <i>v</i> |
| <i>List of Tables</i> | <i>viii</i> |
| <i>List of Figures</i> | <i>ix</i> |
| <i>List of Abbreviations</i> | <i>x</i> |
| <i>Table of Definitions</i> | <i>xi</i> |
| <i>Introduction</i> | <i>1</i> |
| Thesis Contribution | <i>1</i> |
| Thesis Outline | <i>2</i> |
| Literature Review | <i>3</i> |
| The Psychological Impacts of the Coronavirus Pandemic | <i>3</i> |
| The Impacts of the Coronavirus Pandemic on Social Participation | <i>4</i> |
| Factors Affecting Social Participation in Adults With Dyslexia | <i>6</i> |
| Factors Affecting Social Participation in The General Population..... | <i>8</i> |
| Rationale | <i>9</i> |
| Research Questions | <i>9</i> |
| Hypotheses | <i>9</i> |
| <i>Methods</i> | <i>10</i> |
| Study Design | <i>10</i> |
| Participants | <i>12</i> |
| Inclusion Criteria | <i>12</i> |
| Groups | <i>12</i> |
| Survey | <i>12</i> |
| <i>Screening Measures</i> | <i>14</i> |
| Procedure | <i>18</i> |
| <i>Data Analysis & Interpretation</i> | <i>19</i> |
| <i>Results</i> | <i>19</i> |
| Descriptive Statistics | <i>19</i> |
| Hypothesis 1. | <i>20</i> |
| Hypothesis 2..... | <i>21</i> |
| Hypothesis 3..... | <i>24</i> |
| Hypotheses 4 & 5..... | <i>28</i> |
| <i>Discussion</i> | <i>28</i> |

| | |
|---|----|
| <i>Limitations</i> | 35 |
| Self-report | 36 |
| Survey Length | 36 |
| Sampling | 37 |
| Recall Capacity | 37 |
| Generalizability of Findings & Sample Variance | 38 |
| Survey Design: Cross-sectional | 38 |
| <i>Future Directions</i> | 38 |
| <i>Conclusions</i> | 39 |
| <i>References</i> | 41 |
| <i>Appendix A</i> | 50 |
| <i>Appendix B</i> | 61 |
| <i>Appendix C</i> | 69 |

List of Tables

| | |
|---|-----------|
| Table 1: Survey | 14 |
| Table 2: Spearman's correlations between social participation and life satisfaction, emotional support, instrumental support, and loneliness. | 27 |

List of Figures

| | |
|--|-----------|
| Figure 1: Social participation for adults with and without dyslexia before and during COVID-19..... | 21 |
| Figure 2: Instrumental support for adults with and without dyslexia before and during COVID-19..... | 22 |
| Figure 3: Reported anxiety for adults with and without dyslexia before and during COVID-19..... | 23 |
| Figure 4: Depression scores for adults with and without dyslexia before and during COVID-19..... | 23 |
| Figure 5: Life satisfaction (Part A) scores for adults with and without dyslexia before and during COVID-19.. | 24 |
| Figure 6A: Life satisfaction part A scores during the pandemic..... | 25 |
| Figure 6B: Life satisfaction part B scores during the pandemic..... | 25 |
| Figure 7: Emotional support scores during the pandemic..... | 26 |
| Figure 8: Instrumental support scores during the pandemic..... | 26 |
| Figure 9: Loneliness scores before the pandemic..... | 27 |

List of Abbreviations

ARHQ-B: Brief Adult Reading History Questionnaire

CDC: Centers for Disease Control and Prevention

COVID-19: Coronavirus Disease 2019

GAD-7: Generalized Anxiety Disorder 7

ICF: International Classification of Functioning, Disability and Health

JHCRC: Johns Hopkins Coronavirus Resource Center

NIH: National Institute of Health

PHQ-9: Patient Health Questionnaire 9

REB: Research Ethics Board

SARS: Severe Acute Respiratory Syndrome

SCLD: Scottish Commission for People with Learning Disabilities

SPSS: Social Sciences 28

Table of Definitions

| Term | Definition |
|----------------------------------|---|
| Social participation | Face-to-face interaction or mediated communication (e.g., video calling, voice calling, text messaging, or internet-based text discussions) with at least one other individual. |
| Dyslexia | Participants who self-report having dyslexia and/or score $>.32$ on the Brief Adult Reading History Questionnaire. |
| Reading Impairment | Participants who do not self-report having dyslexia and/or score $<.32$ on the Brief Adult Reading History Questionnaire. |
| Anxiety | Severity of anxiety symptoms across a two-week period as measured by the Generalized Anxiety Disorder 7 Questionnaire. |
| Depression | Severity of depression symptoms across a two-week period as measured by the Patient Health Questionnaire 9. |
| Impacts of the COVID-19 pandemic | The effects of the pandemic on social and emotional health factors that may affect social participation. |

Introduction

Invisible disabilities are non-discernible disabilities that may impair one's daily functioning (Mullins & Preyde, 2013). Dyslexia, a reading impairment, is a type of invisible disability that affects several domains of life, including life satisfaction, happiness, socializing, education, and self-esteem (Burden, 2008; Doikou-Avlidou, 2015; Kalka & Lockiewicz, 2018; Livingston et al., 2018; McNulty, 2003; Nalavany et al., 2013). In addition, invisible disabilities often lead to stigmatization such as rejection, humiliation, and social disapproval, as in the case of adults with dyslexia who reported feeling inferior and insecure across the lifespan (Davis, 2005; Doikou-Avlidou, 2015; McNulty, 2003). The invisible nature of the disability also means individuals often face the challenge of informing and convincing others of their disability to receive support (Davis, 2005; Mullins & Preyde, 2013). Importantly, these negative effects are not inherently due to dyslexia, but due to a combination of factors (e.g., social support, the acceptance and understanding of dyslexia in one's social group, etc.) (Terras et al., 2009). Taken together, these challenges may create barriers to social participation in individuals with dyslexia. Given the current social participation restrictions due to the coronavirus (COVID-19) pandemic, these barriers may be exacerbated.

Thesis Contribution

This study will explore supportive social measures for individuals with and without dyslexia, during crisis. This topic has not been studied in individuals with dyslexia, let alone been compared to the general population. Comparisons made between these two populations will help professionals in the field of social science to provide meaningful care to clients who have been

overlooked in much of the social science literature. In accordance with the ICF's participation domain, this thesis sheds light on the importance of acquiring knowledge on the effects of a global health crisis on social participation for individuals with and without disabilities (WHO, 2001). Specifically, this thesis focuses on the 'interpersonal interactions and relationships' chapter of the participation domain by highlighting the protective factors of social participation during a health crisis, as well as the differential impact of social participation on individuals with and without disabilities. Lastly, this research can act both as a guide and preventative measure against the negative social consequences for all individuals during a time of crisis.

Thesis Outline

This thesis is organized in the following manner. Firstly, background on the psychological impacts of the COVID-19 pandemic and other similar health crises is outlined for the following populations: older adults, sexual and gender minorities, healthcare workers, and college students. Next, the impacts of the pandemic on social participation are discussed in relation to the belongingness hypothesis and the social buffer model. Gaps in literature on the impact of the COVID-19 pandemic on social participation in individuals with dyslexia is identified and social participation is defined operationally.

Next, the factors impacting social participation in adults with dyslexia are explored. Specifically, the relationship between distancing restrictions at the time of the COVID-19 pandemic and social participation in individuals with invisible disabilities, including dyslexia, is further discussed. These factors range from mental health variables to physical barriers to social participation.

Then, factors affecting social participation in the general population are explored. These factors include barriers to using mediated communication, gender differences, social support, and friendship networks. Differences in perceived support following social participation with friends and family members is explored. The rationale and hypotheses are then outlined, followed by the method of the study, the results, and lastly the conclusion.

Literature Review

We searched the literature for the psychological impacts of the pandemic, the social participation impacts of the pandemic, and the factors that affected social participation in adults with and without dyslexia before and during the pandemic. These factors are outlined below.

The Psychological Impacts of the Coronavirus Pandemic

The coronavirus began in December of 2019 in Wuhan, China and spread rapidly around the world (Centers for Disease Control and Prevention [CDC], 2019). To date, over 300 million individuals have been infected with COVID-19 (Johns Hopkins Coronavirus Resource Center [JHCRC], 2022). The psychological impacts of the COVID-19 pandemic have been studied globally (Brown & Greenfield, 2021; Bu et al., 2020; Cao et al., 2020; Gan et al., 2020; Kotwal et al., 2020; Luo et al., 2020; Moore et al., 2021). Reports of increased anxiety and depression symptoms were common among older adults, sexual and gender minority populations, and healthcare workers (Brooks et al., 2020; Cao et al., 2020; Luo et al., 2020; Kotwal et al., 2020). Reports of increased anxiety were also common among college students (Cao et al., 2020). These trends are not unique to the COVID-19 pandemic, as similar results were observed during the Severe Acute Respiratory Syndrome (SARS) epidemic in 2002 and the Middle East

Respiratory Syndrome (MERS) outbreak in 2012. A review of psychological responses to quarantine during SARS and MERS confirmed increased reports of nervousness, fear, and sadness during SARS (Brooks et al., 2020). Similarly, in response to MERS quarantine, increased reports of fear, anger, and anxiety-induced insomnia were reported, before decreasing by more than 50% in the 4-6 months following quarantine (Brooks et al., 2020). In terms of the negative, longitudinal psychological impacts which stemmed from SARS quarantine, one study tested hospital employees in Beijing three years after the SARS outbreak; employees reported high levels of depressive symptoms (Liu et al., 2012). Interestingly, the psychological impacts of COVID-19 quarantine include similar symptoms, however, the longitudinal impacts of such effects remain unknown. One study found that two months after a quarantine order, residents in China reported increased psychological distress (Gan et al., 2020). Evidently, the psychological impact of public health emergencies has followed similar trajectories, however the impact of such psychological stress on social participation remains unknown.

The Impacts of the Coronavirus Pandemic on Social Participation

Given that the pandemic has negatively impacted the psychological health of many, we are interested in further exploring these effects, as well as the impacts of the pandemic on social health. According to the belongingness hypothesis, human beings have an innate need to seek and secure long-lasting, positive social interactions, and interpersonal relationships (Baumeister & Leary, 1995). Positive and frequent social participation facilitates positive emotions such as happiness (Baumeister & Leary, 1995). Social participation can be defined as face-to-face interaction or mediated communication (e.g., video calling, voice calling, text messaging, or internet-based text discussions) with at least one other individual (Brown & Greenfield, 2021).

The COVID-19 pandemic has created barriers for social participation and consequently impacted the mental health of individuals around the world. For most individuals, social participation with friends and family has been an effective method of reducing stress, feelings of loneliness, symptoms of anxiety, as well as increasing overall wellbeing (Brown & Greenfield, 2021; Cao et al., 2020; Bu et al., 2020; Kalka & Lockiewicz, 2018; Losada-Baltar et al., 2020; Ogueji et al., 2021). These effects can be explained by the buffer model, which states that social support in the form of positive social interactions, which serve to make us feel cared for, loved, valued, and that fulfil a sense of belonging, can protect us against a host of negative emotions related to life stress, change, and most importantly, the outcomes of crisis situations (Cobb, 1976). During the pandemic, an overall increase in social participation using mediated communication was observed for both older and young adults (Brown & Greenfield, 2021; Kotwal et al., 2020; Ogueji, 2021). Interestingly, increased social participation with friends was significantly related to increased life satisfaction, while increased social participation with family was not, indicating that the ‘buffer’ effect of social participation may be limited to certain types of interactions, rather than being a generalized protective mechanism.

To date, there has been little research conducted on the impact of the COVID-19 pandemic on social participation in adults with dyslexia. One Canadian study completed in Ontario between June and August of 2020 found that adults with intellectual disabilities and/or learning disabilities reported increased isolation, resulting in a loss of connection with friends and family members, both socially and emotionally (Lake et al., 2021). Additionally, one study completed by the Scottish Commission for People with Learning Disabilities (SCLD) explored the effects of the pandemic on individuals with learning disabilities and their support system (i.e., friends, family members, etc.) (SCLD, 2020). The SCLD found that common concerns in individuals

with learning disabilities included changes to one's support system, an increase in social isolation, and a negative impact of the pandemic on mental health (SCLD, 2020). Overall, it appears that the pandemic has impacted the social and mental health of individuals with and without reading impairments, and possibly to disparate degrees.

Factors Affecting Social Participation in Adults With Dyslexia

While there is evidence that social participation has eased the psychological pressure of the pandemic in college students, healthcare workers, and the general public, we are interested in exploring the factors that impact social participation in adults with dyslexia, before and during a global crisis. Before the pandemic, some adults with dyslexia faced challenges to social participation due to increased rates of anxiety and depression, low self-esteem, and poor social skills, each of which pose unique barriers to the creation of a social network (Carroll & Iles, 2006; Doikou-Avlidou, 2015; Livingston et al., 2018; Wilson et al., 2009). That is, dyslexia can impact social participation directly, as adults with dyslexia who experience higher rates of social anxiety will minimize the number of interactions in social settings, and subsequently, any negative social experiences may lead to the increased avoidance of social participation (Carroll & Iles, 2006; Nalavany et al., 2010; Wilson et al., 2009). Low self-esteem also affects social participation in individuals with dyslexia due to a tendency to question one's intelligence or to feel that something is 'wrong' with one's self (McNulty, 2003). Additionally, there is evidence for the impact of social support on social participation in adults with dyslexia. Unsurprisingly, adults who reported higher perceived family support also reported decreased concealment of their dyslexia from others, and consequently reported more positive self-esteem (Nalavany et al., 2013). College students with dyslexia who reported low perceived social support, reported

feeling less accepted and reported less opportunities to share their emotions with others (Kalka & Lockiewicz, 2018).

Importantly, there is reason to believe that social participation plays a protective effect for individuals with dyslexia. For example, researchers have reported that additional social support (i.e., from coworkers and employers) was found to promote participation at work for adults with dyslexia (de Beer et al., 2014; Nalavany et al., 2017). Similarly, in a 20-year longitudinal study prior to the pandemic, adults with dyslexia who were successful (i.e., success in areas of life satisfaction, employment, education, living status, social relations, health, etc.) were socially involved in their communities, were frequently involved in social organizations (e.g., church), and made use of their social support systems (Goldberg et al., 2003).

While there are relatively fewer studies that examine the impact of the pandemic on social participation, one study conducted with adults who have learning disabilities and/or intellectual disabilities found that physical distancing during the pandemic contributed to an exacerbation of diagnoses such as anxiety and depression; this was magnified for individuals who lived alone (Lake et al., 2021). On the other hand, and in line with the hypotheses of Brown and Greenfield (2021), for some adults with learning disabilities, having at least one close friend contributed to resiliency (e.g., positively coping with depression and frustration) (Miller, 2002). The extent to which such findings generalize to adults with reading impairments during a pandemic is one aim of the current work. Overall, it appears that for adults with dyslexia, high rates of anxiety, low self-esteem, and poor social skills hinder social participation, regardless of the presence or absence of a pandemic. The extent to which a global crisis exacerbates this isolation, and the extent to which the presence of social support provides a protective barrier will be explored in this work.

Factors Affecting Social Participation in The General Population

Factors that affect social participation in the general population during the pandemic include barriers to using mediated communication, gender differences, social support, and friendship networks. Firstly, during the COVID-19 pandemic, older adults were more likely to experience barriers to using mediated communication as a means to virtually socialize with others (Kotwal et al., 2020). Secondly, gender differences influenced the frequency of giving and receiving online social support (Tifferet, 2020). However, the effects were small ($d=0.36$, $d=0.14$, respectively), such that women gave and received more online social support than men (Tifferet, 2020). Women also increased their communication with family members and friends during the pandemic, in comparison to men, yet effect sizes were small (family: $\Phi = .14$; friends: $\Phi = .15$) (Brown & Greenfield, 2021). However, recent studies have reported that women are at a greater risk than men for experiencing loneliness, anxiety, and depression during the COVID-19 pandemic (Bu et al., 2020; Luo et al., 2020).

In the context of the pandemic, perceived social support is reported to be a crucial factor that influences social participation, as positive social participation with family and friends was the most frequent coping mechanism reported in some studies (Bu et al., 2020; Ogueji et al., 2021). Ogueji and colleagues (2021) hypothesized that due to the effectiveness of social participation during stressful situations, most participants turned to social participation to cope with the many negative impacts of the pandemic. This hypothesis is in line with the buffer model (Cobb, 1976). Additionally, the availability of social support from friends (at least three) and relatives led to a lower risk of loneliness in adults during the pandemic (Bu et al., 2020; Losada-Baltar et al., 2020; although see Losada-Baltar et al., 2020 for contrary findings). Overall, factors that hinder social participation in the general population include the presence of barriers to mediated

communication and gender differences (for males). Factors that facilitate social participation in the general population include social support and sufficient (at least three) friendship networks.

Rationale

We conducted an online survey to examine changes in social participation, and the factors that influence (favor or hinder) social participation, in adults with and without dyslexia before and during the COVID-19 pandemic. Results of this study will help healthcare professionals gain a thorough understanding of the impacts of a global health crisis on social participation, to identify areas of focus that may improve social participation and in turn, positively impact wellbeing in both groups. The protective and differential impacts of social participation will be outlined for individuals with and without disabilities.

Research Questions

1. What are the effects (positive/negative) of COVID-19 on social participation in adults with and without dyslexia?
2. What other factors influence (favour or hinder) social participation in adults with and without dyslexia?
3. Are there differences in social participation with friends, social participation with family, and/or life satisfaction between individuals with and without dyslexia?

Hypotheses

1. We hypothesize that social participation during the pandemic will be lower than before the pandemic for both individuals with and without dyslexia
2. We hypothesize that adults with dyslexia will report lower quality of life scores, lower levels of perceived emotional and instrumental support, and higher anxiety and

depression scores, compared to adults without dyslexia (both before and during the pandemic).

3. We predict that greater levels of social participation, regardless of having a reading impairment, will be associated with a higher quality of life, greater emotional and instrumental support, and lower anxiety and depression scores (both before and during the pandemic).
4. We predict that increased social participation with both friends and family will be related to increased general life satisfaction for individuals with dyslexia.
5. For participants without dyslexia, we predict that increased social participation with *friends* will be related to increased general life satisfaction to a greater extent, in comparison to increased social participation with *family members*.

Methods

Study Design

A cross-sectional, survey study of adults with and without dyslexia was conducted between May and November 2021. Adults were recruited by email and through social media groups that specifically supported individuals with dyslexia (i.e., 6 Facebook groups, 7 Reddit groups).

Study information was sent out via email to 45 organizations that support individuals with literacy and/or literacy impairments. According to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES), this survey is classified as an open survey (Eysenbach, 2004).

Organizations shared a link to our survey through either a mailing list or in the form of a physical poster in their building. Participants were provided with a link to the online survey where they received an explanation of the study and survey. Participants were given the option of watching

tutorial videos to download study materials (i.e., study consent and information form, how to listen to audio questions, how to use speech-to-text tools). Though it is recommended to report response rates and the demographic information of non-responders, there was no method for tracking individuals who chose to click on our survey link.

According to Kelley and colleagues (2003), best practice for survey research includes answering the research question(s) clearly. To do so, researchers should have a good understanding of the area being researched, explore related areas and speak to others in the same field, brainstorm ideas, etc. Our survey was created with the consideration of the current literature. We discussed the survey with others in the literacy field and brainstormed the survey structure. Additionally, the survey was piloted to ensure ease of use, content, and length before it was released to participants. According to survey best practices, the layout of questions is important. Questions should be grouped by subject, there should be clear instructions, and questions should be grammatically correct. Limitations to our current survey design are discussed in the limitations section. The most rigorous sampling method is simple random sampling, however this was not feasible for our study. The limitations and statistical implications of our sampling method are explored in the discussion section.

In terms of best practices for data collection, we followed the guidelines of recording each point of contact with potential participants. Participants were originally contacted virtually, either through indirect contact by email or indirectly via a social media post of study materials.

Organizations and social media groups received follow-up messages from our research team to help with survey dissemination, in most cases we sent three follow-up messages. Participants had the option of choosing to complete the survey and were able to exit out of the survey at any

point. Lastly, there were no incentives for completing the survey and questions were not randomized.

Participants

We recruited 53 participants for this study ($N_{\text{dyslexia}} = 19$; $N_{\text{non-dyslexia}} = 34$). Participant ages ranged between 18 and 61 years. Mean ages for both groups were comparable ($M_{\text{dyslexia}} = 28$ years; $M_{\text{non-dyslexia}} = 25$ years). Our samples consisted of primarily females for adults with dyslexia (10 females, 4 males, 2 gender-fluid, 2 non-binary) and for adults without dyslexia (30 females, 3 males, 1 gender-fluid).

Inclusion Criteria

Participants were included in the study if they were 18 years of age or older and were able to participate in the survey in the written format or using speech-to-text tools.

Groups

Participants were assigned to the non-dyslexia group if they self-reported typical reading history and/or scored $<.32$ on the Brief Adult Reading History Questionnaire (ARHQ-B) (Feng et al., 2020). They were assigned to the dyslexia group if they self-reported dyslexia and/or scored $>.32$ on the ARHQ-B. The study was approved and conducted in accordance with the Research Ethics Board (REB) at the University of Alberta (Pro001108315).

Survey

A survey was designed based on the work of Brown and Greenfield (2021) and Bu and colleagues (2020). The survey was made accessible through speech-to-text software that participants were instructed (via video) on how to download. Speech-to-text tools were available for questions in which participants were prompted to elaborate on their answers. Arial font was chosen for the survey as it is a dyslexia-friendly font (i.e., sans-serif) (BDA, 2018). The survey was divided into four sections that incorporated the following: socio-demographic information, health history and reading screening (section 1), perceptions of the COVID-19 pandemic (section 2), and social and emotional factors before and during the pandemic (section 3 and 4, respectively). Social and emotional factors included social participation habits, psychological well-being, stress, and social relationships. Table 1 provides an overview of the survey and measures used. The survey was made accessible to individuals with reading impairments by embedding audio-files in all questions. The survey was administered using www.google.ca/forms, which allows for the development of online surveys.

Table 1: Survey

| Construct | Measures or Scale or Questions |
|--|--|
| Section 1: Socio-Demographic Information, History and Reading Screening | |
| Socio-Demographics and Health History | 15-items on socio-demographic information 4-items on health history |
| Reading History | 6-item Brief Adult Reading History Questionnaire (ARHQ-B) 3-items on reading history 1-item on self-report of reading impairment |
| Section 2: Perceptions of the COVID-19 Pandemic | |
| Perceptions of COVID-19 | 3-items modified from the School of Public Health, Imperial College London COVID-19 questionnaire on level of worry, perceived susceptibility, and perceived severity |
| Section 3: Social and Emotional Measures <u>before</u> the COVID-19 Pandemic AND Section 4: Social and Emotional Measures <u>during</u> the COVID-19 Pandemic | |
| Social participation | 7-item Adapted Questionnaire from Brown and Greenfield (2021) and Bu and colleagues (2020) |
| Anxiety | Modified GAD 7-Item Scale |
| Depression | Modified PHQ 9-Item Scale |
| Emotions | 5-subtests from the NIH Toolbox Emotion Battery including: <ul style="list-style-type: none"> • 10-items on General Life Satisfaction • 10-items on Perceived Stress • 8-items on Emotional Support • 8-items on Instrumental Support • 5-items on Loneliness |

Screening Measures

Socio-Demographic Information. Participants were asked to report their age, sex, gender, ethnicity, marital status, spoken language(s), geographic location, place of residence (i.e., city or

rural), living arrangement, and socioeconomic status (educational level, employment status, and household income).

Health History. Participants were asked to describe their health history including prior health diagnoses, daily physical health burdens, and the impact of these on their daily lives (using short answers). This is asked because physical and mental health burdens may bias an individual's perception of the pandemic, as they may be more vulnerable to contracting COVID-19.

Additionally, an existing health condition may cause physical health restrictions (e.g., social distancing) to be more salient. This may in turn affect the methods of social participation chosen before and during the pandemic. Rather than assuming that all participants experienced the social aspects of the pandemic from the same baseline, we are acknowledging the physical and mental health barriers present for some participants.

Dyslexia Screening. To date, there is no consensus on the best approach to identify/classify individuals with a reading impairment. As such, we opted to include three valid measures, to ensure we maximally captured individuals who may struggle with reading. The risk of reading impairment was measured via the ARHQ-B and self-report of a reading impairment, both of which are reliable and valid ways of assessing reading difficulties (Lefly & Pennington, 2000; Feng et al., 2020). We have also used a 3-item general reading history questionnaire.

Perceptions of the COVID-19 Pandemic. Participants' perceptions of COVID-19 were measured using an adapted version of the School of Public Health at the Imperial College London's survey on COVID-19 (Kwok et al., 2020). Questionnaires reflected level of worry, perceived susceptibility, and perceived severity. This questionnaire has been chosen to help us specify our results, such that we are able to report the social participation habits of participants who perceived the pandemic with more or less severity.

Social and Emotional Measures. The following social and emotional measures are asked twice in the study to reflect two time periods, before and during the COVID-19 pandemic (section 3 and 4 of the survey, respectively).

Social Participation Habits. Participants are asked to report their social participation habits using multiple choice questions. These questions were selected based on recent studies on the effects of COVID-19 on communication and mental health in adults (adapted from Brown & Greenfield 2021; Bu et al., 2020). Bu and colleagues (2020) suggested that high usual social contact is equal to weekly face-to-face communication with another individual, therefore we are asking participants about their weekly social contact. Brown and Greenfield (2021) measured changes in social participation on a scale ranging from “less frequent” to “no change” to “more frequent”. We are measuring this by determining the change in social participation before and during the pandemic, on an average weekly basis. Additionally, Bu and colleagues (2020) suggested that a large friend network (i.e., made up of at least three individuals) is correlated with a lower chance of scoring high on a loneliness scale. Therefore, we are asking participants about the change in the size of their friend network.

Questions reflected the number of friends and family members that participants socially participate face-to-face with on a weekly basis, number of friends, and the frequency of social participation with friends and family using technology on a weekly basis. We chose to ask about communication with friends *and* family members to target our third hypothesis. We wanted to see if there is a difference between a change in social participation with friends or a change in social participation with family, on scores of life satisfaction between individuals with and without dyslexia.

Anxiety. Anxiety was assessed based on its connection to individuals with dyslexia and in the general population during the pandemic, such that both groups reported increased levels of anxiety. Anxiety is measured using the 7-item Generalized Anxiety Disorder 7 (GAD-7) scale (Spitzer et al., 2006). The items assess the frequency of anxiety symptoms by addressing feelings such as: worry, nervousness, restlessness, irritability, and fear. Possible answers include scores from “0” (not at all) to “3” (nearly every day). For the purpose of comparing the two time periods in this study (prior to and during COVID), scores for the ‘prior to COVID’ time period were modified to reflect symptoms in any two-week period before COVID. Scores for the ‘during COVID’ time period were modified to reflect symptoms in any two-week period during COVID.

Anxiety severity is graded into four classes based on total score: minimal (0-4), mild (5-9), moderate (10-14) and severe (15-21). Both the GAD-2/-7 have been used to measure the frequency of anxiety symptoms in several studies (Cao et al., 2020; Luo et al., 2020).

The GAD-7 is used in various populations such as college students, medical staff, the general public, and in sexual and gender minority populations (Cao et al., 2020; Luo et al., 2020; Moore et al., 2021). The GAD-7 is reliable and has demonstrated convergent and discriminant validity across several sociodemographic groups (Johnson et al., 2019; Moreno et al., 2019). The tool is highly sensitive and specific in screening for generalized anxiety disorder (Johnson et al., 2019; Moreno et al., 2019; Plummer et al., 2016; Spitzer et al., 2006).

Depression. As previous literature indicated increased levels of depression among the general population during the pandemic, we measured depression as a factor that could impact social participation. Depression is measured using the 9-item Patient Health Questionnaire 9 (PHQ-9) (Spitzer et al., 1999). The 9-items assess the frequency of depression symptoms by addressing

pleasure in daily activities, feelings of hopelessness, sleeping patterns, fatigue, appetite, concentration, restlessness, and thoughts of self-harm. Each question is assigned a score from “0” (not at all) to “3” (nearly every day).

For the purpose of comparing the two time periods in this study (prior to and during COVID), scores for the ‘prior to COVID’ time period are modified to reflect symptoms in any two-week period before COVID. Scores for the ‘during COVID’ time period are modified to reflect symptoms in any two-week period during COVID. Depression severity is graded into five classes based on total score: none-minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27). The PHQ has been used to measure the frequency of depression symptoms in several studies (Luo et al., 2020). The PHQ-9 is a valid and reliable measure that has shown high sensitivity and higher specificity than the PHQ-2 for diagnosing major depression (Arroll et al., 2010; Kroenke et al., 2001; Kroenke & Spitzer, 2002).

Emotional Measures. Overall, there are several emotional measures that have been linked to social participation during the pandemic, such as loneliness, life satisfaction, stress, emotional support, and instrumental support. To determine the extent to which these factors have impacted social participation before and during the pandemic, we will use the National Institutes of Health (NIH) Toolbox Emotion Battery (Salsman et al., 2013). The 10-item General Life Satisfaction from the NIH Toolbox Emotion Battery is used to measure quality of life. To measure stress, emotional support, instrumental support, and loneliness, we will use the Perceived Stress scale, the Emotional Support scale, the Instrumental Support scale, and the Loneliness scale, respectively.

Procedure

Participants were informed of the study procedure and provided consent to participate.

Participants answered several demographic and reading history questions. Then, they completed the survey online, which took approximately 30 minutes. In instances where participants did not answer all the questions, the data was treated as missing data, and the analysis were completed without the participant for that particular question. When participants reached the end of the questionnaire, they were provided with a list of mental health resources that could be helpful during the pandemic.

Data Analysis & Interpretation

Descriptive analysis of the demographic and emotional factors sections of the survey results were completed in JASP (JASP Team, 2021) and Statistical Package for the Social Sciences 28 (SPSS). Non-parametric tests were chosen in light of the Likert nature of the scales, the increased likelihood of non-normality, unequal samples sizes and subsequent violation of homogeneity of variance. Statistical comparisons between groups and time periods were completed using the Mann-Whitney and Wilcoxon Sign non-parametric tests, respectively. Relationships within groups were completed using the Spearman's Rho correlation.

Results

Descriptive Statistics

Our study sample consisted of primarily English first language speakers, living in Alberta. Most participants in the dyslexia group were single (56%), as well as most participants in the non-dyslexia group (74%). Most participants in the dyslexia group and the non-dyslexia group were European (72%; 68%, respectively). Most participants in the dyslexia group and the non-dyslexia

group reported their highest education level as being some university studies (33%; 38%, respectively). Most participants in the dyslexia group were working full-time (33%) or part time (28%). Most participants in the non-dyslexia group were students (41%) followed by working full time (24%). The most common household income for participants with dyslexia was under \$49,020 CAD (50%). Household income for most participants without dyslexia was between \$49,021 and \$98,040 CAD (32%).

Hypothesis 1.

Social participation would decrease during the pandemic for both individuals with and without dyslexia. The reported p -values correspond to a directional test.

Results from the Wilcoxon signed-rank test indicated a significant difference between social participation before and during the pandemic for both participants without dyslexia (Median before pandemic = 13.50; Median during pandemic = 12.00, $p = .026$) and participants with dyslexia (Median before pandemic = 13.00; Median during pandemic = 10.50, $p = .002$), such that social participation decreased during the pandemic (see Figure 1).

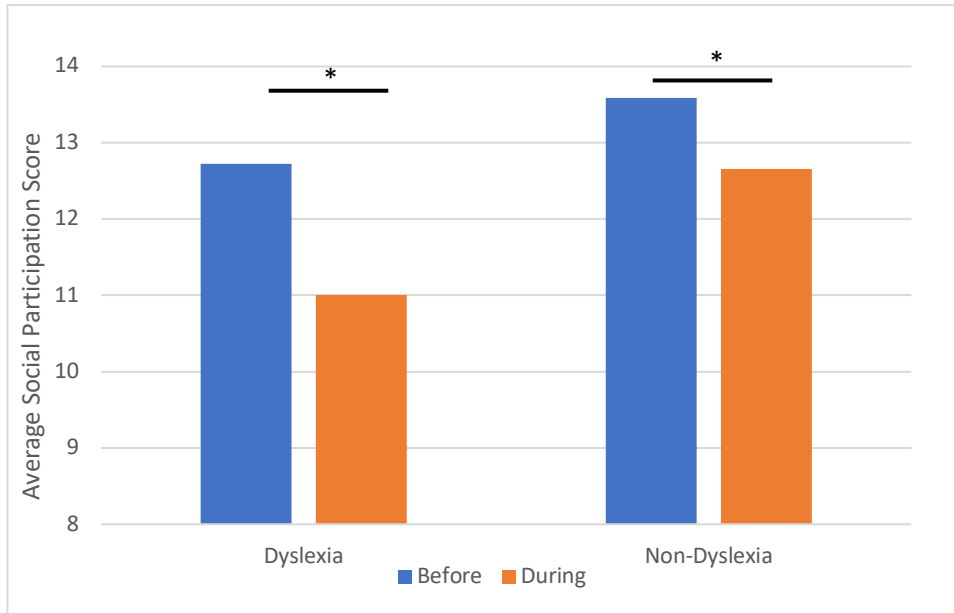


Figure 1: Social participation for adults with and without dyslexia before and during COVID-19. * Significant effect $p < 0.05$.

Hypothesis 2.

Adults with dyslexia would report lower quality of life scores, lower levels of perceived emotional and instrumental support, and higher anxiety and depression scores, compared to adults without dyslexia (both before and during the pandemic).

To explore the relationship between social and emotional factors in adults without dyslexia and adults with dyslexia, we conducted a series of Mann-Whitney U tests. These tests showed that adults in the dyslexia group reported less instrumental support during the pandemic (Median = 39.65) than adults without dyslexia (Median = 62.80; $p = .007$; Figure 2). There was no difference between the groups before the pandemic (Median_{dyslexia} = 47.60, Median_{non-dyslexia} = 56.90; $p = .067$). During the pandemic, adults without dyslexia reported an increase in anxiety levels (Median_{before} = 4.00, Median_{during} = 11.50), as did adults with dyslexia (Median_{before} = 9.50,

Median_{during} = 13.00), but these results were not statistically significant between the groups ($p_{before} = .36$; $p_{during} = .10$; Figure 3). Finally, adults with dyslexia reported greater depression scores (Median = 13.00) in comparison to adults without dyslexia (Median = 5.00, $p = .041$), before the pandemic only (Figure 4). During the pandemic, there were no differences in the depression scores between the groups (Median_{dyslexia} = 11.50, Median_{non-dyslexia} = 12.00; $p = .39$). Adults with dyslexia also reported lower scores on life satisfaction part A (Median = 40.45), in comparison to adults without dyslexia (Median = 49.30) before the pandemic only ($p = .030$; Figure 5). There was no difference between the groups during the pandemic (Median_{dyslexia} = 39.35, Median_{non-dyslexia} = 39.90; $p = .30$).

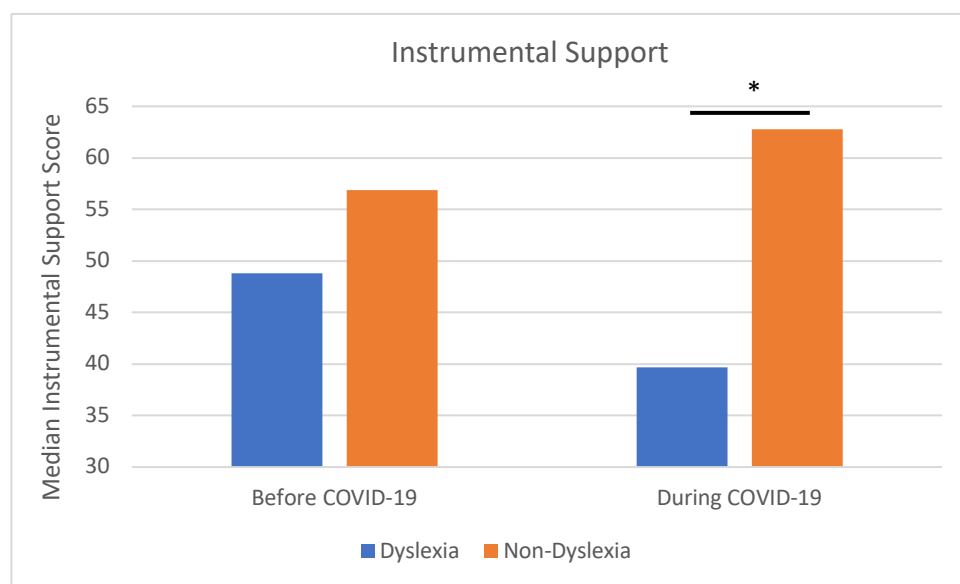


Figure 2: Instrumental support for adults with and without dyslexia before and during COVID-19. * Significant effect $p < 0.05$.

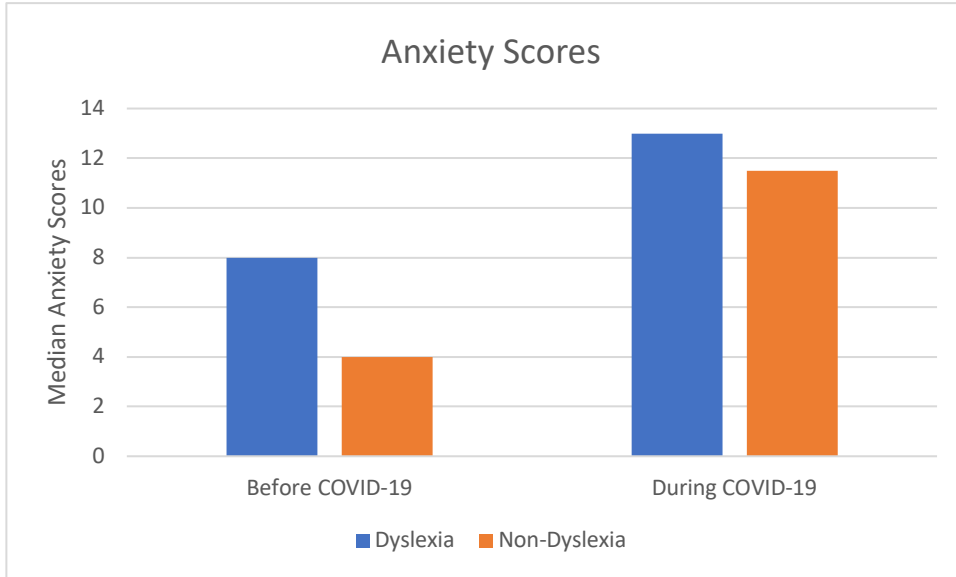


Figure 3: Reported anxiety for adults with and without dyslexia before and during COVID-19. * Significant effect $p < 0.05$.

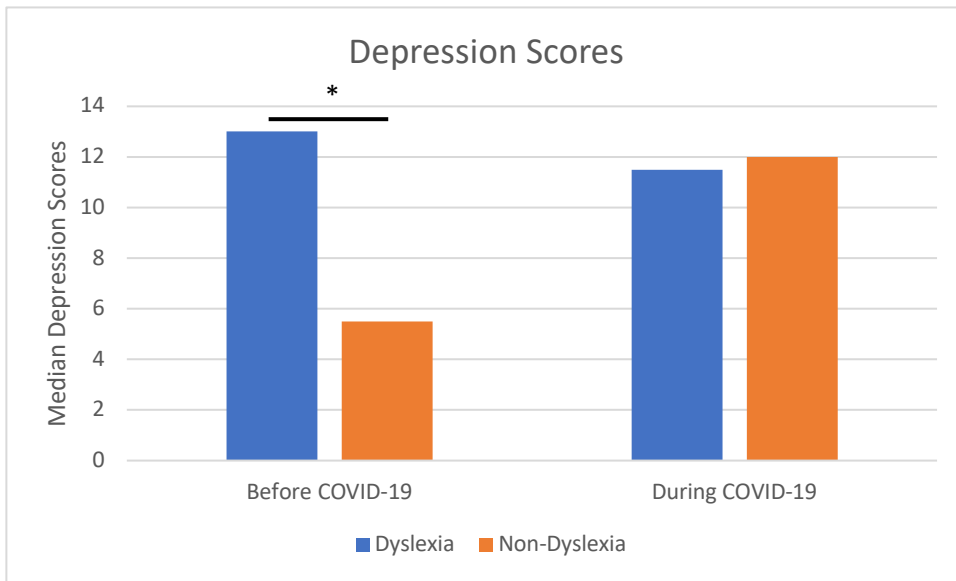


Figure 4: Depression scores for adults with and without dyslexia before and during COVID-19. * Significant effect $p < 0.05$.

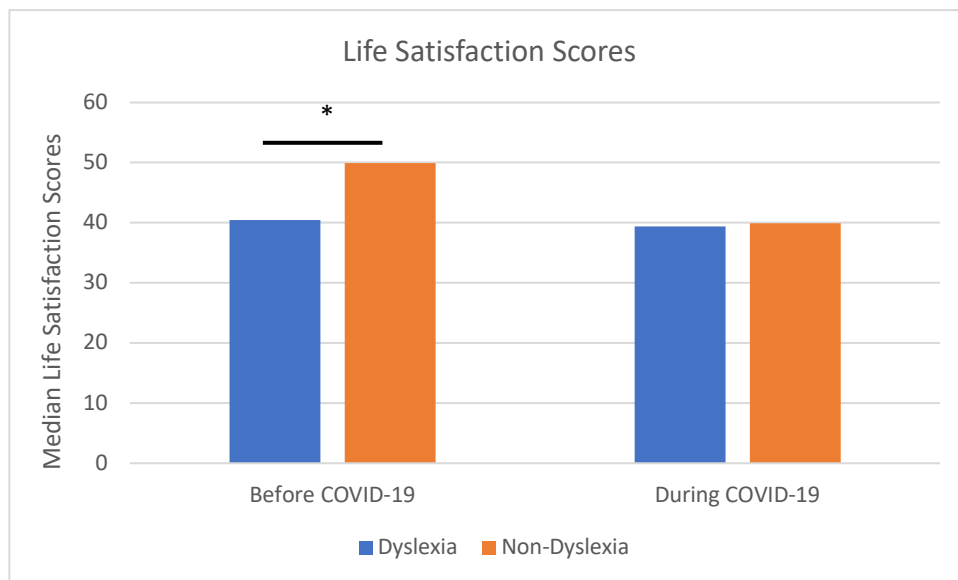


Figure 5: Life satisfaction (Part A) scores for adults with and without dyslexia before and during COVID-19. * Significant effect $p < 0.05$.

Hypothesis 3.

Greater levels of social participation, regardless of having a reading impairment, would be associated with a higher quality of life, greater emotional and instrumental support, and lower anxiety and depression scores (both before and during the pandemic).

To explore the relationship between social and emotional factors related to social participation in adults in general, we conducted a series of spearman rho correlations. We found that in general, adults who had higher social participation during the pandemic, also had higher scores on the life satisfaction questionnaire ($r_s = .319, p = .026$ on part A; $r_s = .304, p = .040$ on part B; Figures 6A and 6B, respectively), as well as on the emotional ($r_s = .501, p < .001$; Figure 7) and instrumental support scales ($r_s = .466, p < .001$; Figure 8) (see Table 2). Loneliness was significantly correlated with social participation before the pandemic, but not during the pandemic ($r_s = -.358,$

$p = .011$; Figure 9), such that as loneliness increased, social participation decreased. This was the only significant correlation before the pandemic.

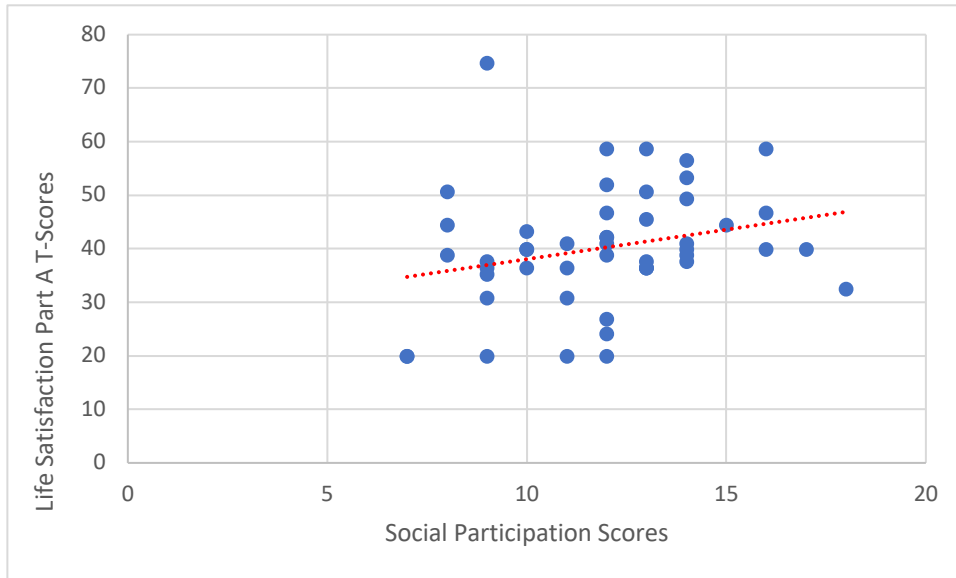


Figure 6A: Life satisfaction part A scores during the pandemic (Spearman's rho, $p = 0.026$).

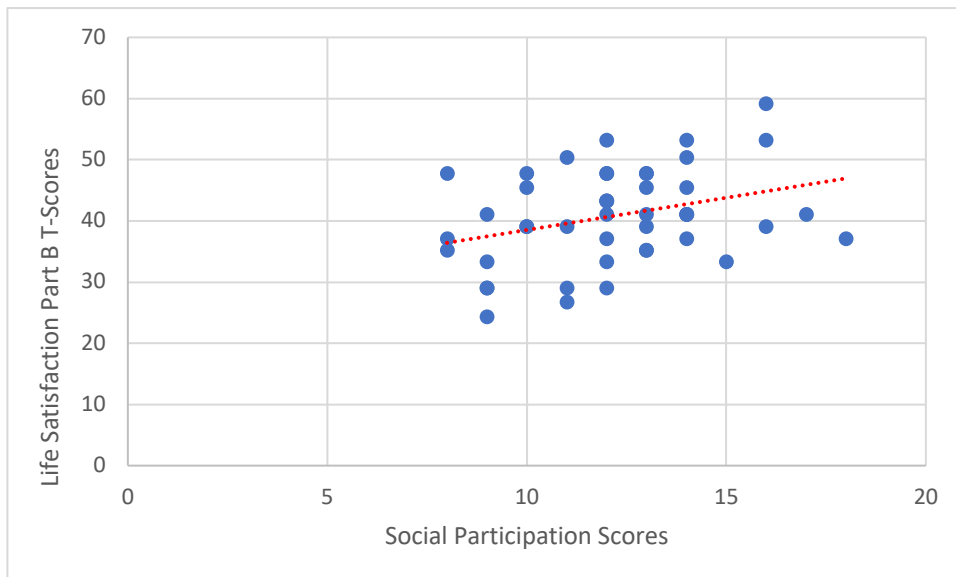


Figure 6B: Life satisfaction part B scores during the pandemic (Spearman's rho, $p = 0.040$).

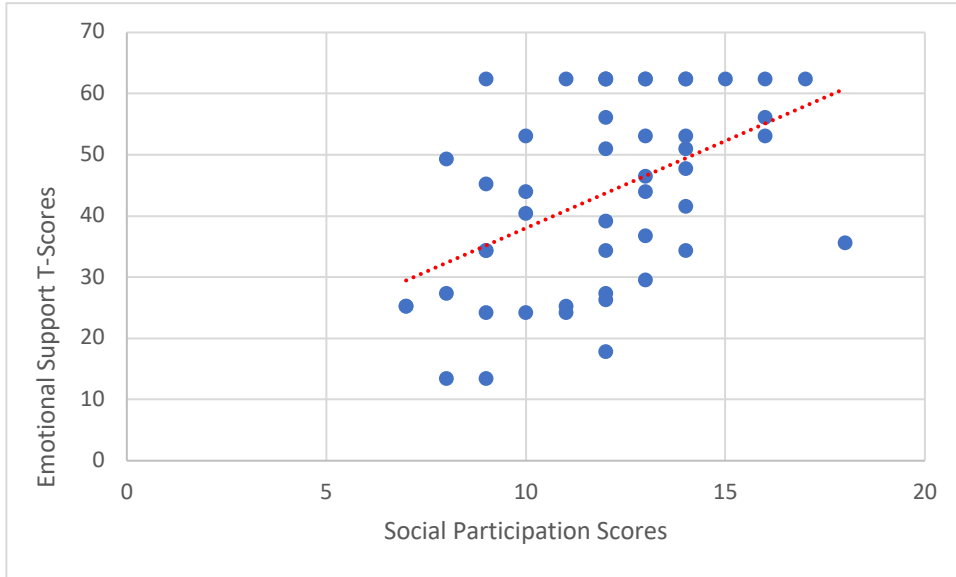


Figure 7: Emotional support scores during the pandemic (Spearman's rho, $p < 0.001$).

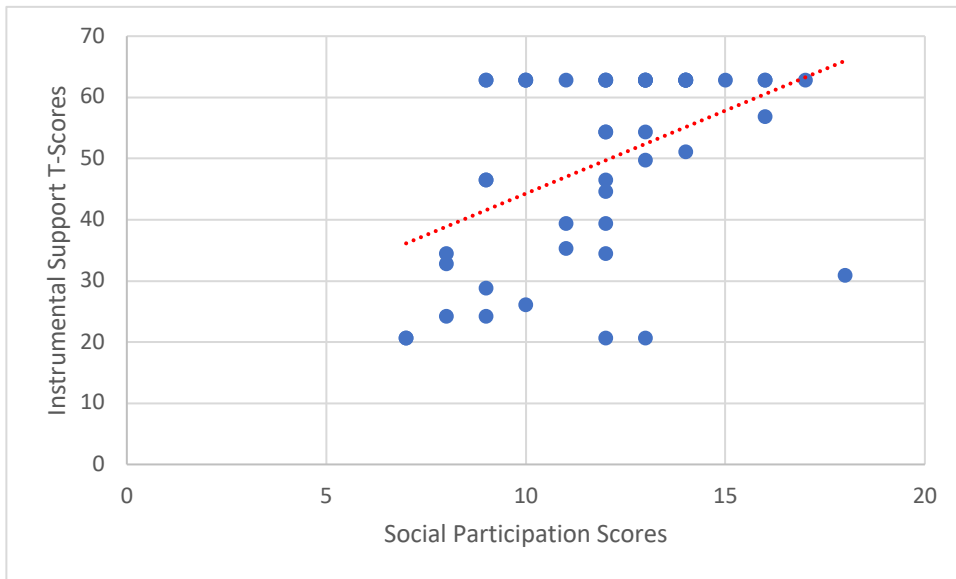


Figure 8: Instrumental support scores during the pandemic (Spearman's rho, $p < 0.001$).

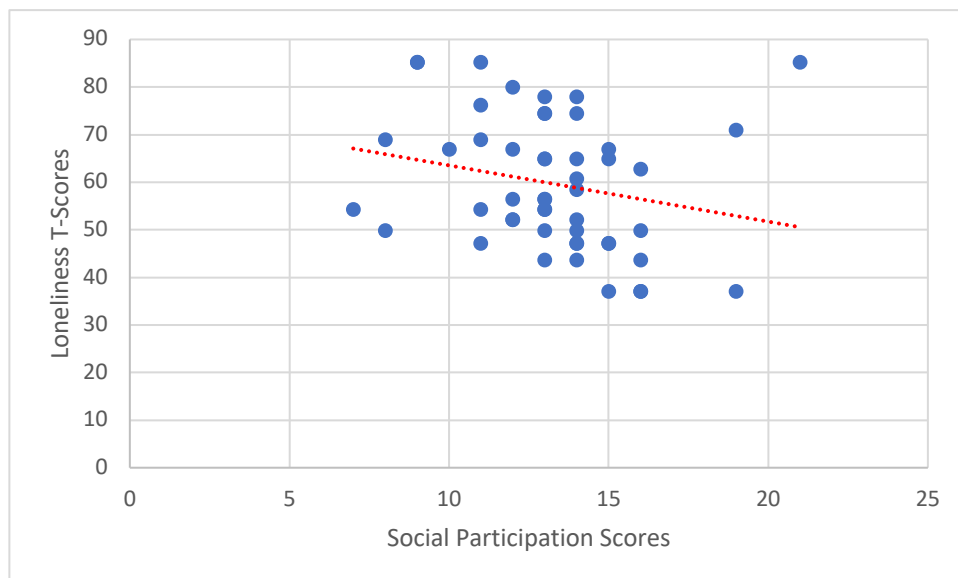


Figure 9: Loneliness scores before the pandemic (Spearman's rho, $p=0.011$).

Table 2: Spearman's correlations between social participation and life satisfaction, emotional support, instrumental support, and loneliness.

| Variable | | Social Participation |
|------------------------------|----------------|----------------------|
| 1. Life Satisfaction Part A | Spearman's rho | 0.319 * |
| | p-value | 0.026 |
| 2. Life Satisfaction Part B | Spearman's rho | 0.304 * |
| | p-value | 0.040 |
| 3. Emotional Support | Spearman's rho | .0501 *** |
| | p-value | < .001 |
| 4. Instrumental Support | Spearman's rho | 0.466 *** |
| | p-value | < .001 |
| 5. Loneliness (pre-COVID-19) | Spearman's rho | -.358 * |
| | p-value | .011 |

* $p < .05$, ** $p < .01$, *** $p < .001$

Hypotheses 4 & 5.

Increased social participation with both friends and family would be related to increased general life satisfaction for individuals with dyslexia. For participants without dyslexia, increased social participation with friends (but not with family members) would be related to increased general life satisfaction.

To explore the relationship between life satisfaction and social participation with family and/or friends, we conducted a series of Spearman's rho correlations. We found that for individuals with dyslexia, neither social participation with friends nor family during, or before the pandemic was significantly correlated with life satisfaction. We found the same to be true for individuals without dyslexia. These relationships can be seen in Appendix B.

Discussion

In the current study, we explored changes in social participation, as well as the factors that are related to social participation, before and during the COVID-19 pandemic, for individuals with and without dyslexia. Four major findings emerged. Firstly, we found that all participants reported decreased social participation during the pandemic. Secondly, adults with dyslexia reported greater depression scores and lower life satisfaction scores (part A), compared to adults without dyslexia, before the pandemic only. Further, adults with dyslexia reported less instrumental support during the pandemic compared to adults without dyslexia. Thirdly, we found that participants who engaged in increased social participation during the pandemic, regardless of reading abilities, had higher life satisfaction scores, higher emotional support scores, and higher instrumental support scores. Loneliness was significantly negatively

correlated with social participation for all participants *before* the pandemic. Finally, we found that for all participants, there was no correlation between life satisfaction scores and increased social participation with either family or friends. The implications of these findings, in the context of the buffer model, and with respect to potential consequences of the disparate effects, are discussed further in the sections below.

Social Participation, Depression, and Instrumental Support: Negative Impacts of Pandemic

Consistent with previous literature that points to a disparity between social participation in adults with and without dyslexia (Carroll & Iles, 2006; Mullins & Preyde, 2013; Nalavany et al., 2010; Wilson et al., 2009), we found that adults with dyslexia engaged in less social participation in comparison to their non-reading impaired counterparts. Such findings have previously been ascribed to increased levels of social anxiety and depression, and social barriers such as invalidation of dyslexia by society. We provide some additional support for this hypothesis as the individuals with dyslexia in the current study also reported greater levels of depression (although not anxiety) compared to skilled readers. In the context of the buffer model, social support can serve as a protective factor against life crises and facilitate adaptations to life changes, therefore one could predict that an increase in social participation would be associated with better adaptation to such changes. As such, resources/remediation that target social participation for adults with disabilities is a potential avenue of rehabilitation that may mitigate the disparate short- and long-term effects resulting from life crises. Notably, recent work on the buffer model has further underscored that the quality of relationships is pivotal to the effectiveness of the protective properties (Feeney & Collins, 2015). In other words, the quality of our social relationships makes a more significant contribution to whether social participation operates as a buffer or not (Feeney & Collins, 2015). This warrants the exploration of both the

quality and quantity of social participation during the pandemic, for both vulnerable populations and the general public.

As mentioned above, we found that adults with dyslexia had higher rates of depression (i.e., pre-pandemic) compared to non-dyslexic individuals, and the rate of depression did not change as a function of the pandemic. This finding also extended to life satisfaction. This is somewhat contrary to previous work that found the physical restrictions of the pandemic exacerbated depression and anxiety diagnoses in individuals with learning and intellectual disabilities (Lake et al., 2021). It is well established that higher reports of depression and negative emotional experiences are common among individuals with disabilities (Goldberg et al., 2003; Kalka & Lockiewicz, 2018; Livingston et al., 2018; Nalavany et al., 2017; Wilson et al., 2009), and thus our findings may represent a chronic state of poor well-being. In contrast, depression scores of individuals without dyslexia increased as a function of the pandemic, while their life satisfaction scores decreased. This has several important implications. First, it is concerning that for individuals with dyslexia, their ‘baseline’ levels of depression and life satisfaction are already sufficiently poor prior to the pandemic, that a significant life crisis did not change these levels. Thus, these individuals may be in a chronic state of depression that warrants substantial (and immediate) investigation and remediation as the long-term effects of depression can impact several areas of wellbeing (as cited in Livingston et al., 2018). Second, individuals without dyslexia saw a marked increase in depression scores, and a marked decrease in life satisfaction, signifying an acute bout of mental health challenges that also warrant immediate and targeted intervention. While acute depression may require different strategies of support compared to chronic depression (as cited in Dinas et al., 2011), the potential consequences on health and mental well-being are equally potent. Overall, these findings beg the question about impacts on

mental health between stability in a negative state vs. a change from a comparatively better state to one that is more negative. Obviously, neither scenario is ideal and the potential treatment for these two groups needs to be considered carefully. It would be beneficial to further explore longitudinal reports of life satisfaction in both groups, to gain an understanding of the extent to which the situational impact of the pandemic lingers as we transition to an endemic, or alternatively when/if COVID-19 is eradicated.

Adults with dyslexia reported less instrumental support (i.e., availability of social support) during the pandemic compared to adults without dyslexia. This is not surprising as we know that individuals with learning disabilities and intellectual disabilities have reported changes in their social support networks during the pandemic, including increased isolation resulting in a loss of connection with friends and family members, both socially and emotionally (Lake et al., 2021). Previous literature has pointed to the role of instrumental support in positively impacting individuals with dyslexia in adulthood, through the provision of guidance and emotional support from others (Goldberg et al., 2003). Unfortunately, some individuals with dyslexia avoid the use of social supports because they believe it creates more stigma when having to explain to others why they use such services (Mullins & Preyde, 2013). However, we know that when adults with dyslexia report instrumental support (i.e., feel cared for and supported), specifically from family members, they tend to report feeling less stigmatized and report fewer negative emotions (Nalavany & Carawan, 2013). Overall, a decrease in instrumental support for individuals with dyslexia during the pandemic could be related to either the avoidance of reaching out for support for fear of stigmatization, or the lack of instrumental support present during the pandemic, or both factors. We can conclude that the role of instrumental support is positive for both

individuals with and without dyslexia and providing increased access to instrumental support during times of crisis may produce significant improvements in overall wellbeing.

Relationships with Social Participation: Life Satisfaction, Emotional Support, Instrumental Support

Based on the buffer model, we predicted that increased social participation would be associated with increased life satisfaction, increased emotional support, and increased instrumental support. We found support for this in our study, such that adults who increased their social participation during the pandemic, regardless of reading history, also reported increased life satisfaction, increased emotional support, and increased instrumental support. Previous literature on individuals with dyslexia supports these findings, as adults with dyslexia who sought several forms of social support (e.g., instrumental support in the form of assistance from therapists or family physicians, emotional support through the form of peer support) were more successful in several areas of life, including life satisfaction, education, and employment (Goldberg et al., 2003). This finding is significant as much of the pre-pandemic literature has formed a consensus on decreased life satisfaction for individuals with reading impairments and other learning disabilities (Doikou-Avliidou, 2015; Kalka & Lockiewicz, 2018; McNulty, 2003). Social participation can therefore serve as a protective factor for adults with dyslexia during the pandemic. The same may be true for adults without dyslexia, as increased social engagement during the pandemic was positively correlated with life satisfaction and positive emotions (Brown & Greenfield, 2021). Overall, for both adults with dyslexia and those without dyslexia, social participation can be an effective tool for increasing life satisfaction, emotional support, and instrumental support. These findings reinforce the recommendations of the International Classification of Functioning, that social participation plays a vital role in the physical and

mental well-being of all individuals, and thus should be a key consideration in the holistic treatment of various conditions.

Interestingly, loneliness scores were negatively correlated with social participation for all participants pre-pandemic, but not during the pandemic. Social participation can help alleviate feelings of loneliness; therefore, this is in line with the literature on the inverse relationship between social participation and loneliness (Brown & Greenfield, 2021; Bu et al., 2020; Cao et al., 2020). However, this relationship did not hold true during the pandemic for either group. This may be due to the extreme and uncertain nature of the pandemic. This explanation is supported by the buffer model as the buffering effects of social support do not result in major effects on significant life transitions, rather social support primarily aids in adaptation to these transitions (Cobb, 1976). Brown and Greenfield (2021) also came to the same conclusion in their study when exploring the effects of mediated communication on wellbeing during the pandemic. Specifically, Brown and Greenfield (2021) proposed that social support is sought when negative emotions are high, then once support is obtained, these emotions decrease, resulting in null relationships at certain stages in the pandemic. In the context of our study, participants likely completed the questionnaire at different stages of the support process, eventually balancing out the negative and positive changes in emotions throughout the pandemic. Another explanation posed by Brown and Greenfield (2021) that could apply to our findings is that negative emotions stemming from uncontrollable and extreme crises, such as the COVID-19 pandemic, may be resistant to the effects of the social buffer model. However, an area of further research that could help us understand this outcome is the exploration of the quality of social participation undertaken by participants. Though participants may have been increasing the quantity of their social participation, we have no information on the quality of those interactions, which is an

important factor in determining the effectiveness of social participation in adapting to life changes.

Social interactions in the form of close relationships can buffer negative emotions related to adverse life events through providing successful coping strategies (Feeney & Collins, 2015). This highlights the importance of the role of *positive* social interactions in the buffer model. As noted by Cobb (1976), social support should fulfil one of the following three criteria to alleviate stress from life crises: social support should help individuals feel loved and cared for, to feel esteemed and valued, and to fulfil a sense of belonging. Because our questionnaire did not delve into the qualitative aspects of social relationships, we have insufficient evidence to conclude that social participation was not effective against loneliness during the pandemic.

We predicted that increased social participation with friends and family would be associated with increased life satisfaction for adults with dyslexia. We also predicted that increased social participation with friends (but not family) would be associated with increased life satisfaction for individuals without dyslexia; however, this was not the case. We did not find a relationship between social participation with friends and/or family members with life satisfaction for either group. We know that increased social participation for adults can lead to increases in life satisfaction, but we do not know the differential effects of social participation for adults with and without dyslexia with friends and family members on life satisfaction (Brown & Greenfield, 2021). Previous literature on individuals without dyslexia indicated that when social participation with family is combined with social participation with friends, life satisfaction increased (Brown & Greenfield, 2021). Additionally, social participation with friends alone acted as a more effective buffer against negative emotions and increased overall wellbeing, compared to social participation with family members during the pandemic (Brown & Greenfield, 2021). It is

important to note that the relationships we found were non-linear (see Appendix B), a possible indication that the relationship between emotional well-being and social participation with friends/family is a more complex relationship than previously reported. While an in-depth exploration of these non-linear effects was beyond the scope of the current work, there is a clear need for future replication and investigation of the relationships between these factors.

Overall, our results indicate that there is a need further research on the similarities and differences between individuals with and without invisible disabilities. The implications for healthcare professionals are far-reaching, as mental health professionals working with individuals with invisible disabilities need to consider the quality vs. quantity of social participation, the acute vs. chronic effects of mental health, and the access to/willingness to seek out instrumental support, just to name a few. For example, it appears that most individuals with dyslexia reported less instrumental support during the pandemic, in comparison to individuals without dyslexia. Focusing on methods to increase instrumental support may lead to increased wellbeing for this group of individuals. It was reassuring to see that increased social participation was associated with increased life satisfaction, increased instrumental support, and increased emotional support, regardless of reading abilities. It may be worthwhile to determine how we can use social support as a tool to increase instrumental support in individuals with dyslexia. It may also be helpful to focus on increasing life satisfaction for typical readers during the pandemic, as life satisfaction and symptoms of depression changed significantly for these individuals.

Limitations

Several limitations with respect to the current study warrant discussion, including the potential challenges associated with self-report, survey length, sampling bias, recall capacity,

generalizability of findings and sample variability, and the cross-sectional nature of the study. We discuss each of these in turn below and encourage the reader to use caution in generalizing the findings of the current study.

Self-report

Sections 3 and 4 of the survey required participants to recollect information regarding specific time periods. Self-report measures, specifically those querying past events, are susceptible to inaccuracies and hindsight biases, and therefore our results should be interpreted cautiously. Additionally, the provincial and municipality reactions and restrictions to the pandemic varied considerably across Canada and thus, the experiences for participants in differing geographic locations may be substantially different. While our demographic data indicated that most of our sample was in Alberta, we cannot be certain about the local impacts that were implemented for all participants.

Survey Length

Our survey was extensive, as we aimed to gather a plethora of information. However, this may have been exhaustive for some, especially for participants with dyslexia. Importantly, the embedded audio files in the survey removed much of the strain of reading each survey question. Though we took these steps to lessen the strain of reading every question in the survey, we cannot guarantee that all participants did not experience difficulties with the length of the survey. We also cannot guarantee that all participants were able to follow the tutorial video indicating how to listen to audio recordings of the survey. These limitations can be addressed by asking participants for their feedback on the survey design.

Sampling

Random sampling was not used in this study, as organizations across Canada were directly contacted to advertise recruitment posters in their facilities/on their mailing lists. Additionally, recruitment materials specifically targeted social media groups. This may have led to an unrepresentative sample, as individuals who did not access these social media groups or services were not considered. Therefore, this limits the generalizability of the study results, as the primary sampling technique was voluntary response sampling. It is likely that those who responded were passionate about sharing their pandemic experiences. Lastly, the study included a small sample size, specifically in the sample of individuals with dyslexia.

As a final note, we encountered significant barriers to survey dissemination due to the title containing the word ‘crisis’. Some organizations were uncomfortable with the connotation that a global pandemic was being classified as a crisis and receiving adequate attention and resources, while members of several vulnerable communities across Canada have been experiencing a plethora of crises and have not received adequate support or attention. As such, we had multiple organizations decline our request to send out our survey to their organization.

Recall Capacity

Some survey questions required participants to recall information from the time prior to the pandemic, as well as the last two weeks. These questions were particularly in sections 3 and 4 of the survey. Answers to these questions are sensitive to recall and hindsight biases, as mentioned earlier. Participants may have been influenced negatively or positively by events that were more significant, making them more accessible for recall (Coughlin, 1990). Participants likely omitted some information or recalled events inaccurately. Past research indicates that recall is susceptible

to inaccuracies, and the older the memory being recalled, the greater the risk for inaccurate reporting (Coughlin, 1990). These contribute to limiting the generalizability of findings. To mitigate these biases, we selected our research questions carefully, worded them in a consistent format, and avoided the inclusion of recall questions unless necessary.

Generalizability of Findings & Sample Variance

As mentioned above, the findings of this study cannot be generalized due to sampling methods and recall bias. Though this survey highlights interesting findings, it is important to note that the variability in the sample also suggests against making generalizations. Variability is evident in the correlation matrices and this points to the need for further research (Appendix C).

Survey Design: Cross-sectional

Lastly, a notable limitation is the cross-sectional nature of the survey. With the given restrictions surrounding the pandemic, a cross-sectional survey was the most feasible option. However, a longitudinal survey is ideal to adequately capture the impact of the pandemic on social participation. Though the survey captured the impacts of the pandemic at a given moment, the uncertain nature of the pandemic may ultimately impact this outcome differently, or it may not. A prospective longitudinal research design is needed to understand this relationship.

Future Directions

Future studies may make comparisons between individuals in different geographical locations, either within or outside of Canada. Participants from these regions can be compared on various factors that may influence social participation. The general social response of individuals located

in each region during the pandemic can then be used to predict changes on several factors such as life satisfaction and depression scores.

A direction of study that may interest individuals in the mental health field is the examination of the use of social participation as a tool to increase instrumental support for individuals with dyslexia, as well as life satisfaction and depression scores for the general population during a period of crisis. The quality of social interactions (i.e., positive or negative) and their associated emotional impact on participants can serve as a covariate, to better understand the mechanisms of social participation and to expand on the mechanism of the buffer model during crisis. In this way, a consensus can be achieved on whether social participation will always play a positive role for individuals. This can also help identify cases in which social participation may not provide adequate support for individuals. Conducting a longitudinal study on these factors may provide more relevant information on the sustained effects of social participation in relation to the buffer model. Longitudinal research can also help us understand the mechanism of the buffer model once a period of extreme stress has subsided.

Conclusions

Understanding the impact of a pandemic on social and mental health factors is imperative, specifically for individuals with invisible disabilities, who have been overlooked in much of the social science literature. Overall, our findings suggest that social participation decreased during the pandemic for both individuals with and without dyslexia. Although we expected to find large differences between adults with dyslexia and adults without dyslexia on several factors, this was not the case.

Our results also helped shed light on the wellbeing of individuals prior to the pandemic. These results indicated that individuals with dyslexia are at a higher risk of experiencing decreased instrumental support and have been experiencing heightened depression symptoms and decreased life satisfaction before the pandemic, in comparison to individuals without dyslexia. Though some individuals with dyslexia may have been reticent about their personal experiences with dyslexia prior to the pandemic due to fears of stigmatization, this survey ultimately revealed the contrast between the emotional states of individuals with and without invisible disabilities. The exploration of factors that can ameliorate and exacerbate the socioemotional health of individuals with dyslexia in Canada is scarce and this paper serves to create more conversation regarding these factors. This research is pivotal as it bridges the gap between social science research and populations with invisible disabilities. These findings have helped us adopt a better understanding of the supports needed for individuals during a health crisis. Lastly, these findings have provided insight for professionals working with individuals who may/may not have an invisible disability regarding potential protective factors against the negative social and emotional consequences of a pandemic.

References

- Arroll, B., Goodyear-Smith, F., Crengle, S., Gunn, J., Kerse, N., Fishman, T., Falloon, K., & Hatcher, S. (2010). Validation of PHQ-2 and PHQ-9 to screen for major depression in the primary care population. *The Annals of Family Medicine*, 8(4), 348-353.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529. <https://doi.org/10.1037/0033-2909.117.3.497>
- British Dyslexia Association [BDA]. (2018). *Dyslexia friendly style guide*. <https://www.bdadyslexia.org.uk/advice/employers/creating-a-dyslexia-friendly-workplace/dyslexia-friendly-style-guide#:~:text=Use%20sans%20serif%20fonts%2C%20such,may%20request%20a%20larger%20font.>
- Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*, 395, 912–920. <https://doi.org/10.2139/ssrn.3532534>
- Brown, G., & Greenfield, P. M. (2021). Staying connected during stay-at-home: Communication with family and friends and its association with well-being. *Human Behavior and Emerging Technologies*, 3(1), 147–156. <https://doi.org/10.1002/hbe2.246>
- Bu, F., Steptoe, A., & Fancourt, D. (2020). Loneliness during a strict lockdown: Trajectories and predictors during the COVID-19 pandemic in 38,217 United Kingdom adults. *Social Science & Medicine*, 265, 113521. <https://doi.org/10.1016/j.socscimed.2020.113521>

- Burden, R. (2008). Is dyslexia necessarily associated with negative feelings of self-worth? A review and implications for future research. *Dyslexia*, 188–196.
<https://doi.org/10.1002/dys.371>
- Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, 287, 112934. <https://doi.org/10.1016/j.psychres.2020.112934>
- Carroll, J. M., & Iles, J. E. (2006). An assessment of anxiety levels in dyslexic students in higher education. *British Journal of Educational Psychology*, 76(3), 651–662.
<https://doi.org/10.1348/000709905x66233>
- Centers for Disease Control and Prevention [CDC]. (2019). *Coronavirus disease 2019 (covid-19)*. <https://www.cdc.gov/coronavirus/2019-ncov/index.html>
- Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, 38(5), 300–314. <https://doi.org/10.1097/00006842-197609000-00003>
- Coughlin, S. S. (1990). Recall bias in epidemiologic studies. *Journal of Clinical Epidemiology*, 43(1), 87-91. [https://doi.org/10.1016/0895-4356\(90\)90060-3](https://doi.org/10.1016/0895-4356(90)90060-3)
- Davis, N. A. (2005). Invisible disability. *Ethics*, 116(1), 153–213.
<https://doi.org/10.1086/453151>
- de Beer, J., Engels, J., Heerkens, Y., & van der Klink, J. (2014). Factors influencing work participation of adults with developmental dyslexia: A systematic review. *BMC Public Health*, 14(1). <https://doi.org/10.1186/1471-2458-14-77>

- Dinas, P. C., Koutedakis, Y., & Flouris, A. D. (2011). Effects of exercise and physical activity on depression. *Irish journal of medical science*, *180*(2), 319-325.
- Doikou-Avlidou, M. (2015). The educational, social, and emotional experiences of students with dyslexia: the perspective of postsecondary education students. *International Journal of Special Education*, *30*(1).
- Eysenbach, G. (2004). Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *Journal of Medical Internet Research*, *6*(3), e132.
- Feeney, B. C., & Collins, N. L. (2015). A new look at social support: A theoretical perspective on thriving through relationships. *Personality and Social Psychology Review*, *19*(2), 113-147.
- Feng, L., Hancock, R., Watson, C., Bogley, R., Miller, Z., Luisa, G. T., Briggs-Gowan, M. J., & Hoeft, F. (2020). Development of an abbreviated Adult Reading History Questionnaire (ARHQ-Brief) using a machine learning approach. *Journal of Learning Disabilities*.
<https://doi.org/10.31234/osf.io/8u5fe>
- Gan, Y., Ma, J., Wu, J., Chen, Y., Zhu, H., & Hall, B. J. (2020). Immediate and delayed psychological effects of province-wide lockdown and personal quarantine during the covid-19 outbreak in China. *Psychological Medicine*, 1–12.
<https://doi.org/10.1177%2F00222194211047631>

- Goldberg, R. J., Higgins, E. L., Raskind, M. H., & Herman, K. L. (2003). Predictors of success in individuals with learning disabilities: A qualitative analysis of a 20-year longitudinal study. *Learning Disabilities Research and Practice, 18*(4), 222–236.
<https://doi.org/10.1111/1540-5826.00077>
- IBM Corp. Released 2021. IBM SPSS Statistics for Macintosh, Version 28.0. Armonk, NY: IBM Corp.
- JASP Team (2021). JASP (Version 0.16). [Mac OS Catalina Version 10.15.2].
- Johns Hopkins Coronavirus Resource Center [JHCRC]. (2022). *Covid-19 map*.
<https://coronavirus.jhu.edu/map.html>.
- Johnson, S. U., Ulvenes, P. G., Øktedalen, T., & Hoffart, A. (2019). Psychometric properties of the general anxiety disorder 7-item (GAD-7) scale in a heterogeneous psychiatric sample. *Frontiers in Psychology, 10*, 1713. <https://doi.org/10.3389/fpsyg.2019.01713>
- Kalka, D., & Lockiewicz, M. (2018). Happiness, Life Satisfaction, resiliency and social support in students with dyslexia. *International Journal of Disability, Development and Education, 65*(5), 493–508. <https://doi.org/10.1080/1034912x.2017.1411582>
- Kelley, K., Clark, B., Brown, V., & Sitzia, J. (2003). Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care, 15*(3), 261-266.
<https://doi.org/10.1093/intqhc/mzg031>
- Kotwal, A. A., Holt-Lunstad, J., Newmark, R. L., Cenzer, I., Smith, A. K., Covinsky, K. E., Escueta, D. P., Lee, J. M., & Perissinotto, C. M. (2020). Social isolation and loneliness

among San Francisco Bay Area older adults during the covid -19 shelter-in-place orders. *Journal of the American Geriatrics Society*, 69(1), 20–29.

<https://doi.org/10.1111/jgs.16865>

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals*, 32(9), 509–515. <https://doi.org/10.3928/0048-5713-20020901-06>

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of general internal medicine*, 16(9), 606-613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>

Kwok, K. O., Li, K. K., Chan, H., Yi, Y. Y., Tang, A., Wei, W. I., & Wong, S. (2020). Community responses during early phase of COVID-19 epidemic, Hong Kong. *Emerging infectious diseases*, 26(7), 1575–1579. <https://doi.org/10.3201/eid2607.200500>

Lake, J. K., Jachyra, P., Volpe, T., Lunskey, Y., Magnacca, C., Marcinkiewicz, A., & Hamdani, Y. (2021). The wellbeing and mental health care experiences of adults with intellectual and developmental disabilities during COVID-19. *Journal of Mental Health Research in Intellectual Disabilities*, 14(3), 285–300. <https://doi.org/10.1080/19315864.2021.1892890>

Lefly, D. L., & Pennington, B. F. (2000). Reliability and validity of the Adult Reading History Questionnaire. *Journal of Learning Disabilities*, 33(3), 286–296. <https://doi.org/10.1177/002221940003300306>

Liu, X., Kakade, M., Fuller, C. J., Fan, B., Fang, Y., Kong, J., Guan, Z., & Wu, P. (2012).

Depression after exposure to stressful events: Lessons learned from the severe acute respiratory syndrome epidemic. *Comprehensive Psychiatry*, *53*(1), 15–23.

<https://doi.org/10.1016/j.comppsy.2011.02.003>

Livingston, E. M., Siegel, L. S., & Ribary, U. (2018). Developmental dyslexia: Emotional impact

and consequences. *Australian Journal of Learning Difficulties*, *23*(2), 107–135.

<https://doi.org/10.1080/19404158.2018.1479975>

Losada-Baltar, A., Jiménez-Gonzalo, L., Gallego-Alberto, L., Pedroso-Chaparro, M. del,

Fernandes-Pires, J., & Márquez-González, M. (2020). “We are staying at home.”

Association of self-perceptions of aging, personal and family resources, and loneliness with psychological distress during the lock-down period of covid-19. *The Journals of Gerontology: Series B*, *76*(2). <https://doi.org/10.1093/geronb/gbaa048>

Luo, M., Guo, L., Yu, M., Jiang, W., & Wang, H. (2020). The psychological and mental impact

of coronavirus disease 2019 (COVID-19) on medical staff and general public – A systematic review and meta-analysis. *Psychiatry Research*, *291*, 113190.

<https://doi.org/10.1016/j.psychres.2020.113190>

McNulty, M. A. (2003). Dyslexia and the life course. *Journal of Learning Disabilities*, *36*(4),

363–381. <https://doi.org/10.1177/00222194030360040701>

Miller, M. (2002). Resilience elements in students with learning disabilities. *Journal of Clinical*

Psychology, *58*(3), 291–298. <https://doi.org/10.1002/jclp.10018>

Moore, S. E., Wierenga, K. L., Prince, D. M., Gillani, B., & Mintz, L. J. (2021).

Disproportionate impact of the COVID-19 pandemic on perceived social support, mental health and somatic symptoms in sexual and gender minority populations. *Journal of Homosexuality*, 68(4), 577–591. <https://doi.org/10.1080/00918369.2020.1868184>

Moreno, E., Muñoz-Navarro, R., Medrano, L. A., González-Blanch, C., Ruiz-Rodríguez, P.,

Limonero, J. T., Moretti, L. S., Cano-Vindel, A., & Moriana, J. A. (2019). Factorial invariance of a computerized version of the GAD-7 across various demographic groups and over time in primary care patients. *Journal of Affective Disorders*, 252, 114–121. <https://doi.org/10.1016/j.jad.2019.04.032>

Mullins, L., & Preyde, M. (2013). The lived experience of students with an invisible disability at a Canadian University. *Disability & Society*, 28(2), 147–160.

<https://doi.org/10.1080/09687599.2012.752127>

Nalavany, B. A., Carawan, L. W., & Rennick, R. A. (2010). Psychosocial experiences associated with confirmed and self-identified dyslexia: A participant-driven concept map of adult perspectives. *Journal of Learning Disabilities*, 44(1), 63–79.

<https://doi.org/10.1177/0022219410374237>

Nalavany, B. A., Carawan, L. W., & Sauber, S. (2013). Adults with dyslexia, an invisible disability: The mediational role of concealment on perceived family support and self-esteem. *British Journal of Social Work*, 45(2), 568–586.

<https://doi.org/10.1093/bjsw/bct152>

- Nalavany, B. A., Logan, J. M., & Carawan, L. W. (2017). The relationship between emotional experience with dyslexia and work self-efficacy among adults with dyslexia. *Dyslexia*, *24*(1), 17–32. <https://doi.org/10.1002/dys.1575>
- Ogueji, I. A., Okoloba, M. M., & Demoko Ceccaldi, B. M. D. (2021). Coping strategies of individuals in the United Kingdom during the COVID-19 pandemic. *Current Psychology*. <https://doi.org/10.1007/s12144-020-01318-7>
- Plummer, F., Manea, L., Trepel, D., & McMillan, D. (2016). Screening for anxiety disorders with the GAD-7 and GAD-2: a systematic review and diagnostic metaanalysis. *General hospital psychiatry*, *39*, 24-31. <https://doi.org/10.1016/j.genhosppsy.2015.11.005>
- Salsman, J. M., Butt, Z., Pilkonis, P. A., Cyranowski, J. M., Zill, N., Hendrie, H. C., Kupst, M. J., Kelly, M. A. R., Bode, R. K., Choi, S. W., Lai, J., Griffith, J. W., Stoney, C. M., Brouwers, P., Knox, S. S., & Cella, D. (2013). Emotion assessment using the NIH toolbox. *Neurology*, *80*(11 Supplement 3), S76-S86. <https://doi.org/10.1212/WNL.0b013e3182872e11>
- Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of internal medicine*, *166*(10), 1092-1097. <https://doi.org/10.1001/archinte.166.10.1092>
- Spitzer, R. L., Kroenke, K., Williams, J. B., Patient Health Questionnaire Primary Care Study Group, & Patient Health Questionnaire Primary Care Study Group. (1999). Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. *Jama*, *282*(18), 1737-1744. <https://doi.org/doi:10.1001/jama.282.18.1737>

Terras, M. M., Thompson, L. C., & Minnis, H. (2009). Dyslexia and psycho-social functioning: An exploratory study of the role of self-esteem and understanding. *Dyslexia, 15*(4), 304–327. <https://doi.org/10.1002/dys.386>

The Scottish Commission for People with Learning Disabilities [SCLD]. (2020). *The impact of coronavirus on people with learning* <https://www.sclld.org.uk/wp-content/uploads/2020/06/SCLD-Coronavirus-Report-Easy-read-Designed-FINAL.pdf>.

Tifferet, S. (2020). Gender differences in social support on social network sites: A meta-analysis. *Cyberpsychology, Behavior, and Social Networking, 23*(4), 199–209. <https://doi.org/10.1089/cyber.2019.0516>

Wilson, A. M., Deri Armstrong, C., Furrie, A., & Walcot, E. (2009). The mental health of Canadians with self-reported learning disabilities. *Journal of Learning Disabilities, 42*(1), 24–40. <https://doi.org/10.1177/002221940832621>

World Health Organization [WHO]. (2001). *International classification of functioning, disability and health: ICF*. <https://apps.who.int/iris/handle/10665/42407>

Appendix A

Survey

Section 1: Socio-Demographic Information, History and Reading Screening

1. How old are you (in years)?
2. What is your sex?
 1. Male
 2. Female
 3. Prefer not to say
3. What is your gender?
 1. Agender
 2. Female (including transgender women)
 3. Gender-fluid
 4. Male (including transgender men)
 5. Non-binary
 6. Prefer not to say
4. What is your ethnicity?
 1. African
 2. East Asian
 3. European
 4. Hispanic/Latin-American
 5. Indigenous: First Nations, Métis, Inuit, Other (specify)
 6. Middle Eastern
 7. South Asian
 8. Other...
5. What is your marital status?
 1. Single, never married
 2. Married or domestic partner
 3. Widowed
 4. Divorced
 5. Separated
6. What is your native language?
7. What language(s) do you speak fluently?
8. If you live in Canada or the US, state the province/state that you live in.
9. If you live outside of Canada or the US, state the country that you live in.
10. What is your place of residence?
 1. City
 2. Rural
11. Do you live alone or with others?
 1. Alone
 2. With others
12. If you live with others, please specify how many others and your relationship to them (e.g., 3 children, 1 roommate, 1 partner, 2 siblings).
13. Do you have dependents or children in the home?
 1. Yes

2. No
14. What is your highest level of education?
 1. Doctorate (e.g., Ph.D.)
 2. Master's degree (e.g., M.A., M.Sc., M.Ed.)
 3. Degree in medicine, dentistry, veterinary medicine, optometry, or law (e.g., M.D., D.D.S., D.M.D., D.V.M., O.D., J.D.)
 4. Bachelor's degree (e.g., B.A., B.Sc., B.Ed.)
 5. Some university studies
 6. Diploma or certificate from college
 7. Diploma or certificate from trade, technical, business or vocational school
 8. Some college or trade, technical, business
 9. Some high school
 10. High school diploma
15. What is your employment status?
 1. Full time
 2. Part time
 3. Student
 4. Retired
 5. Unemployed
16. What is your household income?
 1. Less than \$49,020 CAD
 2. \$49,021 to \$98,040 CAD
 3. \$98,041 to \$151,978 CAD
 4. \$151,979 to \$216,511 CAD
 5. More than \$216,512
17. Please check all of the following conditions that you have been diagnosed with in the last year.
 1. Allergies
 2. Asthma
 3. Chicken pox
 4. COVID-19/ Coronavirus
 5. Headaches
 6. Hearing impairment
 7. Influenza
 8. Measles
 9. Pneumonia
 10. Sinus infections
 11. Tonsillitis
 12. Visual impairment
 13. Other...
18. Please describe any other daily physical health burden(s) that you have not received a formal diagnosis for within the last year, and how they impact your daily life.
19. Please check all of the mental health conditions that you have been diagnosed with in the last year.
 1. Depression (including chronic)

2. Personality disorders (e.g., Bipolar, Paranoid, Schizoid, Schizotypal, Antisocial, etc.)
 3. Post-traumatic stress disorder (PTSD)
 4. Attention deficit hyperactivity disorder (ADHD)
 5. Anxiety disorder
 6. Obsessive-compulsive disorder (OCD)
 7. Other...
20. Please describe any other daily mental health burden(s) that you have not received a formal diagnosis for within the last year and how they impact your daily life.
21. Do you identify as having a reading impairment?
1. Yes
 2. No
22. How much difficulty did you have learning to read in elementary school?
1. 0 - None
 2. 1
 3. 2
 4. 3
 5. 4 - A great deal
23. Did you ever reverse the order of letters or numbers when you were a child?
1. 0 - No
 2. 1
 3. 2
 4. 3
 5. 4 - A great deal
24. Did you have difficulty learning letter and/or color names when you were a child?
1. 0 - No
 2. 1
 3. 2
 4. 3
 5. 4 - A great deal
25. All students struggle from time to time in school. Compared to others in your classes, how much did you struggle to complete your work?
1. 0 - Not at all
 2. 1 - Less than most
 3. 2 - About the same
 4. 3 - More than most
 5. 4 - Much more than most
26. Did you experience difficulty in high school or college English classes?
1. 0 - No
 2. 1 - Enjoyed and did well
 3. 2 - Some
 4. 3 - A great deal
 5. 4 - Did poorly
27. How would you compare your current spelling to that of others of the same age and education?
1. 0 - Above Average

2. 1
 3. 2
 4. 3
 5. 4 - Below Average
28. Do you find learning new words hard?
1. 0 - Very Easy
 2. 1- Easy
 3. 2- Neutral
 4. 3- Difficult
 5. 4- Very difficult
29. Do you find reading new words hard?
1. 0 - Very Easy
 2. 1- Easy
 3. 2- Neutral
 4. 3- Difficult
 5. 4- Very difficult
30. How would you rate the number of words you know/use?
1. 0- Poor
 2. 1- Fair
 3. 2- Good
 4. 3- Very good
 5. 4- Excellent

Section 2: Perceptions of the COVID-19 Pandemic

1. In general, how worried, if at all, are you about the current coronavirus outbreak (i.e., COVID-19)?
 1. Very worried
 2. Fairly worried
 3. Neutral
 4. Not very worried
 5. Not worried at all
 6. Don't know
2. How likely or unlikely do you think it is you will be infected with the coronavirus at any point in the future?
 1. Very likely
 2. Fairly likely
 3. Neither likely or unlikely
 4. Fairly unlikely
 5. Very unlikely
3. Please imagine you were infected with coronavirus, which of the following do you think best apply?
 1. I would expect it to be life-threatening
 2. I would expect it to be severe (e.g. may need care and treatment in hospital)
 3. I would expect it to be moderate (e.g. may need self-care and rest in bed)
 4. I would expect it to be mild (e.g. can go about daily tasks normally)
 5. I would expect to have no symptoms

6. Don't know

Section 3: Social and Emotional Measures before the COVID-19 Pandemic

These questions are about the time period BEFORE the COVID-19 pandemic...

1. How many close friends did you have?
 1. No friends
 2. 1-2 friends
 3. Greater than or equal to 3 friends
2. How many days out of the week did you have face-to-face contact with friends (in-person)?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
3. How many days out of the week did you have face-to-face contact with family (in-person)?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
4. BEFORE the COVID-19 pandemic, how many days out of the week did you video call a friend?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
5. How many days out of the week did you video call a family member?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
6. How many days out of the week did you voice call a friend?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
7. How many days out of the week did you voice call a family member?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
8. In the 2 week period BEFORE the COVID-19 pandemic, how often were you bothered by the following... (0=not at all, 1=several days during the two weeks, 2=more than half the days during the two weeks, 3=nearly every day during the two weeks)
 1. Feeling nervous, anxious, or on edge?
 2. Not being able to stop or control worrying?
 3. Worrying too much about different things?
 4. Trouble relaxing?
 5. Being so restless that it was hard to sit still?
 6. Becoming easily annoyed or irritable?
 7. Feeling afraid, as if something awful might happen?

9. If you checked any problems in the 2 week period BEFORE the COVID-19 pandemic, how difficult did those problems make it for you to do your work, take care of things at home, or get along with other people in those two weeks?
1. Not difficult at all
 2. Somewhat difficult
 3. Very difficult
 4. Extremely difficult
10. In the 2 week period BEFORE the COVID-19 pandemic, how often were you bothered by the following: (0=not at all, 1=several days during the two weeks, 2=more than half the days during the two weeks, 3=nearly every day during the two weeks)
1. Little interest or pleasure in doing things?
 2. Feeling down, depressed, or hopeless?
 3. Trouble falling or staying asleep, or sleeping too much?
 4. Feeling tired or having little energy?
 5. Poor appetite or overeating?
 6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down?
 7. Trouble concentrating on things, such as reading the newspaper or watching television?
 8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual?
 9. Thoughts that you would be better off dead or of hurting yourself in some way?
11. If you checked any problems BEFORE the COVID-19 pandemic, how difficult did those problems make it for you to do your work, take care of things at home, or get along with other people in those 2 weeks?
1. Not difficult at all
 2. Somewhat difficult
 3. Very difficult
 4. Extremely difficult
12. Indicate how much you agree or disagree (1=strongly disagree, 2= disagree, 3= slightly disagree, 4=neither agree nor disagree, 5=slightly agree, 6=agree, 7=strongly agree)
1. Indicate how much you agree or disagree: BEFORE the COVID-19 pandemic...
 - a. In most ways, my life was close to perfect.
 - b. If I could have lived my life over, I would have changed almost nothing.
 - c. I was satisfied with my life.
 - d. I got the important things I wanted in life.
 - e. My life situation was excellent.
 13. Indicate how much you agree or disagree: (1=strongly disagree, 2= disagree, 3= neither agree nor disagree, 4= agree, 5=strongly agree)
 1. Indicate how much you agree or disagree: BEFORE the COVID-19 pandemic...
 - a. My life was going well.
 - b. My life was just right.
 - c. I wished I had a different kind of life.
 - d. I had a good life.
 - e. I had what I wanted in life.

14. Please respond to each question or statement by choosing one number for each question. In the one month-period before the COVID-19 pandemic... (1=never, 2=almost never, 3=sometimes, 4=fairly often, 5=very often).
1. In the one-month period BEFORE the COVID-19 pandemic..
 - a. How often were you upset because of something that happened unexpectedly?
 - b. How often did you feel that you were unable to control the important things in your life?
 - c. How often did you feel nervous and “stressed”?
 - d. How often did you feel confident about your ability to handle your personal problems?
 - e. How often did you feel that things were going your way?
 - f. How often did you find that you could not cope with all the things that you had to do?
 - g. How often were you able to control irritations in your life?
 - h. How often did you feel that you were on top of things?
 - i. How often were you angered because of things that happened that were outside of your control?
 - j. How often did you feel difficulties were piling up so high that you could not overcome them?
15. Please respond to each question or statement by choosing one number for each question. In the one-month period before the COVID-19 pandemic, please describe how often... (1=never, 2=rarely, 3=sometimes, 4=usually, 5=always).
1. In the one-month period BEFORE the COVID-19 pandemic please describe how often...
 - a. You had someone who understood your problems.
 - b. You had someone who would listen to you when you needed to talk.
 - c. You felt there were people you could talk to if you were upset.
 - d. You had someone to talk with when you had a bad day.
 - e. You had someone you trusted to talk with about your problems.
 - f. You had someone you trusted to talk with about your feelings.
 - g. You could get helpful advice from others when dealing with a problem.
 - h. You had someone to turn to for suggestions about how to deal with a problem.
16. Please respond to each question or statement by choosing one number for each question. In the one-month period before the COVID-19 pandemic, please describe how often... (1=never, 2=rarely, 3=sometimes, 4=usually, 5=always).
1. In the one-month period BEFORE the COVID-19 pandemic please describe how often...
 - a. Someone was around to make your meals if you were unable to do it yourself.
 - b. You had someone to take me shopping if you needed it.
 - c. You had someone to help you if you were sick in bed.
 - d. You had someone to pick up medicine for you if you needed it.
 - e. You had someone to take you to the doctor if you needed it.
 - f. There was someone around to help you if you needed it.
 - g. You could find someone to drive you places if you needed it.
 - h. You could get help cleaning up around your home if you needed it.

17. Please respond to each question or statement by choosing one number for each question. In the one-month period before the COVID-19 pandemic, please describe how often... (1=never, 2=rarely, 3=sometimes, 4=usually, 5=always).
1. In the one-month period BEFORE the COVID-19 pandemic, please describe how often...
 - a. You felt alone and apart from others.
 - b. You felt left out.
 - c. You felt that you were no longer close to anyone.
 - d. You felt alone.
 - e. You felt lonely.

Section 4: Social and Emotional Measures during the COVID-19 Pandemic

These questions are about the time period DURING the COVID-19 pandemic...

1. How many close friends do you have?
 1. No friends
 2. 1-2 friends
 3. Greater than or equal to 3 friends
2. How many days out of the week did you have face-to-face contact with friends (in-person)?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
3. How many days out of the week did you have face-to-face contact with family (in-person)?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
4. How many days out of the week do you video call a friend?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
5. How many days out of the week do you video call a family member?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
6. How many days out of the week do you voice call a friend?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
7. How many many days out of the week do you voice call a family member?
 1. Not at all
 2. Some days (1-2 days per week)
 3. Often (3+ days per week)
8. DURING the COVID-19 pandemic, in any 2 week period, how often have you been bothered by the following: (0=not at all, 1=several days during the two weeks, 2=more than half the days during the two weeks, 3=nearly every day during the two weeks).
 1. Feeling nervous, anxious, or on edge?

2. Not being able to stop or control worrying?
 3. Worrying too much about different things?
 4. Trouble relaxing?
 5. Being so restless that it is hard to sit still?
 6. Becoming easily annoyed or irritable?
 7. Feeling afraid, as if something awful might happen?
9. If you checked any problems DURING any 2 week period in the COVID-19 pandemic, how difficult did those problems make it for you to do your work, take care of things at home, or get along with other people in those 2 weeks?
1. Not difficult at all
 2. Somewhat difficult
 3. Very difficult
 4. Extremely difficult
10. DURING the COVID-19 pandemic, in any 2 week period, how often have you been bothered by the following: (0=not at all, 1=several days during the two weeks, 2=more than half the days during the two weeks, 3=nearly every day during the two weeks).
1. Little interest or pleasure in doing things?
 2. Feeling down, depressed, or hopeless?
 3. Trouble falling or staying asleep, or sleeping too much?
 4. Feeling tired or having little energy?
 5. Poor appetite or overeating?
 6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down?
 7. Trouble concentrating on things, such as reading the newspaper or watching television?
 8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual?
 9. Thoughts that you would be better off dead or of hurting yourself in some way?
11. If you checked any problems DURING any 2 week period in the COVID-19 pandemic, how difficult did those problems make it for you to do your work, take care of things at home, or get along with other people in those 2 weeks?
1. Not difficult at all
 2. Somewhat difficult
 3. Very difficult
 4. Extremely difficult
12. Indicate how much you agree or disagree: DURING the COVID-19 pandemic...(1=strongly disagree, 2= disagree, 3= slightly disagree, 4=neither agree nor disagree, 5=slightly agree, 6=agree, 7=strongly agree).
1. Indicate how much you agree or disagree: DURING the COVID-19 pandemic...
 - a. In most ways, my life is close to perfect.
 - b. If I could live my life over, I would change almost nothing.
 - c. I am satisfied with my life.
 - d. I have gotten the important things I want in life.
 - e. My life situation is excellent.

13. Indicate how much you agree or disagree: DURING the COVID-19 pandemic...(1=strongly disagree, 2= disagree, 3= neither agree nor disagree, 4= agree, 5=slightly agree).
1. Indicate how much you agree or disagree: DURING the COVID-19 pandemic...
 - a. My life is going well.
 - b. My life is just right.
 - c. I wish I have a different kind of life.
 - d. I have a good life.
 - e. I have what I want in life.
14. Please respond to each question or statement by choosing one number for each question. In a one-month period DURING the COVID-19 pandemic... (1=never, 2=almost never, 3=sometimes, 4=fairly often, 5=very often).
1. In a one-month period DURING the COVID-19 pandemic...
 - a. How often have you been upset because of something that happened unexpectedly?
 - b. How often have you felt that you were unable to control the important things in your life?
 - c. How often have you felt nervous and “stressed”?
 - d. How often have you felt confident about your ability to handle your personal problems?
 - e. How often have you felt that things were going your way?
 - f. How often have you found that you could not cope with all the things that you had to do?
 - g. How often have you been able to control irritations in your life?
 - h. How often have you felt that you were on top of things?
 - i. How often have you been angered because of things that happened that were outside of your control?
 - j. How often have you felt difficulties were piling up so high that you could not overcome them?
15. Please respond to each question or statement by choosing one number for each question. In a one-month period DURING the COVID-19 pandemic, please describe how often... (1=never, 2=rarely, 3=sometimes, 4=usually, 5=always).
1. In a one-month period DURING the COVID-19 pandemic, please describe how often..
 - a. You had someone who understood your problems.
 - b. You had someone who would listen to you when you needed to talk.
 - c. You felt there were people you could talk to if you were upset.
 - d. You had someone to talk with when you had a bad day.
 - e. You had someone you trusted to talk with about your problems.
 - f. You had someone you trusted to talk with about your feelings.
 - g. You could get helpful advice from others when dealing with a problem.
 - h. You had someone to turn to for suggestions about how to deal with a problem.
16. Please respond to each question or statement by choosing one number for each question. In a one-month period DURING the COVID-19 pandemic please describe how often... (1=never, 2=rarely, 3=sometimes, 4=usually, 5=always).
1. In a one-month period DURING the COVID-19 pandemic please describe how often...
 - a. Someone was around to make your meals if you were unable to do it yourself.
 - b. You had someone to take me shopping if you needed it.
 - c. You had someone to help you if you were sick in bed.
 - d. You had someone to pick up medicine for you if you needed it .

- e. You had someone to take you to the doctor if you needed it.
 - f. There was someone around to help you if you needed it.
 - g. You could find someone to drive you places if you needed it.
 - h. You could get help cleaning up around your home if you needed it.
17. Please respond to each question or statement by choosing one number for each question. In a one-month period DURING the COVID-19 pandemic, please describe how often... (1=never, 2=rarely, 3=sometimes, 4=usually, 5=always)
- 1. In a one-month period DURING the COVID-19 pandemic, please describe how often...
 - a. You felt alone and apart from others
 - b. You felt left out
 - c. You felt that you were no longer close to anyone
 - d. You felt alone
 - e. You felt lonely

Appendix B

Social Participation With Family/Friends During COVID-19

Figure B1: Social Participation with Friends and Life Satisfaction Part A During COVID-19 (Dyslexia Group)

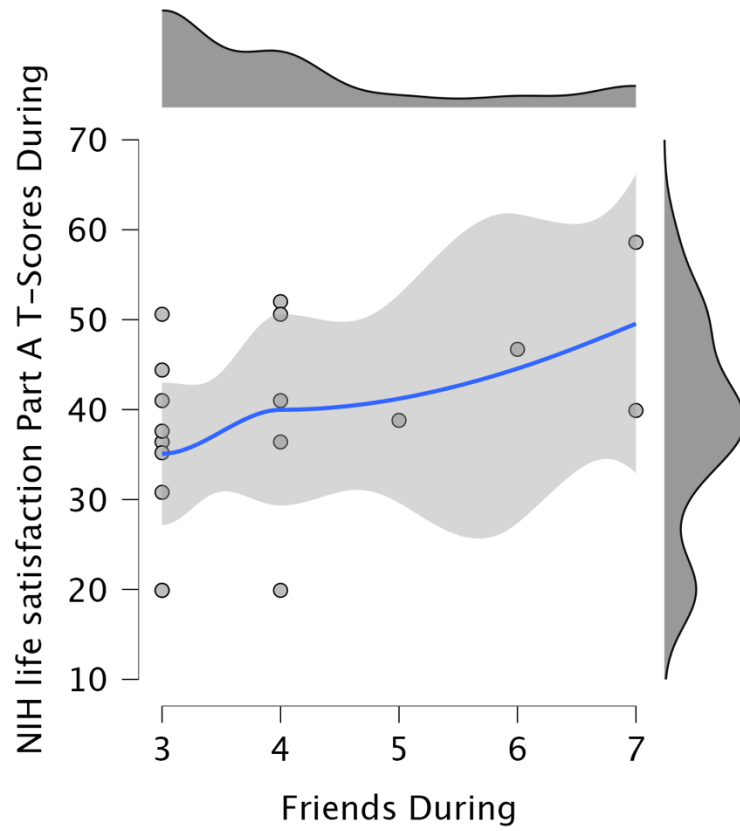


Figure B2: Social Participation With Friends and Life Satisfaction Part B During COVID-19 (Dyslexia Group)

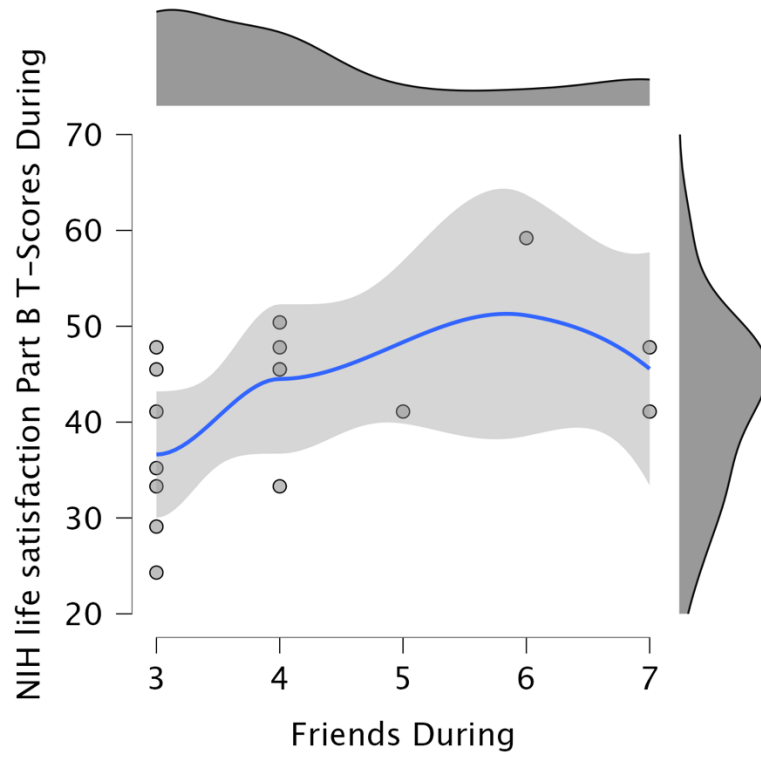


Figure B3: Social Participation with Family and Life Satisfaction Part A During COVID-19 (Dyslexia Group)

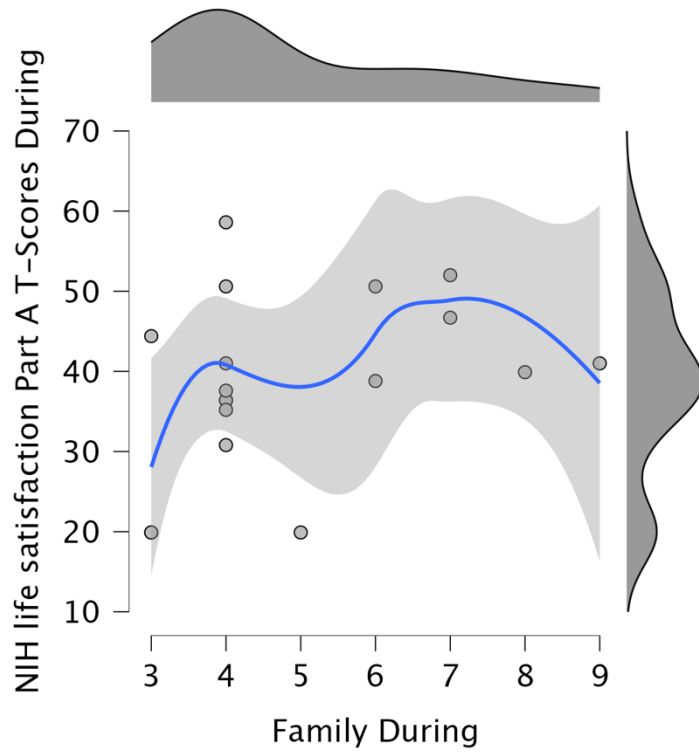


Figure B4: Social Participation with Family and Life Satisfaction Part B During COVID-19 (Dyslexia Group)

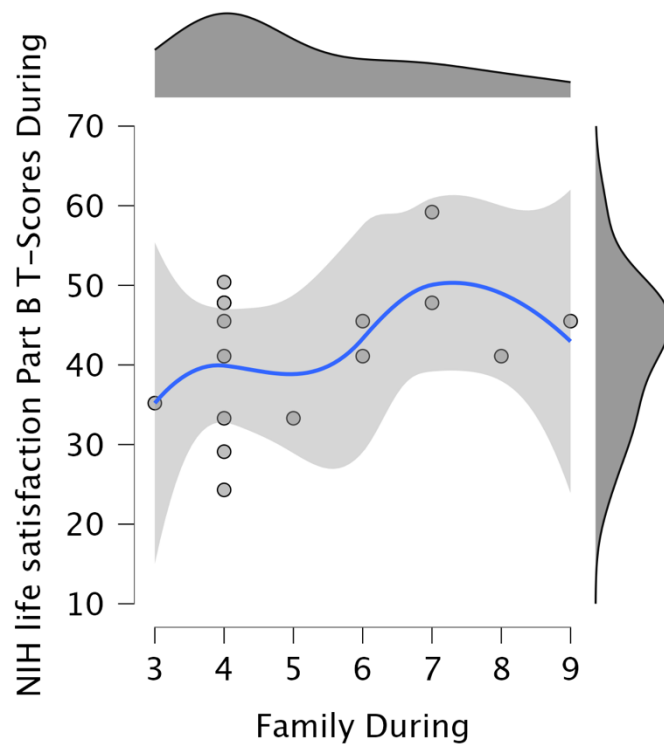


Figure B5: Social Participation with Friends and Life Satisfaction Part A During COVID-19 (Non-Dyslexia Group)

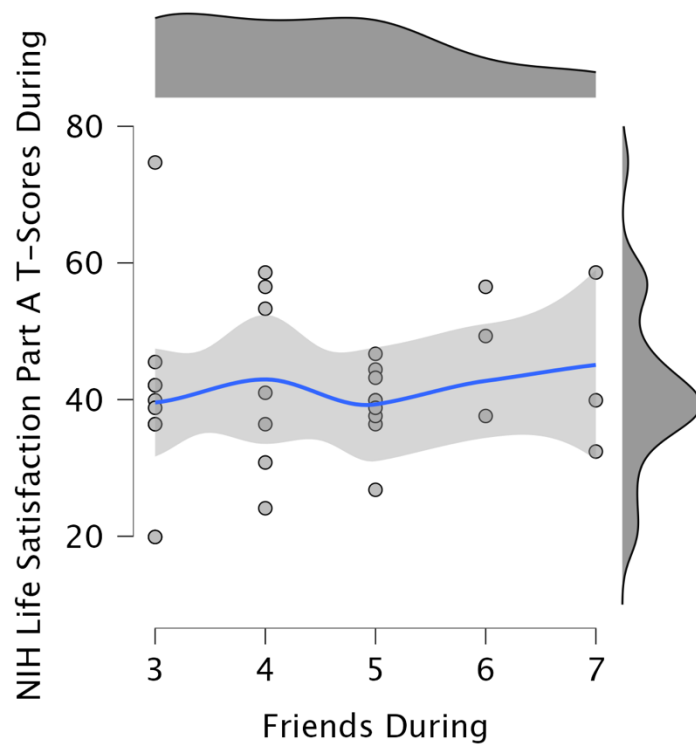


Figure B6: Social Participation with Friends and Life Satisfaction Part B During COVID-19 (Non-Dyslexia Group)

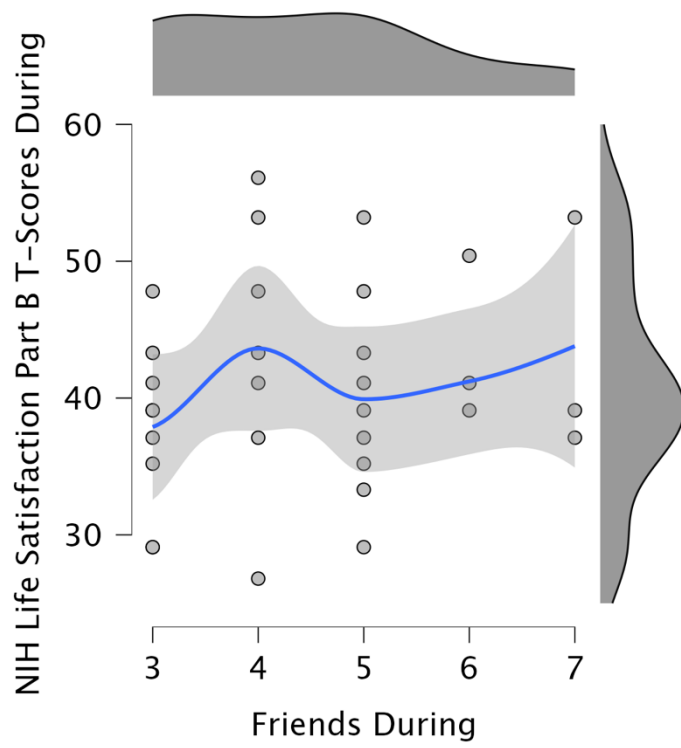


Figure B7: Social Participation with Family and Life Satisfaction Part A During COVID-19 (Non-Dyslexia Group)

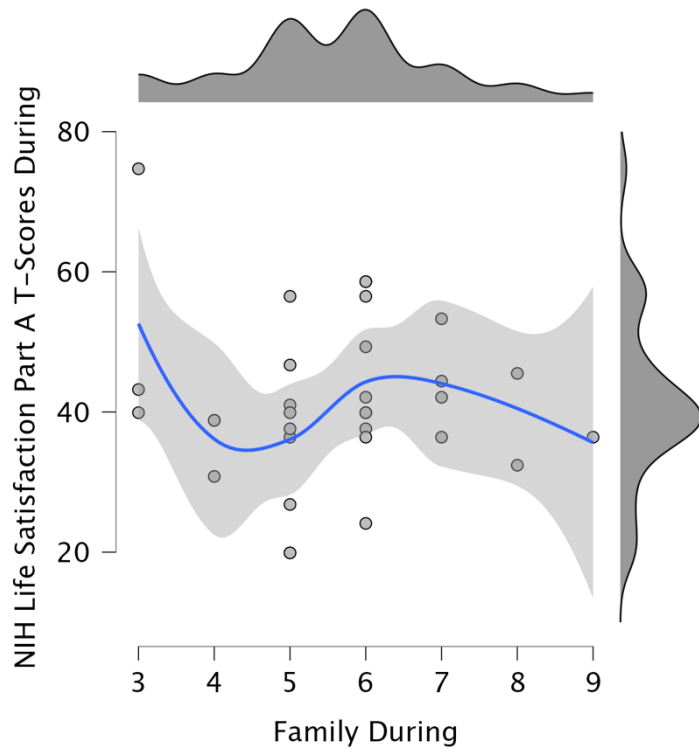
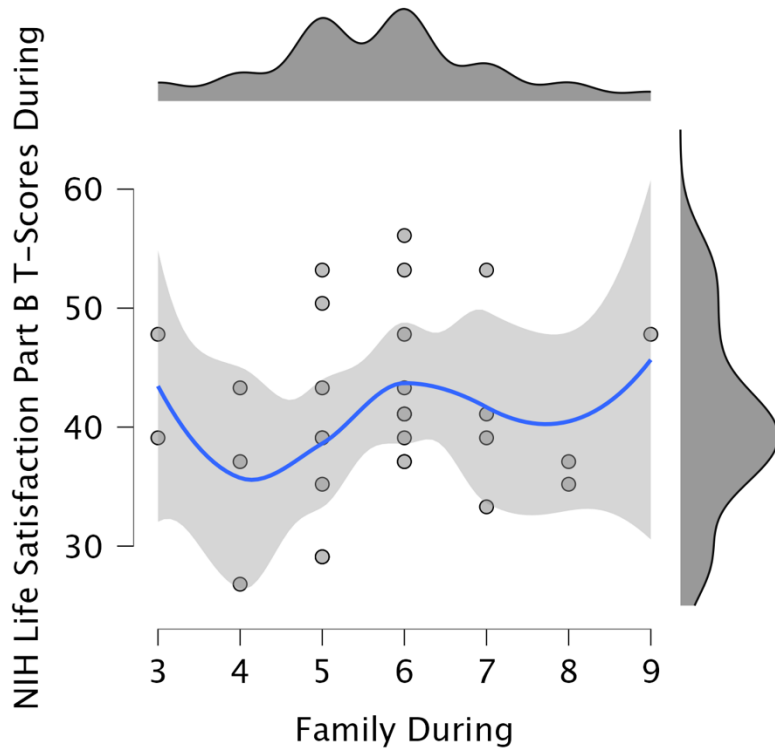


Figure B8: Social Participation with Family and Life Satisfaction Part B During COVID-19 (Non-Dyslexia Group)



Appendix C

Correlation Matrices for Survey Sections

Table C1: Perceptions of the Pandemic

Spearman's Correlations

| Variable | | Worry | Susceptibility | Severity |
|-------------------|----------------|-------|----------------|----------|
| 1. Worry | Spearman's rho | — | | |
| | p-value | — | | |
| 2. Susceptibility | Spearman's rho | 0.358 | — | |
| | p-value | 0.009 | — | |
| 3. Severity | Spearman's rho | 0.067 | 0.183 | — |
| | p-value | 0.639 | 0.194 | — |

*p < .05, ** p < .01, *** p < .001

Table C2: Social & Emotion Correlations (Before Pandemic)**Spearman's Correlations**

| Variable | | Social Participation | GAD-7 | PHQ-9 | Life Sat. Part A | Life Sat. Part B | Perceive Stress | Emotional support | Instrumental support |
|-------------------------|----------------|----------------------|------------|------------|------------------|------------------|-----------------|-------------------|----------------------|
| 1. Social Participation | Spearman's rho | — | | | | | | | |
| | p-value | — | | | | | | | |
| 2. GAD-7 | Spearman's rho | -0.138 | — | | | | | | |
| | p-value | 0.340 | — | | | | | | |
| 3. PHQ-9 | Spearman's rho | -0.164 | 0.636 *** | — | | | | | |
| | p-value | 0.255 | < .001 | — | | | | | |
| 4. Life Sat. Part A | Spearman's rho | 0.150 | -0.407 ** | -0.566 *** | — | | | | |
| | p-value | 0.297 | 0.003 | < .001 | — | | | | |
| 5. Life Sat. Part B | Spearman's rho | 0.078 | -0.455 *** | -0.439 ** | 0.561 *** | — | | | |
| | p-value | 0.592 | < .001 | 0.001 | < .001 | — | | | |
| 6. Perceived Stress | Spearman's rho | -0.086 | 0.304 * | 0.492 *** | -0.207 | 0.093 | — | | |
| | p-value | 0.552 | 0.032 | < .001 | 0.149 | 0.519 | — | | |
| 7. Emotional Support | Spearman's rho | 0.164 | -0.113 | -0.312 * | 0.456 *** | 0.417 ** | 0.043 | — | |
| | p-value | 0.254 | 0.435 | 0.028 | < .001 | 0.003 | 0.768 | — | |
| 8. Instrumental Support | Spearman's rho | 0.032 | 0.009 | -0.039 | 0.321 * | 0.200 | 0.092 | 0.285 * | — |
| | p-value | 0.827 | 0.949 | 0.786 | 0.023 | 0.164 | 0.524 | 0.045 | — |
| 9. Loneliness | Spearman's rho | -0.358 * | 0.332 * | 0.548 *** | -0.451 ** | -0.390 ** | 0.229 | -0.497 *** | -0.104 |
| | p-value | 0.011 | 0.019 | < .001 | 0.001 | 0.005 | 0.109 | < .001 | 0.473 |

*p < .05, ** p < .01, *** p < .001

Table C3: Social & Emotion Correlations (During Pandemic)**Spearman's Correlations**

| Variable | | Social Participation | GAD-7 | PHQ-9 | Life Sat. Part A | Life Sat. Part B | Perceived Stress | Emotional Support | Instrumental Support |
|-------------------------|----------------|----------------------|-----------|------------|------------------|------------------|------------------|-------------------|----------------------|
| 1. Social Participation | Spearman's rho | — | | | | | | | |
| | p-value | — | | | | | | | |
| 2. GAD-7 | Spearman's rho | -0.011 | — | | | | | | |
| | p-value | 0.942 | — | | | | | | |
| 3. PHQ-9 | Spearman's rho | -0.027 | 0.770 *** | — | | | | | |
| | p-value | 0.856 | < .001 | — | | | | | |
| 4. Life Sat. Part A | Spearman's rho | 0.319 * | 0.411 ** | -0.414 ** | — | | | | |
| | p-value | 0.026 | 0.003 | 0.003 | — | | | | |
| 5. Life Sat. Part B | Spearman's rho | 0.304 * | 0.459 ** | -0.470 *** | 0.731 *** | — | | | |
| | p-value | 0.040 | 0.001 | < .001 | < .001 | — | | | |
| 6. Perceived Stress | Spearman's rho | 0.134 | 0.690 *** | 0.516 *** | -0.116 | -0.199 | — | | |
| | p-value | 0.362 | < .001 | < .001 | 0.426 | 0.185 | — | | |
| 7. Emotional Support | Spearman's rho | 0.501 *** | 0.103 | 0.032 | 0.302 * | 0.381 ** | 0.255 | — | |
| | p-value | < .001 | 0.484 | 0.825 | 0.035 | 0.009 | 0.077 | — | |
| 8. Instrumental Support | Spearman's rho | 0.466 *** | 0.010 | -0.116 | 0.290 * | 0.237 | 0.310 * | 0.469 *** | — |
| | p-value | < .001 | 0.945 | 0.434 | 0.046 | 0.117 | 0.032 | < .001 | — |
| 9. Loneliness | Spearman's rho | -0.093 | 0.369 ** | 0.589 *** | -0.303 * | -0.546 *** | 0.366 * | -0.267 | -0.120 |
| | p-value | 0.533 | 0.010 | < .001 | 0.036 | < .001 | 0.010 | 0.067 | 0.418 |

*p < .05, ** p < .01, *** p < .001